

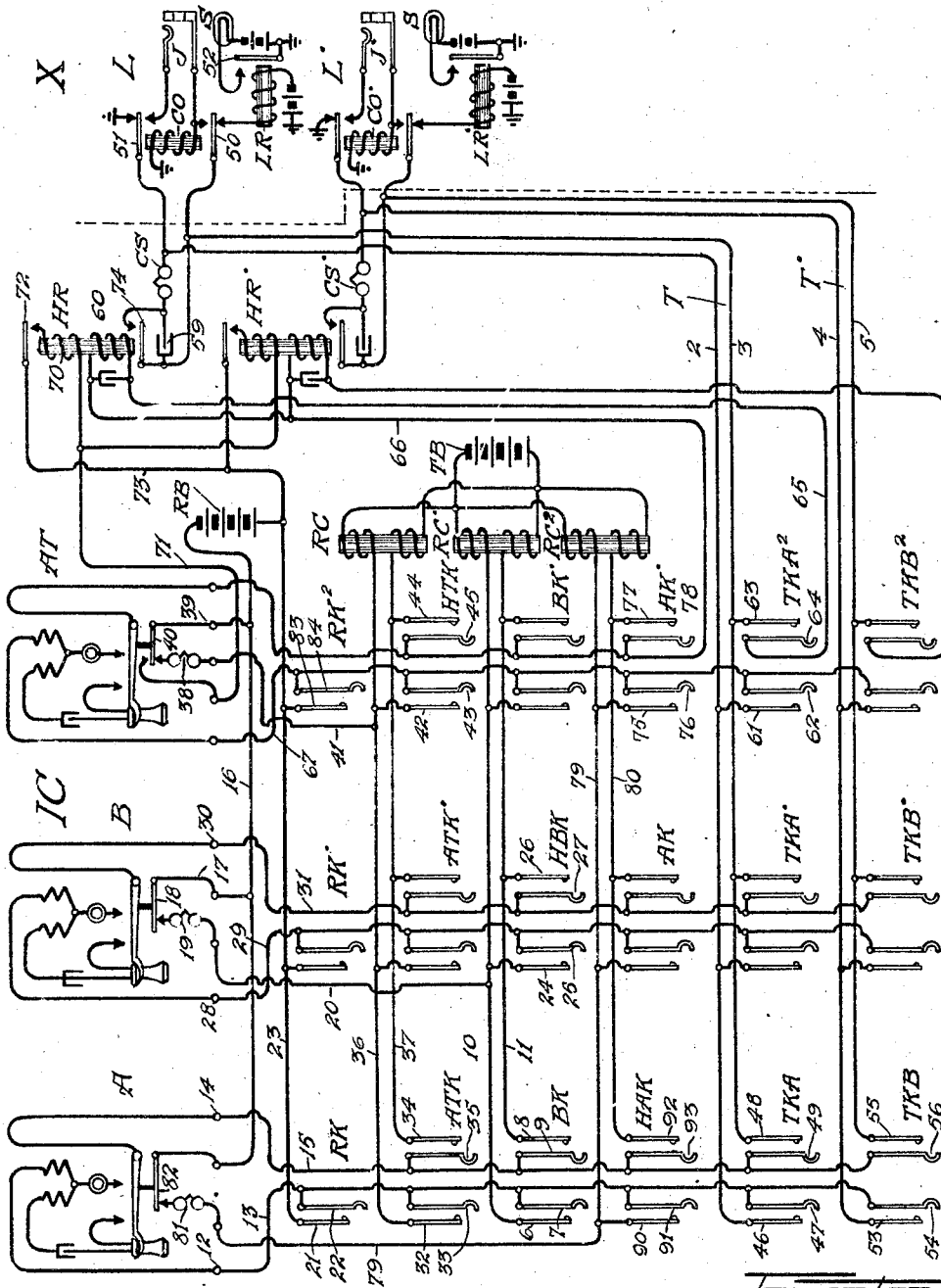
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D. B. ROBISON

TELEPHONE SYSTEM

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

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My invention relates to telephone systems and has to do more particularly to telephone systems of the intercommunicating type in which each telephone station is provided with lines leading to each of the other stations, suitable switching arrangements being also provided whereby any station of the system may be connected to the line leading to another station or to one or more trunks common to all of the stations and leading to a distant central office or main exchange.

In systems of this general character the attendant at the station that receives the incoming calls from the main exchange in addition to the usual key equipment is provided with additional key means for holding the connection between the main exchange and the party at the station of the intercommunicating system and this additional key means also controls the supervisory apparatus at the main exchange so that upon the termination of conversation the key means is actuated to operate the supervisory apparatus to give the operator at the main exchange a disconnect signal. This additional key means at the attendant's station further complicates a system of this character and to overcome this objectional feature I eliminate these additional keys associated with the attendant's station and provide the station with the key equipment similar to the other stations and in place of which I provide relay means for accomplishing the same result which is entirely automatic.

A feature of my invention is the provision of a holding relay for each incoming trunk, the said relay of a trunk being operated when the attendant removes his receiver in response to a call from the main exchange to control the supervisory apparatus thereat. This holding relay remains energized during the time that the attendant is extending the connection to the called party and upon completion of the connection the act of replacing the receiver at the attendant station, the relay is de-energized and cut out of the circuit thus placing the control of the supervisory apparatus of the main exchange under the sole control of the called party.

Another feature of my invention is the provision of a signal for apprising the attendant that a call from a main exchange is awaiting his attention, and this signal in

addition to serving as a call signal also serves as a holding coil to hold the control of the supervisory apparatus at the main exchange under the control of the intercommunicating branch during the time that the attendant is extending the connection to the called party.

For a more complete understanding of my invention reference may be had to the accompanying drawing and referring now in general to my invention as illustrated in the accompanying drawing I show for the purpose of illustration three stations associated with the intercommunicating system of my invention. Stations A, B and AT are of a well known type comprising the usual substation equipment including, a receiver and its associated switchhook, transmitter, call bell and induction coil.

The substations A, B and AT in addition to carrying on the usual conversation between stations are also adapted to be connected to a main exchange. As is well known in a system of this type the stations connected thereto are scattered throughout the building in which the system is located and it is of course necessary to have one station of the system receive the incoming calls from the main exchange. For the purpose of illustration I have shown the station AT as the attendant's station and all the incoming calls will be answered by him and extended to the station wanted. Each station of the system is equipped with a group of keys by means of which the stations may be interconnected and are of the well known locking type whereby upon depressing any key, the depressed key is locked in its depressed position and any key having been previously operated being at the same time released for the purpose of interconnecting itself with any other station of the system, and for extending itself over a trunk to the main exchange.

The station A is provided with a home or local answering key HAK which the party thereat will actuate when called to connect his station with the station calling. Keys BK and ATK are also provided the key BK being multiply connected with keys BK, associated with the other stations and the home or local answering key HBK associated with the station B so that any station of the system may connect itself with station B. The key ATK is multiply connected

with the keys ATK associated with the other stations and the home key or local answering HTK of station AT so that any station of the system may connect itself with station AT and vice versa. A ringing key RK which is of the non-locking type is provided which is depressed by the party at station A when signalling any other station of the system. Trunk keys TKA and TKB are also provided with lead to the trunks T and T' at the main exchange over their respective trunk conductors 2, 3 and 4, 5 whereby the station A may extend a call to the main exchange or receive a call from the main exchange.

The station B is provided with a home or local answering HBK key for purposes as already described and in addition is provided with a key AK which is multiply connected with the keys AK associated with the other stations and the home or local answering key HAK of station A so that any station of the system may connect itself with the station A. The key ATK' associated with the substation is provided for purposes as already described in connection with station A, ring key RK' and trunk keys TKA' and TKB' are also provided for purposes as above described. The station AT is provided with a home or local answering key HTK and in addition is provided with a key AK' and BK', a ringing key RK² and trunk keys TRK² for the purposes as above described.

The trunks T and T' leading from the intercommunicating system IC terminate at the main exchange X which I have shown to the right of the dotted line into line circuits L and L' which comprise respectively line relay LR and LR', line signals S and S', jacks J and J' and cut off relays CO and CO'. The trunks T and T' at IC are also provided with holding relay HR and HR' for purposes as will presently be described. Call signals CS and CS' at IC in the form of the usual call signal bells are associated respectively with trunks T and T' and are actuated when a call is extended from the main exchange to signal the attendant at IC. I provide a source of ringing current battery RB for operating the call bells at the stations the said battery also serving to operate certain supervisory equipment for purposes as will presently be described. Talking battery TB is also provided for supplying talking current to the stations through retardation coils RC, RC' and RC².

With the general description in mind the invention may now be fully understood from a description of the operation. Assuming that the party at the station A desires to call the station B, the party at station A removes his receiver from its switchhook and fully depresses the key BK which key is multiply connected to the stations to close its spring

contacts 6, 7 and 8, 9 to bridge his telephone set across line conductors 10 and 11 from the station terminal 12 over conductor 13, closed contacts 6 and 7 of the key BK to the conductor 10, the other station lead extending from terminal 14 over conductor 15, through closed contacts 8 and 9 of the key BK to the line 11. The party at the station A now depresses the ringing key RK to connect ringing current to the call bell of the station B the ringing circuit may now be traced from one side battery RB over conductor 16 conductor 17, normally closed contact 18 of the switchhook of the station telephone B, the call bell 19, conductors 20 and 10, closed contacts 6 and 7 of the key BK, conductor 13, closed contacts 21 and 22 of the depressed ringing key RK, conductor 23 to the other side of battery RB. The call bell 19 at station B is actuated each time the ringing key RK is depressed by the party at the station B. The party at the station B in response to the signal thus given from his call bell 19 removes his receiver from its switchhook to open contact 18 to open the ringing current circuit through the call bell 19. The party at station B now depresses the home or local answering key HBK and the closure of contacts 24, 25 and 26, 27 will bridge his telephone set to the line conductors 10 and 11 from the station terminal 28 over conductor 29 through the closed contacts 24 and 25 of the key HBK to the conductor 10, the other telephone lead extending from the station terminal 30 over conductor 31 through closed contacts 26 and 27 of the key HBK to conductor 11. The parties at stations A and B now have their telephone sets bridged across the line conductors 10 and 11 and may now carry on a conversation, talking current for the stations A and B is supplied from talking battery TB through the retardation coil RC' and upon the termination of the conversation they replace their receivers upon their respective switchhooks.

If the party at station A wishes to communicate with the party at the station AT key ATK at the station A, will be fully depressed and release any key that may be in a locked position and the closure of contacts 32, 33 and 34 and 35 of the key ATK will bridge the telephone set of the station A to line conductors 36 and 37. The party at the station A now depresses the ringing key RK closing a circuit for ringing current through the call bell 38 at substation AT which may be traced from one side of battery RB over conductors 16 and 39 closed contact 40 of the switchhook at the station AT, call bell 38, conductor 41, conductor 36, closed contacts 32 and 33 of the key ATK, conductor 13, closed contacts 21 and 22 of the ringing key RK to the other side of the battery RB over the conductor 23. The party at the substation AT in response to the call

signal removes his receiver from the switchhook and presses his home or local answering key HTK located at the substation AT and the closure of contacts 42, 43 and 44, 45 will
 5 bridge the telephone set of the station AT to the line conductors 36 and 37 and the parties at the stations A and AT, now have their telephone sets bridged across line conductors 36 and 37 and may now carry on a
 10 conversation. Battery for talking purposes extends from the talking battery TB through the retardation coil RC to the line conductors 36 and 37 and supplies the station A and AT with battery for talking purposes.

15 Assuming that the party at the station A desires to obtain access to the central office or main exchange over the trunk T the trunk key TKA associated with the trunk T located at the station A is depressed
 20 thereby bridging the telephone set of the station A over conductors 13 and 15 through the closed contacts 46, 47 and 48, 49 of the depressed trunk key TKA to the trunk conductors 2 and 3 of the trunk T which terminates the central office or main exchange
 25 X into the line circuit L, the removal of the receiver at the station A closes an energizing circuit for the line relay LR at the main exchange X from battery through the winding of the relay LR normal contact 50 of the
 30 cut off relay CO trunk conductor 3 through the closed contacts 48 and 49 of the trunk key TKA, conductor 15 through the now closed contacts at the station switchhook conductor 13 through the closed contact 46
 35 and 47 of the key TKA trunk conductor 2 to ground at normal contact 51 of the cut off relay CO at the main exchange. The closure of alternate contact 52 of the line relay
 40 LR closes a circuit through the line lamp or signal S, to apprise the operator at the main exchange that a connection is desired. The operator at the main exchange in response to the lighted signal S inserts an answering
 45 plug of a cord circuit into the jack J associated with the trunk T to establish an energizing circuit of the cut off relay CO as is well understood. The relay CO upon energization opens its normal contact 50 and
 50 51 to open the energizing circuit of the line relay LR. The line relay LR restoring effectuates line signal S at the main exchange. The party at the station A is now connected to the main exchange and the connection
 55 will be completed at the central office in the usual manner.

Should the party at the station A remove his receiver and depress the trunk key TKA and upon listening find that this trunk is
 60 busy the party at station A will then depress the trunk key TKB and the closure of contacts 53, 54 and 55, 56 of the trunk TKB will now bridge the telephone set of station A to the trunk conductors 4, 5 of trunk T'
 65 which terminates at the central office or

main exchange X to a line circuit L'. The stations B and AT of the intercommunicating set IC are also provided with trunk keys TKA' and TKB' and TKA² and TKB² respectively and by depressing the respective
 70 keys may connect themselves with the main exchange X over trunk conductors 2 and 3 or 4 and 5 of the trunks T or T'.

If a call comes in over the trunk T associated with line circuit L from the central
 75 office for the station A ringing current from the main exchange will flow from the tip contact of the jack J through alternate contact 51 to the cut off relay CO which relay is energized when connection is made to the
 80 jack J of line circuit L through the call signal CS located at the attendant's station AT through the condenser 59 back through alternate contact 50 to the sleeve contact of the jack J and to the source of ringing current at the central office. The attendant at
 85 station AT who answers all incoming calls from the main exchange as previously described removes his receiver from the switchhook in response to the signal CS and depresses the trunk key TKA² which is multiply associated with the trunk T over which
 90 the call from the main exchange has been extended to close its contacts 61, 62 and 63, 64 and the closing of the normally open switchhook contacts at the station AT establishes an energizing circuit through the lower
 95 winding 60 of the holding relay HR associated with the trunk T from battery at the main exchange through the sleeve of the jack J alternate contact 50 of the cut off relay CO over the trunk conductor 3 closed
 100 contacts 63 and 64 of the depressed trunk key TKA² associated with the station AT conductor 65 through the winding 60 of the holding relay HR, conductor 66 through the closed contacts of the switchhook at the station AT back over conductor 67 through the
 105 closed contact 62 and 61 of the depressed trunk key TKA² over the trunk conductor 2 through alternate contact 51 of the cut off relay CO of the trunk T to the tip contact of the jack J associated with the trunk T to ground or other side of battery at the main
 110 exchange. The circuit just traced through the lower winding 60 of the holding relay HR of trunk T controls the operation of the supervisory apparatus at the main exchange X as is well understood. The energization of relay HR closes a locking circuit for itself
 115 as will be hereinafter described.

The attendant at the station AT being apprised of the fact that the party at the station A is wanted now depresses the key
 120 AK' associated with the station A and multiply connected with the station A. The key AK' upon being depressed releases the depressed trunk key TKA² and the opening of contacts 61, 62 and 63, 64 of the said
 125 key opening the circuit through the lower

winding 60 of the holding relay HR but the relay HR does not de-energize as the closing of alternate contact 40 of the switch hook when the same was raised upon the removal of the receiver and upon the operation of relay HR established a locking circuit through the upper winding 70 of relay HR which circuit may be traced from one side of the battery RB over conductors 16 and 39 through alternate contact 40 of the switchhook contact, conductor 71 through the winding 70 of the holding relay HR, its alternate contact 72 over conductor 73 to the other side of battery RB. The holding relay HR is thus held energized. The closure of its alternate contact 74 permitted the circuit of the supervisory apparatus of the cord circuit at the main exchange to extend through the call signal CS through alternate contact 74 of the home relay HR to hold the supervisory apparatus at the main exchange after the key TKA² is released. The closure of contacts 75, 76, 77 and 78 of the key AK' now bridges the attendant's station AT across the line conductors 79 and 80. The attendant at the station AT now depresses the ringing key RK² to operate the call signal 81 at the station A the circuit for ringing current to actuate the called signal 81 at the station A being traced from one side of the battery RB over the conductors 16 normal contact 82 of the switchhook at station A called signal 81, conductor 79 through the closed contact 75 and 76 of key AK' conductor 65 through the closed contacts 83 and 84 of the ringing key RK², conductor 23 to the other side of battery RB.

The party at the station A in response to the call signal 81 removes his receiver from the switchhook and the opening of normal contact 82 of the switchhook interrupts the ringing circuit. The party at the station A now depresses the home or local answering key HAK associated with the station A and the closure of contacts 90, 91 and 92, 93 of the key HAK bridges the telephone set of the station A to the line conductors 79 and 80. The party at the station A and the attendant at the station AT are now in conversation over circuit of the line conductor 79 and 80. The attendant at the station AT now informs the party at station A that a call from the main exchange X is waiting his attention and also assigns the trunk which is to be used by the party at the station A. Having assumed that the call from the main exchange has been extended over the trunk T, the attendant at the station AT informed the party at the station A to depress the trunk key TKA and when the key TKA is depressed the closure of its contacts 46, 47 and 48, 49 bridges the telephone set of the station A over the trunk conductors 2 and 3 of the trunk T with the

main exchange conductors through the medium of the jack J of the line circuit L and the plug of the cord circuit at the main exchange. The attendant at the station AT after listening and finding that the party at the station A is connected and talking to the calling party at the main exchange now replaces his receiver upon the switchhook and the opening of alternate contact 40 of the switchhook opens the locking circuit of the holding relay HR through its winding 70 and the relay HR restores and as trunk conductors 2 and 3 of the trunk T are connected to the tip and sleeve conductors of the line circuit L, the party at the station A now controls supervisory apparatus at the main exchange. Upon completion of conversation, the party at the station A replaces his receiver and the opening of the switch hook contacts thereat, operates supervisory apparatus at the main exchange notifying the operator that supervised the connection that the party at station A has replaced his receiver and the disconnection from the line circuit L by the operator is brought about. Should a call be extended from the main exchange through the line circuit L' which leads to the trunk T', the call signal CS' associated with the trunk T' is operated and the attendant at the station AT moves his receiver and depresses a trunk key TKB² to connect his telephone set with the trunk T and the operation of the system IC for extending the connection from the main exchange over the trunk T' to any of the parties of the intercommunicating system IC is readily understood from the previous description in which call from the main exchange has been extended to the station A.

While I have shown the station AT as the attendant station it is readily apparent that I may select any of the stations of the system IC as the attendant station by the simple adding of the alternate contact to the switchhook contact as illustrated in connection with the station AT. It may be seen that by the arrangement above described, various stations of an intercommunicating system may be connected by means of the keys and all the stations of the system may also extend calls to the main exchange by means of the trunk keys without the aid of an attendant. The stations of the system IC may also receive calls from the main exchange and after the attendant has apprised the party of the fact that a call from the main exchange is awaiting his attention, he may again replace his receiver upon the switch hook and automatically disconnect himself from the connection and place control of the supervisory apparatus at the main exchange under the sole control of the station that is connected.

It may also be seen that I have eliminated

all additional keys at the attendant's station and place the control of the supervisory apparatus under his control during the time that he is extending the connection to the
 5 called party and the replacing of his receiver disconnects his station from the connection and places the control of disconnection under the sole control of the called party.

While I have illustrated and described a
 10 preferred embodiment of my invention, it will be understood that it may be embodied in many widely different organizations and I therefore do not wish to be limited to the exact system shown and described but aim
 15 to cover all such changes and modifications as come within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent, is as
 20 follows:

1. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to
 25 the stations, a telephone set at each station adapted to be connected with said trunk circuit, a trunk key and a relay associated with said trunk circuit, said telephone set being
 30 connected to said trunk when said trunk key is actuated, an energizing circuit for said relay upon connection of said set and actuation of said trunk key, and means controlled by said relay for maintaining the continuity of said trunk until another said trunk key
 35 and set is connected thereto.

2. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to the
 40 stations, a telephone set at each station adapted to be connected with said trunk circuit, a trunk key and a relay associated with said trunk circuit, said telephone set being
 45 connected to said trunk when said trunk key is actuated, an energizing circuit for said relay upon connection of said set to said trunk and upon actuation of said trunk key, and a bridge for maintaining the continuity of said trunk circuit in substitution of said
 50 set.

3. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to said
 55 stations, a trunk key, a telephone set at each station adapted to be connected with said trunk upon actuation of said trunk key, a relay associated with said trunk energized
 60 when said telephone set is connected to said trunk by said key, a bridge for maintaining the continuity of said trunk in substitution of said set and switching means controlled by said relay for controlling said substitution.

4. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to said

stations, a trunk key, a telephone set at each
 65 station adapted to be connected with said trunk upon the actuation of said trunk key, a relay associated with said trunk energized when said telephone set is connected to said trunk by said key, a locking circuit for said
 70 relay controlled by said telephone set, and a substitute bridge for said trunk controlled by said relay for maintaining the continuity of said trunk in substitution of said set.

5. An intercommunicating system of the
 75 character described comprising a plurality of stations, a trunk circuit multiplied to said stations, a trunk key, a telephone set at each station, a relay, an energizing circuit for said relay controlled by said trunk key and
 80 one of said telephone sets, a locking circuit for said relay controlled by said telephone set, and a bridge for maintaining the continuity of said trunk in substitution of said
 85 set.

6. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to said
 90 stations, a trunk key, a telephone set at each station, a relay, an energizing circuit for said relay controlled by said trunk key and one of said telephone sets, a bridge for maintaining the continuity of said trunk in substitution of said set controlled by switching
 95 means of said relay, and a locking circuit for said relay controlled by said telephone set.

7. An intercommunicating system of the character described comprising a plurality of stations, a trunk circuit multiplied to said
 100 stations, a trunk key, a telephone set at each station, a relay associated with said trunk, connection means controlled by said trunk key and one of said telephone sets for connecting said one of said sets to said trunk, an energizing circuit for said relay controlled by said trunk key and said one of
 105 said telephone sets and a bridge for maintaining the continuity of said trunk in substitution of said set.

8. An intercommunicating system of the
 110 character described, comprising a plurality of stations, a trunk circuit multiplied to said stations, a trunk key, a telephone set at each station, a relay associated with said trunk, connection means controlled by said trunk
 115 key and one of said telephone sets for connecting said one of said sets to said trunk, an energizing circuit for said relay controlled by said trunk key and said one of said telephone sets, a bridge for maintaining the continuity of said trunk in substitution of said set, and switching means of said relay for controlling said substitution.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 19th day of
 125 September, 1923.

DANIEL B. ROBISON.