Sept. 19, 1944. W. M. BACON ET AL 2,358,375

COMMUNICATION SYSTEM

Filed Aug. 26, 1942 6 Sheets-Sheet 1

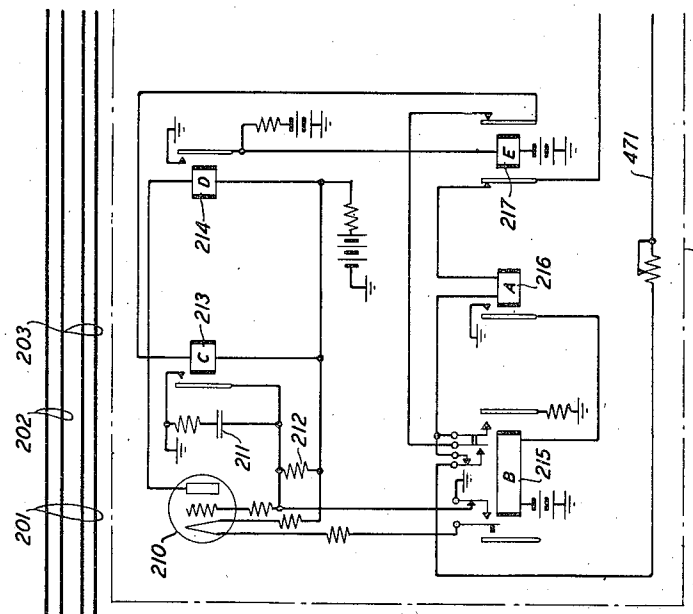

FIG. 2

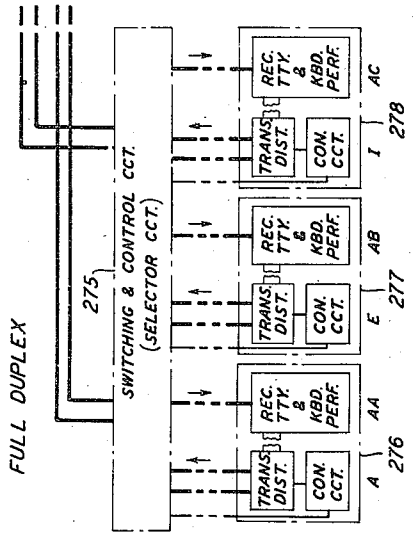

FIG. 1

FIG. 2	FIG. 3	FIG. 5	FIG. 6
	FIG. 4		FIG. 7

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COMMUNICATION SYSTEM

Filed Aug. 26, 1942 6 Sheets-Sheet 2

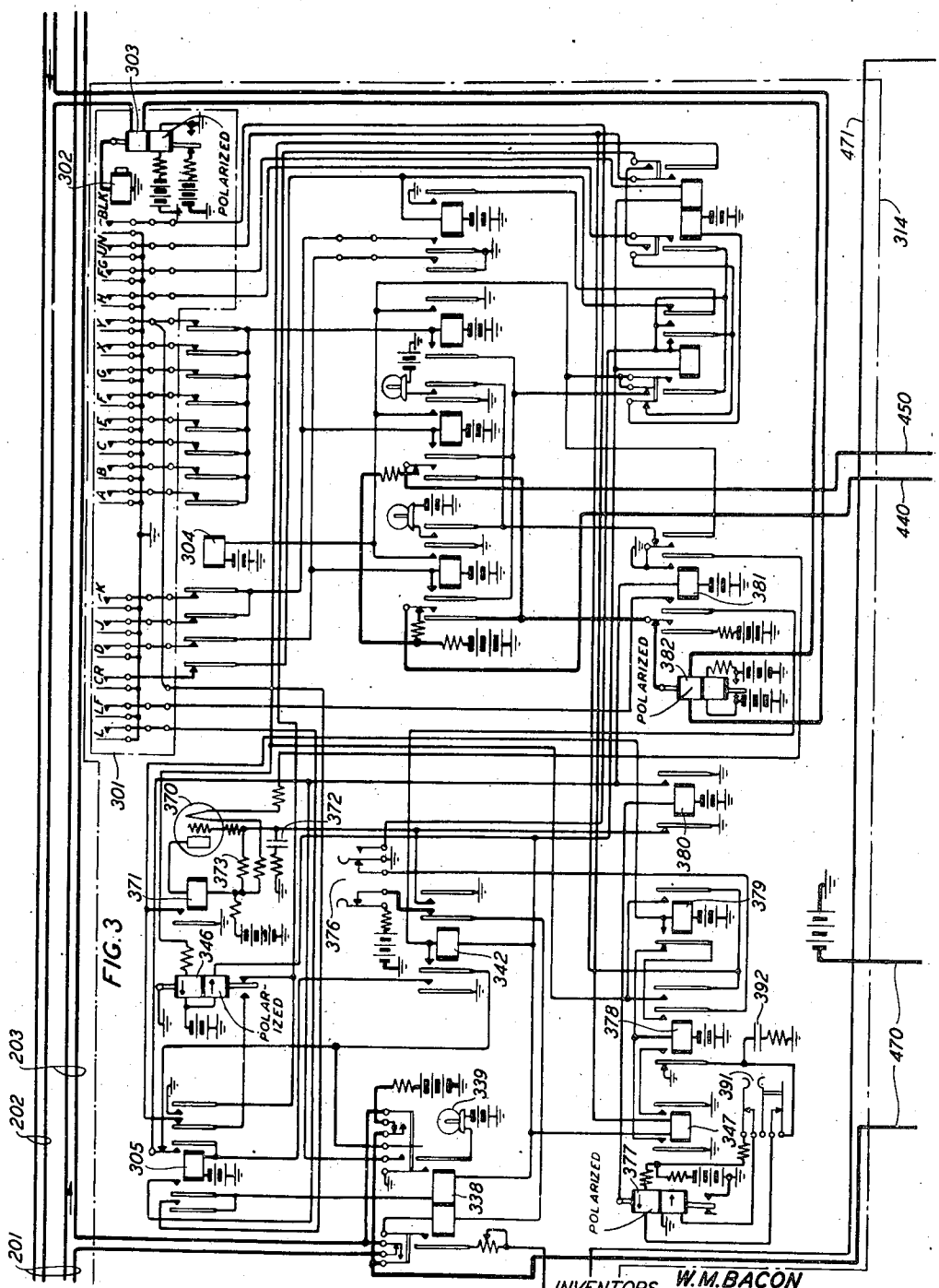

FIG. 3

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COMMUNICATION SYSTEM

Filed Aug. 26, 1942 6 Sheets-Sheet 3

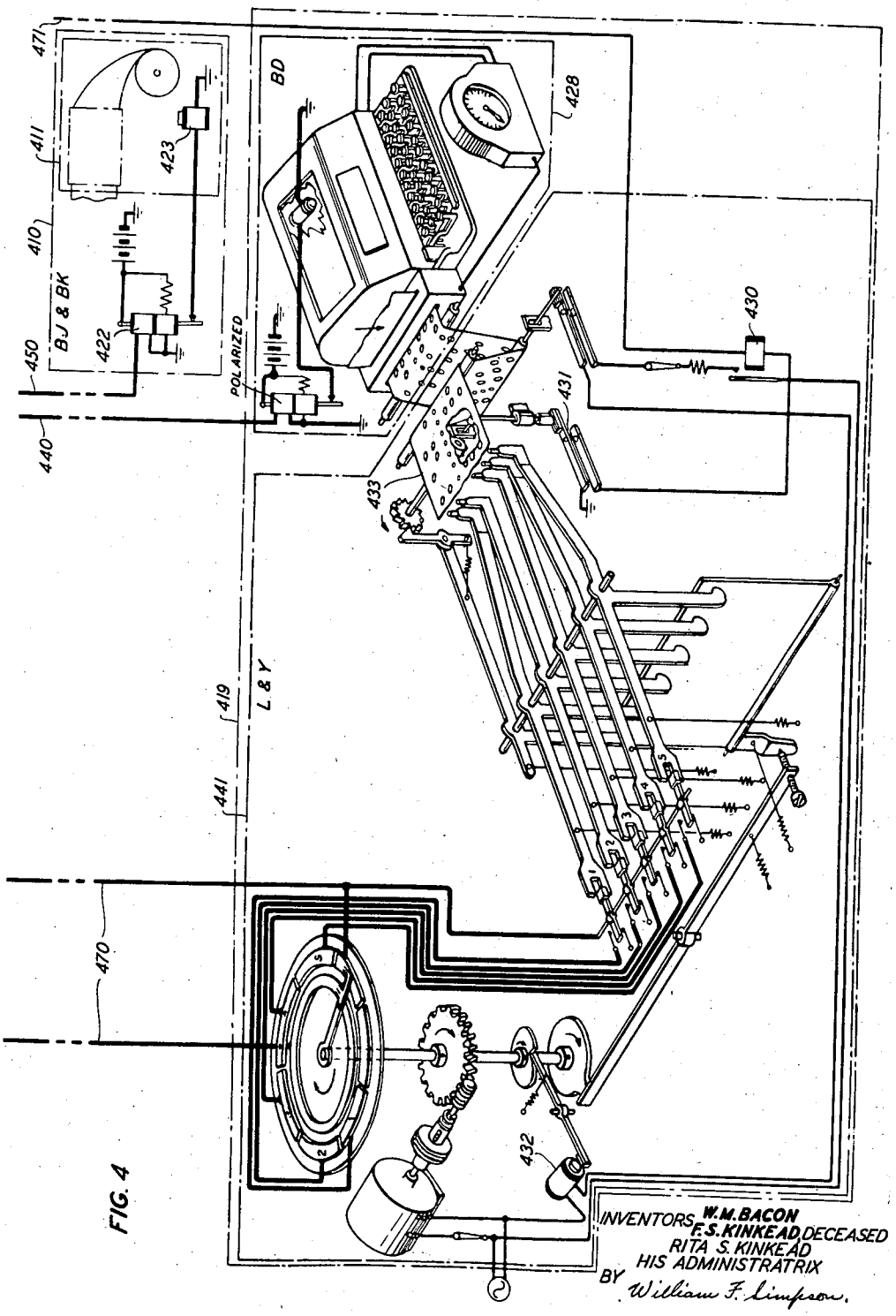

FIG. 4

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COMMUNICATION SYSTEM

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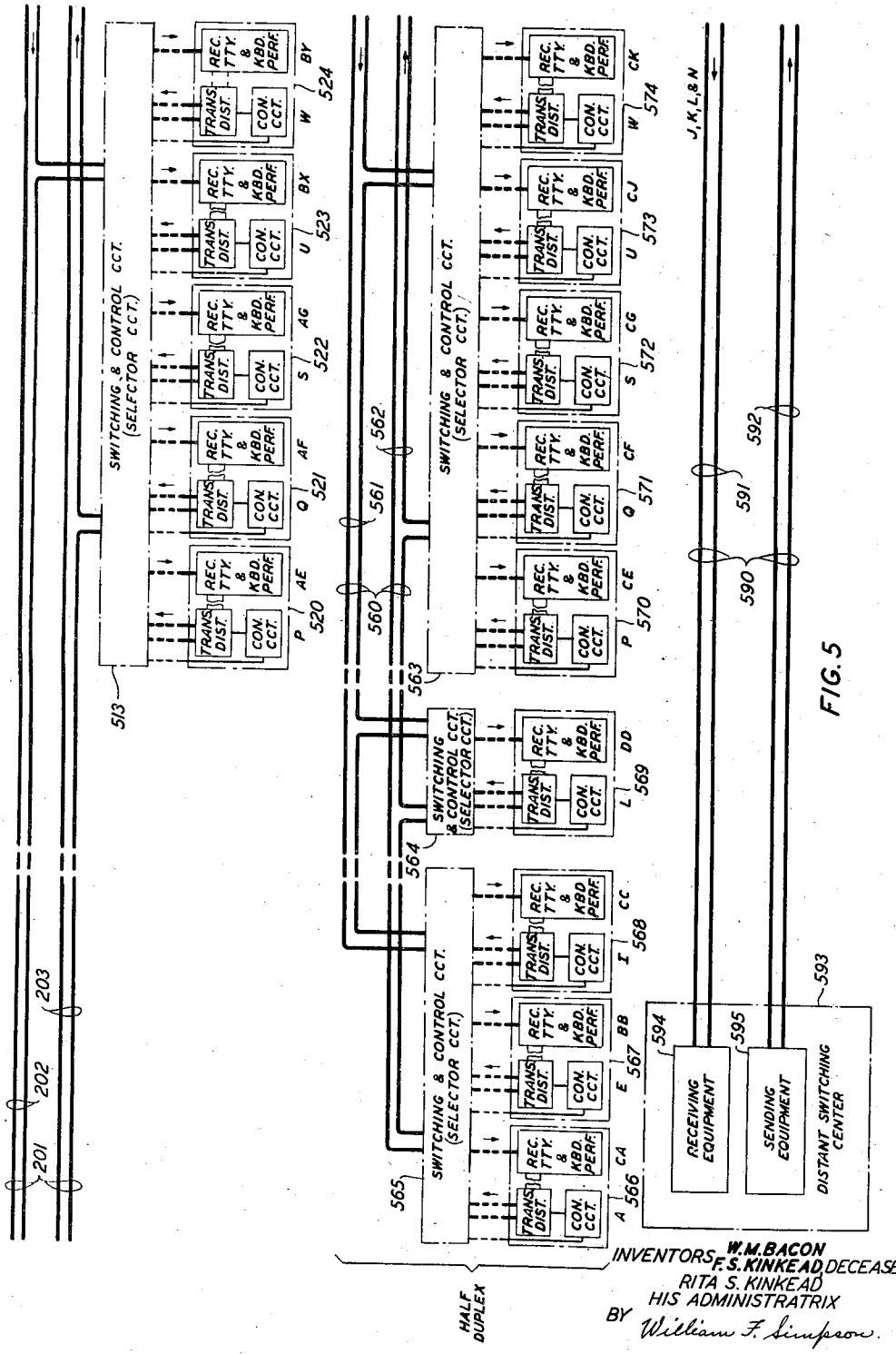

FIG. 5

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COMMUNICATION SYSTEM

Filed Aug. 26, 1942 6 Sheets-Sheet 5

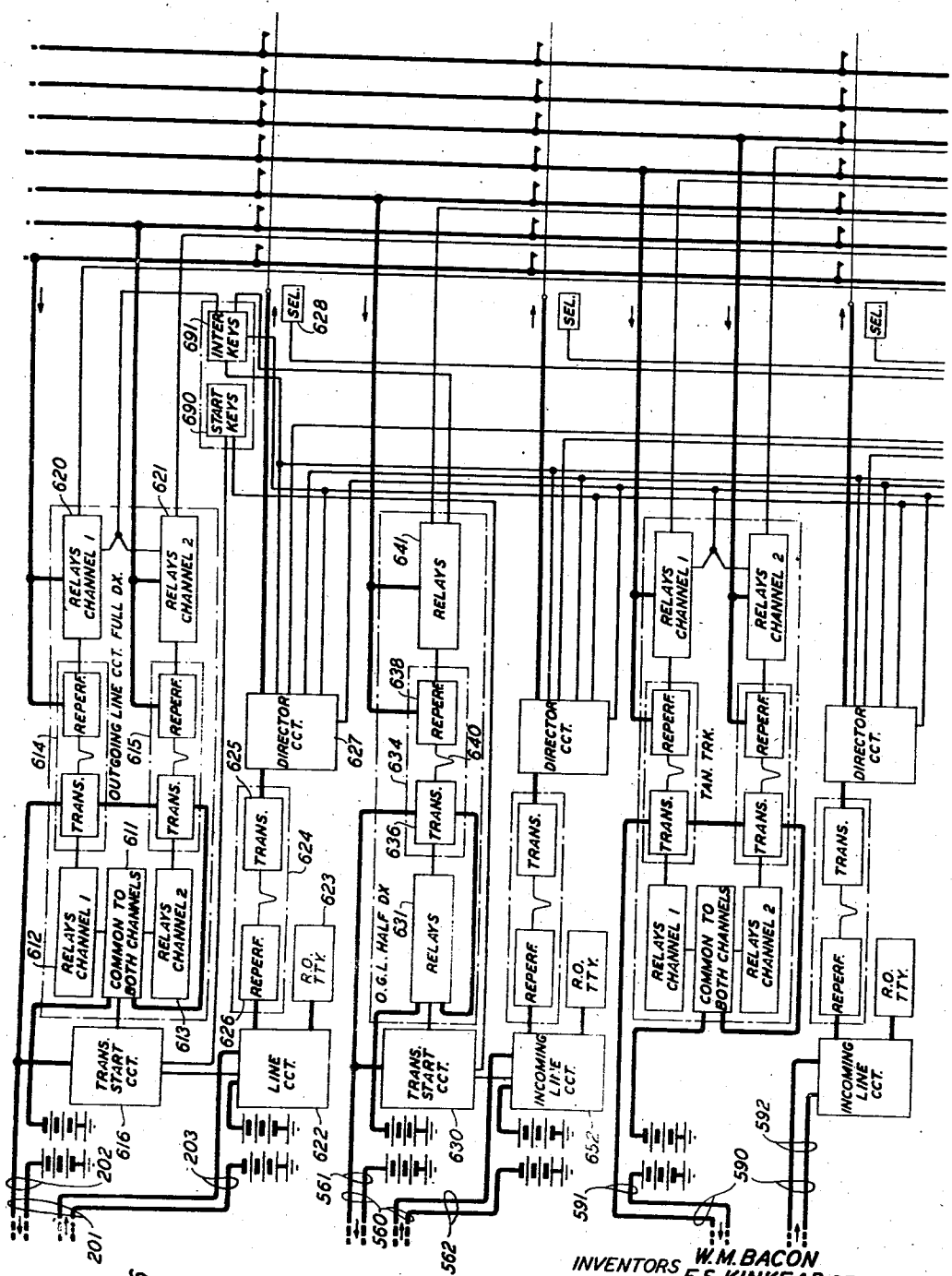

FIG. 6

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COMMUNICATION SYSTEM

Filed Aug. 26, 1942 6 Sheets-Sheet 6

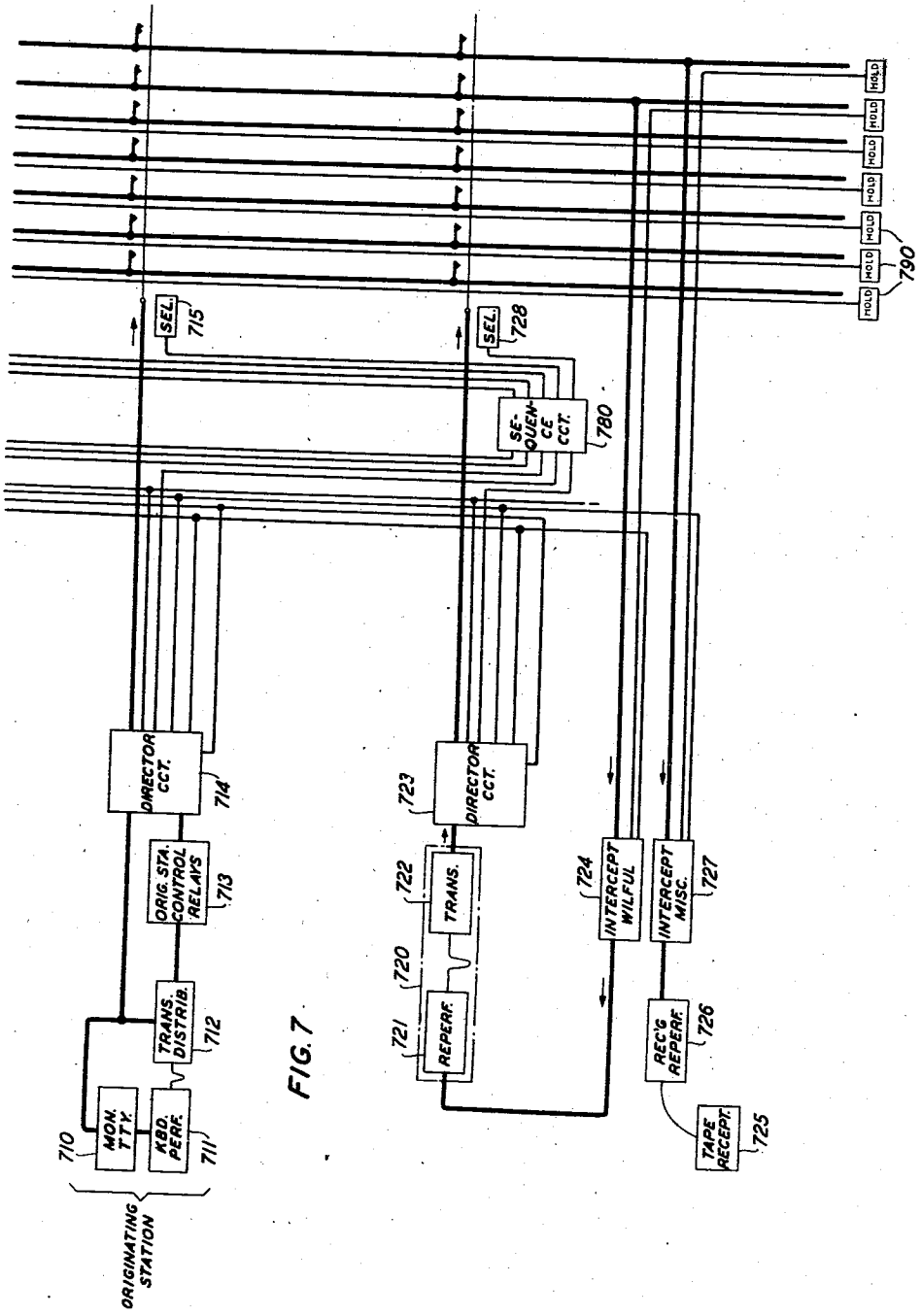

FIG. 7.

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Patented Sept. 19, 1944 2,358,375

UNITED STATES PATENT OFFICE

2,358,375

COMMUNICATION SYSTEM

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Application August 26, 1942, Serial No. 456,147

5 Claims. (Cl. 178—17)

This invention relates to an improved telegraph subscriber's station, arrangements and control equipment suitable for connection to and operable in combination with comprehensive telegraph transmission system and in one embodiment thereof in combination with comprehensive telegraph network employing automatic switching apparatus.

An object of this invention is to provide a more flexible outlying station or subscriber's equipment and apparatus and control equipment therefor for more efficiently and effectively receiving messages from said outlying station and equipment.

Telegraph systems employing a storage or tape control transmitter for the transmission of message material over a transmission system to another station are frequently arranged so that when the tape passes out of the transmitter or when the supply of message material available for transmission is reduced below a predetermined quantity, the operation of the transmitting apparatus is interrupted and frequently disconnected from the transmission channel or system in order to permit the channel to be employed for transmission from another transmitter or other outlying station or equipment.

It sometimes happens that there may be more than one source of message material at one or more of the outlying stations, each of which will produce a punched tape or stored message material available for transmission.

In accordance with this invention the circuits at the subscriber's station are arranged so that the attendant thereat will have a short interval of time of approximately thirty seconds in which to insert a second or succeeding tape or group of stored signals after the first group has passed out of the transmitter before the transmission path to the transmitter in question is interrupted. Thus the transmitter in question is permitted to transmit from a plurality of tapes, one after another, provided they are inserted in the transmitter within a predetermined interval of time after the previous one passes out of the transmitter.

In the specific embodiment of the invention described herein, the apparatus at the subscriber's station, in accordance with this invention, has been arranged to cooperate with the switching system disclosed in copending application of Branson et al., Serial No. 448,878, filed June 27, 1942, the disclosure of which application is incorporated herein by reference to the same extent as if wholly included herein.

In the specific embodiment of the invention disclosed herein, one of the outlying subscriber's station circuits or equipment, as disclosed in said Branson et al. application, has been modified in accordance with this invention in order to permit the attendant or subscriber thereat to insert a plurality of tapes in a tape control transmitter, one after the other, without losing its turn of transmission provided the succeeding tape is inserted in the transmitter within a predetermined maximum interval of time after the previous tape has run out of the machine.

It will be readily appreciated by those skilled in the art that modification in accordance with this invention may be employed at any of the stations in combination with any of the transmitters located thereat.

The foregoing objects and features of this invention may be more readily understood from the following description when read with reference to the attached drawings, in which:

Fig. 1 illustrates a manner in which Figs. 2 through 7 are positioned adjacent each other;

Figs. 2 through 7, when positioned in accordance with Fig. 1, illustrate details of the present invention in an embodiment suitable for use in combination with the switching system described in said above-identified application of Branson et al.

Specifically, Figs. 2, 3 and 4 show details of a subscriber's station equipment and control equipment associated therewith, while Figs. 5, 6 and 7 show in schematic form the various circuits and apparatus and their manners of cooperation in a typical switching system such as described in said above-identified application of Branson et al. with which the improved station equipment and control apparatus in accordance with this invention are arranged to cooperate.

Figs. 3 and 4 of this application are similar to Figs. 11 and 24 of said Branson et al. application and may be directly substituted for these figures providing that the associated additional equipment shown in detail on the right-hand portion of Fig. 2 is also included with Figs. 3 and 4 of this application. With this addition Figs. 3 and 4 of the present application may be substituted for the corresponding figures in said Branson application without further change. In this case, however, the equipment and apparatus shown in Figs. 3 and 4, as well as the right-hand portion of Fig. 2, will operate as described herein.

The remaining portion of Fig. 2 as well as Figs. 5, 6 and 7 show in outline form the various circuits and apparatus comprising a typical switching system such as set forth in the above-identified Branson et al. application.

It is to be understood that the apparatus and circuits in accordance with the present invention for controlling a transmitter may be applied to any of the transmitters of the other stations or other transmitters incorporated in the system including transmitters located either at other stations served by the same party line or by stations served by different party lines. As will be appreciated by those skilled in the art, the transmitters may be controlled by any of the secondary switching centers and any of the centers may control one or more transmitters. In each case, where desired, an arrangement in accordance with the invention may be provided.

Before describing the operation of the improved control arrangement in accordance with this invention, reference should be made to the other equipment of the system which is described in detail in the above-identified Branson et al. application.

Briefly, the system comprises a plurality of party lines **201** and **560**. These party lines comprise a receiving channel **202** and **561**, respectively, for the transmission of signals from a central switching center shown in Figs. 6 and 7 to the respective stations served by these party lines. The party lines also include the transmission channel **203** and **562**, respectively, for the transmission of signals from the outlying stations to the central switching center. As described in the above-identified application of Branson et al., these party lines may be arranged to operate either on a full duplex or half duplex basis. The party line **201** is assumed to be a full duplex party line, while the line **560** is assumed to be a half duplex party line. As will be well understood by those skilled in the art, any number of full duplex and half duplex lines may be provided. As shown in the drawings, full duplex party line **201** extends to the secondary switching centers **275**, **314** and **513**. These switching centers control the stations **276**, **277**, **278** and **419** and the receiving reperforator **410** and stations **520**, **521**, **522**, **523** and **524**. Party line **560** extends to the secondary control centers **565**, **564** and **563** which centers in turn control the stations **566** through **574**, inclusive.

Lines **590** represent a line extending from the switching center shown in Figs. 6 and 7 to a second switching center **593**. This line or trunk includes a channel **591** for transmitting messages from the switching center shown in Figs. 6 and 7 to the second switching center **593** where receiving equipment **594** is associated therewith. The trunk **590** also includes a second channel for transmission of signals from the sending equipment **595** at the second switching center **593** to the central exchange shown in Figs. 6 and 7.

The party lines **201** and **560** as well as the trunk circuit **590** may include any suitable type of telegraph transmission channel. As shown in the drawings, these lines are shown as two one-way full metallic transmission paths in an effort to avoid further complication of the disclosure. It is to be understood, however, that these transmission paths may include one or more of the following types of telegraph transmission systems and in actual practice will usually combine the number of the different following types of transmission paths, as will be readily understood by those skilled in the art. The transmission paths of the different lines will vary from section to section independently of the type of transmission apparatus employed in any of the other lines or trunk circuits.

Briefly, these lines and channels may include both full and half duplex low frequency telegraph lines or channels which may be operated either on a ground return or full metallic basis and which channels may comprise telegraph channels of composited telephone and telegraph lines of any of the well-known composite systems including simplex and phantom circuits as well as so-called Morse legs of cable quads. These channels may also include channels of the so-called time division multiplex telegraph systems for the transmission of signals in either one or both directions.

The telegraph transmission channels may also include channels of voice frequency carrier telegraph systems as well as channels of high frequency carrier current telegraph systems and also radio channels.

These party lines may also include the usual types of terminal and interconnecting equipment for the various types of communication systems employed as well as the usual types of amplifiers, repeaters, volume compensators and other control equipment generally employed with systems of the respective types. Inasmuch as the respective types of telegraph systems operate in their usual manner and are well understood by those skilled in the art, they have not been shown in the drawings but merely represented by two one-way telegraph channels for each of the lines of the system.

As set forth in the above-identified Branson et al. application, the party lines terminate at the central exchange in equipment individual to each of the lines. The incoming channel party line **201** terminates in an incoming line circuit **622**. The incoming line circuit causes the message to be recorded either by receiving-only teletypewriter **623**, when the messages are intended for the central switching station, or upon a combined reperforator and transmitter **624** comprising reperforating unit **626** and a transmitting unit **625**. The transmitter **625** is associated with the director circuit **627** which controls crossbar switch including the selector magnet **628** and the holding magnets **790** and causes the transmitter to be connected to some channel extending towards the party line for which the message is intended.

Each message is preceded by a plurality of address characters, which characters control the directing circuit **627** and cause transmitter **625** to be connected to the proper line under control of these address characters. Each of the outgoing lines is provided with one or more channels of transmission through the crossbar switch. The party line **201** is provided with two sets of channels and each channel is provided with a group of relays individual thereto illustrated symbolically at **620** and **621**. Each of the channels is also provided with a combined reperforating and transmitting instrument **614**, **615**. The transmitting units of these instruments are arranged to transmit alternately over the receiving channel of the party line **201**. They are provided with various control relays **611**, **612** and **613**. The transmitter start circuit **616** is also associated with the receiving channel or party line **201** for transmitting transmitter start signals or control patterns over this channel. These transmitter start patterns control the switching equipment at the secondary switching center and cause the associated transmitters to be started

into operation when they are supplied with stored message material available for transmission.

The secondary switching centers also respond to at least certain of the address characters and cause the receiving equipment controlled by them to be selectively and operatively connected to the receiving channel of the party line in accordance with address characters so that they will receive the messages intended for them.

The other party lines of the trunk circuits are similarly equipped with the various circuits as described above. In the case of the half duplex lines only one channel through the crossbar switch will generally be provided since half duplex lines will only be provided when traffic or messages for the stations and line connected thereto are not heavy. No transmitter start circuit has been shown for the trunk circuit because such a circuit generally will be unnecessary since there will be no transmitters to be started under control of the central switching center. With these exceptions the equipment provided for each of the lines and trunks operate in substantially the same manner and perform substantially the same function.

Message originating equipment comprising monitoring teletypewriters **710**, keyboard perforator **711**, transmitters **712**, control relays **713** and a director circuit **714** is provided at the central switching station for the transmission of messages from that station to any of the other stations of the system.

In addition a miscellaneous intercepting circuit **727**, receiving reperforators **726** and tape receptacle **725** are provided for the reception of improperly addressed messages and other messages which fail to properly control the switching equipment.

A wilful intercept circuit **724** and a combined reperforator and transmitter **720** comprising a reperforator unit **721** and a transmitting unit **722** together with a director circuit **723** are provided for the reception of certain messages intended for stations which it is desired for one reason or another to intercept and prevent from transmission to their ultimate station of destination at the particular moment.

The operation of the circuits of such a typical switching system has been described in detail in the above-identified Branson et al. application and need not be repeated here. It is to be understood, however, that equipment and circuits of this invention cooperate with circuits of said Branson et al. application as will be described hereinafter.

In large switching systems of this type it frequently happens that it is desired to transmit some of the messages over other systems of the same type or over other types of systems or other circuits not forming a part of the main switching system.

At the stations at which the messages are transferred from one system to another there will usually be several sources of signals, that is, several different instruments for perforating the tape in accordance with the messages to be transmitted over the large switching system in question. In the system set forth in the above-identified patent application of Branson et al., as soon as the tape runs out of any one of the transmitters of the system, that transmitter loses its turn to transmit and becomes disconnected from the party line. Thus, in case only a short piece of tape is perforated by one of the perforating instruments at the interconnecting station, this tape would use up the entire turn of that station for transmitting over the comprehensive switching system while there may be many other messages available for transmission from other sources. In order to overcome this difficulty, the present invention provides a control arrangement which permits a second tape to be inserted in a transmitter at the transfer station a short interval of time after a previous tape passes out of the transmitter without causing the disconnection of the transmitter from the party line and thus without causing the transmitter to lose its turn for transmission.

If the succeeding tape is not inserted in the transmitter within a predetermined short interval of time, the transmitter will be disconnected from the system and another transmitter started as set forth in the above-identified application of Branson et al.

Briefly, the circuits at the secondary switching point **314** are shown in their normal condition with relay **377** maintained in the position shown due to the effect of the current flowing through its upper winding which is greater than the effect of the current flowing through its lower winding.

When it is desired to start a transmitter of a party line, the operator at the central station will operate keys associated with the transmitter start circuit **616** and cause a start pattern to be transmitted over the receiving channel **202** of party line **201**. If the transmitter start circuit is set to operate automatically, the transmitter start pattern will be transmitted over the receiving channel **202** of party line **201**, either upon the cessation of the reception of signals over the transmitting channel of this party line or upon the reception of the end of the transmission signals as set forth in the application of Branson et al.

The transmitter start circuit in operating first interrupts the transmission over the receiving channel of party line **201**, if any transmission is in progress at the time the operation of this circuit is initiated. After a short pause a blank signal combination is transmitted by the transmitter start circuit. After another short pause a line feed signal combination is transmitted and this in turn is followed by a selecting code combination which is assigned to one of the transmitters served by the party line. After the transmission of this signal the transmitter will start transmisison provided it is supplied with message material in the form of perforated tape for transmission to some other station.

As indicated in the above-identified application of Branson et al., the transmitters at the transfer station or, in fact, any other transmitters in the system may be assigned more than one code combination for the selection thereof so that in case of particularly heavy traffic, as will usually be encountered at the transfer stations, the transmitters at these stations may be given more opportunities to transmit and thus are in position to handle the greater amount of message material originating at these stations for stations of the main switching system.

At each of the secondary switching centers of the party line, monitoring and selecting apparatus receives all of the signals transmitted over the receiving channel of party line **201** and controls the associated switching circuits and apparatus in accordance with these signals to properly

connect the telegraph equipment controlled thereby to the respective channels of the party line. Only the switching equipment at the secondary switching center 314 is shown in detail in the drawings, but it is to be understood that similar switching equipment is provided at each of the other secondary switching centers 275 and 513. Details of typical switching equipment suitable for use at these secondary switching centers are shown in the above-identified application of Branson et al. and as described in that application, the equipment at all of these centers responds to the signals transmitted over the receiving channel in such a manner as to properly control the associated telegraph apparatus.

At the secondary switching center 314 the monitoring selector 301 will respond to the blank signal of the transmitter start pattern transmitted from the transmitter start circuit 616 by causing the blank contacts BLK to momentarily close. Operation of the blank contacts BLK completes a circuit for the operation of relay 347 from battery through the lower winding of relay 346, winding of relay 347 to ground through the momentarily closed contacts BLK. Current flowing through the lower winding of relay 346 causes the armature of this relay to be maintained in the position shown in the drawings.

The operation of relay 347 completes an obvious circuit for the operation of relay 378. Relay 378 in operating completes a circuit for maintaining itself operated from battery through its winding and the break contacts of relay 379 and the right-hand inner operated contacts of relay 378 to ground through the break contacts of key 376.

The operation of relay 378 also extends a circuit from battery through the upper winding of relay 346 and the right-hand outer operated contacts of relay 378 to ground through the momentarily closed universal contacts UN. These UN contacts close a short interval of time after the blank contacts BLK close and open a short interval of time before the blank contacts open. The effect produced by the current flowing through the upper winding of relay 346 is not as great as the effect produced by the current flowing through the lower winding of this relay. Consequently, the armature of this relay remains in the position shown in the drawings.

At the end of the response of the selector 301 to the blank signal, the blank contacts BLK will open and interrupt the circuit through the winding of relay 347. A suitable type of selector 301 and the manner in which it selectively closes the respective contacts in response to received signals is set forth in greater detail in United States Patents 2,120,235, granted to Beattie et al. on June 14, 1938; 2,112,234, granted to Beattie on March 29, 1938; and 2,154,547 granted to Walker on April 18, 1939; the disclosures of which patents are hereby made a part of this application as if fully included herein.

The release of relay 347 interrupts a circuit through the upper winding of relay 377. However, the current does not immediately cease flowing through this winding because the upper terminal of condenser 392 starts to charge to battery potential through the upper winding of relay 377. The effect of this charging current upon the armature of relay 377 is sufficient to overcome the effect of the current flowing through the lower winding of this relay and maintain the armature of relay 377 in its left-hand position for a predetermined interval of time.

After a predetermined interval of time dependent upon the constants of the windings and adjustments of relay 377, condenser 392, and the resistances associated therewith, the charging current flowing through the upper winding of relay 377 will fall to such a value that its effect will no longer overcome the effect of the current flowing through the lower winding of this relay at which time the armature of relay 377 is operated to its right-hand position.

As set forth in the above-identified application of Branson et al., this predetermined interval of time comprises a substantial proportion of the pause following the transmission of the blank signal.

If signals are received over the receiving channel 202 of party line 201 during this interval of time, the selector 301 in responding to them will cause the universal contacts UN to close. If the signal received during this interval of time is other than a blank signal, a line feed signal or a figure signal, a circuit will be completed through the upper winding of relay 346 but no circuit will be completed through the lower winding of this relay. Consequently, its armature will operate to its left-hand position. If this signal happens to be either the figure signal or a blank signal, circuits will operate as described in said above-identified application of Branson et al.

The operation of the armature of relay 346 to its left-hand position completes a circuit for the operation of relay 379 from battery through the winding of relay 379 and the center set of right-hand break contacts of relay 305 to ground through the left-hand contact and armature of relay 346. Relay 379 in operating interrupts the locking circuit of relay 378 and permits this relay to release. At the end of the response of the selector 301 to the signal in question the universal contacts will open and interrupt the circuit through the upper winding of relay 346, whereupon this relay will be released and its armature moved to its right-hand position, thus interrupting a circuit of relay 379 and permitting this relay to release and restore the circuits to their previous condition.

However, assuming that no signals are transmitted during the charging time of condenser 392, the operation of relay 377 at the end of the predetermined time interval completes an obvious circuit for the operation of relay 380. Relay 380 in operating removes ground from the grid of tube 370 and permits condenser 372 to start to charge through high resistance 373. The operation of relay 380 also completes an obvious circuit for the operation of relay 381 which relay operates and completes a circuit for lighting the filament of vacuum tube 370. Tube 370 does not pass anode current at this time due to the fact that the potentials applied to it are such that this tube will not pass sufficient anode current to operate relay 371 for an appreciable interval of time.

The operation of relay 381 interrupts the transmission circuit from the contacts of repeating relay 382 so that any receiving equipment connected to the receiving channel of party line 201 will not receive the following signals transmitted thereover. It should be noted that the blank signal transmitted by the transmitter start circuit while received by the receiving equipment at any of the stations which was then in the progress of receiving a message

will not be printed because the receiving equipment disregards this signal and does not respond to it by printing or performing any other useful function at this time.

If no further signals are received at the end of a predetermined interval of time, relay 371 is operated and an obvious circuit is completed for the operation of relay 379 which relay again restores the circuits to their previous conditions described above.

However, if a line feed signal is received during this time interval and if no other signals are received preceding it, the selector 301 in responding thereto will cause the LF contacts to momentarily close and complete a circuit for the operation of relay 342 from battery through the lower winding of relay 346, winding of relay 342 and the left-hand inner operated contacts of relay 381 to ground to the momentarily closed contacts LF. The operation of relay 342 completes a circuit for maintaining itself operated under control of relays 305 and 380. The operation of relay 342 again connects ground to the right-hand terminal of condenser 372 and thus discharges this condenser and prevents the operation of relay 371 at this time. The operation of relay 342 completes an obvious circuit for the operation of relay 305. The operation of relay 305 interrupts the locking circuit of relay 342 and permits this relay to release after the LF contacts open. The release of relay 342 removes ground from the right-hand terminal of condenser 372 whereupon this condenser will again start to charge through the high resistance 373. However, relay 371 will not operate for an appreciable interval of time as pointed cut above.

Assume now that the letter L signal has been transmitted by the transmitter start circuit 616 and received by the selector 301 during this interval of time. Selector 301 in responding to this signal will cause the L contacts to momentarily close and complete a circuit for the operation of relay 338 from battery through the lower winding of relay 346, the right-hand winding of relay 338 and left-hand operated contacts of relay 305 to ground through the momentarily closed contacts L of selector 301.

The operation of relay 338 completes an obvious circuit for lighting lamp 339, thus indicating that the transmitter controlled by station or equipment 314 will be connected to transmit over the party line 201. The operation of relay 338, in addition, connects the transmission channel 470 extending from the transmitter 441 at station 419 to the transmitting channel 203 of party line 201. The operation of relay 338 also disconnects the transmission channel 203 extending to the secondary switching center 275 from the remainder of this channel. Consequently, any interfering currents encountered over that portion of transmitting channel will be ineffective to interfere with the transmission from transmitter 441.

The operation of relay 338 at this time also completes a locking circuit for maintaining itself operated from battery through the break contacts of key 376 and relay 342, the left-hand winding and the left-hand inner operated contacts of relay 338, the left-hand break contacts of relay 217, winding of relay 216, the right-hand inner break contacts of relay 215, over conductor 471 through the winding of relay 430 to ground through the tape control contacts 431. If the tape has been inserted in the transmitter 441, contacts 431 will be closed and maintained closed so long as the tape remains in the transmitter 441. If no tape has been inserted in the transmitter these contacts will not be closed. Consequently, the locking circuit will be incomplete and relay 338 released when contacts L open.

However, assuming that tape has been inserted in the transmitter, the above-described circuit will be complete and maintain relay 338 operated and in addition cause relays 430 and 216 to operate. Relay 430 in operating completes a circuit through the start magnet 432 and causes the transmitter 441 to start the transmission of the message material stored in tape 433 over the conductors 470 and the transmission channel 203 of party line 201 to the central exchange.

The operation of relay 216 in the circuit described above completes an obvious circuit for the operation of relay 215.

Operation of relay 215 completes a circuit for lighting the filament 210 and disconnects ground from the lower terminal of condenser 211 which then starts to charge to a positive potential through high resistance 212. Relay 214 is not operated at this time because constants of tube 210, condenser 211, and resistance 212 are such that it requires approximately thirty seconds after ground has been removed from the lower terminal of condenser 211 before relay 214 operates. The operation of relay 215 interrupts the locking circuit through the left-hand winding of relay 338 extending over conductor 471. The operation of relay 215, however, prior to the interruption of this locking circuit first connects ground to the left-hand winding terminal of relay 216 and thus tends to maintain relays 216 and 338 operated. Relay 215 in operating also connects battery through the winding of relay 213 and the right-hand break contact of relay 217 to conductor 471, prior to interrupting this lead and thus maintains relay 430 operated. Relay 213 operates due to current flowing through its winding in the above-described circuit and again connects the ground from the lower terminal of condenser 211 thus fully discharging the condenser and preventing the operation of relay 214. Relay 430 is maintained operated at this time due to the battery connected through the winding of relay 213 and the contacts of relays 217 and 215 to conductor 471.

The circuits of the transmitter 441 are thus energized and the transmitter started into operation for the transmission of the messages stored in tape 433.

A short interval of time after the L signal is received, as described above, the right-hand terminal of the condenser 372 is charged to a sufficiently high potential through the high resistance 373 to initiate the discharge of sufficient current through tube 370 to operate relay 371. Relay 371 in operating completes the circuit for the operation of relay 379. Relay 379 in operating interrupts the locking circuit of relay 378 which relay then releases. The release of relay 378 again completes the circuit through the upper winding of relay 377 and causes the armature of this relay to move to its left-hand position where it interrupts the circuit of relay 380. Relay 380 in releasing connects ground to the right-hand terminal of condenser 372 and thus causes relay 371 to release. The release of relay 378 also interrupts the locking circuit of relay 379 which together with the release of relay 371 causes relay 379 to release. The release of relay 380 also

causes relay 381 to release. The release of relay 381 interrupts the filament circuit of tube 370 and thus restores the circuits of this tube to their normal or idle condition. The release of relay 381 again establishes a transmission path from the contacts of the repeating relay 382 to any receiving instrument controlled from station 314 which may have previously been receiving messages.

Thereafter the circuits controlled by the secondary switching center 314 remain in the above-described condition so long as messages are transmitted from tape 433. If in the meantime signals are transmitted over the receiving channel to party line 201, addressed to any of the receiving stations served by this party line, the equipment and the circuits will operate as described in the above-identified application of Branson et al. but will not interfere with or affect the operation of the transmitting equipment 441 at station 419.

The circuits or the other secondary switching centers operate in a similar manner in response to the transmitter start pattern assumed above to have been transmitted over the receiving channel of party line 201 except that the circuits controlled from these centers do not cause any transmitter controlled by these other secondary switching centers to start transmitting since they are selected by different selecting signals.

So long as tape 433 remains in the transmitter 441 in transmitting position, contacts 431 remain closed and the circuits remain in the condition described above. However, when the end of tape 433 passes out of the transmitter 441, after all of the signals recorded in it have been transmitted, contacts 431 open and interrupt the circuit of relay 430 and relay 213. Relays 430 and 213 release and relay 430 in releasing interrupts the circuit of the start magnet 432 of transmitter 441, thus stopping the operation of transmitter 441.

The release of relay 213 disconnects ground from the lower terminal of condenser 211 which then starts to charge to a positive potential through a high resistance 212. However, as explained above, nothing further happens for at least approximately thirty seconds because relay 214 does not operate until after the lapse of this interval of time in the specific embodiment of the invention described herein. In addition, incoming line circuit 622 and the transmitter start circuit 616 are arranged so that they will wait at least thirty, and preferably forty-five, seconds after the cessation of transmission of signals over the transmitting channel 203 of the party line 201 before initiating the transmission of another transmitter start pattern over the receiving channel 202 of the party line 201 by the transmitter start circuit 616.

If the attendant at station 419 has another length of perforated tape to insert in the transmitter at this time, it may be inserted and when inserted contacts 431 will again reclose and complete the circuits for the operation of relays 430 and 213 over conductor 471. These relays will reoperate and relay 430 in reoperating again completes the circuit of transmitter start magnet 432 which magnet operates and causes the transmitter 441 to transmit the signals in accordance with the perforations in the tape 433 just inserted in the transmitter.

The operation of relay 213 again connects ground to the lower terminal of condenser 211 thus discharging this condenser and preventing the operation of relay 214.

Thereafter the circuits will maintain in the above-described condition so long as tape 433 remains in the transmitter 441. If upon the completion of transmission of the signals in the second tape, a third tape is available for transmission, it may be similarly inserted within the thirty-second time interval after the second tape passes out of the transmitter and the message recorded in the third tape transmitted as described. This operation may be repeated as often as desired so long as each succeeding tape is inserted in the transmitter within the thirty-second time interval after the previous tape passes out of the transmitter.

When the final tape 433 passes out of the transmitter 441, contacts 431 will open and remain open for a longer interval of time than thirty seconds. Upon the opening of contacts 431 relays 430 and 213 will release. Relay 430 in releasing interrupts the circuit of the transmitter start magnet 432 which in turn releases and stops the operation of the transmitter 441.

The release of relay 213 removes ground from the lower terminal of condenser 211 which then starts to charge to a positive potential through the high resistance 212. At the end of approximately thirty seconds during which relay 213 does not reoperate, the potential of the lower terminal of condenser 211 will reach a sufficient positive value to cause tube 210 to pass sufficient current for the operation of relay 214. The operation of relay 214 completes an obvious circuit for the operation of relay 217. Relay 217 in operating interrupts the circuit of conductor 471 so that the subsequent insertion of the tape in transmitter 441 will not cause the reoperation of relay 430 and thus will not start the operation of transmitter 441.

The operation of relay 217 in addition interrupts the circuit through the winding of relay 216 and the left-hand locking winding of relay 338 thus permitting these relays to release. The release of relay 216 causes relay 215 to release, which relay interrupts the filament circuit of tube 210 and connects ground to the lower terminal of condenser 211 thus causing relay 214 to release and relay 214 in turn causes relay 217 to release. Thus the circuits at the secondary switching center 314 are restored to their normal or idle condition. A short interval of time later, the incoming line circuit 622 will cause the transmitter start circuit 616 to either indicate that the transmission from station 419 has ceased or else will cause transmitter start circuit 616 to transmit another start pattern for testing another transmitter for material available for transmission over the transmitting channel 203 of the party line 201.

If an end-of-transmission signal is perforated in tape 433, either before the tape passes out of the transmitter 441 or just before it passes out of the transmitter, the incoming line circuit 622 will recognize this signal and initiate the operation of the transmitter start circuit and cause it to transmit another start pattern. When the line feed signal of this start pattern is received, relay 342 will operate as described above. The operation of relay 342 at this time, which may be before the end of tape 433 passes out of transmitter 441 or before the end of the thirty-second time interval after the end of the tape passes out of the transmitter 441 as measured by condenser 211 and tube 210, interrupts the circuit through the left-hand locking winding of relay 338 and the winding of relay 216 thus permitting these relays

to release. The release of relay **216** causes relay **215** to release. Relay **215** in releasing disconnects battery through the winding of relay **213** from the conductor **471** extending to station **419**. This causes relay **430** to release and stop the operation of the transmitter **441** at station **419**. The release of relay **215** also interrupts the filament circuit of tube **210** and connects ground to the lower terminal of condenser **211** and thus restores the circuits to their idle condition.

The circuits operate in substantially the same manner when a transmitter stop pattern is transmitted over the receiving channel of the party line **201**. This signal causes the operation of the transmitter to be interrupted and the control circuits restored to their normal or idle condition in the manner described when another transmitter is started under control of the transmitter start circuit **616**.

It is thus apparent that the circuits operate in substantially the same manner as those described in the above-identified application of Branson et al. excepting that the outlying operator has a period of approximately thirty seconds after one tape passes out of the transmitter before inserting another tape therein without causing the transmitter in question to be disconnected from the transmitting channel and another transmitter started.

What is claimed is:

1. A telegraph system including a channel of transmission, a storage-type transmitter conditionable for transmissive association over said channel, means operated by absence of storage medium in said transmitter for interrupting the transmissive relation of said transmitter to said channel, and means for delaying said interruption for a predetermined time during which the supply of further storage medium to the transmitter maintains the transmissive association.

2. A communication transmission channel, a storage-controlled transmitter for transmitting over said channel, remotely controlled apparatus local to said transmitter for operatively associating said transmitter with said channel when said transmitter is supplied with storage material available for transmission, other apparatus for interrupting said operative association when storage material is no longer available for transmission, and time delay equipment for delaying the operation of said last-mentioned apparatus for a predetermined time interval.

3. A communication transmission channel, a storage-controlled transmitter for transmitting over said channel, remotely controlled apparatus for operatively associating said transmitter with said channel when said transmitter is supplied with storage material available for transmission, other apparatus for interrupting said operative association when the storage material passes out of said transmitter, time delay equipment for delaying the operation of said last-mentioned apparatus for a predetermined time interval and means responsive to the provision during said predetermined time interval of an additional supply of storage material available for transmission for restoring said time delay equipment.

4. In combination, a telegraph transmission channel, a tape-controlled telegraph transmitter, apparatus local to said transmitter controlled from a remote point for operatively associating said transmitter with said channel, apparatus controlled by the tape controlling said transmitter for interrupting said operative association, time measuring equipment for delaying the operation of said apparatus for interrupting said operative connection.

5. In combination, a telegraph transmission channel, a tape-controlled telegraph transmitter, apparatus responsive to the insertion of a tape in said transmitter for conditioning said transmitter for transmission, instrumentalities controlled from a point remote from said transmitter for operatively associating said transmitter with said channel when said transmitter is conditioned to transmit, time measuring apparatus for measuring a definite time interval and interrupting said operative connection at the end thereof, apparatus responsive to the passing of a tape out of said transmitter for initiating the operation of said time measuring apparatus, and equipment responsive to the insertion of another tape in said transmitter within said definite interval for restoring said time measuring apparatus without interrupting said operative connection.

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RITA SMITH KINKEAD,
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