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EXTENSION OR PARTY LINE TELEPHONE.
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EXTENSION OR PARTY-LINE TELEPHONE.

1,168,904.


To all whom it may concern:
Be it known that I, Roy Owens, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have
invented a certain new and useful Improvement in Extension or Party-Line Telephones, of which the following is a specification.

My invention relates to telephone systems in general, but more particularly to automatic or semi-automatic telephone systems, and especially to automatic or semi-automatic systems in which several telephones are connected with one and the same line, such arrangements being ordinarily known as extension or party line telephones.

Generally stated, the object of my invention is the provision of an improved extension or party line system having improved means for preventing one subscriber from interfering with the use of the line by another subscriber on the same line, or for preventing the use of one extension telephone in such manner as to interfere with the already established occupancy or use of the line by another telephone on the same line.

Special objects of my invention are the provision of improved means whereby each subscriber can release or restore the automatic exchange switches by simply grounding both sides of his line when he is through talking, and whereby, notwithstanding the use of this particular method of releasing, no other telephone or substation on the same line can subsequently be used in such manner as to release any connections already established by some other subscriber over the same line; the provision of an improved arrangement whereby the use of any telephone on an extension or party line will temporarily cut off the releasing grounds from all other telephones on the same line, as well as from the one in use, thereby making it impossible for the switching machinery at the exchange or central station to be accidentally or prematurely released before the subscriber who is in possession of the line is through talking; and the provision of certain details and features of improvement and combinations tending to increase the general efficiency and certainty of operation of a telephone system of this particular character.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings Figure 1 is a diagrammatic representation of an extension or party line showing the circuits, locking-out mechanism, and central office apparatus. Fig. 2 is a view of the substation telephone apparatus, together with the locking-out device. Fig. 3 is a detailed view of certain improved parts of the substation. Fig. 4 shows the substation provided with another form of the locking device. Fig. 5 is a diagram showing another method carrying out the idea of my invention, a number of substations being represented connected to the same line.

Briefly, my invention, as disclosed in Fig. 1, operates as follows: Each telephone line is provided with a selector A at the central office. Said selector is normally connected with the battery B and is common to the substations C, D, E and F. The central battery B, as shown, preferably has its positive terminal grounded at G, and the substations named are provided with one common ground G'. The said ground G' is used for sending calling impulses as well as for releasing. I design the circuits in such a manner that the circuit between the ground G' and the releasing apparatus of all the telephones is controlled by the ground relay R. Whenever any one of the subscribers C, D, E or F removes his receiver from the switchhook, he energizes the relay R. This relay remains energized as long as the said subscriber's receiver is off, and as a result the ringer or bell 2, which is also controlled by the relay R, is removed from across the line that leads to the central office, and the ground connection to all the releasing devices is destroyed. Any other subscriber, after the first subscriber has obtained his connection, may come in on the line, but when he hangs up his receiver, after discovering that the line is busy, he will not release the connection established by the original or first subscriber. The relay R is energized over the subscriber's line by the central battery B, but this is not necessary since the local battery B', as shown in Fig. 4, may be provided for energizing the 105 ground relay. Also, it may be stated that
it is not absolutely necessary to use a relay at all, since by arranging the circuits as shown in Fig. 5 the same result will be accomplished.

The substation apparatus may be of any suitable, known or approved type. The substation shown in Fig. 2 is provided with a well-known impulse-wheel 3 which is provided with vertical impulse teeth 4 adapted to operate the vertical impulse finger 5 in such a manner that the said spring may be pressed intermittently against the ground post 6 for the purpose of sending ground impulses to the vertical line conductor 7 of the subscriber's line. Furthermore, the said impulse-wheel 3 has a rotary impulse tooth 8 which, after the vertical impulses are sent in, so acts upon the rotary impulse finger 9 that one ground impulse is sent to the rotary line conductor 10. The switch-hook 11 is provided with the cam-arms 12, 13 and 14 for controlling certain circuits to be described. The cam-arm 14 controls the so-called locking cam 15, so that when the switch-hook rises, and before the dial is rotated, the insulating tip 16 upon the end of said locking cam is driven to the inner edge of the angled section on the end of the so-called ground spring 17. When the dial (which is not shown) is pulled down by the calling subscriber the pin 18 upon the end of the locking dog 19 raises the said locking cam 15 a trifle more and causes the said insulating tip 16 to fall behind the angled section of the spring 17, permitting the latter to make electric contact with the second ground spring 20. The engagement of the said springs 17 and 20 by the operation described places the ground post 6 in connection with the ground G, whereby when the subscriber releases the dial, after having pulled it down as described, the vertical impulse teeth 4 will then first act upon the vertical impulse finger 5, and after that the rotary impulse tooth 8 acts upon the rotary impulse finger 9, as described. The substation is, of course, provided with a transmitter 21 and induction-coil 22, the primary winding 23 of which is, when the switch-hook is raised, normally connected in series with said transmitter and with the local battery 24; and the secondary winding 25 is connected in series with the receiver 26 and bridged across the line conductors 7 and 10.

When the switch-hook is down the cam-arm 12 separates the springs 29 and 30 and the springs 27 and 28. The cam-arm 14 maintains the springs 17 and 20 apart, but when the switch-hook rises the said springs come into contact, and the springs 31 and 32 which are normally open, as shown in dotted lines in Fig. 3, are pressed together. The said springs 31 and 32 may, if desired, be arranged as shown by the full lines in Fig. 3, in which case the cam-arm 12 would control the springs 31 and 32 instead. As the switch-hook 11 rises it rotates about the pivot a, and the cam-arm 12 then engages the insulation 9, thus pressing the spring 31 toward the spring 32. It will be understood, of course, that the dotted lines in Fig. 3 mean to indicate that either full line springs 31 and 32 or the dotted line springs 31 and 32 may be used. The cam arm 13 is designed to so operate the release springs 33, 34 and 35 that when the switch-hook descends the said springs are pressed into contact, but not when the switch-hook ascends. The adjustment of the cam-arms 13 and 14 is such that as the switch-hook descends the release-springs 33, 34 and 35 are kept in contact until after the springs 31 and 32 are permitted to separate. The substation is further provided with a condenser 36 to maintain the line conductors 7 and 10 normally open when the receiver is off of the hook, for otherwise the said conductors would be connected through the secondary winding 25 and through the receiver 26. The subscriber's signaling device consists of a push-button 37 which controls the spring 38 with respect to the contact-points 39 and 40. It will be noticed that each telephone line is provided with only one ringer 2 which is normally connected through the condenser 41 across the conductors 7 and 10. This ringer, however, may, as previously stated, be disconnected from across the line conductors by the ground relay H, by means of the springs 42 and 43 which are under the control of the said relay H. It will be noticed that the release-spring 35 is connected with the ground G by way of the springs 44 and 45 which are controlled by the ground relay H. The selector A may also, like the substations, be of any desired or approved character. Preferably the selector A is of the general class described in Patent No. 815,821, granted March 13, 1906, to Keith, Erickson & Erickson. The line wipers 46 and 47 and the private wiper 48 are controlled by the vertical and rotary line relays 49 and 50, respectively, through the medium of the vertical and rotary magnets 51 and 52. The release circuits of the selector, as is well known, may be connected through the line relays 49 and 50 or through the back-release-relay 53 and the private magnet 54. The said selector when operated may be caused to extend the subscriber's line conductors 7 and 10 to a connector-switch I, said connector being of the general class described in Patent No. 815,176, granted March 13, 1906, to Keith, Erickson & Erickson. The vertical and rotary line relays 55 and 56 of the connector, as shown, are of course connected to the battery B.

In detail the operation of the system is as follows: When the subscriber at substation F desires to use the line he removes
his receiver 26, as shown in Fig. 2, from his switch-hook and proceeds by operating the dial to send in the requisite number of impulses in the proper way for operating the selector A and the connector I to establish connection with the desired line. As soon as the switch-hook goes up the springs 31 and 32 are carried into contact and the ground relay H at once energizes or pulls up. The energizing circuit for the said relay extends from ground G to the conductors 57, 58 and 59 to the spring 31, thence through the spring 32 and conductors 60, 61 and 62 to the relay H, thence through the conductor 63 to the rotary line conductor 10 and through the selector rotary line relay 50 to the battery B. The relay H upon energizing removes the ringer 2 from across the line by separating the springs 42 and 43 and destroys the connection between the substation ground release springs 64, 65, 66 and 67 and the ground G. After the subscriber at substation F is through talking he may restore the switches at the central office by grounding the vertical and rotary line conductors 7 and 10 simultaneously, as is well known. As the switch-hook descends the release-springs 33, 34 and 35 are pressed into contact and are kept so until after the springs 31 and 32 are permitted to separate. As soon as the springs 31 and 32 separate the ground relay H deenergizes and the springs 44 and 45 reengage and restore the connection between ground G and the release-springs of the substations and, therefore, the ground spring 35. A current then flows from the ground release spring 35 to the release springs 34 and 33, thence by way of the conductors 68 and 67 to the vertical and rotary line conductors 7 and 10 and through the vertical and rotary line relays 55 and 56 of the connector I to the battery B. As is well known, the said relays will energize and the switches will be released. If, however, before the subscriber at substation F is ready to release another subscriber comes on the line and, after attempting to make a call, finds the line is busy he (the intruding subscriber) cannot destroy the connection established by the subscriber at substation F by restoring his receiver, since all ground connection is cut off from the release-springs of all the substations. If, however, the subscriber C, for instance, comes on the line just prior to the time when the subscriber at the substation F is ready to hang up his receiver, and the subscriber at substation F hangs up his receiver before the subscriber at substation C does so, the subscriber at substation F cannot then restore the switches by hanging up his receiver, because the ground relay H will be retained energized. This is due to the fact that the springs 69 and 70 at the substation C are now in contact, performing the same function previously performed by the springs 31 and 32—that is, providing an energizing circuit for the ground relay H. Of course, therefore, even if the springs 31 and 32 do separate while the release-springs 33, 34 and 35 of the substation F are in contact there will then be no ground circuit established to the line conductors 7 and 10, as previously described. However, when the subscriber at substation C hangs up his receiver the switches will be released by him instead. It is clear, of course, that when the relay H is deenergized the ringer 2 is restored across the line conductors. This ringer, together with the ground relay H and associated apparatus, may be mounted upon any suitable frame and retained at any one of the substations, or, if desired, at any other point.

For some purposes it may be desirable to have each substation provided with a ringer, and it may also be desirable to energize the ground relay H from current provided by a local battery B, as shown in Fig. 4. In such case each ringer 2 may be bridged across the vertical and rotary line conductors 7 and 10 through the condenser 56, as shown. Then again, instead of providing two springs 31 and 32, only the one spring 31 (see Fig. 4) need be provided, the insulation 5 removed from the spring 31, and the rotary line conductor 10 connected to the switch-hook, as shown; and then when the switch-hook is raised the relay H is energized over a circuit as follows: from battery B through the relay H to the conductor 71, thence to the spring 31 and through the switch-hook 11 to the rotary line conductor 10 and back to battery B. The relay H upon energizing separates the springs 44 and 45 and breaks the connection between ground G and all the release-springs of the different substations which are connected with the common lead 74.

When the ringers 2 are bridged across the line (see Fig. 4) it is not necessary to provide the party line with a line relay, as in that case the circuits may then be arranged as shown in Fig. 5. The spring 72 is, in that event, bent upward, as shown in Fig. 5, so that the cam 12 may be able to press the springs 72 and 29 together while the release-springs 33, 34 and 35 are still in contact. If no relay is employed the circuits at the substations will be arranged as follows: Referring to Fig. 5, the first substation C on the line has the spring 73 connected with the ground release spring 64 and with a common lead 74; the substation F, namely the last one on the line, has the spring 72 connected to ground G and the ground release-spring 35 connected to the common lead 74, and the ground release-springs 65 and 66 of all the other substations D and E are also connected to the common lead 74.
common lead 74. Furthermore, the spring 29 at the substation F is connected with the spring 75 of the substation E, and the spring 76 with the spring 77 of the substation D, 5 and in turn the spring 78 of the substation D with the spring 79 of the substation C. Now, if a subscriber at any one of the substations removes his receiver, for instance at the substation F, the springs 72 and 29 will separate and the ground connection between all the ground release-springs 64, 65, 66 and 85 and ground G² is thus destroyed. Therefore, if any other subscriber along the line attempts to make a call he cannot release the connection when he restores his switch-hook and presses his release-springs 80, 81 and 64 of substation C into contact. It will be understood that if the subscriber C attempts to use the line while the subscriber F is on the line, the said subscriber F will not be able to release by pressing his release-springs 83, 84 and 35 into contact, since the ground connection between his ground release-spring 85 and the ground G² is broken at the substation C between the springs 75 and 79. Subsequently, however, when the subscriber at substation C restores his receiver he presses the release-springs 80, 81 and 64 into contact, and at the same time the springs 75 and 79 into contact, thereby simultaneously establishing a ground connection between ground G² and the vertical and rotary line conductors 7 and 10.

It may be desirable for the substation C (Fig. 1) to call the substation F at which the ringer 2 may be located. In that event the calling subscriber calls back on his own line and bridges the ringer-generator 82 across the line conductors 10 and 7, by pressing his signaling button 37. When the button 37 is pressed the spring 38 is carried onto the ground contact 40 and the vertical line conductor 7 is grounded. Grounding the vertical line conductor energizes, of course, the ringer-relay 83 of the connector, which latter then operates to connect the ringer-generator across the line, as stated. Current will flow from the ringer-generator through the side switch wiper 84, shaft wiper 85 and rotary normal conductor 10 (with which the wiper 85 is then in contact), to the rotary line conductor 10, thence through the relay H and springs 70 and 80, thence through the springs of the ringing button to the vertical line 7, vertical normal 7², shaft wiper 86 and side switch wiper 87 back to the generator. The alternating current from the generator will cause the relay H to deenergize and energize, causing the said relay to rattle. The springs 42 and 43 will, of course, be brought into contact at each operation of the relay H and retained in contact sufficiently long to allow the bell 2 to be rung. The subscriber at the substation F upon hearing the signal will respond by coming to the phone. After the subscribers are through talking they will, of course, release in the usual manner.

It is necessary, in order for a substation to call back upon its line, that the selector A be of the general type described in U. S. Patent No. 1,151,544, granted on August 24th, 1915, to Talbot G. Martin. Such a selector is provided with a private normal relay c that controls a connection between ground G² and the connector private bank-contacts. This permits the removal of the guarding potential at just the instant when a connector is required to connect with a calling line.

When the relay H is energized by the central battery B good results may be obtained by winding same to seventy-five hundred ohms resistance. Of course, when local battery B³, as described in Fig. 4, is employed for energizing the relay H, a coil of much lower resistance may then be substituted for the high wound coil. The battery B³ may be of 50 volts.

From the foregoing it will be seen that I provide each of the several telephones on an extension or party line with a release circuit for use in grounding both sides of the line to release the switching machinery at the exchange or central station. In addition, I also provide means for automatically opening all of said release circuits of the different telephones whenever any telephone is brought into use and the line temporarily appropriated for switching or talking or signaling purposes. In this way the use of any telephone precludes the releasing of any established connection by the subsequent attempted use of another telephone on the same line; for when any telephone is used all releasing circuits opened, including the one allotted to the telephone in use.

What I claim as my invention is:

1. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground releasing circuit for each telephone, and means for opening all of said releasing circuits when any telephone is used.

2. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground releasing circuit for each telephone, each releasing circuit including a ground common to all of the telephones, and means for disconnecting the ground from all of said circuits when any telephone is used.

3. In a telephone exchange system, the combination of a telephone line, a plurality...
of telephones connected therewith, automatic switches at the exchange or central station, a ground common to all of the telephones, a set of releasing springs for each telephone, one spring in each set being normally connected with the said ground, grounded release circuits controlled by said springs, and means for disconnecting the ground from all of said springs when any telephone is used.

4. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground common to all of the telephones, a set of releasing springs for each telephone, one spring in each set being normally connected with the said ground, a relay common to all of said telephones, provided with contacts through which the said ground is connected with the said releasing springs, as many grounded energizing circuits for said relay as there are telephones, each energizing circuit controlled by its allotted telephone, whereby the use of any telephone energizes said relay and cuts off the ground from all of said releasing springs.

5. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground releasing circuit for each telephone, and means for opening all of said releasing circuits when any telephone is used, said switches including first-selectors, and the exchange comprising a battery for operating said selectors.

6. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground releasing circuit for each telephone, each releasing circuit including a ground common to all of the telephones, and means for disconnecting the ground from all of said circuits when any telephone is used, said switches including first-selectors, and the exchange comprising a battery for operating said selectors.

7. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a set of releasing springs for each telephone, one spring in each set being normally connected with the said ground, grounded release circuits controlled by said springs, and means for disconnecting the ground from all of said springs when any telephone is used, said switches including first-selectors, and the exchange comprising a battery for operating said selectors.

8. In a telephone exchange system, the combination of a telephone line, a plurality of telephones connected therewith, automatic switches at the exchange or central station, a ground common to all of the telephones, a set of releasing springs for each telephone, one spring in each set being normally connected with the said ground, grounded release circuits controlled by said springs, and means for disconnecting the ground from all of said springs when any telephone is used, said switches including first-selectors, and the exchange comprising a battery for operating said selectors.
matically preventing interference between the different subscribers in the use of said line.

14. In a party-line telephone system, a party-line, a ground connection for each subscriber's station, and a relay common to all of the subscribers' stations on a party-line, located outside of the exchange, and responsive to any subscriber's station for automatically breaking the ground connection to the remaining subscribers' stations.

15. In a telephone system, a party-line, a calling device at each station, switching means at the central station responsive to said device, a hook-switch for each station on the line, a circuit through all the other stations, and means whereby the operation of any hook-switch controls said circuit.

16. In a telephone system, a party-line, a calling device at each station, switching means at the central station responsive to said device, a hook-switch for each station on the line, a circuit through contacts of all other hook-switches on the line, and means whereby the operation of any hook-switch serves to control said circuit.

17. In a telephone system, a party-line consisting of parallel line conductors, a plurality of substations suitably connected in said line, a plurality of auxiliary line conductors extending between the substations and terminating at the station nearest the exchange or central station, and automatic means for extending connection from said party-line.

18. In a telephone system, a party-line consisting of parallel line conductors, a plurality of substations suitably connected with said line conductors, an automatic trunk-selecting switch in which said line terminates; and means for partially preventing interference between the subscribers in the use of said line, including one or more conductors independent of the line conductors extending through all of said substations and terminating at the station nearest the exchange or central station.

19. In a telephone system, means including one or more conductors extending through all of the stations on a party-line, but not to the exchange or central station, for partially preventing interference, and automatic means for extending connection from said party-line.

20. In a telephone system, a party-line consisting of parallel line conductors, a plurality of substations suitably connected with said line conductors, means for partially preventing interference between the subscribers in the use of said line, including one or more conductors extending through all of said substations and terminating at the station nearest the exchange or central station, and automatic means for extending connection from said party-line.

21. In a telephone system, a party-line consisting of parallel line conductors, a plurality of substations suitably connected in said line, a plurality of auxiliary line conductors extending between the substations and terminating at the station nearest the exchange or central station, and automatic means having motion in one plane to select groups and motion in an intersecting plane to find a line in a selected group for extending connection from said party-line.

22. In a telephone system, a party-line consisting of parallel line conductors, a plurality of substations suitably connected with said line conductors, means for partially preventing interference between the subscribers in the use of said line, including one or more conductors extending through all of said substations and terminating at the station nearest the exchange or central station, and automatic means having motion in one plane to select groups and motion in an intersecting plane to find a line in a selected group for extending connection from said party-line.

23. In an automatic telephone system, a line, a plurality of telephones on said line, a ground connection common to said telephones, a hook-switch and calling dial for each telephone, cooperating to control the continuity of the talking circuit thereof, a single relay controlling the said ground connection, and a ringing key located at and controlling the talking circuit of each telephone.

24. In an automatic telephone system, a line, a plurality of automatic telephone equipments on said line, a ground connection common to said telephone equipments, a single relay controlling said ground connection, and circuits by which any subscriber on the line can energize said relay to disconnect the ground and thereby preclude the other subscribers from interfering, said relay adapted to be energized and deenergized without affecting the continuity of the line circuit.

25. The extension or party-line arrangement for automatic telephone exchange systems, including a ground cut-off relay common to the different subscribers on the line, adapted to be energized without opening the line circuit, and automatic switching means controlled by said ground connection, substantially as shown and described.

26. In a telephone exchange system, the combination of a telephone line, a plurality of grounded substations on said line, switch-hooks at said substations, telephones on said switch-hooks, and an automatic means for disconnecting all substations from ground by the taking down of any telephone, said automatic means including a ground-con-
controlling relay common to all of said substations.

27. The combination of a telephone line, a plurality of substations on said line having a common ground connection, a substation relay which is common to all of said substations for controlling the common connection to ground therefrom, and switching means at the central station responsive to said ground.

28. In a telephone system, a party-line, a substation relay controlling the continuity of said line at a point between the exchange and the first substation, and means for energizing said relay when any subscriber on the line takes down his telephone.

29. In a telephone system, a party-line, a combined line and ground-controlling relay common to and operable from all of the substations on the party-line, a ground circuit for said relay, said relay controlling a ground connection from a plurality of substations, trunk lines, and an automatic trunk-selecting switch for extending a connection from said line to an idle trunk-line.

30. In a telephone system, the combination of a telephone line, a plurality of substations on said line, a ground connection common to said substations, switch-hooks at said substations, telephones on said switch-hooks, and automatic means for disconnecting all substations from said ground by the taking down of any telephone, said automatic means including a ground-controlling relay common to all said substations.

31. The combination of a telephone line, a plurality of substations on said line having a common ground connection, a substation relay which is common to all of said substations for controlling the common connection to ground therefrom, and switching means at the central station the release of which is responsive to said ground.

32. In a telephone system, a party-line, automatic progressively movable trunking apparatus for said line for calling any desired telephone in the system, a common battery for supplying current for operating and signaling purposes, a circuit from said battery in each party line telephone for controlling progressively movable trunking apparatus, a circuit from said battery in each party line telephone for signaling, and a circuit from said battery for supplying current for releasing purposes to all of said party line telephones, a relay for controlling said last circuit, means for energizing said relay to render said circuit inoperative while the said other circuits are retained operative.

Signed by me at Chicago, Cook county, Illinois, this 27th day of June, 1906.

ROY OWENS.

Witnesses:

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