

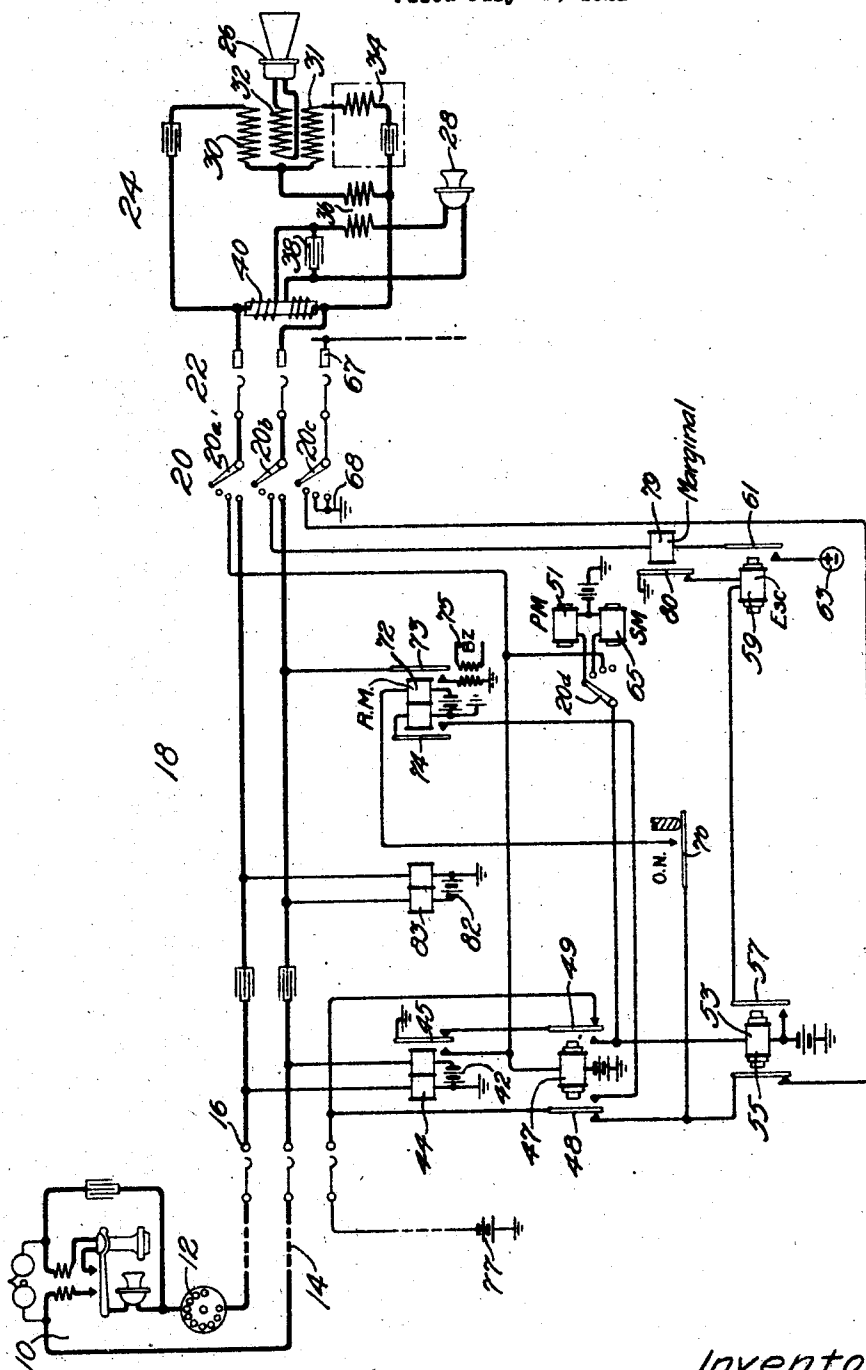
June 1, 1926.

1,586,554

C. L. GOODRUM

TELEPHONE SYSTEM

Filed July 21, 1921



Inventor:
Charles L. Goodrum
by W. Beatty, Att'y.

Patented June 1, 1926.

1,586,554

UNITED STATES PATENT OFFICE.

CHARLES L. GOODRUM, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

Application filed July 21, 1921. Serial No. 486,441.

This invention relates to a loud speaking telephone substation circuit and to circuit arrangements for connecting the loud speaking telephone automatically to a calling substation.

The invention has for an object to provide an arrangement whereby a loud speaking telephone substation, which may be employed for paging, dictation purposes, or the like, may be automatically connected to a system designed for use with ordinary subscribers' substations.

A further object of the invention is to prevent the ringing current ordinarily supplied to the substation circuits of an automatic system from actuating a loud speaker substation.

A further object of the invention is to provide a telephone substation having a loud speaking receiver and a sensitive transmitter which will be free from singing or howling due to the interaction of the instruments.

The above and other objects of the invention will be more fully understood from the following detailed description and claims taken in connection with the accompanying drawing, in which the figure illustrates diagrammatically a system employing the invention.

Referring to the drawing by reference numerals, a subscriber's substation set 10 of a well-known form having a dialing switch 12 is adapted to be connected through a loop circuit 14, a trunk finder switch 16, and a connector switch 18, comprising a side switch 20 and brushes 22 to the loud speaking substation circuit 24. The above switches are a part of a well-known form of automatic system differing only in minor details from the system shown in my Patent No. 1,231,013, dated June 26, 1917, for automatic telephone exchange system. This system may be a local telephone system such as one installed in a hotel, business house, or the like, and comprises a number of subscribers' stations similar to the station 10 which have bells or similar calling devices which are automatically energized when a substation has been selected. In accordance with this invention one or more substations similar to the one shown at 24 are adapted to be connected to a calling party by the use of the same apparatus used to call an ordinary substation. The invention, however, is not limited to use in a local exchange,

but may be used in a city exchange or elsewhere if desired.

Substation 24 comprises a loud speaking receiver 26, a sensitive transmitter 28, which may, for example, be of the type used in dictagraph work, and the substation circuit is an adaptation of the circuit shown in Fig. 5 of Campbell Patent No. 1,254,472, dated January 22, 1918, for signaling circuit. The receiver 26 is in a local circuit comprising the secondary winding 32 of a transformer, the primary windings 30 and 31 of which are connected respectively in the line circuit and in an artificial line circuit comprising the artificial line 34. The transmitter, instead of being connected directly in the conductor joining the common terminals of windings 30 and 31, as in the above Campbell patent, is inductively connected thereto by a transformer 36. For the purpose of direct current supply, the transmitter is also directly connected to the line through a double inductance 40 and a shunt condenser 38, which provides a path for the alternating component of the transmitted currents. The inductance 40 may be of high impedance to voice currents but should be of low impedance to ringing currents, as will be apparent from the description of operation below. By this arrangement, the transmitter is in a local circuit with respect to talking currents, but is adapted to be connected to the line for the purpose of common battery supply. As explained in the above Campbell patent, currents generated in the transmitter 28 divide between the line and the artificial line 34 in such a way that no response is produced in the receiver 26. This is very important for the reason that if side tone were present, the transmitter 28 would pick up room noises, tone would be produced in the loud speaker which would again react on the transmitter, and singing would result.

The arrangement of the relays of the connector switch 18 will be best understood in connection with their operation, which is as follows: When the receiver at substation 10 is removed from the hook, the trunk finder switch indicated at 16 is set in operation in a manner well understood in the art and makes connection to an idle connector switch 18, such as the one shown in the drawing. As soon as this connection is made, current from the battery 42 is supplied through the windings of relay 44 to the transmitter at

substation 10. Armature 45 is drawn up energizing slow-acting relay 47, the armatures 48 and 49 of which are then drawn up. In the circuit shown, it is assumed that no
 5 substation to be called will have a number having more than two digits. The subscriber now dials the first digit of the number to be called. Armature 45 of relay 44 is released as many times as there are units in
 10 this digit. Armature 49 of slow-acting relay 47, however, does not release, and it may be stated here that this contact as well as contact 48 remains up until the party at substation 10 hangs up his receiver. The vibrations of armature 45 intermittently close a
 15 circuit from ground through armature 49, brush 20_a, primary magnet 51 and battery thus actuating the primary magnet 51 and stepping up the brushes 22 the desired number of steps. The movements of armature
 20 45 also supply an intermittent ground to the slow-acting relay 53, causing its armatures 55 and 57 to be drawn up. Armature 57 closes a circuit through the escape magnet 59, closing the contact 61 in the circuit of
 25 the source of ringing current 63. This circuit, however, is open at the brush 20_b, and there is no flow of ringing current. As soon as the subscriber has ceased dialing, ground
 30 is disconnected from relay 53, thus deenergizing this relay and escape magnet 59, which in deenergizing steps the side switch 20 to its second position. It will be noted that the side switch 20 comprises four
 35 brushes 20_a, 20_b, 20_c and 20_d. The subscriber now dials the second digit, and each time the armature 45 makes contact with its back contact an impulse is sent to the secondary magnet 65, which is now connected to the
 40 brush 20_d. This steps the brushes 22 around to the terminals of the substation desired to be called. If the substation is busy, there will be ground present on contact 67 due to a connection from brush 20_c to ground
 45 68 of some other connector switch. A circuit will thus be connected from ground to contact 67, brush 20_c, armature 55, off normal switch 70, which was closed at the first movement of brushes 22, through the release
 50 magnet 72, closing armatures 73 and 74 of the latter. Closing the armature 73 causes busy tone from the source 75 to be sent out on the line, indicating to the calling party that the called substation is busy. Mean-
 55 while the release magnet 72 restores switch 18 and its associated side switch 20 to normal position and contact 74 keeps closed a locking circuit extending through armature 48, battery 77 to ground, so that the busy
 60 tone is continuously applied until the subscriber releases armature 48 by hanging up his receiver.

If the substation 24 is not busy, as soon as the subscriber ceases dialing, relays 53 and 59, which have been energized as in the
 first dialing step, are again deenergized and the side switch 20 is moved to its third position. Ground is thus immediately again
 connected to relay 53 through armature 45 and brush 20_a and again causes armature 61
 70 of escape magnet 59 to be drawn up. The circuit for ringing current is now completed through armature 61, relay 79, brush 20_b, transmitter 28, brush 20_a and armature 45.
 75 In the case of an ordinary substation circuit, the impedance of the circuit when the receiver is on the hook is large, and the ringing current supplied is of such a small value that relay 79 is not actuated until the subscriber takes down his receiver closing a low
 80 impedance path to the transmitter, after which relay 79 draws up its armature 80, breaking the circuit through the escape magnet 59. The substation 24 is, however, designed so that a low impedance path to ring-
 85 ing current always exists through the transmitter 28, and at this stage in the operation of the circuit, relay 79 is actuated as soon as ringing current begins to flow, and as soon as armature 80 is drawn up, and 61 released,
 90 the ringing current is tripped. The deenergization of escape magnet 59 also moves side switch 20 to its fourth position. Brushes 20_a and 20_b then connect the substation
 95 24 to the line and to a source of talking current 82, which supplies current through a retard coil 83.

The substation 24 may be located in a room containing a number of persons, for example, a room in which a large clerical
 100 force is seated, or in a hotel rest room, or the like. The calling party simply calls the person with whom he wishes to speak by name, the loud speaking receiver 26 giving
 sufficient volume of sound to be heard
 105 in any part of the room, and the called person may reply from his position by reason of the fact that transmitter 28 is extremely sensitive, or if he desires, he may approach the substation and reply directly
 110 into the transmitter 28.

As soon as the conversation is completed, the party at substation 10 hands up his receiver, breaking the circuit through relay
 115 44, releasing armature 45 which in turn breaks the circuit through relay 47, releasing armatures 48 and 49 and connecting ground through armatures 45, 49, 48, off
 normal switch 70 to release magnet 72. Release magnet 72 in a manner well understood
 120 in the art restores the switch 18 to normal position and as soon as the switch has reached normal position, off normal switch 70 is opened, thus breaking the circuit for
 release magnet 72 and the connector switch
 125 18 and associated switches are in condition to be selected for another call.

While the invention has been illustrated in connection with a certain type of automatic system, it is obvious that it may be

used with other systems and it is to be understood that the invention is to be limited only by the scope of the following claims.

What is claimed is:—

1. In combination, a line, a substation normally disconnected from said line, said substation comprising a transmitter, a loud speaking receiver and a balancing line for preventing side tone in said receiver, and means operable from a distant point on said line for connecting said substation to said line.

2. A telephone system comprising a plurality of substations, automatic means controllable by a calling party for interconnecting two of said substations, at least one of said substations comprising a loud speaking receiver and a sensitive transmitter, said transmitter being permanently connected in bridge across the substation line conductors.

3. A telephone system comprising a line, a second line, means for interconnecting said lines, a source of current in said first line, a loud speaking receiver and a sensitive transmitter, said transmitter being permanently connected in circuit with said second line with respect to direct current from said source but in inductive relation therewith with respect to voice currents, and means to prevent impulses produced by said transmitter from energizing said receiver.

4. A telephone system comprising a line, a second line, means for interconnecting said lines, a source of current in said first line, a loud speaking receiver and a transmitter,

said transmitter being permanently connected to said second line with respect to voice currents and directly connected to said line with respect to direct current from said source, and means including a balancing network to prevent impulses produced by said transmitter from energizing said receiver.

5. A telephone system comprising a line, a second line, means for interconnecting said lines, a source of current in said first line, a loud speaking receiver and a sensitive transmitter, said instruments being permanently connected to said second line to receive and transmit telephone currents substantially solely by induction, and means for supplying current from said source directly to said transmitter.

6. A telephone system comprising an automatic switch, a source of current in said switch, a loud speaking receiver and a sensitive transmitter accessible to said switch via a set of terminals, said transmitter which is permanently connected to said terminals being, when a connection is established, inductively connected in circuit with said switch with respect to voice currents and directly connected in circuit with said switch with respect to direct current from said source, and means including a balancing network to prevent impulses produced by said transmitter from energizing said receiver.

In witness whereof, I hereunto subscribe my name this 20th day of July A. D., 1921.

CHARLES L. GOODRUM.