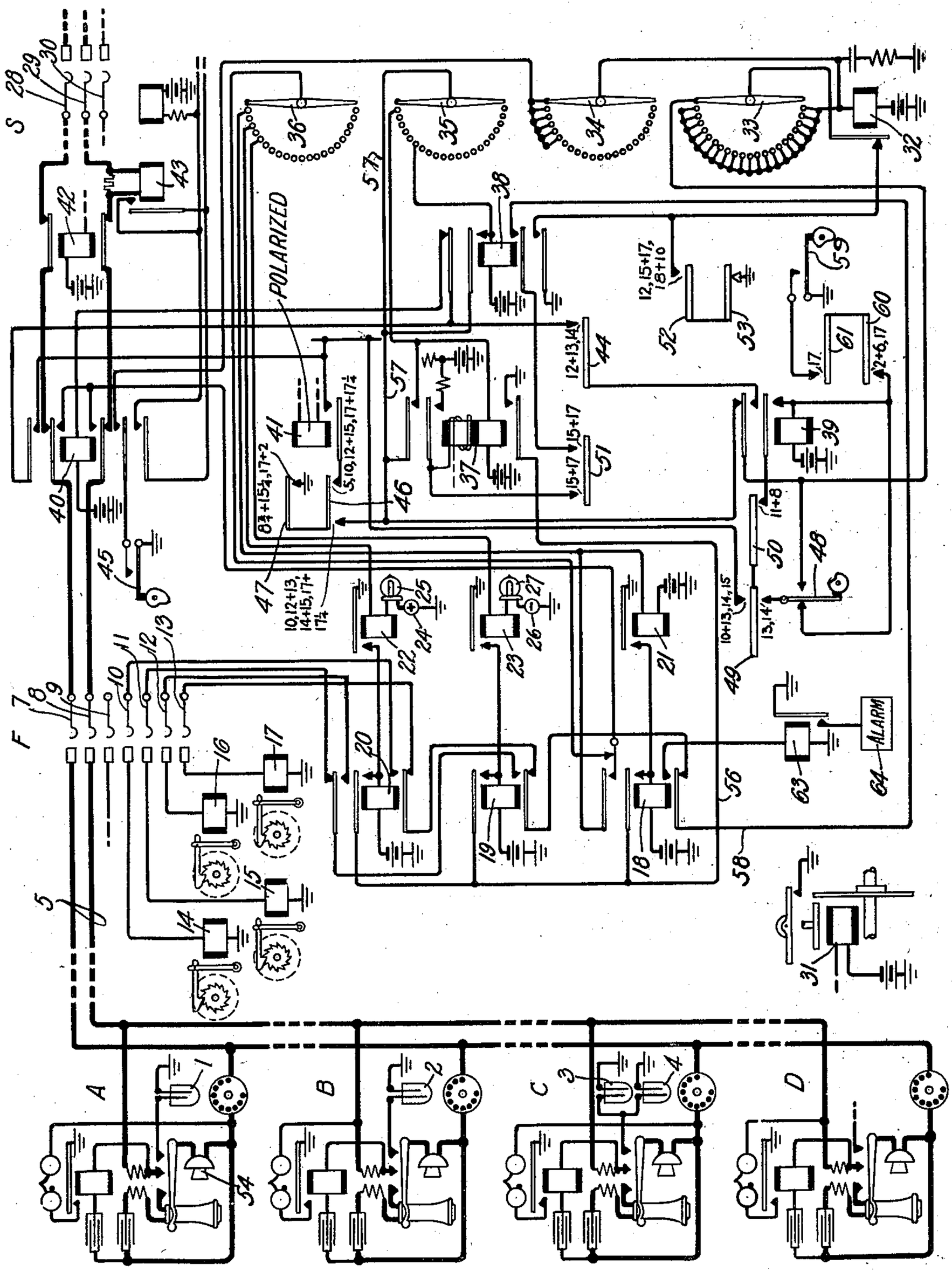
March 27, 1928. 1,663,747

H. M. BASCOM

TELEPHONE EXCHANGE SYSTEM

Filed Aug. 5, 1927



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Patented Mar. 27, 1928. 1,663,747

UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM.

Application filed August 5, 1927. Serial No. 210,928.

This invention relates to telephone exchange systems and particularly to improvements in message registration for party lines.

According to this invention directional space discharge devices are employed at the stations on a party line in such manner that a discriminating test, to determine the calling station, may be performed at central office by applying to the line sources of potential of different polarities. By means of the discriminating test the message register of the calling party may be selected and operated.

The drawing shows the invention applied to a four-party line in an automatic telephone system. The party line 5 is shown with four substations A, B, C and D. The station A is provided with a space discharge device 1, one electrode of which is connected to a switchhook contact and the other to ground. The arrangement of the device is such that, for a given voltage, current flows from one electrode to the other but will not flow in the reverse direction. The station B is similarly provided with a device 2 which is reversed to allow current to flow in the direction opposite from that in the device 1. Station C is equipped with two devices 3 and 4 oppositely connected to the switchhook contacts. Thus, when potential of one polarity is applied to the line, current flows through the device 3 and when potential of the opposite polarity is applied current flows through the other device 4. No discharge device is provided at the station D.

The space discharge device may be of any suitable construction such as the one illustrated in the application of Gray, Serial No. 98,655, filed March 31, 1926.

At the central office the party line terminates in a line finder switch F illustrated diagrammatically by the brushes 7 to 13 inclusive. The finder F is joined directly to a selector switch S having brushes 28, 29, and 30. The line finder selector unit partially shown herein may be of substantially the same construction and operation as illustrated and described in detail in the patent to Kopp, No. 1,589,402, issued June 22, 1926. Control and operating circuits for a selector switch of this character are also shown in the patent to Stearn et al., No. 1,395,977, issued November 1, 1921. The switches F and S may be of the panel type and the sequence switch 31 which controls the circuit changes may be the same as that illustrated in the Kopp and Stearn patents.

At the central office there are also provided individual message registers for the different parties on the party line. The registers 14, 15, 16 and 17 are respectively individual to the stations A, B, C and D.

A detailed description will now be given, assuming that the party at substation A initiates a call. The initiation of the call causes the operation of line finder F to seize the subscriber's line 5. The calling subscriber thereupon manipulates his impulse transmitter to set up the designation of the called line in the register sender at the central office. Thereupon the sender controls the selector S and succeeding switches to extend the connection to the called subscriber's line in the usual manner. A system of this type is fully described in the Stearn patent above mentioned.

When the called subscriber answers, the relay 41 operates and at this time the sequence switch 31 has advanced to some position, such as position 13. As soon after the relay 41 operates as the interrupter 48 closes its left contact, a circuit is completed from battery, through the winding of relay 39, left contact of interrupter 48, contacts of sequence switch spring 49, contact of relay 41 through contacts of springs 46 and 47 to ground. Relay 39 operates and locks through its winding and contact, contact of spring 50 and thence as above traced to ground. With relay 39 operated a circuit is closed from battery, through the winding of relay 40, upper contact of relay 38, spring 44, upper front contact of relay 39, right contact of interrupter 48, when closed, to ground as above traced. Relay 40 operates and locks in a circuit from battery through its winding, upper contact of relay 38, upper contact of relay 40, contact of relay 41 to ground at the spring 47.

The stepping switch having the brushes 33, 34, 35 and 36 and the stepping magnet 32 is now set in operation to make a test of the calling subscriber's line to determine which station has initiated the call. The circuit for initiating the operation of the stepping switch is closed by the interrupter 45 and may be traced through the middle lower contact of relay 40, brush 34 in its first position and the winding of the magnet 32. On the next opening of interrupter

45 magnet 32 deenergizes and steps the brushes 33 to 36 forward to the second position.

In position 2 of the switch a preliminary test is made to determine whether a false condition exists on the line 5. The test circuit for this purpose may be traced from battery, through winding of relay 21, brush 36, normal contact or relay 18, thence through the front contacts of relay 40 in parallel and the brushes 7 and 8 of the finder switch to the tip and ring conductors of the line 5. If a low resistance ground is connected to either side of the line relay 21 operates and brings about the operation of a signal in the manner to be explained hereinafter. If, however, the calling line is in proper condition relay 21 does not operate.

While the stepping switch is in position 2, a circuit is closed from battery, through the winding of relay 37, brush 35, contacts of sequence switch springs 46 and 47 to ground. Relay 37 operates and locks in a circuit through its winding and contact, conductor 57 and thence to ground as traced through the springs 46 and 47.

On the next closure and opening of the interrupter 45 the switch steps to its third position in which nothing happens. On the following closure and opening of the interrupter the switch steps to its fourth position where another test is made of the line to determine the calling substation. A circuit for this test may be traced from the positive pole of a high potential source 24 through the lamp 25, winding of relay 22, brush 36, normal contacts of relay 18 through the contacts of relay 40 in parallel to the tip and ring conductors of the line 5. The circuit over the tip conductor may be traced through the talking transmitter 54 and the switchhook to the space discharge device 1. It will be assumed that the device 1 is so arranged that current will flow in the circuit traced. Accordingly, the relay 22 operates and closes an obvious circuit for relay 20. Relay 20 locks from battery, through its winding and contact, conductor 56, ground at the front contact of relay 37.

The stepping switch is advanced from position 4 into position 5, where nothing happens and then into position 6. In position 6 another test is made of the line using the opposite polarity of the testing source. The circuit may be traced from the negative pole of the high potential source 26, lamp 27, relay 23, brush 36 and thence as previously traced to the tip and ring conductors of the line 5. No appreciable current flows in this cirucit, however, since the device is connected to permit current to flow only in the opposite direction. Accordingly, the relay 23 does not operate.

The next closure and opening of the interrupter 45 advance the stepping switch out of position 6 and into position 7 where it is no longer under the influence of said interrupter. In position 7 relay 38 is operated in a circuit from battery, through its winding, brush 35 to ground through the springs 46 and 47. Relay 38 locks through its winding and contact independently of the brush 35. Relay 38 at its upper contact opens the holding circuit of relay 40 and this latter relay releases. The stepping switch is advanced to its normal position in a circuit from battery, through the winding of the magnet 32, brush 33, contact of the magnet 32 to ground at the contact of relay 38. The apparatus remains in this condition during conversation.

At the end of the conversation the called party replaces his receiver on the switchhook resulting in the deenergization of the relay 41. In the well known manner the sequence switch 31 moves from the talking position to a subsequent position, such as position 17, to prepare for metering. The release of relay 41 opens the holding circuit of relay 39 and this latter relay releases. Relay 38 is now held in a circuit from battery through its winding and contact, conductor 57, upper back contact of relay 39, brush 33, contact of magnet 32 to ground at the lower contact of relay 38. Relay 37 is also held in a circuit from battery, through its winding and contact, conductor 57 and thence to ground at the lower contact of relay 38.

When the sequence switch 31 moves from the talking position, and while it is moving to position 17, a circuit for operating the calling party's meter is closed. This circuit may be traced from battery, through the inner upper contact of relay 37, contacts of spring 51, inner lower contact of relay 38, conductor 58, lower back contacts of relays 18 and 19, lower front contact of relay 20, brush 10, message register 14 to ground. The meter 14 operates charging the call against the subscriber at station A. When the sequence switch reaches position 17 and as soon thereafter as interrupter 59 closes, a circuit is completed from battery, through the winding of relay 39, springs 60 and 61 to ground at the interrupter 59. Relay 39 in operating releases relays 37 and 38. Relay 37 releases relay 20. From this point the release of the line finder and district selector takes place in any well known manner such as explained in the patent to Kopp, No. 1,589,402, issued June 22, 1926.

Assume next that the call is initiated by the subscriber at station B. In this case when the test circuit including the source 24 is closed, no current flows through the device 2 and accordingly relay 22 does not operate. When the next test circuit including the source 26 is closed, however, current does flow and relay 23 operates. Relay 23

operates relay 19 in an obvious circuit. Later when the district sequence switch 31 reaches position 15, the metering circuit is completed over conductor 58, back contact of relay 18, lower front contact of relay 19, upper back contact of relay 20, brush 11 to ground through the register 15. Thus, the call is charged to the substation B.

If the subscriber at substation C initiates the call current will flow through both of the test circuits and accordingly both relays 22 and 23 operate. With relays 19 and 20 operated the metering circuit leads through the front contacts of these relays, brush 12 and register 16 to ground.

Should the subscriber at station D initiate the call neither of the test circuits is effective and therefore both relays 22 and 23 remain inert. Accordingly, the metering circuit leads over the lower back contacts of relays 19 and 20 and the brush 13 to the register 17.

It was hereinbefore explained that the relay 21 operates if the initial test of the line discovers an unstandard ground potential on one of the conductors. Relay 21 closes an obvious circuit for relay 18. Relay 18 operates and locks to the conductor 56. Subsequently, when the metering circuit is closed it may be traced over conductor 58, through the lower front contact of relay 18, to ground through the winding of relay 63. Relay 63 operates any suitable alarm device 64.

While the invention has been shown in connection with a telephone system employing panel switches, it is to be understood that it may be embodied in systems of other types.

What is claimed is:

1. In combination, a line having a plurality of stations thereon, devices at said stations, each device arranged to allow current of a given polarity to flow and to prevent the flow of current of opposite polarity, means to apply sources of potential of different polarity to the line, and testing means responsive to the flow of current from said sources to discriminate one station from another.

2. In combination, a line having a plurality of stations thereon, devices at said stations, each device arranged to allow current of a given polarity to flow and to prevent the flow of current of opposite polarity, means to apply sources of potential of different polarity to the line, individual message registers for said stations, and testing means responsive to the flow of current from said sources to discriminate one station from another and to cause the operation of said registers.

3. In combination, a central office, a party line terminating therein, directional devices at the stations on said line, each device arranged to pass current in a given direction and to prevent flow in the opposite direction, sources of potential of different polarity at the central office, means for applying said sources to the line, individual registers for said stations, testing means under control of said potential sources for discriminating between said stations, and means controlled by said testing means for selecting and operating said registers.

4. In combination, a central office, a party line terminating therein, space discharge devices at the stations on said line, each device arranged to pass current in a given direction and to prevent current flow in the opposite direction, sources of potential of different polarity at the central office, individual registers for said stations, means including said sources of potential for making a test of the line to determine which station is calling, and means effective in accordance with the test for operating the register individual to the calling station.

5. In combination, a central office, a party line terminating therein, space discharge devices at the stations on said line, each device arranged to pass current in a given direction and to prevent current flow in the opposite direction, sources of potential of different polarity at the central office, individual registers for said stations, means for making successive tests by applying said sources of different polarity to the line, and means operative in accordance with the test for selecting and operating the register individual to a calling station.

6. The combination with a central office of a party line terminating therein, current discharge devices at the stations on said line, each device arranged to pass current only in a given direction when potential of proper value is applied, sources of potential of different polarity at the central office, individual registers for said stations, means at the central office including said sources of potential for testing the party line to determine which station is calling, and means controlled by the testing means for operating said registers.

7. The combination with a central office of a party line, current discharge devices at the stations on said line, each device comprising an envelope including two electrodes arranged to pass current in a given direction and to prevent the flow of current in the opposite direction, testing means at the central office including sources of potential of different polarity, means for applying said testing means to the party line to discriminate between the stations thereon, registers for said stations, and means controlled by the testing means for selecting and operating said registers.

In testimony whereof, I have signed my name to this specification this 2nd day of August, 1927.

HENRY M. BASCOM.