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G. J. KNANDEL ET AL

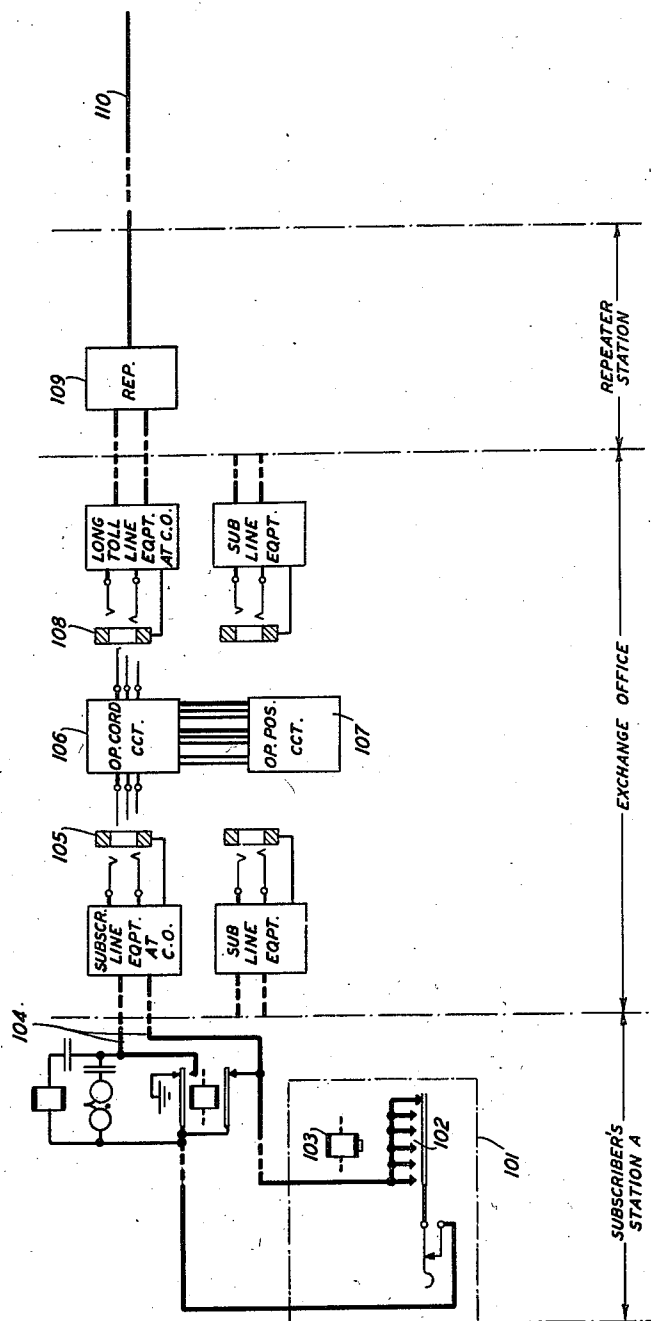
2,306,734

PARTY LINE PRINTING TELEGRAPH SYSTEM

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2 Sheets-Sheet 1

FIG. 1



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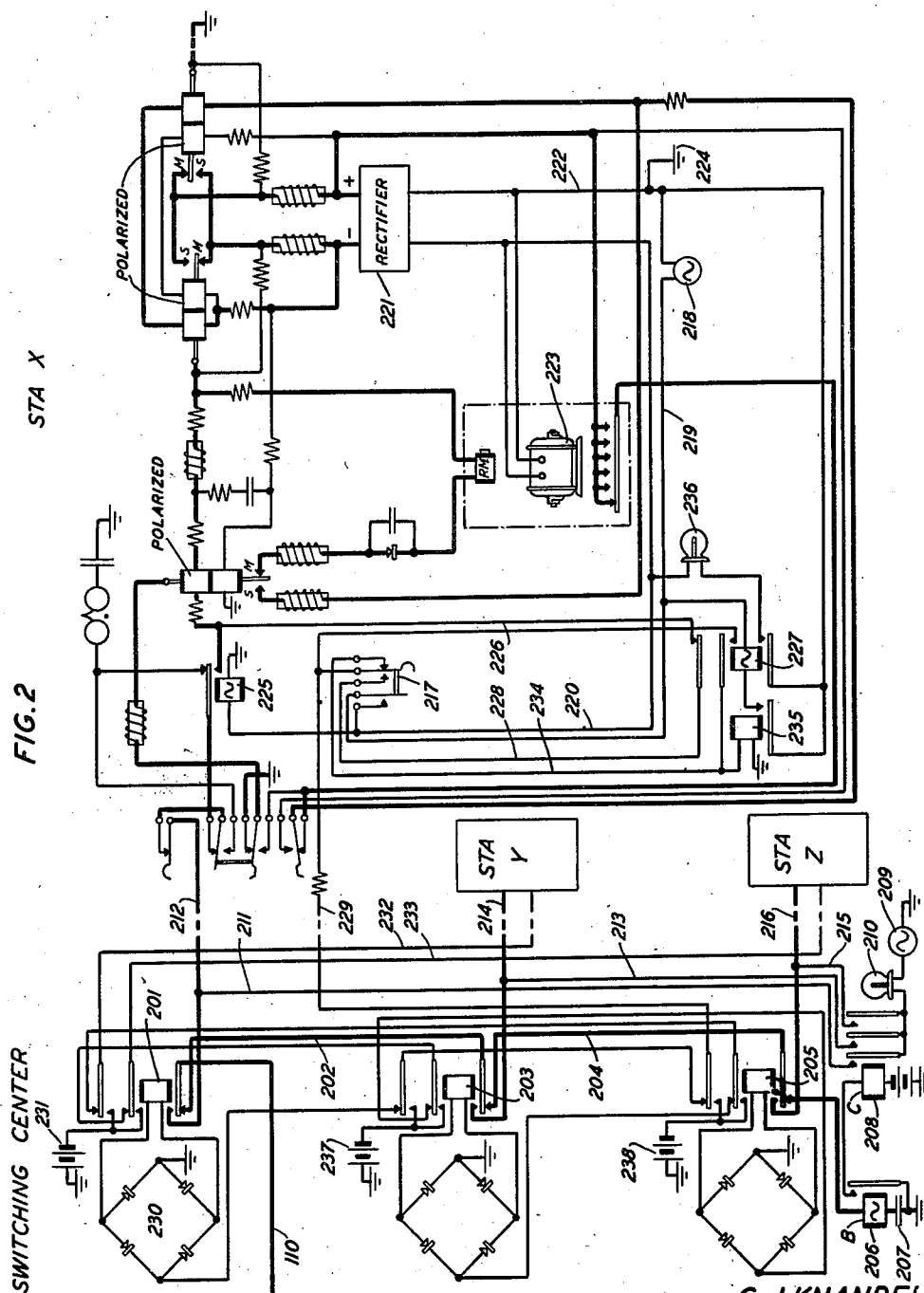
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2,306,734

PARTY LINE PRINTING TELEGRAPH
SYSTEM

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This invention relates to a communication system for transmitting signaling impulses over telegraph lines or channels and more particularly to a telegraph system for connecting an outlying telegraph subscriber's station to a central switching office over a telegraph line or channel.

An object of the invention is to lock out or prevent a subscriber's station from using a line when another subscriber's station is operatively connected to the same line.

Another object is to utilize a telegraph line of the trunk or repeater type as a means whereby there may be connected one of a plurality of subscribers' stations to a central office, thereby giving the subscribers a party line service over a particular trunk.

Another object of the invention is to permit one only of such plurality of subscribers' stations to be connected to a line extending to a repeater station which in turn is connected to a telegraph exchange office.

Another object is to provide a plurality of subscribers with teletypewriter switching service over one line by improved means.

According to an embodiment of the present invention, two or more subscribers' telegraph stations may be connected over individual lines to relay contacts of a switching arrangement located in a switching center at a local telephone central office or other convenient place, the switching arrangement being connected to a telegraph line circuit of the long line type that extends through one or more repeater stations connected to a distant telegraph exchange office. a line circuit which extends from the repeater. The relay arrangement is controlled either over a line circuit which extends from the repeater station, or from any one of the subscribers' stations, depending upon the direction in which the call originates. The relay arrangement at a local telephone central office provides a combination of relay-operated circuits whereby the subscriber at one station of a party line group is prevented from establishing a connection to the exchange office or to the telegraph circuit terminating at the exchange office when another station of the group is busy.

A feature of the invention is locating the switching equipment at a local telephone central office for maintenance purposes.

Another feature is the provision of lock-out relay in the relay arrangement for preventing one subscriber's station of a party line group from seizing a line when the line is engaged by another subscriber's station of the group.

Another feature is the use at the switching center of a relay arrangement comprising a plurality of relays individual to the outlying subscribers' stations of a party line group, each of the relays being operable through a rectifier and controlled by the source of message signals at its associated subscriber's station.

Another feature is the use of each of the relays individual to the outlying subscribers' stations of a party line group for connecting the associated subscriber's station to the line and locking out other subscribers' station of the group when the associated station is connected to the line.

Another feature resides in the relay arrangement at the switching center, whereby as many party line subscribers' stations may be connected as is possible to add a relay for each subscriber's station and an armature to each of the other relays for every subscriber's station that may be connected.

The invention will now be described with respect to the accompanying drawings which illustrate the telegraph exchange system in which an embodiment of the invention may be satisfactorily adapted. The drawings are arranged into two figures:

Fig. 1 shows a distant telegraph exchange office connected on one side to a single telegraph subscriber's station and on the other side to a toll line extension circuit extending to a repeater at a distant point and a line outgoing to a telephone central office.

Fig. 2 shows a switching arrangement at a local telephone central office whereat the line from the telegraph exchange office terminates, and three subscribers' lines connected thereto and extending to their respective subscribers' stations.

Referring to Fig. 1 of the drawings, a subscriber's teletypewriter set 101 at station A comprising transmitting contacts 102 and printing magnet 103 of a teletypewriter is connected over a line 104 which terminates in jack 105 of the subscriber's line circuit equipment at the teletypewriter exchange office. The equipment at the subscriber's station A and at the termination of the line may be similar to that shown in Fig. 5 of U. S. Patent 2,143,000 granted to W. W. Cramer et al. on January 10, 1939. Line 104 may be one of a plurality, as shown terminating at the switchboard at the teletypewriter exchange office.

By means of the operator's cord circuit 106, the operator's position circuit 107 and jack 108,

subscriber's line 104 may be extended over a toll line extension circuit, the toll line extension circuit including jack 108 together with the terminating equipment adjacent thereto, repeater 109 and toll line 110. The repeater 109 may be located at a point distant from the exchange office. The operator's cord circuit 106 and the operator's position circuit 107 may be similar to those shown in Figs. 3 and 4, respectively, of U. S. Patent 2,143,000, supra. The terminating equipment connected to jack 108 at the exchange office may be similar to Fig. 8 of U. S. Patent 2,143,000, supra. The repeater 109 may be similar to the left side of Fig. 7 of U. S. Patent 2,143,000, supra.

The toll line 110 terminates at the lower armature of relay 201 which is normally in engagement with its back contact. The toll line 110 is extended over the lower armature and back contact of relay 201, conductor 202, lower armature and back contact of relay 203, conductor 204, lower armature and back contact of relay 205, through the winding of alternating current relay 206, condenser 207, to ground. Relays 201, 203 and 205 are respectively associated with outlying subscribers' stations X, Y and Z.

The ringing current generally applied at the switchboard at the distant teletypewriter exchange office when a connection is established operates the alternating current relay 206. Relay 206 upon operating closes an operating circuit for relay 208. Relay 208 operates and thereby closes over its armatures and their respective contacts three circuits which connect ringing generator 209 and lamp 210 to the subscribers' stations X, Y and Z, one of said circuits extending over conductors 211 and 212, another of said circuits extending over conductors 213 and 214 and the third extending over conductors 215 and 216. Code ringing, which is well known in the telephone art, is employed, that is, one pulse of ringing current is transmitted to call the subscriber at station X, two pulses to call the subscriber at station Y and three pulses to call the subscriber at station Z. The equipment at stations X, Y and Z are identical. A description of the equipment at station X will suffice for a description of that at stations Y and Z.

Relays 206 and 208 successively respond to the ringing current transmitted from the switchboard at the distant teletypewriter exchange office and relay 208, in turn, supplies ringing current locally to the three subscribers' stations X, Y and Z. Assume that one pulse only of the ringing current is received. The subscriber at station X answers by turning on power switch 217. The operation of switch 217 closes a circuit extending from source 218 of alternating current, conductor 219, left-hand spring member and contact of switch 217, conductor 220, rectifier 221, conductor 222, back to source 218. Connected in parallel with rectifier 221 is teletypewriter motor 223. Another circuit closed by the operation of switch 217 extends from ground 224, source 218, conductor 219, left-hand spring member and contact of switch 217, conductor 220, through the winding of alternating current relay 225 to ground. Motor 223 and relay 225 operate and rectifier 221 is energized.

Relay 225, upon operating, connects conductor 212 through the subscriber's set at station X and thence to the subscriber's station teletypewriter. Switch 217 upon being operated connects a source of positive and negative current obtained from

rectifier 221 to a circuit extending over conductor 226, contact and outer upper armature of relay 227, conductor 228, right-hand spring member of switch 217, in an operated position, control conductor 229, through the switching center whereat the circuit extends through the outer upper armature and back contact of relay 205, outer upper armature and back contact of relay 203, rectifier 230, through the winding of relay 201 to ground. The source of positive and negative currents obtained from rectifier 221 will be applied to relay 201 during the time that station X is in use, but will be negative when the subscriber's set is in the marking condition and positive when the subscriber's set is in spacing condition. Either polarity applied to the control conductor 229 will hold relay 201, which is associated with subscriber's station X, operated as long as the station is in use. Relay 201 upon operating will at its lower armature and back contact disconnect the alternating current relay 206 from the toll line 110 and toll line 110 will be extended over conductor 212 to the subscriber's set at station X. Transmission to and from station X may now take place in the normal manner.

Relay 201, upon operating, will make the extensions through stations Y and Z busy by connecting grounded battery 231 to two parallel paths being respectively connected to the outer, upper and the inner, upper armatures of relay 201. These paths respectively extend over conductors 232 and 233 to stations Y and Z shown in diagrammatic form, conductors 232 and 233 being the control conductors for stations Y and Z.

For the purpose of illustration assume that grounded battery is connected to the control conductor 229 whose termination at station X is shown in detail. It will be further assumed that the power switch 217 is in normal position as shown in the drawing because the corresponding switch at each of stations Y and Z will be in normal positions when station X is operatively connected to the line. Grounded battery in being connected to conductor 229, is applied to a circuit extending over the right-hand spring member of switch 217 in normal position, conductor 234, through the winding of busy relay 235 to ground. Busy relay 235 operates and thereby closes a circuit extending from source 218 of alternating current, conductor 222, armature and contact of relay 235, through the winding of alternating current relay 227, conductor 219 to source 218. Relay 227 operates. Accordingly when station X is operatively connected to line 110, as hereinbefore described, the busy relay corresponding to relay 235 at station X, at each of stations Y and Z, will operate. The busy relays, being operated, respectively close circuits for operating their associated alternating current relays corresponding to relay 227. The operation of these alternating current relays at stations Y and Z will result in a busy indication being given by their respectively associated lamps, corresponding to lamp 236, if either or both of the subscribers at stations Y and Z attempt to initiate a call while station X is connected to the line 110.

At the end of the call, power switch 217 is restored to normal thereby deenergizing rectifier 221, stopping motor 223, releasing relay 225, and disconnecting the source of alternate positive and negative message signals that was received over conductor 226 and applied to control conductor 229. The disconnection of the source of message signals from control conductor 229 causes relay 201 to release. Relay 201 upon releasing

restores the busy relays at stations Y and Z to normal.

Outgoing call from station X

Assume the subscriber at station X initiates a call if the toll line extension 110 is not in use. Power switch 217 is operated to connect the source of message signals as applied to conductor 226 and control conductor 229, in series, to operate relay 201 in a manner hereinbefore described. Relay 201 upon being operated connects toll line extension 110 to the subscriber's set and thence to the teletypewriter at station X and makes the extensions to the other stations busy in the manner hereinbefore described. If the toll line extension 110 to the switchboard is in use, grounded battery 237 or 238 depending upon whether station Y or Z is using the line, will be connected to the corresponding control conductor 229 which will result in a busy indication on busy lamp 236 in response to the operation of power switch 217.

When a called signal is received at the switchboard at the exchange office from a toll line extension circuit, having three or more stations connected to it, the operator will be unable to distinguish at which of the stations the call originated. It will, therefore, be necessary for the subscriber to transmit signals indicating the name of the calling subscriber as soon as the operator answers. The subscriber's teletypewriter circuit as shown at station X is similar to that shown in Fig. 1 of U. S. Patent 2,143,000, supra, except for modifications to take care of the facility for giving a busy indication and of furnishing a source of current to operate relays 201, 203 and 205 at the switching center.

The break, the recall and disconnect features are not affected by three or more party operations and a recall from any station of a party line group does not provide a means whereby another station of the group may take over the circuit, providing a recall key rather than the power switch is employed at each station for recalling. The operation of the recall key opens the message line circuit which does not cause the release of relay 201, 203 or 205 in the local telephone central office and therefore the circuit to the subscriber at station X, Y or Z remains locked out.

It is understood that the present invention is not limited to the arrangement shown and that it may be adapted for use in systems having four or more parties connected to the toll line extension circuit. For each additional subscriber's station added to the party line, an extra relay such as 201 and an extra rectifier such as 239 are required. Also it is necessary to furnish an extra armature on each of the relays such as relays 201, 203 and 205 and also an extra armature on relay 206. As many subscribers' stations may be added as is practicable to develop multicontact relays or until the line 110 becomes too heavily loaded from a traffic standpoint.

What is claimed is:

1. A telegraph system comprising an exchange office, a switching center, a plurality of outlying stations, a main circuit interconnecting said exchange office and said switching center, a plurality of circuits for respectively connecting said outlying stations to said switching center, a source of current at each of said outlying stations, operable means arranged when operated to impress code signals of alternate positive and negative polarities from said source on one of said plurality of circuits, an electromagnetic means re-

sponsive to current of both positive and negative polarities from said source for maintaining the connection of said one of said plurality of circuits to said main circuit.

2. A telegraph system comprising an exchange office, a switching center, a plurality of outlying stations, a normally idle main circuit interconnecting said exchange office and said switching center, a plurality of normally idle circuits respectively connecting said outlying stations to said switching center, a source of current at each of said outlying stations, operable means arranged when operated to impress code signals of alternate positive and negative polarities from one of said sources on one of said plurality of circuits, an electromagnetic means responsive to the code signals of positive and negative current of its associated source for operatively connecting said one of said plurality of circuits to said main circuit, and means coincidentally operative with the electromagnetic means associated with said one of said plurality of stations for preventing any one of the other of said plurality of circuits from being operatively connected to said main circuit.

3. A telegraph system comprising an exchange office, a main line from said office to a switching center, a plurality of subscribers' stations having individual lines extending to said switching center and connectable to said main line, a circuit varying device at each of said subscriber's stations operable to control the connection of its line to said main line at said switching center, a signal at each subscriber's station, and means whereby operation of said circuit varying device at any of said stations actuates its associated signal when any other of said circuit varying devices has previously been and remains operated.

4. A telegraph system comprising a teletypewriter exchange office, a switching center, a plurality of subscribers' teletypewriter stations, a main circuit interconnecting said exchange office and said switching center, a plurality of circuits respectively connecting said plurality of subscribers' stations to said switching center, a supply source of code signals of positive and negative current at each of said subscribers' stations, operable means arranged when operated to impress code signals of positive and negative polarities from its associated one of said sources on its associated one of said plurality of circuits, and a control device responsive to the code signals of positive and negative polarity from said one source for operatively holding connected one of said plurality of subscribers' stations to said main circuit and indicating means comprising a signal at each of said plurality of subscribers' stations responsive to the operation of one of said operable means for operating said signal at one of said plurality of subscribers' stations when one of the other of said plurality of subscribers' stations is operatively connected over its associated circuit to said main circuit.

5. A telegraph system according to claim 4 wherein one of said indicating means comprises a pair of electromagnetic devices responsive to the operation of one of said operable means associated with one of the other of said plurality of subscribers' stations for conditioning its associated said signal to operate when its associated said operable means is operated.

6. A telegraph system comprising a teletypewriter exchange office, a switching center, a plurality of subscribers' teletypewriter stations, a main circuit interconnecting said exchange of-

office and said switching center, a plurality of circuits respectively connecting said plurality of subscribers' stations to said switching center, a source of positive and negative current at each of said subscribers' stations, operable means arranged when operated to impress code signals of alternate positive and negative polarities of varying duration from one of said sources on one of said plurality of circuits, and means including a rectifier responsive to the signals of both positive and negative polarities from its associated said source for operatively connecting one of said plurality of subscribers' stations to said main circuit.

7. In a telegraph system comprising a teletypewriter exchange office, a switching center, a single channel of telegraphic transmission interconnecting said office and said switching center, switching instrumentalities for normally terminating said channel at said switching center, a plurality of teletypewriter stations normally terminating at said instrumentalities, means in said instrumentalities responsive to current variations incoming over said transmission channel for transmitting current fluctuations to each of said stations, switching means at each of said stations for initiating an operative connection between one of said stations and said transmission channel, said switching means comprising a source of current which may be varied to produce telegraph impulses, means in said switching center responsive to current from said source for completing said operative connection, and operable elements at each of said stations responsive to the operation of said completing means for preventing one of said stations from being oper-

atively connected to the transmission line when another of said stations is operatively connected to said transmission line.

8. In a telegraph system, an arrangement according to claim 7, wherein the means for varying said current is a teletypewriter cooperating therewith sending message signals over the subscriber's station circuit connected to said transmission circuit.

9. A telegraph system comprising a main office, a switching center geographically remote therefrom, a plurality of outlying stations, a main circuit interconnecting said exchange office and said switching center, a plurality of circuits for respectively connecting said outlying stations to said switching center and thence to said main office whereby said plurality of outlying stations have access to said exchange office through said main circuit, means operable under control of the main office for selectively indicating at any one of said outlying stations a calling condition for said station, instrumentalities operable at the selected indicated station to establish a connection of a circuit individual thereto and extending therebetween and the switching center to said main circuit for telegraphic intercommunication between said outlying station and said main office, and further instrumentalities operative by current incidental to said transmission to maintain said connection.

10. A system in accordance with claim 9 having further means whereby a current incidental to said transmission establishes a busy condition for all other of said outlying stations.

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