

Feb. 22, 1949.

G. G. LIGHT ET AL

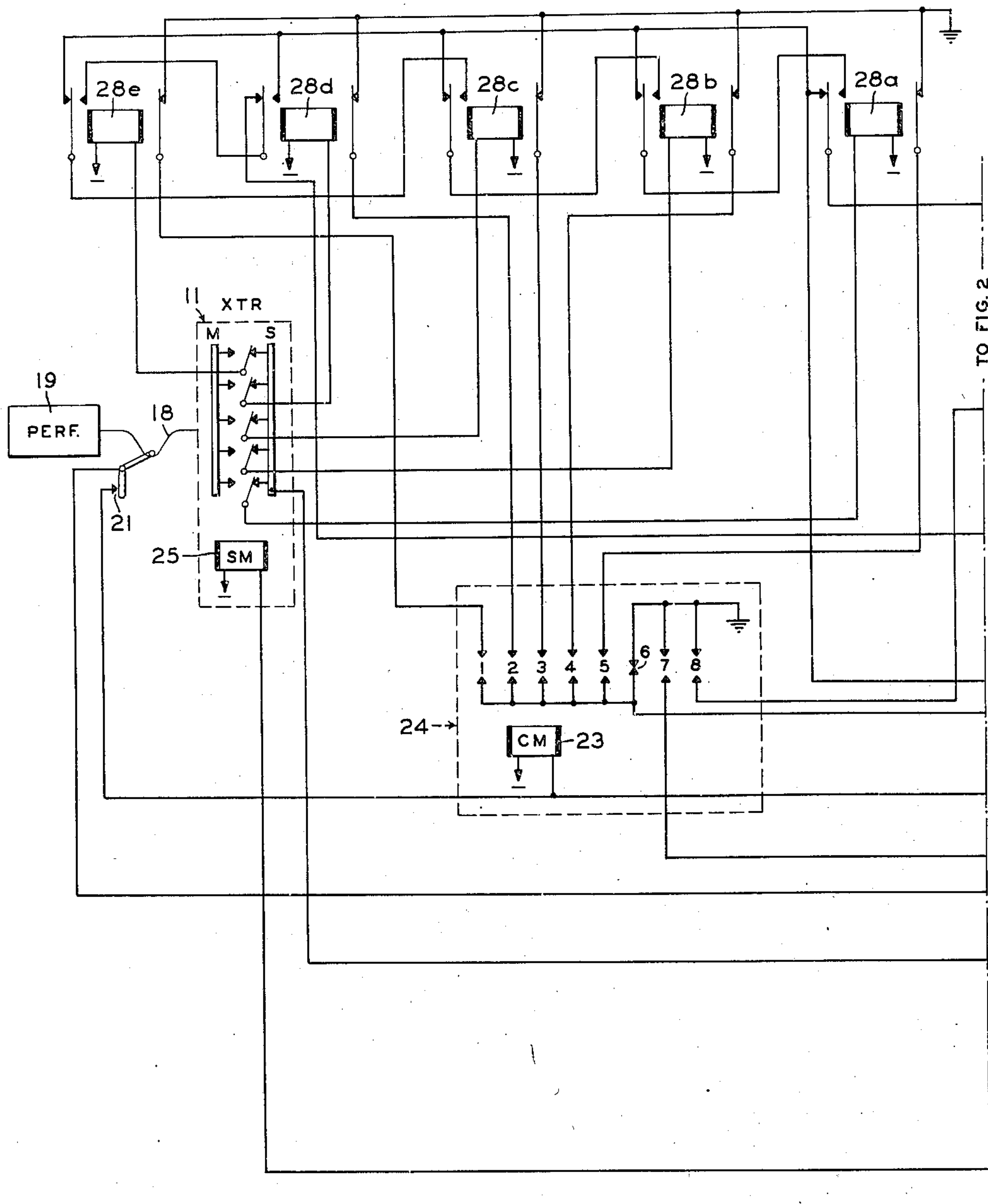
2,462,112

TELEGRAPH SYSTEM

Filed March 10, 1945

3 Sheets-Sheet 1

FIG. 1



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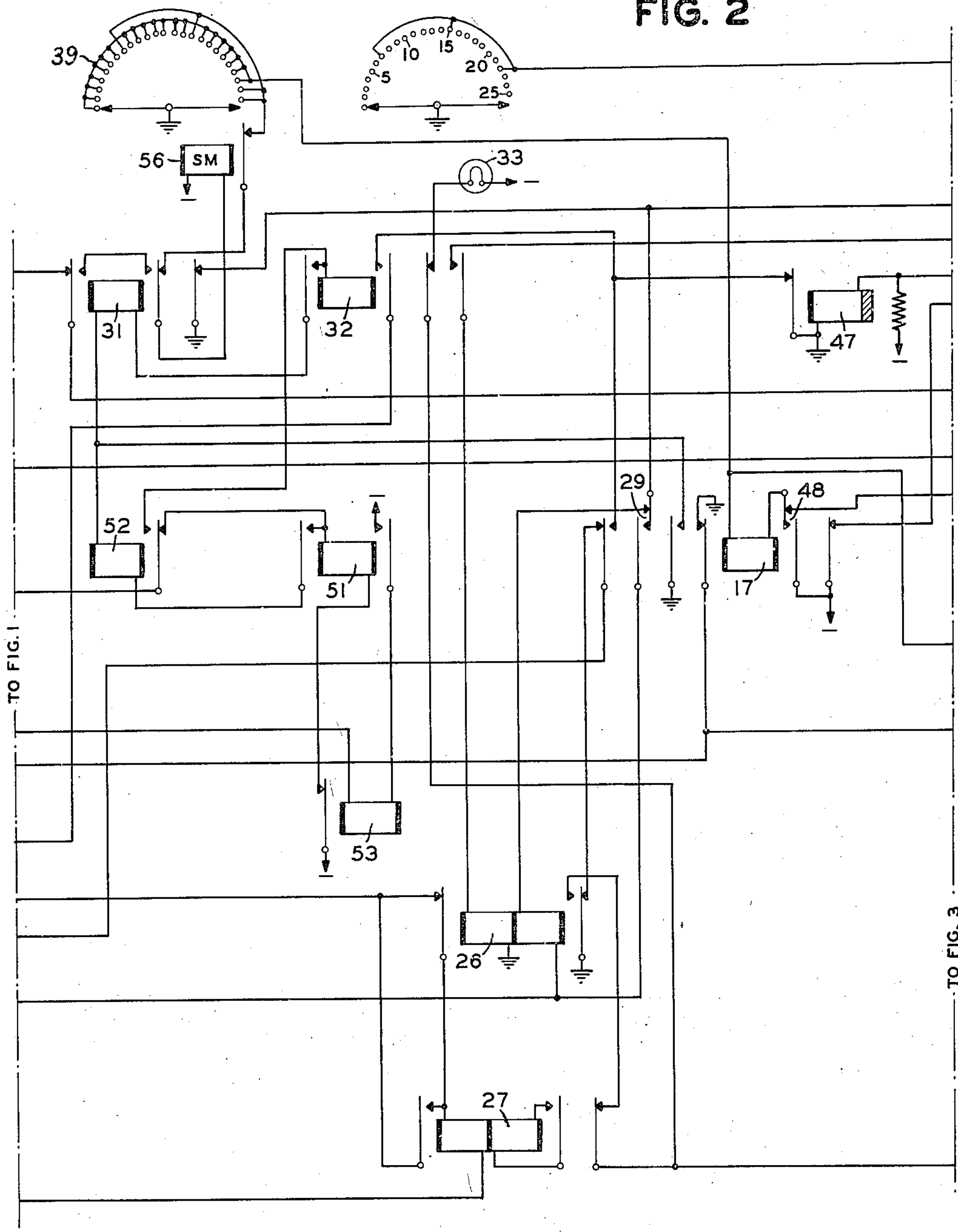
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TELEGRAPH SYSTEM

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3 Sheets-Sheet 2

FIG. 2



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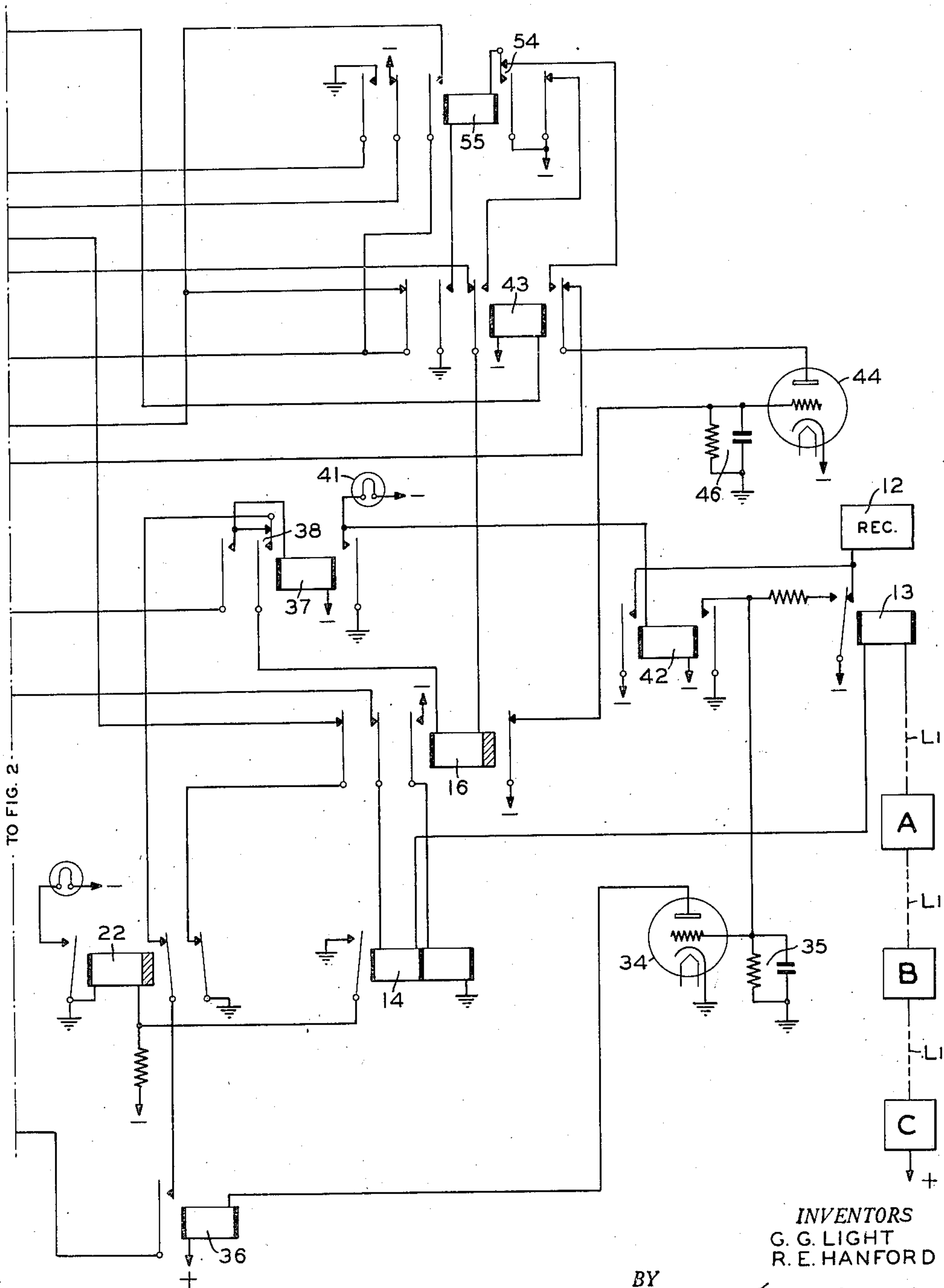
2,462,112

TELEGRAPH SYSTEM

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3 Sheets-Sheet 3

FIG. 3



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## UNITED STATES PATENT OFFICE

2,462,112

## TELEGRAPH SYSTEM

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Application March 10, 1945, Serial No. 582,020

5 Claims. (Cl. 178—4)

1

This invention relates to telegraph systems and more particularly to so-called reperforator switching systems of the type wherein messages are stored in a storage medium such as a perforated tape at a switching center incident to the relaying or switching of the messages through the switching center.

In such types of telegraph systems each sending line or circuit normally has a tape transmitter associated therewith and a message to be transmitted over any one of such lines is stored in a tape adapted to control the transmitter associated with the desired line. The outgoing lines may be of the so-called single station type and terminate in a single branch station, or the lines may be party lines and have a plurality of serially connected branch stations thereon.

Various selecting arrangements for party lines have been proposed whereby any station on the party line may select any one or more of the other stations with which it may desire to communicate to the exclusion of the other stations on the party line. In these systems the selection of one or more stations by another locks out the other stations and prevents use of the line by those locked out. In one type of a party line selecting system the line is normally closed and the opening of the line for at least a predetermined length of time, which is usually longer than that required to transmit a number of character representing code groups, conditions the signal responsive means such as recorders at all of the other stations on the line to a receiving condition. The line is opened by the calling station and after the transmission of the long open, the calling station effects transmission of selecting characters which select and lock in the receivers at the desired other station or stations on the line. The subsequent transmission of a predetermined character or characters by the calling station locks out the printers at the unwanted stations to prevent such station transmitting to the line or receiving signals hereover. The message from the calling station is then transmitted to the locked in or desired stations on the circuit.

The message or messages are usually terminated by an end-of-message signal of certain code groups and following the transmission thereof another long open is transmitted which is effective to condition the circuit to its normal condition whereby any station on a circuit may selectively call and lock in any one or more of the other stations thereon. In systems of this type the transmission of the long opens before and after

2

the transmission of a message has heretofore been effected by the manual operation of a key or similar instrument.

It is a general object of the present invention to provide a control circuit for a station on a party line adapted to operate in the manner set forth above whereby messages stored in a control tape at such a station and destined for various other stations on the party line are successively transmitted to the desired stations automatically.

In connection with the above, another object of the invention is to provide a control circuit for automatically transmitting to a party line a long open or conditioning impulse to receptively condition all the party line stations and thereafter automatically select and lock in the desired station or stations and lock out the unwanted stations.

Another object of the invention is the provision of means whereby messages stored in a tape associated with a transmitter assigned to a party line are automatically transmitted to the desired station on the party line when the party line becomes idle if the party line should happen to be busy at the time the message or messages are stored in the tape.

Another object of the invention in connection with the above is to prevent transmission of a message stored in the tape until the party line has been idle for at least a predetermined length of time.

Another object of the invention is to enable the automatic return of the party line to its normal condition following the transmission of a message or messages from the tape transmitter associated therewith at one of the stations thereon.

The above and further objects of the invention will be more apparent in the following description when taken in conjunction with the accompanying drawings wherein:

Figs. 1, 2 and 3, taken together, illustrate the detailed circuits of the invention.

The invention is shown and described herein as it may be applied, for example, to one terminal of a party line, such as that terminating at a central office switching center or message relaying station. The party line is represented in the drawings by reference character L1 and the circuits shown herein and comprising Figs. 1, 2 and the major portion of Fig. 3 represent those at the central office terminal of the party line. As shown in the remainder of Fig. 3, the party line extends from the central office to other



offices represented by rectangles A, B and C which are referred to hereinafter as branch offices.

The party line L1 as shown herein is adapted for single line operation, that is for operation in one direction at a time. However, the invention is not limited in application to a party line operated in one direction at a time and may readily be applied to a party line adapted for duplex operation, or operation in both directions at a time. The branch office stations A, B and C each have station selecting equipment whereby any one or more of these stations may be locked in on the party line and the remainder locked out. The equipment at the branch offices A, B and C may be similar to that shown in Patent No. 2,152,010 wherein a station is locked in on the transmission and receipt of its particular selecting character following a long opening on the party line. Inasmuch as the equipment at a branch station and the manner in which it responds to signals from the central office constitute no part of the present invention, a description of the detailed operation thereof will not be included herein.

At the central office which includes the equipment shown in Figs. 1, 2 and 3, the party line L1 has associated therewith a tape transmitter 11 for transmitting permutation code groups of impulses to the party line and a receiver 12 for recording code groups of impulses received at the central office over the party line. The transmitter 11 and receiver 12 may be similar to any of the well known permutation types.

The idle or normal condition of the party line L1 is closed and the permuted impulses comprise groups of open and closed line conditions. As shown, the party line has potential applied thereto at the remotest branch office such as C and at the central office the line extends through the coil of a relay 13, the left-hand coil of another relay 14, the central left-hand tongue and back contact of a slow-to-release relay 16, to ground at the first left-hand tongue and back contact of a relay 17. The tape transmitter 11 is adapted to be controlled by a perforated tape 18 prepared by a perforator 19. The perforator 19 may be of the type disclosed in a patent to Dirkes et al. No. 2,174,731, which operates in accordance with received signals to store messages in the tape 18 destined for stations on the party line L1. The perforator 19 may also be provided with any of the well-known automatic tape feed-out mechanisms whereby, on the cessation of signals for a predetermined length of time, the perforator automatically feeds out sufficient tape to allow the last message character in the tape to reach the pins of the tape transmitter 11. In accordance with the principles of operation of the present invention, the perforator 19 perforates so-called branch station selecting characters in the tape 18 ahead of each message. In the manner pointed out, these selecting characters cooperate in the selection of the desired branch stations and the exclusion of the undesired ones.

Let it be assumed that the party line L1 is idle and that the perforator 19 is also idle. The perforator 19 is adapted to perforate the tape 18 with letters combinations wherein all five code positions are marking or are perforated when automatically feeding out tape to enable the last message character to reach the pins of the tape transmitter 11. If the tape transmitter has transmitted the last message character perforated in the tape and no more tape is prepared

by the perforator 19, the tape 18 will become taut and effect opening of tape lever contacts 21. For these conditions perforations in the tape between the perforator 19 and transmitter 11 will be letters perforations and during such an idle condition relay 14 will be energized by the circuit heretofore described. With the relay 14 energized, a circuit is established for operating a slow-to-release relay 22 since the operation of relay 14 through its tongue breaks the short circuit around the coil of relay 22.

Let it be assumed that after the above condition has existed for some time, the perforator 19 operates to begin the storing of a message in the tape 18. After a number of characters have been perforated in the tape, the tape lever contacts 21 are permitted to close, whereupon a circuit is completed from potential through the clutch magnet 23 of a distributor 24, the closed tape lever contacts 21, the outer left-hand tongue and back contact of relay 17, the back contact and right-hand tongue of relay 26 to ground, whereupon clutch magnet 23 becomes energized and releases the distributor 24 for operation. The distributor 24 may be of the type commonly used in well-known perforator switching systems and consists essentially of a rotatable member controlled by the clutch magnet 23 which, upon energization of the clutch magnet, is adapted to operate a plurality of sets of contacts in a predetermined sequence. As shown the distributor 24 includes eight sets of contacts all of which with the exception of No. 6 are open during the idle condition of the distributor.

After the energization of the clutch magnet 23 and the release of distributor 24, contacts No. 7 close and completes a circuit from ground at the distributor through these contacts, the back contact and left-hand tongue of a relay 26, the left-hand coil of a relay 27 and the coil of a step magnet 25 of the tape transmitter 11 to potential. whereupon relay 27 and the step magnet 25 are energized. Under the assumed conditions of letters perforations separating messages in the tape 18, such a perforation will at this time be associated with the pins of the transmitter 11. Accordingly all the tongues thereof will be, prior to the energization of the step magnet, in contact with the marking bus bar M and the energization of the step magnet will move all the tongues into contact with the spacing bus bar S.

Each of the tongues of the transmitter 11 are connected through coils of individually associated relays 28a to 28e to potential, and as the tongues are moved into contact with the spacing bus bar, a circuit is completed from potential through the coils of the relays 28, the tongues and spacing bus bar of the transmitter 11, the right-hand coil of relay 26, the closed contacts 29 associated with the third left-hand tongue of relay 17, to ground at the back contact and second right-hand tongue of a relay 31. This effects energization of relays 28 and 26, and the energization of the latter relay by its left-hand tongue interrupts the circuit therethrough but relay 27 remains energized by the shunt circuit through its left-hand tongue and front contact. Operation of relay 26 through its right-hand tongue also removes the ground from the circuit heretofore described to the clutch magnet 23 of the distributor 24 whereupon said magnet releases and the distributor will therefore stop at the end of its current cycle of operation provided the clutch magnet circuit is not restored. Before the



## 5

distributor comes to rest, the No. 7 contacts open to interrupt the circuit through relay 27 and the step magnet 25 of tape transmitter 11. The release of the step magnet 25 advances the next character in the tape over the sensing pins thereof and if this character is another letters character, the distributor 24 and transmitter 11 go through another cycle of operation to advance such characters through the transmitter. In the same manner all succeeding letters perforations in the tape 18, provided the tape lever contacts 21 remain closed, are advanced through the transmitter.

When any character other than a letters character, which will be the first character of the message perforated in the tape 18, is advanced over the pins of the transmitter 11, all of the tongues thereof will not contact the marking bus bar when the step magnet 25 releases but one or more of the tongues will remain in contact with the spacing bus bar since any characters with the exception of a letters character is not all marking. Accordingly, with other than a letters character in the transmitter, the circuit through the right-hand coil of relay 26 will not be opened since this circuit is now maintained through one or more of the tongues of transmitter 11 in contact with its spacing bus bar. With relay 26 held operated the above described circuit to the clutch magnet 23 of the distributor 24 is maintained open and the clutch will not be operated for the time being to initiate the distributor for another cycle of operation. Sometime after the last release of the step magnet 25 of transmitter 11, slow-to-release relay 27 releases and through its outer right-hand tongue completes a circuit from the grounded right-hand tongue of relay 26 and the front contact thereof, the back contact and outer right-hand tongue of relay 27, the second right hand tongue and back contact of a relay 32, through the filament of a so-called message waiting lamp 33 to potential. This effects illumination of lamp 33 and indicates that a message is waiting in the tape 18 of transmitter 11 for transmission to the party line L1.

If the party line L1 is adapted for single line operation, it obviously is undesirable for the tape transmitter 11 to begin transmitting unless the line is idle. To this end means are provided to prevent transmission from the transmitter 11 unless the party line is idle and has been idle for at least a predetermined length of time. As shown, the line circuit passes through the coil of relay 13 and hence this relay responds to all line signals. If the line is busy, as for example, if station A should be transmitting to the central office with signals being recorded on the receiver 12, the tongue of relay 13 would vibrate and operate in accordance with the signals received at the central office. Each time relay 13 is deenergized, negative potential at the tongue thereof is applied through its back contact to the control grid of a vacuum tube 34. This negative potential on the control grid prevents the tube 34 from passing current and the grid leak arrangement 36 including the condenser and resistance in the usual manner maintain the control grid negative for at least a predetermined length of time after the tongue of relay 13 leaves its back contact.

When the party line becomes idle, relay 13 is energized and removes the negative potential from the control grid of tube 34 and if this idle condition prevails for at least a predetermined length of time, the negative charge in the control grid is permitted to leak off whereupon the

## 6

tube 34 becomes conducting. The time required for the negative potential of the grid to leak off and effect operation of vacuum tube 34 is determined by the grid leak 35 and this time interval preferably exceeds that of several character impulses and may be a twelve-second interval for example.

When vacuum tube 34 passes current, relay 36 in the plate circuit thereof operates and completes a circuit for the operation of relay 37 if a message is waiting to be transmitted. The circuit for operating relay 37 may be traced from potential through the coil of relay 37, the contacts 38 associated with the inner left-hand tongue thereof, the front contact and inner right-hand tongue of relay 22, the front contact and tongue of relay 36, the outer right-hand tongue and back contact of relay 27 to ground at the front contact right-hand tongue of relay 26 which for the conditions assumed is at this time energized. Thus when a message character is stepped over the pins on the tape transmitter 11, relay 37 will become operated if the line circuit is idle and has been idle for at least a predetermined length of time. If the line is busy when a message character appears over the pins of the transmitter operation of relay 37 will be delayed until after the line has been idle for the predetermined length of time.

When relay 37 operates it establishes a locking circuit for itself through the front contact and outer left-hand tongue thereof to ground at the wiper of the left-hand level of a rotary switch 39. Energization of relay 37 also through its right-hand tongue establishes circuits for the illumination of a connect lamp 41 and the operation of a relay 42. Illumination of connect lamp 41 indicates that the transmitter 11 is connected or about to be connected to the party line L1 and operation of relay 42 applies a short-circuiting ground to the grid of vacuum tube 34 and through its left-hand tongue, relay 42 applies a holding potential to receiver 12. Relay 42 thus prevents the receiver 12 from responding to signals transmitted from transmitter 11 and establishes a condition to maintain vacuum tube 34 conducting regardless of the operation of relay 13 which will operate in accordance with signals transmitted from the transmitter 11 as the said relay is in the line circuit.

When relay 37 operates, the first left-hand tongue thereof opens contacts 38 and extends the grounded circuit from the right-hand tongue and front contact of relay 26, through the coil of slow-to-release relay 16, the inner left-hand tongue and back contact of a relay 43, and the back contact and outer right hand tongue of relay 17 to potential. This circuit effects energization of relay 16 and in operating the second left-hand tongue of relay 16 removes the ground previously applied to the line circuit L1 and thereby opens the line L1 and causes the transmission of an open line condition. Although the line circuit extends through the left-hand coil of relay 14, the said relay will not be deenergized by transmission of this open line condition since the inner left-hand tongue of relay 16 on energization thereof completes an obvious circuit through the right-hand coil of relay 14 to maintain the same energized. Operation of relay 16 through its right-hand tongue also interrupts the circuit from negative potential to the control grid of a vacuum tube 44 whereupon the negative charge on said grid begins to dissipate through a grid leak arrangement 46 including a grounded con-



7

denser and resistance. When the control grid of vacuum tube 44 reaches or nearly reaches ground potential, tube 44 becomes conducting and the length of time before tube 44 becomes conducting after the operation of relay 16 is determined by the characteristics of the grid leak 46 and this time may, for example, be in the neighborhood of four seconds. The outer left-hand tongue of relay 16 in moving from its unoperated position, interrupts the obvious short circuit around the coil of a relay 47 whereupon said relay becomes energized.

When vacuum tube 44 passes current which will be, under the assumed conditions, four seconds after the operation of relay 16, a circuit is completed for the operation of relay 17, the coil of which together with the right-hand tongue and back contact of relay 43 and the contacts 48 of relay 17 are included in the plate circuit of vacuum tube 34.

The operation of relay 17 as the result of tube 44 passing current, opens contacts 48 in the operating circuit therefor and through its first right-hand tongue establishes a locking circuit for itself from potential to ground at the left-hand level of rotary switch 39. Operation of relay 17 through its outer right-hand tongue opens the operating circuit for relay 16 but the tongues of relay 16 do not immediately assume a deenergized position since relay 16 is a slow-to-release relay. Operation of relay 17 also through the inner left-hand tongue removes the ground applied to the back contact and second left-hand tongue of relay 16 so that when relay 16 subsequently releases, the line circuit will be grounded through the closed No. 6 contact of the distributor 24. Another function effected by the operation of relay 17 is the opening of contacts 29 by its third left-hand tongue and the removal of the right-hand coil of relay 26 from the circuit to the spacing bus bar of the transmitter 11. The outer left-hand tongue of relay 17 in operating extends the clutch magnet circuit of the distributor 24 to the back contact of relay 47 and this circuit is now independent of contact of relay 26. Relay 47 will, however, at this time, be energized so that the circuit of the clutch magnet 23 will not immediately be completed.

Some time after operation of relay 17, relay 16 releases and this interval of time is dependent upon the slow-to-release characteristic of relay 16. Relay 16 in releasing through its second left-hand tongue closes the line circuit to ground which, at this time, is applied through the normally closed No. 6 contacts of distributor 24. When relay 16 releases, it re-applies negative potential to the control grid of vacuum tube 44, opens the circuit through the right-hand coil of relay 14 and establishes a short-circuiting ground connection for the coil of relay 47. The last-mentioned function of relay 16 permits relay 47 to release within a predetermined length of time, as determined by the slow-to-release characteristic of relay 47.

From the above description, it will be noted that the line circuit to party line L1 is opened by the operation of relay 16 and this circuit is maintained in an open condition for a period of approximately four seconds as determined by the operating characteristic of vacuum tube 44 with its associated grid leak 46 plus the release time of relay 16. Shortly after the closing of the line circuit, resulting from the release of relay 16, relay 47 releases to complete a circuit from ground to the clutch magnet 23 of the distributor

8

24 which operates and releases the distributor 24 for continuous operation for the time being.

Nos. 1 to 5 contacts of the distributor 24 are individually connected to the right-hand tongues of relays 28a to 28e, the back contacts of which are grounded. The coils of relays 28 are connected over individual circuits to respective tongues of transmitter 11 and as long as the spacing bus bar is grounded, a relay 28 will be operated when its respective tongue of transmitter 11 is in contact with the spacing bus bar and deenergized when its tongue is in contact with the marking bus bar. Thus, the upper parts of Nos. 1 to 5 contacts of distributor 24 will have ground applied thereto in a combination representative of the positions of the tongues of transmitter 11 which, in turn, are positioned in accordance with the perforation in the tape over the pins of the transmitter.

On the release of distributor 24, contacts No. 6 open whereby the start impulse preceding each code group of impulses is transmitted to the line circuit and thereafter contacts Nos. 1 to 5 sequentially close and open and effect transmission of a code group of open and closed line conditions representative of the character over the pins in the transmitter 11. This character will be the first character in the tape following the letters perforations and incident to the transmission thereof, contacts No. 7 of the distributor 24 close to re-operate the stepping magnet 25 to advance the succeeding message character in the tape over the pins of the transmitter which will be transmitted to the line in a similar manner. If the tape 18 becomes taut during the transmission of the message and effects opening of the tape lever contacts 21, the circuit to the clutch magnet 23 of distributor 24 is interrupted and the distributor will cease further operation following the transmission of the code group in progress of being transmitted at the time tape lever contacts 21 open. The reclosing of tape lever contacts 21 by the accumulation of more tape 18 recloses the clutch magnet circuit of distributor 24 whereupon the same resumes operation to transmit succeeding message characters to the line circuit.

At the branch stations on the party line L1, the receipt of the long open preceding a message transmitted from the central office is effective to start the motors of the printers thereat and thereby conditions these printers or other receiving mechanisms for receipt of following signals. As pointed out hereinabove, the branch offices such as A, B and C, each may be equipped with selecting equipment such as that disclosed in Patent No. 2,152,010. In accordance therewith, after the long open one or more selecting characters are transmitted to lock in the one or more desired receiving stations. For example, stations A, B and C may have selecting characters A, B and C assigned thereto whereby the same are selected and lock in. Thus, if it is assumed that the message in the tape 18 at the central office is destined for station A, under the assumed conditions the selecting character A would be transmitted. Since at the time of transmission of this character the printers at all stations A, B, C, on the party line will be in operation, this character will be recorded at all stations. However, the receipt of this character at station A establishes a circuit whereby the subsequent transmission of a disconnecting or de-activating character transmitted after the selecting character is unaffactive at station A. At the



other station or those at which respective selecting characters have not been received, the deactivating character is effective to operatively disconnect the recording mechanism from the line circuit whereupon the printers at such stations are prevented from recording subsequent signals transmitted from the transmitting station. Thus, certain of the stations as determined by the selecting characters transmitted at the beginning of each message are effectively locked in on the circuit and all other stations locked out. In this manner, only the desired one or ones of the stations on the party line are selectively conditioned to receive messages.

As shown in the accompanying drawings, the central office does not have means whereby it may be selectively conditioned to receive messages from one of the branch offices such as A, B or C as it is assumed messages originating at these branch offices will be destined for the central office. Should the branch office A desire to communicate with another branch office, such as B, the receiver 12 at the central office would also record such a message since no means is shown whereby the central office may be locked out. However, the central office could be provided with selective selecting apparatus similar to that at the branch offices to enable the central office to be selectively called from any one of the branch offices, A, B or C. If such were provided, the branch offices could communicate amongst themselves to the exclusion of the central office.

The messages are terminated by an end-of-message signal which in accordance with the present arrangement consists of two carriage return combinations. These end-of-message signals are effective to restore the system to its normal condition. The restoration of the circuit to its normal condition consists primarily of the transmission of another long open whereby the receiving and transmitting mechanisms at any of the branch stations which may have been locked out during the transmission of a message from another station, are reconnected into the line circuit.

The end-of-message signal of two carriage returns, each of which consists of the first, second, third and fifth pulses spacing and the fourth pulse marking, appears in the tape, such as 18, following each message. As the first carriage return is stepped into the tape transmitter 11, and contacts No. 8 of the distributor 24 close concomitantly with the transmission of this character, a circuit is completed for the energization of a relay 51. This circuit may be traced from ground through contacts No. 8 of the distributor 24, the back contact and outer left-hand tongue of relay 43, the left-hand tongue and back contact of relay 31, through a baffle circuit including the left-hand tongues of relays 28a to 28e when operated in accordance with the carriage return signal, said baffle circuit specifically including the left hand tongue and front contact of relay 28a, the left hand tongue and front contact of relay 28b, the left hand tongue and front contact of relay 28c, the left hand tongue and front contact of relay 28e, and the left hand tongue and back contact of relay 28d, through the tongue and back contact of a relay 52, coil of relay 51 and the back contact and tongue of a relay 53 to potential. The operation of relay 51 through its left hand tongue establishes a locking circuit for itself which also includes the coil of relay 52. This locking circuit extends to ground at the front contact and second left-hand

tongue of relay 17 which is at this time operated but relay 52 does not operate until No. 8 contacts of distributor 24 open.

The baffle circuit to the left-hand tongues and contacts of relays 28 are so arranged that a circuit to relay 51 is only completed when relays 28 are operated in accordance with a carriage return signal. If the next character following a carriage return signal is some other character, a circuit is completed for the operation of relay 53 which, when operated, interrupts the locking circuit extending through relays 51 and 52 whereupon said relays release. The circuit for relay 53 is partially completed by the operation of relay 51 and the contacts associated with the left-hand tongues of relays 28 are so arranged that ground is applied to this circuit at the time contacts No. 8 of the distributor transmitter close with any character other than the carriage return set up in relays 28. For example, should relay 28a be unoperated or in a marking condition, the circuit for operation of relay 53 would extend from ground through contacts No. 8 of distributor 24, the back contact and outer left-hand tongue of relay 43, the left-hand tongue and back contact of relay 31, the left-hand tongue and back contacts of relay 28a through the coil of relay 53 to potential at the right-hand tongue and front contact of relay 51. Accordingly, any signal in the tape following a carriage return, which carriage return affects relays 51 and 52, restores relays 51 and 52 to their normal unenergized condition.

However, should a first carriage return be followed immediately by a second carriage return, which signifies the end of a message, the second carriage return effects energization of relays 31 and 32. The first carriage return, which as described effects operation of relay 52, transfers the circuit extending through the baffle arrangement of relays 28 through the coil of relay 32. Hence, on the second carriage return, the closure of contacts No. 8 of the distributor 24 causes relay 32 to operate. When relay 32 operates the left-hand tongue thereof establishes a locking circuit therefor which circuit also includes the coil of relay 31. This circuit extends to ground through the front contact and second left-hand tongue of operated relay 17 and when contacts No. 8 of distributor 24 open, relay 31 operates in the same manner as relay 52 operated in conjunction with the receipt of the first carriage return. Thus, in accordance with the end-of-message signal consisting of two carriage return signals, relays 31, 32, 51 and 52 are operated.

Operation of relay 32 through its outer right-hand tongue completes a circuit for operation of relay 26. This circuit may be traced from ground, through the left-hand coil of relay 26, the outer tongue and front contact of relay 32 and the second left-hand tongue and back contact of a relay 55 to potential. When relay 26 operates, its left-hand tongue opens the circuit extending therethrough to the step magnet 25 of the tape transmitter 11. Accordingly, when contacts No. 7 of distributor 24 subsequently close, the step magnet 25 will not be energized and the second carriage return of the end-of-message signal will stay over the pins of the transmitter and the tongues will remain operated in accordance therewith for the time being.

The operation of relay 31 establishes a circuit from the ungrounded one of the terminals of contacts No. 8 of the distributor transmitter 24 through a step magnet 56 of the rotary switch



## 11

39 to potential so that when contacts No. 8 subsequently close, the step magnet 56 will be energized. In addition to the above, operation of relay 31 through its outer right-hand tongue lifts the ground heretofore applied to the spacing bus bar of the transmitter 11 whereupon all the relays 28 are markedly conditioned.

The operation of relay 32 completes through its inner right-hand tongue and front contact a circuit for maintaining the clutch magnet 23 of the distributor 24 energized independently of the tape lever contacts 21 and independently of the condition of relays 17 and 26 so that the distributor will continue to operate for the time being. Each such cycle of operation of the distributor 24 will effect the transmission of an all-marking or letters code combination inasmuch as each of the relays 28 is at this time in a marking condition and concomitantly with the transmission of each such all-marking or letters character, the closure of the No. 8 contacts of distributor 24 effects operation of step magnet 56 of rotary switch 39. The wipers of the rotary switch 39 are advanced one step for each such letters character transmitted and on the sixth step the grounded right-hand wiper completes an obvious circuit for the operation of relay 43. Operation of relay 43 completes the circuit for energization of relay 16 which extends from potential at the outer right-hand tongue of relay 55 through the front contact and inner left-hand tongue of relay 43, coil of relay 16, the inner left-hand tongue and front contact of relay 37, the front contact and inner right-hand tongue of relay 22, the front contact and tongue of relay 36, the outer right-hand tongue and back contact of relay 27 to ground at the front contact and tongue of relay 26.

In the manner above set forth, the operation of relay 16 removes negative potential from the grid of vacuum tube 44 and after a predetermined length of time as determined by the grid leak 35, plate current will flow in said tube. The plate circuit of tube 44 now includes the coil of relay 55 so that when the tube passes current, relay 55 will be operated. The circuit for relay 55 extends from the plate of tube 44 through the right-hand tongue and front contact of relay 43, the make-before-break contacts 54 of relay 55, the coil of relay 55, to ground through a tongue and front contact of relay 43.

The line circuit L1 extending through the back contact and second left-hand tongue of relay 16 is opened by the operation of relay 16, and remains open until relay 16 releases. As in the first operation of relay 16, before the transmission of the message, the second operation thereof in conjunction with the end-of-message signal completes a circuit for holding relay 14 operated and the outer left-hand tongue of relay 16 effects operation of relay 47. Operation of relay 47 interrupts the described circuit to the clutch magnet 23 of distributor 24 whereby said distributor comes to rest at the end of its current cycle.

When relay 55 operates, as the result of tube 44 passing current, it interrupts the circuit to slow-to-release relay 16. Release of relay 16 recloses the line circuit extending through its second left-hand tongue and back contact to thereby terminate the long open which was transmitted while relay 16 was operated. The transmission of this long open to the party line L1 effects reconnection of all the locked-out branch stations to the party line. A short time after the

## 12

release of relay 16, relay 47 releases to reapply ground to the clutch magnet circuit of distributor 24 whereupon the said distributor is released. At this time operated relay 55 applies a ground through its outer left-hand tongue to the spacing bus bar S of transmitter 11, which will cause operation of relays 28 in accordance with the character over the pins. This character will be the second carriage return of the end-of-message signal and hence the distributor will effect transmission of this carriage return to the party line. The circuit to the step magnet 56 of rotary switch 39 was interrupted by operation of relay 43 through its outer left-hand tongue but operation of relay 55 re-establishes this circuit so that the closure of contacts No. 8 of distributor 24 concomitantly with the transmission of the second carriage return effects another energization of step magnet 56. This last step of rotary switch 39 advances the wipers to their eighth contacts whereupon the circuit to relay 43 is broken and said relay releases. As the left-hand wiper of rotary 39 advances to its eighth contact, the locking circuit through relays 17 and 37 is interrupted whereupon these relays release. Release of relay 17 opens the locking circuits for relays 31, 32, 51 and 52, and also grounds the line L1 ahead of the distributor 24.

If there are no further messages stored in the tape 18, there will in accordance with the above assumed conditions be sufficient letters characters therein to permit the last carriage return signal of the end-of-message signal to advance through the transmitter 11. Subsequently, tape lever contacts 21 will open to interrupt the circuit to the clutch magnet 23 and stop further operation of the distributor 24.

From the above description of the circuits, it will be noted that an end-of-message signal in the tape controlling the transmitter 11, temporarily interrupts transmission from the transmitter between the two carriage return signals of the end-of-message signal and effects transmission of six letters combinations. These six letters combinations follow the first transmitted carriage return signal substantially immediately and after the transmission of these letters, a long open is transmitted, after which the second carriage return signal of the end-of-message signal is transmitted. It will also be noted that letters signals interposed between the two carriage returns are transmitted to the line even though the transmitter 11 is operated in accordance with and has a carriage return signal over the pins thereof.

At the receiving branch office the six letters signals may be employed to convey certain information to the operator thereat and the long open transmitted thereafter is effective to operatively reconnect all the party line stations that may have been locked out to the party line. The second carriage return transmitted thereafter returns the party line to its normal idle condition.

It will be obvious to those skilled in the art that various modifications of the invention may be made without departing from the spirit or essential attributes thereof, and it is desired, therefore, that only such limitations be placed thereon as are specifically set forth in the appended claims.

What is claimed is:

1. In a telegraph system, a normally closed transmitting circuit, a tape transmitter for transmitting to said circuit, a perforated tape



13

having messages stored therein for controlling said transmitter with said messages separated by predetermined perforations, means controlled by any character perforation in said tape on the advancement thereof into said transmitter following passage of said predetermined message separating perforations therethrough to open said transmitting circuit for a predetermined length of time and means to prevent operation of said transmitter during said open circuit condition and to automatically start operation of the same at the end of said open circuit condition.

2. In a telegraph system, a normally closed transmitting circuit, a tape transmitter for transmitting to said circuit, a perforated tape having messages stored therein for controlling said transmitter, each of said messages including terminating end-of-message perforations with said messages separated by other predetermined perforations, means including said end-of-message and said message separating perforations for automatically transmitting to said transmitting circuit ahead of and following each message transmitted from said transmitter open line conditions of substantially equal length and means to prevent operation of said transmitter during the transmission of said open line conditions.

3. In a telegraph system, a normally closed transmitting circuit, a tape controlled transmitting mechanism for transmitting code groups of impulses to said circuit, a reading device associated with said transmitting mechanism for normally reading each of said code groups individually prior to the transmission thereof to said circuit, means controlled by said reading device on the reading of predetermined code groups to open said line circuit for a predetermined length of time and transmit a noncoded signal of greater length than the length of a code group and means to prevent operation of said transmitting mechanism during the open line condition.

4. In a telegraph system, a normally closed transmitting circuit, a tape controlled transmitting mechanism for transmitting code groups of

14

impulses to said circuit, a reading device associated with said transmitting mechanism for normally reading each of said code groups individually prior to the transmission thereof to said circuit, means controlled by said reading device when reading a predetermined sequence of consecutive code groups to interrupt transmission from said transmitting mechanism for a predetermined length of time and transmit a noncoded signal of greater length than the length of a code group and means to open said line circuit during the interrupted transmission from said transmitting mechanism.

5. In a telegraph system, a normally closed transmitting circuit, a tape controlled transmitting mechanism for transmitting code groups of impulses to said circuit, a reading device associated with said transmitting mechanism for normally reading each of said code groups individually prior to the transmission thereof to said circuit, means controlled by said reading device after the transmission by said transmitting mechanism of a part of a predetermined sequence of code groups to effect transmission to said circuit of a predetermined number of other predetermined code groups followed by a noncoded open line condition of predetermined length of greater duration than the required to transmit a code group and means to thereafter transmit the remainder of said sequence of code groups.

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