June 25, 1940. S. B. WILLIAMS 2,205,551

TELEPHONE SYSTEM

Filed July 8, 1939 2 Sheets-Sheet 1

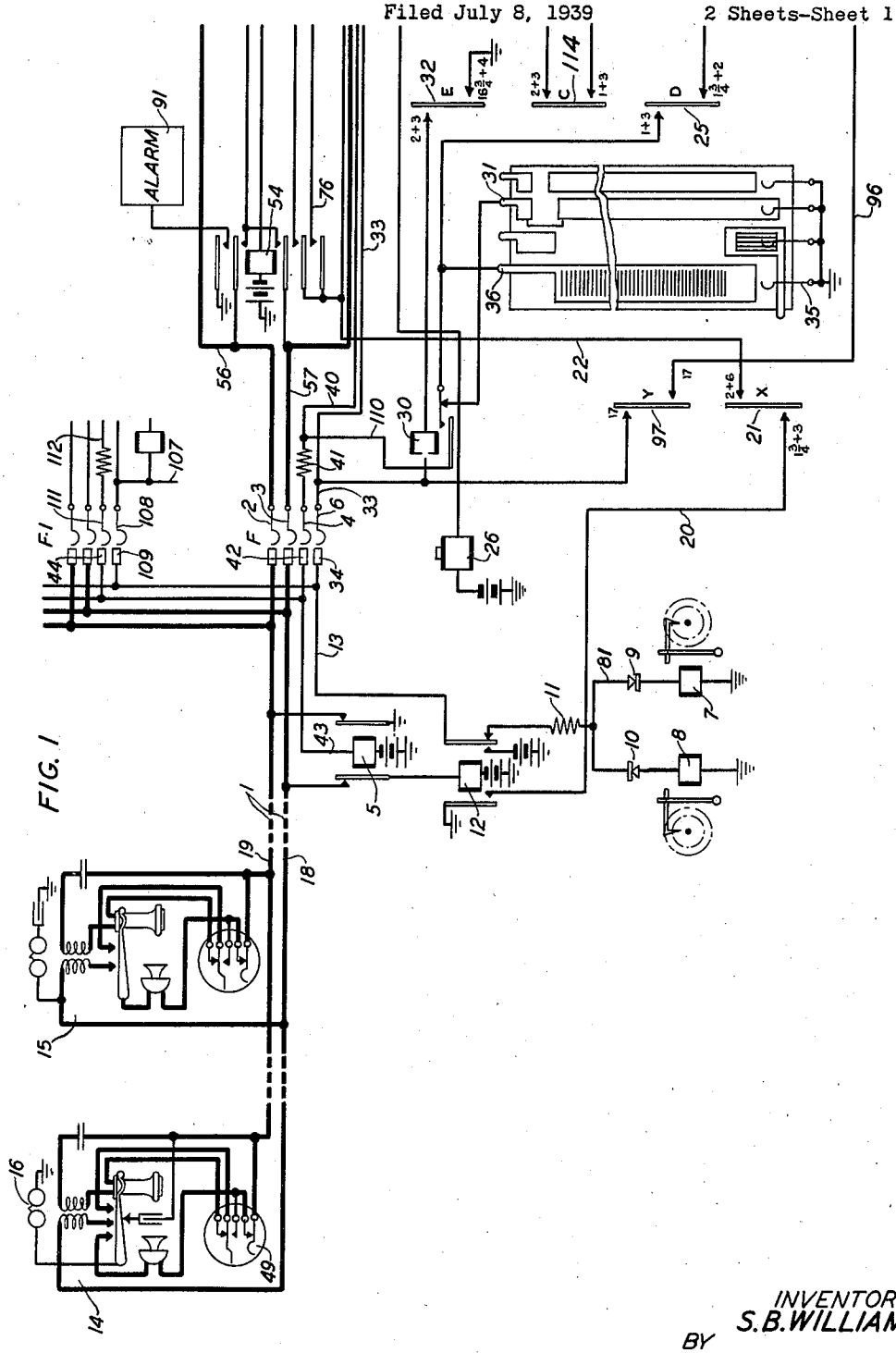

FIG. 1

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June 25, 1940. S. B. WILLIAMS 2,205,551

TELEPHONE SYSTEM

Filed July 8, 1939 2 Sheets-Sheet 2

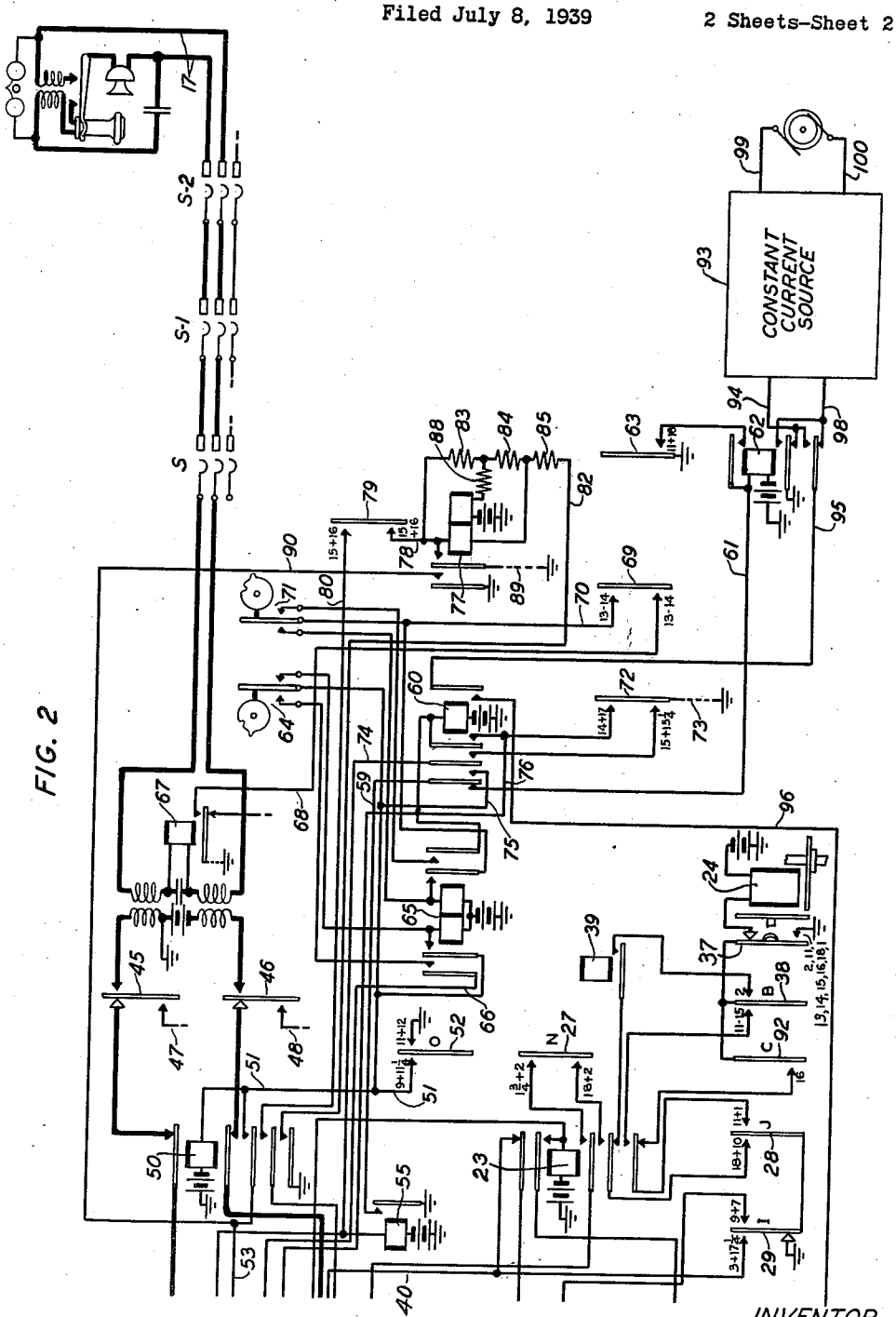

FIG. 2

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Patented June 25, 1940 2,205,551

UNITED STATES PATENT OFFICE

2,205,551

TELEPHONE SYSTEM

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Application July 8, 1939, Serial No. 283,352

6 Claims. (Cl. 179—9)

This invention relates to telephone systems and particularly to automatic systems in which the subscribers are charged for the service rendered by means of message registers.

The objects of the invention are to prevent the operation of the message registers from interfering with the functions of the switching equipment; to insure against false operation of the message registers in the event that unstandard conditions occur in the circuits associated therewith; to test the message register operating circuits to determine that they are in proper condition before applying operating currents thereto; and to secure other improvements in systems of this character.

A feature of the invention is a system in which a single control conductor is utilized for controlling the hunting movement of the line finder that seizes the subscriber's line and for applying operating current to the subscriber's message register, in which the test relay of the line finder, which energizes to stop the movement of the line finder when it seizes the terminals of the calling line, is permitted to operate in case the finder encounters the terminals of a line on which message registration is taking place, and in which the test relay so operating prepares a circuit, depending upon the busy condition of the line encountered, to maintain the continued movement of the finder over the busy line thus encountered. This feature has special utility in connection with party line systems where two message registers are connected through polarizing devices, such as rectifiers, to the combined message register and hunting lead of the line finder switch. The presence of these rectifying devices in this lead increases the resistance thereof and raises the potential on the multiple terminals of the lead in the line finder switch. If, therefore, a finder encounters the multiple terminals of this lead at the instant message registration is taking place, the potential thereon is sufficient to operate the test relay of the finder. This operation would, except for the provisions above explained, result in the stopping of the switch falsely on the terminals of the busy line.

Another feature of the invention is a message register system in which a source of constant current is provided for the purpose of supplying current to the message register operating conductor. This provision insures against false operation of a message register in case the operating conductors extending to the registers of two or more subscribers' lines are accidentally in electrical connection with each other. If these operating conductors are crossed the current supplied over the common operating conductor from the constant current source is insufficient to operate both registers.

Another feature of the invention is a testing arrangement in which a test is made automatically to determine whether the message register lead of any particular line is in proper condition before operating current is applied thereto. If the operating lead is in engagement accidentally with the corresponding lead of some other line, a test relay operates and serves to withhold the application of the register operating current and to give an alarm.

These and other features and advantages of the present invention will be described more fully in the following detailed specification.

In the drawings accompanying the specification Figs. 1 and 2 illustrate an automatic telephone system partly in diagrammatic manner and partly in detail.

Fig. 1 shows a two-party subscriber's line appearing in a line finder switch together with a portion of one of the links comprising a line finder and a district selector switch; and

Fig. 2 shows the remainder of the finder-district link circuit together with the succeeding switches used in establishing a connection to a called line.

The subscriber's line 1, having two substations thereon, appears in the terminals of line finder switches, such as switches F and F—1. Each of the finder switches is paired with an individual district selector switch comprising a link circuit. For example, the finder F is paired with the district selector S, and the relays and other equipment associated with these switches constitute the link circuit. In addition to the various relays of the link circuit a sequence switch is provided having numerous circuit-controlling contact springs which advance through successive positions for performing the necessary switching operations.

The district selector switches have access to succeeding switches for extending calls either to local subscribers' lines or to trunks outgoing to other offices. Two of these switches S—1 and S—2, shown diagrammatically, serve to complete local calls.

The line finder switches have four brushes, two of which extend to the tip and ring conductors of the line to complete the talking circuit. The third or sleeve brush completes the circuit for operating the cutoff relay when the

finder switch seizes the calling line. The fourth brush of the finder switch has two functions. One of these is to extend the test or hunting circuit whereby the finder is able to determine which line is calling. The second function is to furnish a circuit for the operation of the subscribers' message registers. Since it is necessary to discriminate between two message registers, where the subscriber's line has two parties thereon, the operation of one or the other of these registers must be performed over a single circuit, namely the one extending through the fourth brush of the finder switch. More specifically, the brushes 2 and 3 of finder F are the ones that extend the talking circuit. Brush 4 is the sleeve brush, which completes the operating circuit for the cutoff relay 5. The fourth brush 6 is the one that controls the hunting operation and also the message register operating circuit.

The discrimination between the message registers 7 and 8 of the party line 1 is obtained by means of rectifying devices 9 and 10. The registers 7 and 8 are connected through a resistance 11 and a contact of the line relay 12 to the single hunting and message register control conductor 13. By poling the rectifiers 9 and 10 oppositely it is possible to select the register 7 by applying current of one polarity to the conductor 13 and to select the other register by applying current of the opposite polarity.

Discrimination between the two substations 14 and 15 is made by means of a party test in the link circuit. This test is made at the proper stage in the progress of the call to determine whether a ground connection exists on the line. If the party at substation 14 is calling, a ground connection is applied through the switchhook contacts and the ringer 16 to the tip conductor 19 of the line 1, whereas if the party at substation 15 is calling no ground connection is present.

While the invention is not necessarily limited to any particular kind of system, it has been illustrated in connection with an automatic system employing switches of the panel type. In view of their well-known character the structure of these switches, such as the line finders F and F—1 and the selectors S, S—1 and S—2, has been largely omitted from the disclosure. Also the controlling circuits associated with the line finder and district selector switches F and S have been abbreviated as far as possible in order to facilitate an understanding of the present invention. However, reference may be had to the following patents for an understanding of the detailed circuits and operation of systems of the type to which this invention is applicable: Taggart et al. 1,513,351 of October 28, 1924, Irvine 1,541,356 of June 9, 1925, and Johnson et al. 1,859,924 of May 24, 1932. In particular, the patent to Taggart et al. and the patent to Irvine disclose a system of this character in which identification tests are made on two-party lines for the purpose of message registration.

The rectifying devices 9 and 10 may be of any suitable type, such as the well-known copper-oxide rectifier.

The operation of the system will now be described, and to this end it may be assumed that the subscriber at station 14 wishes to converse with the subscriber of line 17. When the calling party removes his receiver from the switchhook, a circuit is closed from battery through the line relay 12, left contact of cutoff relay 5, over the line conductor 18, through the closed loop at substation 14 and returning over the line conductor 19 to ground through the right back contact of relay 5. Relay 12 at its right front contact applies battery potential to the hunting lead 13. At its left contact relay 12 closes a circuit from ground over the start conductor 20 through closed contacts of sequence switch cam 21, conductor 22 through the winding of the line finder relay 23 to battery and ground.

The cam 21 is one of a plurality of contact-making elements controlled by the sequence switch magnet 24, which advances the cams through a succession of positions to cause the opening and closing of the various contacts for circuit controlling purposes. It may be assumed that the sequence switch 24 is standing in position 2 at this time awaiting the seizure of the link, to which it is individual, comprising the finder F and district selector S. In position 1 the sequence switch serves in the well-known manner to control the allotment of the link. In position 1 of the sequence switch the link comprising the line finder F and selector S awaits the preselection by a sender link circuit, not shown. As soon as the preselection takes place the sequence switch 24 advances into position 2 where, as stated, it awaits a call. The purpose of the sender selector link, with which we are not particularly concerned in connection with this invention, is to associate the subscriber's line, after it has been seized by the line finder F, with an idle central office register sender.

Relay 23 in operating locks in a circuit from battery through its winding and contact, contacts of sequence switch cam 25, normal contacts of relay 30 to ground through the normal commutator segment 31 of the finder switch. The segment 31 has ground potential connected thereto in all positions of the finder F except the extreme uppermost position of the brushes.

Relay 23 in operating also closes the driving circuit for the line finder F. This circuit may be traced from battery through the winding of the up-drive magnet 26, inner lower contact of relay 23, contacts of sequence switch cam 27, middle lower front contact of relay 23, left contact of sequence switch cam 28 to ground at sequence switch cam 29. The magnet 26 causes the brushes 2, 3, 4 and 6 of the line finder F to move upwardly over the terminal bank in search of the terminals of the calling line 1. As the finder moves upward the hunting brush 6 passes over the hunting terminals of the subscribers' lines, and the test relay 30 tests these terminals for the presence of battery potential, indicating the calling condition of a line. As soon as the brushes 2, 3, 4 and 6 encounter the terminals of the line 1 the test relay 30 operates in a circuit from ground through the contacts of sequence switch cam 32, winding of relay 30, conductor 33, brush 6, terminal 34, lead 13, front contact of relay 12 to battery. Relay 30 opens the holding circuit of relay 23. Relay 23 remains energized until the brush 35 engages an insulating segment of the centering commutator 36. Thereupon relay 23 releases to open the circuit of the power magnet 26 and bring the line finder F to rest centered on the terminals of the calling line 1. While the sequence switch is in positions 2 and 3 the line is held busy by means of a circuit from ground over cam 29, cam 114, back contacts of relay 23 to conductor 40.

Relay 23 on releasing closes a circuit for driving the sequence switch 24 out of position 2. This circuit may be traced from battery through

the winding of the sequence switch magnet 24, contact cam 37, upper contacts of cam 38, through the contacts of relay 39, which relay is in an operated condition at this time, middle lower back contacts of relay 23, left contacts of cam 28 to ground at cam 29. In position 3 of the sequence switch, and from there on to position 17¼, a circuit is maintained over the sleeve conductor for operating and holding the cutoff relay 5 energized and for placing a busy condition on the multiple sleeve terminals accessible to other finder switches. The busy sleeve circuit may be traced from ground through the left contacts of cam 29, conductor 40, resistance 41, brush 4, terminal 42, conductor 43, winding of the cutoff relay 5 to battery. This ground potential also appears on the multiple sleeve terminal 44 in the line finder switch F—1 and similarly on the terminals of other line finder switches having access to this line. Relay 5 operates and releases the line relay 12 to remove ground from the start conductor 20 and also to remove calling battery potential from the hunting lead 13.

In the manner well known in the art and disclosed in detail in the Taggart et al., Irvine, and Johnson et al. patents, above mentioned, the line finder-district link progresses to the point where the calling subscriber's line is extended by way of sequence switch cams 45 and 46 and conductors 47 and 48 to an idle register sender, not shown; the subscriber at the calling station manipulates his dial 49 to set the registers of the sender in accordance with the designation of the called line 17; the fundamental circuits are prepared, and the selectors S, S—1 and S—2 are operated under the control of the register sender to extend the connection to the called line. During these proceedings the sequence switch 24 associated with the link is advanced from position to position, passing into position 11 following the extenson of the connection to the called line.

As the sequence switch 24 reaches position 11 a test is made of the calling line 1 to determine which one of the two stations has initiated the call. In preparation for this test a circuit is closed from battery through the winding of relay 50, conductor 51, contacts of sequence switch cam 52 to ground. Relay 50 operates and extends the grounded conductor 51 through its front contact, over conductor 53 through the winding of relay 54 to battery. Relay 54 operates in this circuit and connects the test relay 55 to both talking conductors 56 and 57 of the link. Relay 55, therefore, is connected by way of finder brushes 2 and 3 to the talking conductors 18 and 19 of the line 1. Since the party at station 14 has his receiver off the hook, the grounded ringer 16 is connected through the upper switchhook contacts to both line conductors 18 and 19. Test relay 55 operates in this circuit and closes a circuit from ground over its front contacts, conductor 59, outer left contact of relay 60, conductor 61 through the winding of relay 62 to battery. Relay 62 operates and locks through its upper front contact to ground through sequence switch cam 63. Relay 62 remains locked through position 18 of sequence switch 24 to record the fact that the test revealed the presence of a ground potential on the calling line, indicating that the call was initiated by the party at station 14. As soon following the arrival of the sequence switch in position 11 as the constantly-driven interrupter 64 operates its right contacts a circuit is completed from battery through the left winding of relay 65, right contacts of interrupter 64, contacts of cam 52 to ground. Relay 65 operates and locks through its inner left contact to ground on conductor 51. As soon thereafter as interrupter 64 closes its left contacts a circuit is completed from the grounded conductor 51, left contacts of said interrupter, outer left front contact of relay 65, conductor 66, middle lower contact of relay 54, winding of relay 23 to battery. Relay 23 operates and closes a circuit for driving the sequence switch out of position 11. This circuit may be traced from battery through the magnet 24 of the sequence switch cam 37, left contact of cam 38, lower front contact of relay 23, through the contacts of cams 28 and 29 to ground. As the sequence switch passes out of position 11¼ it opens the left contacts of cam 52, and ground is removed from conductor 51 to permit the release of relays 50, 54, 55 and 65. The release of relay 54 opens the operating circuit of relay 23.

In subsequent positions of the sequence switch, such as positions 13 and 14, the talking circuit is completed, and for conversation between the calling and called subscribers. At the time the called subscriber answers the supervisory relay 67 operates, closing a circuit from ground through the front contact of said relay, conductor 68, contacts of sequence switch cam 69 to conductor 70. As soon thereafter as the power-driven interrupter 71 closes its left contacts the conductor 70 is extended through the right winding of relay 65 to battery and ground. Relay 65 operates and locks through its inner right contact to the grounded conductor 70. When thereafter interrupter 71 next closes its right contacts the grounded conductor 70 is extended by way of said right contacts, outer right front contacts of relay 65, through the winding of relay 60 to battery and ground. Relay 60 operates and locks through its inner left contact, upper left contact of sequence switch cam 72 to ground over conductor 73. Thus the relay 60 operates to record the fact that the called subscriber has answered.

After conversation has ceased and the calling subscriber has replaced his receiver on the switchhook, the sequence switch 24 is driven out of the talking position and into position 15. As the sequence switch enters position 15, the relay 55 is reoperated and, in its operated condition, is applied to the calling line to make a second test to determine whether the line is free from ground potentials. The operating circuit of the relay may be traced from battery through the winding thereof, conductor 74, middle left contact of relay 60, lower left contacts of sequence switch cam 72 to the grounded conductor 73. Relay 55 operates relay 50 in a circuit from ground through the contact of relay 55, conductor 59, outer left front contact of relay 60, conductor 75, conductor 51, thence through the winding of relay 50 to battery. Relay 50 operates and extends the grounded conductor 51 through its closed contact to conductor 53, operating relay 54. Relay 54 connects the winding of the operated test relay 55 to the tip and ring conductors of the subscriber's line 1 to determine whether relay 55 will hold after its energizing circuit has been opened; or, in other words, to determine whether there is a ground connection on the subscriber's line after he has replaced his receiver to remove the grounded connection at the ringer 16. Relay 54 in operating also closes a circuit from battery through the winding of relay 23, lower contact of relay 54, conductor 76, upper left contacts of cam 72 to ground over con-

ductor 73. Relay 23 operates and completes the circuit above traced for driving the sequence switch 24 out of position 15 and into position 16. As the sequence switch leaves position 15¼ the lower left contact of cam 72 opens the energizing circuit of the test relay 55, leaving this relay dependent for its maintained energization upon the circuit closed through the contacts of relay 54 to the line conductors. If the line has ground potential thereon, relay 55 is maintained energized and in turn holds relays 50 and 54 to prevent the sequence switch from advancing further. Relay 54 energizes the time measuring and alarm device 91, and, after an interval has expired, this device gives an alarm to indicate the presence of an abnormal condition. If the subscriber's line is in its normal condition and has no ground connection thereon, relay 55 immediately releases. The release of relay 55 permits the release of relays 50 and 54, provided the test relay 77, which will be described presently, has not operated at this time to indicate an unstandard condition on the message register operating conductor 13.

In positions 15 and 16 of the sequence switch a second test is made, simultaneously with the testing of the subscriber's line, to determine whether the hunting and message register operating lead 13 is in accidental connection with the corresponding lead of some individual subscriber's line. If two of these leads are crossed, the danger is that the application of metering potential to one of them will cause the false operation of the register on the other line.

The test for the crossed condition of the operating leads is made by the test relay 77. This relay is differential, and its windings and the associated resistance elements constitute a bridge circuit in which the operating winding of the relay is insufficient to attract the relay's armature if the lead 13 to which the test relay is applied is in standard condition. However, the test relay will operate in case the resistance of the lead 13 is abnormally low due to a parallel path to ground through the message register of an individual subscriber's line. When relay 50 operates following the movement of the sequence switch into position 15, the conductor 78, connected to the test relay 77, is extended through contacts of cam 79, conductor 80, closed contact of relay 50, conductor 33, brush 6, terminal 34, conductor 13, back contact of relay 12, resistance 11, to the conductor 81 common to the registers 7 and 8. Also the operation of relay 50 connects the conductor 82 to ground. With these circuits closed an electrical bridge arrangement is established in which three of the arms are formed respectively by the resistances 83, 84 and 85, in which the fourth arm is formed by the resistance 11 and the register 8, in which the left winding of relay 77 is connected across the balance points of the bridge, and in which the battery and the right winding of relay 77 and the resistance 88 are connected in series with the bridge. The left winding is differential to the right winding and receives sufficient current in the opposing direction to prevent the relay from operating when only the conductor 13 of one line is included in the fourth arm of the bridge.

Should the conductor 13 of the party line be accidentally crossed with the corresponding conductor of an individual line, the combined resistance would be sufficiently low to cause the operation of the differential relay 77 to prevent the subsequent application of metering potential to the conductor 13. It follows, of course, that the parallel paths present when the conductors 13 of two lines are crossed result in a lowering of the resistance connected in series with conductor 33. And in the case assumed, namely, when a two-party line is crossed with an individual line, the combined resistance is so lowered that relay 77 operates. This is true by reason of the fact that the conductor 13 of an individual line is substantially lower in resistance since it does not include a rectifier nor the series resistance 11. Should the conductors 13 of two different party lines become crossed, the combined resistance would be somewhat higher than the case assumed, and it might be that the test relay would not be adjusted to detect this condition. In such a case, however, false operation of the registers on the party lines is prevented by limiting the current supply. This feature will be explained later.

Assuming, therefore, that conductor 13 of line 1 is crossed with the corresponding conductor of an individual line, relay 77 operates and locks in a circuit through its windings in series and its inner lower contact to ground over conductor 89. In operating, relay 77 closes a grounded circuit by way of its outermost contact, conductor 90 and thence through the windings of relays 54 and 50 to battery, holding these relays energized after the sequence switch has passed out of position 15¼ to release relay 55 in the event the tip and ring conductors of the subscriber's line are in normal condition. The maintained energization of relay 54 prevents the sequence switch from advancing out of position 16, and a circuit is closed from ground through the uppermost contact of relay 54 to the timing and alarm circuit 91. After a measured interval has expired the circuit 91 gives the necessary alarm to call attention to the fact that the equipment has encountered trouble.

If, however, the subscriber's line 1 is free from ground potential, and if the message register operating lead 13 is not in contact with the corresponding lead of an individual subscriber's line, when the sequence switch moves into position 15 and into position 16 as above described, the test relay 55 releases, and the test relay 77 fails to operate. Consequently, relays 50 and 54 release as the sequence switch moves out of position 15¼ and into position 16. Relay 54 releases the relay 23, and a circuit is closed from battery through the winding of sequence switch magnet 24, contacts of cam 37, contacts of cam 92, back contacts of relay 23 and thence to ground through the contacts of cams 28 and 29. The sequence switch moves out of position 16, through position 17 and into position 18.

In position 17 metering current is applied to the conductor 13 to operate the register individual to the calling party on the line 1. The metering current is supplied from the current supply device 93 and the circuit therefor may be traced from the positive pole of said device over conductor 94, through the lower front contact of operated relay 62, conductor 95, right front contact of relay 60, conductor 96, contacts of cam 97, thence over conductor 33, brush 6, and terminal 34 to conductor 13 through the back contact of relay 12, resistance 11, conductor 81, through the rectifier 9 and the winding of register 7 to ground and returning through the inner lower front contact of relay 62 and conductor 98 to the negative pole of the supply circuit 93. Since the current flowing in this circuit passes only through the rectifier 9, only the mes-

sage register 7 will operate, charging the call to the subscriber of station 14.

As the sequence switch moves into position 18 the necessary release circuits are closed for restoring the line finder switch F and the other switches to their normal position. The sequence switch then advances into position 1 where it awaits allotment.

When the other party on the line 1, namely, the party at station 15, makes a call, the operation of the system is substantially the same, except that the test of the line by the relay 55 fails to find a ground potential thereon. There being no ground potential on the line when the party at station 15 calls, relay 55 does not operate in position 11 of the sequence switch, and relay 62 consequently remains deenergized. When, later, the sequence switch is in position 17, the metering circuit is closed, and current of the opposite polarity flows thereover to operate the register 8 individual to the station 15. This circuit may be traced from the negative pole of the constant current supply device 93, conductor 98, lowermost back contact of relay 62, thence over conductor 95 as above traced to the common conductor 81 through the rectifier 10, winding of register 8 to ground and from ground through the inner lower back contact of relay 62, conductor 94 to the positive pole of the current supply device 93.

It has already been explained how the system is guarded against possible false operation of a message register when the conductor 13 of a party line is in accidental connection with the corresponding conductor of an individual subscriber's line. This safeguard is afforded by the test relay 77 which does not operate in circuit with the normal resistance of the lead 13 of a party line but does operate in circuit with the relatively low combined resistance of lead 13 of a party line and the corresponding lead (crossed therewith) of an individual subscriber's line. It is also desirable, of course, to prevent false operation in the event that the leads 13 of two party lines should become accidentally crossed. Since both of these leads contain the resistance element 11 and the rectifier element, the combined resistance is substantially greater than that encountered when a party line and an individual line are crossed. In such a case it might be difficult for the relay 77 to distinguish between the resistance of a single party line lead and the combined resistances of two party line leads. It is possible, however, to prevent the false operation of the registers by limiting the amount of current flowing over the message register operating circuit to a value which is insufficient to operate either of the registers of the two party lines whose leads have become crossed. This is accomplished by means of the constant supply device 93, which converts alternating current into direct current and supplies it to the output conductors 94 and 98. For this purpose alternating current is supplied over conductors 99 and 100 to the constant current rectifier 93.

Thus if the conductors 13 of two party lines are crossed at the moment metering current is applied over conductor 95 to the conductor 13 of the line against which it is desired to assess a call, the lowered resistance, which would otherwise tend to draw the greater current required for operating both registers is without effect. The constant current device 93 maintains its output current at a constant value regardless of the increased load, and this value is insufficient to operate either one of the message registers. Consequently, false operation is avoided notwithstanding the unstandard condition. A constant current rectifying device suitable for use in this system is shown in the patent to Bodde, No. 1,298,443 of March 25, 1919.

It will be recalled from the foregoing description that the single lead 13 is used for the hunting operation of the line finder and later for the message register operation. Since each line is multipled before a number of final switches, it is possible for a moving finder switch to test the lead 13 of a line in the hunting operation at the same instant that another finder, which has already seized said line for a conversational connection, is applying message register operating current to the same lead. Under these conditions the resistance included in the lead 13 may be sufficient to raise the potential of the hunting terminal to a point where a test relay in the hunting finder operates. Inasmuch as the operation of the test relay normally indicates that the finder has found the calling line it is seeking, it is necessary to provide means for ignoring the operation of the test relay under the conditions above mentioned. Assume, for example, that the subscriber's line 1 has made a call, that the connection was established by way of the line finder switch F—1, that conversation is over, and that message register operating current is being applied by way of conductor 107, brush 108, terminal 109 to the lead 13 to the line 1. Assume also that the finder switch F, which is seeking some other calling line, encounters the terminals of line 1 at this particular instant. It will be recalled that during the hunting operation of the finder switch F, sequence switch 24 is in position 2 and the relay 23 is operated and locked through its inner upper contact, contacts of cam 25 to ground through the commutator 31. When the brush 6 of the finder F encounters the terminal 34, having the message register operating potential thereon, current flows by way of the brush 6 and conductor 33 through the winding of relay 30, contact cam 32 to ground. This operates the relay 30, but relay 23, which normally would release at this time to terminate the hunting movement of the finder, is held in another circuit to insure the continued movement of the finder F past the line 1 and in search for the other calling line. The holding circuit for relay 23 may be traced from battery through the winding and inner upper contact thereof, contacts of cam 25, make-before-break contacts of relay 30, conductor 110, resistance 41, sleeve brush 4, terminal 42, multiple sleeve terminal 44, brush 111, thence over the sleeve conductor 112 which is grounded at this time by the contacts of a sequence switch cam corresponding to cam 29 in the line finder F. This holds the relay 23 operated until the finder F passes over the line 1, at which time relay 30 releases and recloses the normal holding circuit of relay 23 through the commutator 31.

What is claimed is:

1. In a telephone system, line finder switches, subscribers' lines appearing in the multiple terminals of said finders, each line having a message register, a combined test and register operating conductor for each line appearing in the test terminals of said finders, means associated with a finder that has seized a line to render the seized line busy and to apply a source of register-operating potential to said test terminals to operate the register of said seized line, means for applying a calling potential to the test terminals of a

calling line and for initiating the hunting movement of one of said finders, test means operative in response to said calling potential to stop the hunting finder on the terminals of the calling line and also operative in response to said register-operating potential in case the hunting finder engages said seized line at the moment register-operating potential is present on the test terminals thereof, and means for preventing the hunting finder from stopping on said seized line when the said finder test means is operated by said register-operating potential.

2. In a telephone system, line finder switches, subscribers' lines appearing in the multiple terminal sets in said switches, each terminal set including a sleeve terminal and a hunting terminal, message registers for said lines, means responsive to a call on one of said lines for applying a calling potential to the hunting terminal thereof and for initiating the hunting movement of a line finder switch, a test relay in the line finder responsive to the calling potential on said hunting terminal for causing the finder to seize the terminals of the calling line, means controlled by the operated finder switch for placing a busy potential on the sleeve terminal of the seized line, means controlled by the operated finder switch for applying a register-operating potential to the hunting terminal of the seized line to operate the associated message register, means responsive to a call on a second line for initiating the hunting movement of a second finder switch, a test relay in the second finder switch responsive to the calling potential on the hunting terminal of a calling line for seizing the same and also responsive to the register-operating potential on the hunting terminal of said first-mentioned line in case said second finder encounters the hunting terminal of said first line at the moment the said register-operating potential is present thereon, and means associated with said second finder switch for rendering its test relay ineffective to stop said second finder on the terminals of said first line and for causing said second finder to continue its movement in search of said second-mentioned calling line.

3. In a telephone system, subscribers' lines having message registers, a control conductor for each of said lines for operating the message register thereof, a common current supply conductor connectable to the control conductor of any calling line, and a source of constant intensity current for operating a desired register over a circuit including the common supply conductor and the control conductor associated with the desired register, the current supplied from said source being sufficient to operate the register of any one of said lines but insufficient to operate the registers of two lines in case the control conductors of said lines are accidentally in contact with each other.

4. In a telephone system, subscribers' lines having individual message registers, control circuits individual to said lines for operating the respective registers, a line finder switch for seizing a calling line, a common supply conductor connectable by said finder switch to the control conductor of the seized line, and a constant current supply source associated with said finder switch for supplying operating current to the register of the seized line over a circuit including the common supply conductor and the individual control conductor, the current from said source being independent of the resistance of said circuit and sufficient to operate a single register but insufficient to operate two registers in case the control conductors of two lines are in contact with each other.

5. In a telephone system, subscribers' lines having message registers, message register conductors for operating said registers, a selective switch for seizing a calling line, a common operating conductor connectable through said switch to the message register conductor of the calling line, resistances in said message register conductors, a test relay connectable to said common conductor for testing the resistance in series therewith and operative if the message register conductor of the calling line is in contact with that of a second line, a source of current applicable to said common conductor to operate the calling line message register, and means controlled by said test relay to withhold the application of said source.

6. In a telephone system, party lines, individual lines, message registers for said lines, control conductors individual to said lines for operating the associated message registers, resistance elements in the control conductors of said party lines, a finder switch for seizing a calling line, a common supply circuit connectable through said switch to the control conductor of the calling line, a test relay connectable to said common conductor for testing the resistance in series therewith and operative if the control conductor of the calling line is in contact with that of a second line, a source of current applicable to said common supply circuit to operate the calling line message register, and means controlled by said test relay to withhold the application of said source.

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