Sept. 30, 1941. C. GOODWIN 2,257,677

PRINTING TELEGRAPH SYSTEM

Filed Jan. 9, 1940 2 Sheets-Sheet 1

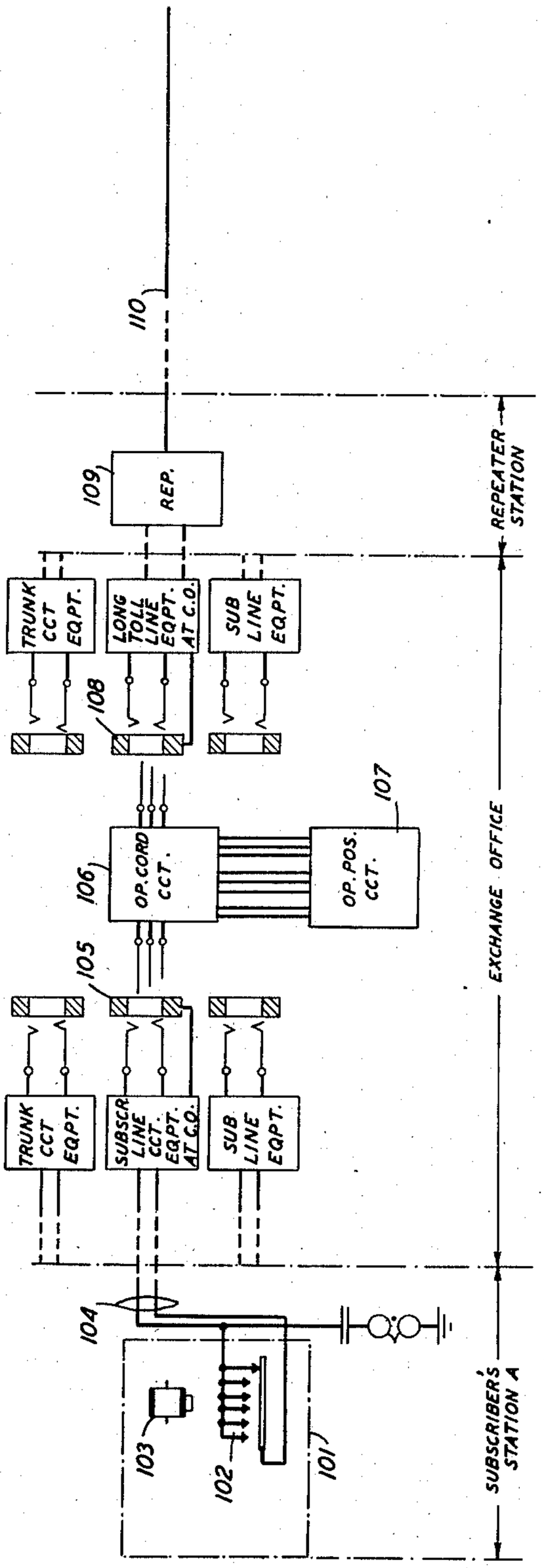

FIG. 1

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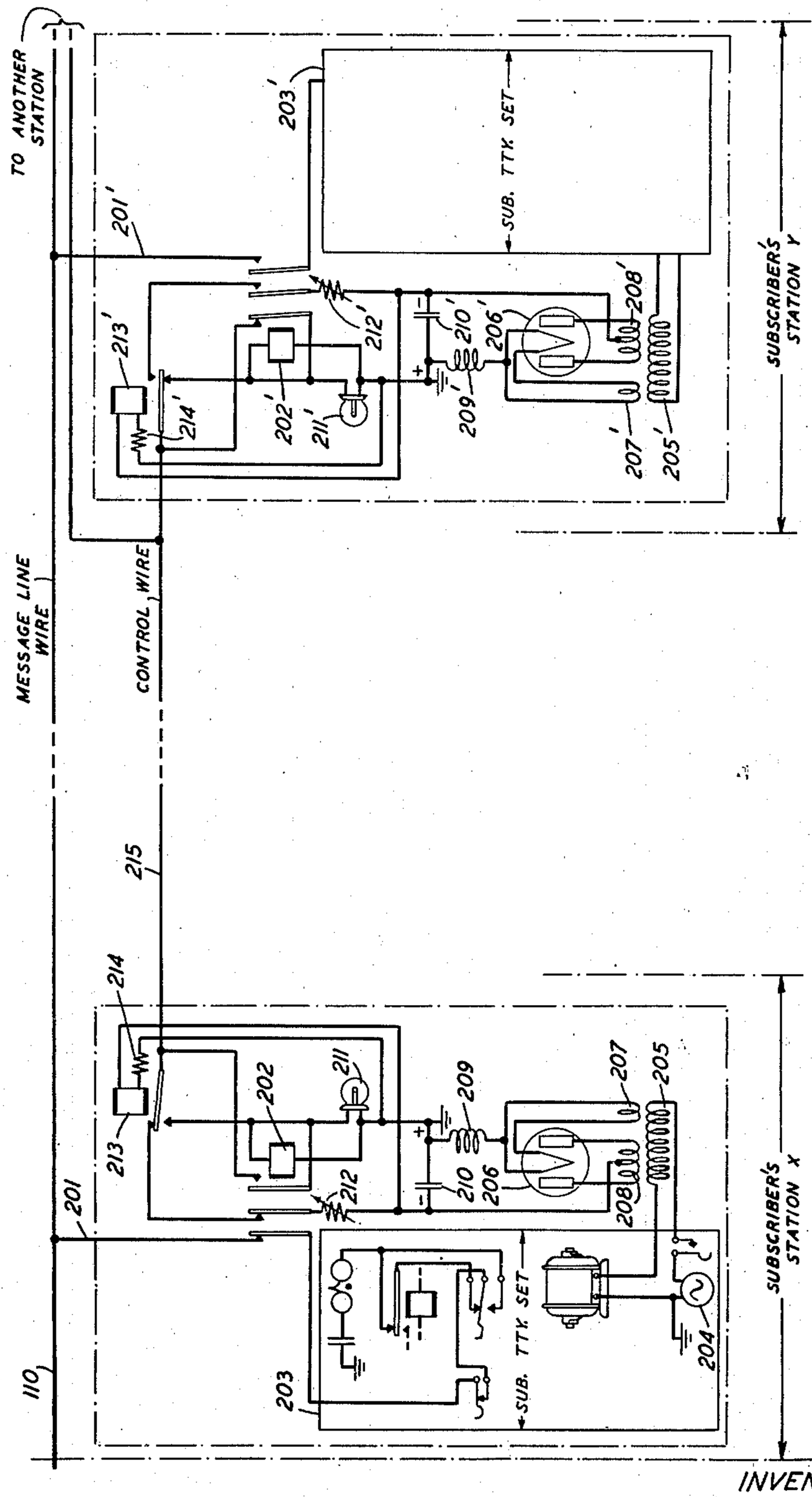

FIG. 2

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2,257,677

PRINTING TELEGRAPH SYSTEM

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Application January 9, 1940, Serial No. 313,111

11 Claims. (Cl. 178—23)

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

A telegraph system of this character permits the extension of telegraph lines each of which may be connected to a plurality of subscribers' stations, in parallel.

An object of the invention is to permit a plurality of subscribers' stations connected to a line to be extended to a repeater station which, in turn, is connected to a central office.

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

According to the present invention, a plurality of subscribers' stations may be connected to a toll line extension circuit that extends from a distant telegraph exchange office through a distant repeater station. Each of the subscribers' stations is equipped with a teletypewriter set comprising a source of alternating current, a low voltage rectifier and a switch for connecting the alternating current source to the primary winding of a high voltage transformer. Connected to the secondary winding of the high voltage transformer is a full wave rectifier, the output of which serves to operate a connector relay, a busy lamp and a lock-out relay. When the connector relay operates, a control wire operatively connects one station with the other stations whereby a grounded circuit is completed to operate the busy lamp and lock-out relay at each of the other stations so that the subscribers at the other stations are prevented from establishing a connection to the exchange office when one of the stations is busy.

A feature of the invention is the use of a control circuit in addition to the message circuit, between the subscribers' stations connected to the line and a lock-out relay at each of the subscribers' stations connected to put the line on a non-seizure basis.

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

Figure 1 shows a distant teletypewriter exchange office equipped on one side with a teletypewriter subscriber's station and on the other side with a toll line extension circuit extending through a repeater station at a distant point to a line to which two subscribers' stations are connected in parallel.

Fig. 2 shows the two subscribers' stations connected to the line extending from the distant repeater station.

Referring to Fig. 1 of the drawings, a subscriber's teletypewriter set **101** at station A comprising the transmitting contacts **102** and printer magnet **103** of a teletypewriter, is connected over 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 line **104** may be similar to that shown in Fig. 5 of United States 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 station A.

By means of the operator's cord circuit **106** and the operator's position circuit **107**, the subscriber's line **104** may be extended over a toll line extension circuit including jack **108**, repeater **109**, single conductor 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 respectively shown in Figs. 3 and 4 of United States Patent 2,143,000, supra. The terminating equipment connected to jack **108** at the exchange office may be similar to Fig. 8 of United States Patent 2,143,000, supra. The repeater **109** may be similar to that shown at the left side of Fig. 7 of United States Patent 2,143,000, supra.

The single conductor toll line **110** terminates in two or more parallel paths **201**, **201'**, etc., respectively extending to stations X, Y, etc. The equipment at stations X and Y is identical. A description of the equipment at station X should suffice for a description of that at station Y. Corresponding parts of the equipment at stations X and Y will hereinafter be designated by like reference characters except that the part at station Y will be further designated with prime marks. The circuit including conductor **201** may be traced through the contact and outermost armature of lock-out relay **202** to ground at subscriber's teletypewriter set **203**. The teletypewriter set **203** is similar to that shown in Fig. 1 of United States Patent 2,143,000, supra, and is energized from an alternating current source **204**. Power source **204**, in response to the operation of a power switch in the teletypewriter set, energizes the primary winding **205** of a transformer in addition to energizing the teletypewriter motor, the rectifier and the start relay (the latter two not shown) of the teletypewriter set as described in United States Patent 2,143,000, supra, page 3, under caption "Subscriber originates a call."

A full-wave rectifier tube **206** obtains its cathode current from secondary winding **207** and

plate currents from secondary winding 208 of the transformer. Connected across the output of the tube is a filter comprising inductance 209 and condenser 210 to smooth out any ripples that may be in the rectified alternating current. The positive side of the output circuit is connected to busy lamp 211 and the winding of lock-out relay 202, in parallel and to connector relay 213. The negative side is connected through resistance 212, middle armature and contact of relay 202 to the front contact and winding of relay 213. When rectifier tube 206 is energized, the current flows in the output circuit through resistance 214 of comparatively high value and the winding of relay 213. The relay operates to connect a control wire 215 to its front contact.

Method of operation

The system will now be described from the viewpoint of originating a call at station X. The subscriber at station X operates the power switch (included in the teletypewriter set 203) to energize rectifier tube 206 and, in turn, connector relay 213. Rectified current therefore flows from the negative side of the output circuit of tube 206, through resistance 212, middle armature and contact of lock-out relay 202, front contact and armature of relay 213, control wire 215 to station Y where it extends over armature and back contact on connector relay 213', then over parallel paths, one through the winding of lock-out relay 202', and the other through busy lamp 211' to the grounded positive side of the output circuit of tube 206'. Busy lamp 211' lights and lock-out relay 202' operates. The lighting of lamp 211' indicates to the subscriber at station Y that the toll line 110 is busy and relay 202', upon operating, opens the normally closed contacts at its middle armature to prevent seizure of the line by the subscriber at station Y when the line is engaged by the subscriber at station X.

Assume that station X is operatively connected to line 110, busy lamp 211' at station Y is lighted and relay 202' at station Y is operated. Now assume that the power switch of subscriber's teletypewriter set 203' is operated, then rectifier tube 206' becomes energized. Accordingly, current will flow from the positive side of the output circuit of tube 206', through resistance 214' and the winding of relay 213' and back to the negative side of the output circuit. Relay 213' will operate but will not upset the circuit condition previously established. The control current from tube 206 at station X will continue to flow through busy lamp 211' and relay 202' at station Y and back through the control wire 215 to station X, the circuit now being closed at the front contact and innermost armature of relay 202'.

At stations operated on a polarential basis with the type of teletypewriter set equipped with the flashing recall feature and shown in Fig. 1 of United States Patent 2,143,000, supra, it would be possible under the following to cause an objectionable delay on a call. Assume that station X is operatively connected to the line circuit and the subscriber at station Y awaits an opportunity to get the line. Also assume that the subscriber at station X wishes to recall the operator by restoring the power switch in teletypewriter set 203 for a short interval. If the power switch at teletypewriter set 203' at station Y has been in its operated position for a time sufficient to energize the rectifier tube 206', then the moment that the power switch at set 203 is restored, relay 202' at station Y would release and the subscriber at station Y would seize the line circuit and the teletypewriter set 203 at station X would be locked out. This will not occur in polarential systems wherein the spacing signal voltage at the end where the polar signals are received, is of the same polarity as the marking signal voltage at the opposite end. However, in systems wherein the spacing signal voltage at the polar receiving end is of the opposite polarity to the marking signal voltage at the other end and wherein the above-mentioned objection may exist, the manual recall feature is employed whereby the line circuit itself is opened for a short interval of time to send a recall or flashing signal and there is no need of opening the power circuit of the teletypewriter set.

Call originating at the exchange office

On a call incoming at one of the two stations X and Y, coded ringing may be provided since the ringers, or call bells will ring. The ringers are shown in Fig. 1 of United States Patent 2,143,000, supra. Ordinarily the code used will be one ring for station X and two rings for station Y.

Special operating feature for subscriber

When a called signal is received at the switchboard at the exchange office from a toll line circuit having two stations connected to it, the operator will be unable to distinguish at which of the two stations the call originated. It will, therefore, be necessary for the subscriber to transmit signals indicating the name of the subscriber as soon as the operator answers.

What is claimed is:

1. A telegraph system comprising a main station, a plurality of stations, a communication channel connecting said stations to said main station, operable means, normally deenergized, at each of said stations for causing the seizure of said channel for communication purposes to the exclusion of the remaining of said stations.

2. In a telegraph switching system having a single telegraph central office, a multiparty single telegraph line extending from said office to a plurality of subscribers' stations, means whereby an operator may call any of said stations, means for setting any called station into communicative relation to the central office over said line, lock-out means in each station and means controlled by setting any one of said stations into communication relation to actuate said lock-out means to prevent all but said called one subscriber station from being conditioned for communicative relation in response to the operation of the setting means at said called subscriber's station.

3. A telegraph system comprising a main station and a source of signals thereat, a plurality of stations, a line circuit connecting said stations to said main station, signal means at each of said stations responsive to signals from said source, operable start switch in each of said stations for seizing said line circuit for communication purposes, and means at each of said stations responsive to the operation of said operable switch at any one of said stations for preventing the remaining of said stations from seizing said line circuit when said line circuit is seized by said one station.

4. A telegraph system comprising a main station and a source of signals thereat, a plurality

of stations, a line circuit connecting said stations to said main station, operable start key at each of said stations for seizing said line circuit for communication purposes, means at each of said stations responsive to the operation of said start key at any one of said stations for preventing the remaining of said stations from seizing said line circuit when said line circuit is seized by said one station, and indicating means at each of said stations responsive to the operation of said start key at any one of said stations for indicating at only the remaining of said stations that said one of said stations has seized said line circuit.

5. A telegraph system comprising a teletypewriter exchange office, a plurality of teletypewriter stations, a normally deenergized line circuit connecting said stations to said teletypewriter exchange office, a starting switch at each of said stations, said starting switch at any one of said stations arranged, when operated, to operatively connect said one only of said stations to said line circuit for telegraphic communication purposes to the exclusion of the remaining of said stations.

6. A signaling system comprising a signal transmission circuit, a plurality of stations normally connected unoperatively to said circuit, a source of alternating current at each of said stations, a start switch cooperating with each of said sources for operatedly connecting said transmission circuit to one of said stations, a converting means connected to each of said sources and a grounded output circuit therefor capable, when its associated start switch is operated, of producing a voltage of steady amplitude, a switching element at each of said stations responsive to the voltage of steady amplitude, a control circuit interconnecting said stations, and adapted to switch in response to the operation of said switching element at any one of said stations from one to the other polarity of the output circuit at said one station, and means at said other station responsive to the switching of the polarity of said control circuit at said one station for furnishing an indication that said one station is operatively connected to said transmission circuit.

7. A switching system comprising a signal transmission circuit, a plurality of stations normally connected unoperatively to said circuit, a source of alternating current at each of said stations, a start switch cooperating with each of said sources for operatively connecting said transmission circuit to one of said stations, a rectifying means connected to each of said sources and a grounded output circuit therefor capable, when its associated start switch is operated, of producing a direct current voltage, a switching element at each of said stations responsive to the direct current voltage, a control circuit interconnecting said stations, and adapted to switch in response to the operation of the switching element at one of said stations from one to the other polarity of the output circuit at said one station, means at said other stations responsive to the switching of the polarity of said control circuit at said one station for furnishing an indication that said one station is operatively connected to said transmission circuit, and other means in said other stations responsive to the switching of the polarity of said control circuit at said one station for preventing said transmission circuit from being operatively connected to any one of the other of said stations during the time that said transmission circuit is operatively connected to said one station.

8. A teletypewriter system comprising a signal transmission circuit, a plurality of stations normally connected to said circuit, a teletypewriter set including a low voltage rectifier and a source of alternating current therefor at each of said stations, said teletypewriter set being normally connected unoperatively to said transmission circuit, a high voltage rectifier responsive to each of said sources, a start switch for operatively connecting each of said sources to its associated low voltage and high voltage rectifiers, a grounded output circuit for each of said high voltage rectifiers capable, when its associated start switch is operated, of producing a direct current voltage, an electro-magnetic relay at each of said stations responsive to the direct current voltage, a control circuit interconnecting said stations and adapted to switch in response to the operation of the electromagnetic relay at one of said stations, from one to the other polarity of the output circuit at said one station, a lamp at each of said other stations responsive to the switching of said control circuit at said one station for furnishing an indication that said teletypewriter set at said one station is operatively connected to said transmission circuit, and another electromagnetic means at said other stations responsive to the switching of the polarity of said control circuit at said one station for preventing the teletypewriter set at each said other stations from being operatively connected to said transmission circuit during the time that said transmission circuit is operatively connected to the teletypewriter set at said one station.

9. In a teletypewriter exchange system a central office, a plurality of outlying stations, a normally deenergized transmission channel interconnecting said central office and said outlying stations, a source of signals at said central office and each of said outlying stations, signal means at each of said outlying stations responsive to signals from said source at said central office, manually operable means at each of said outlying stations, and energizing means at said outlying stations responsive to said operable means at any one of said outlying stations for operatively connecting one of said outlying stations to said transmission channel and for disconnecting the other of said outlying stations from said transmission channel during the time that said one station is operatively connected to said transmission channel.

10. In a telegraph system, a central office, a normally deenergized line extending therefrom, a plurality of substations capable of operative association with said line, and a control circuit common to and between said stations whereby any one station controls the operative condition of the remaining stations.

11. In a system according to claim 10, lock-out means at each station operable by a voltage condition applied to said control circuit.

CLAYTON GOODWIN.

DISCLAIMER

2,257,677.—*Clayton Goodwin*, Denver, Colo. PRINTING TELEGRAPH SYSTEM. Patent dated September 30, 1941. Disclaimer filed April 17, 1943, by the assignee, *American Telephone and Telegraph Company*.

Hereby enters this disclaimer to claims 2, 3, and 4 of said patent.

[*Official Gazette May 18, 1943.*]