July 10, 1945. W. J. ZENNER 2,380,007

TELEGRAPH SWITCHING SYSTEM

Filed March 3, 1943 3 Sheets-Sheet 1

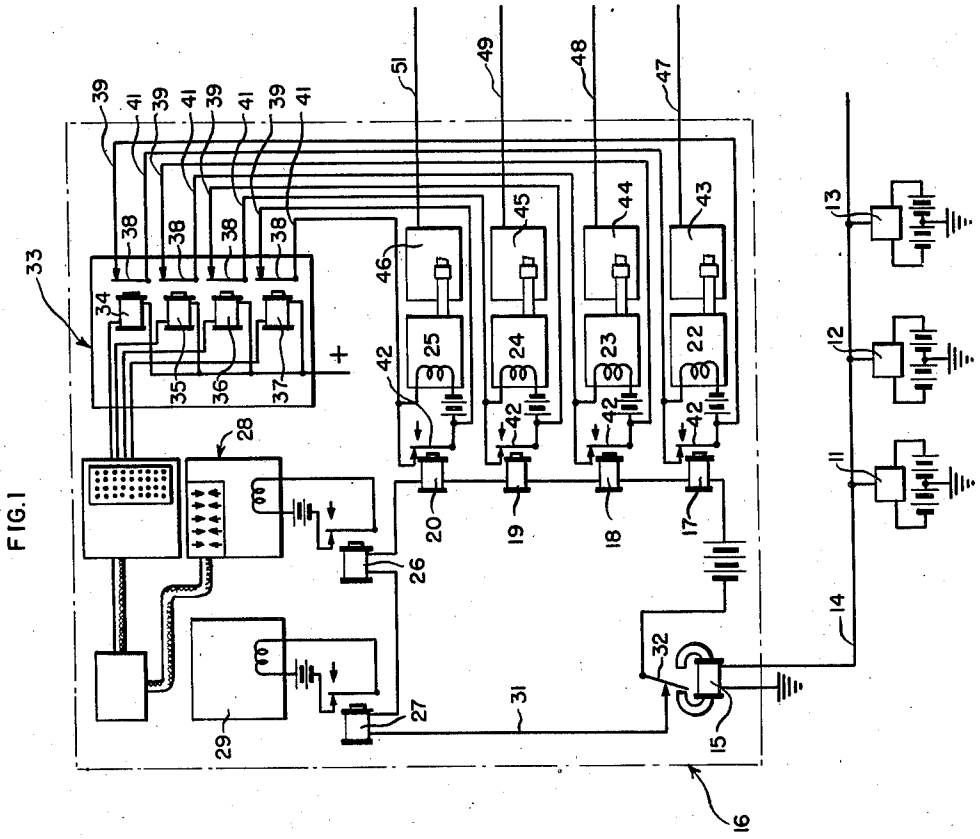


FIG. 1

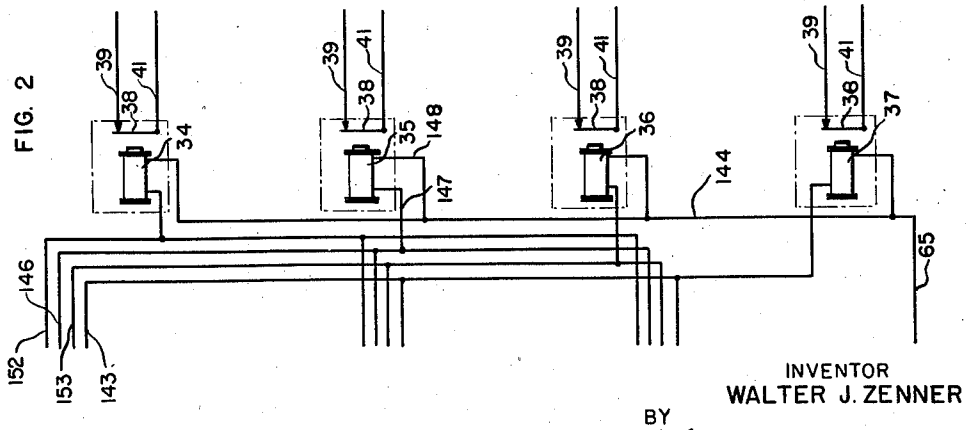


FIG. 2

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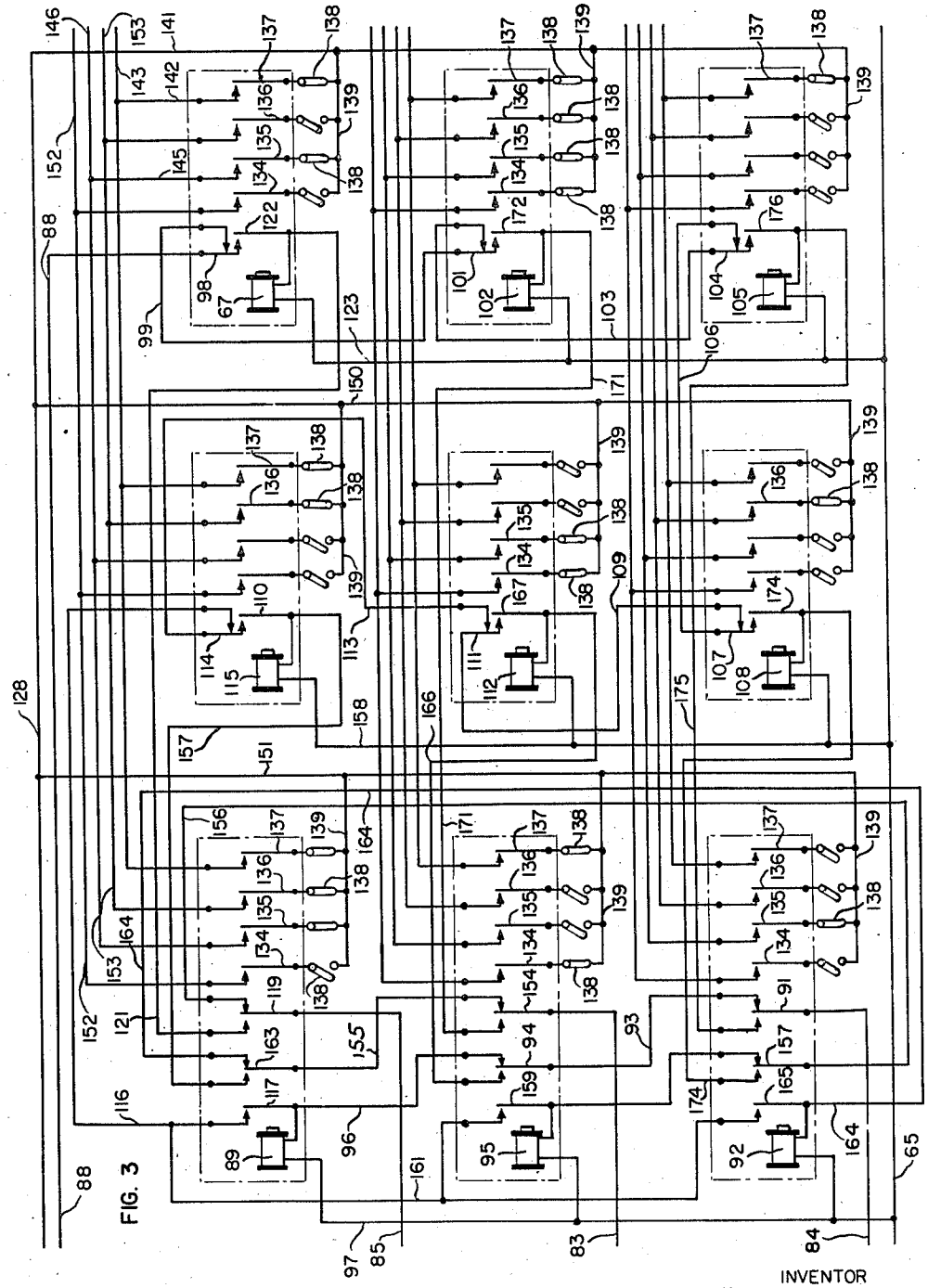


FIG. 3

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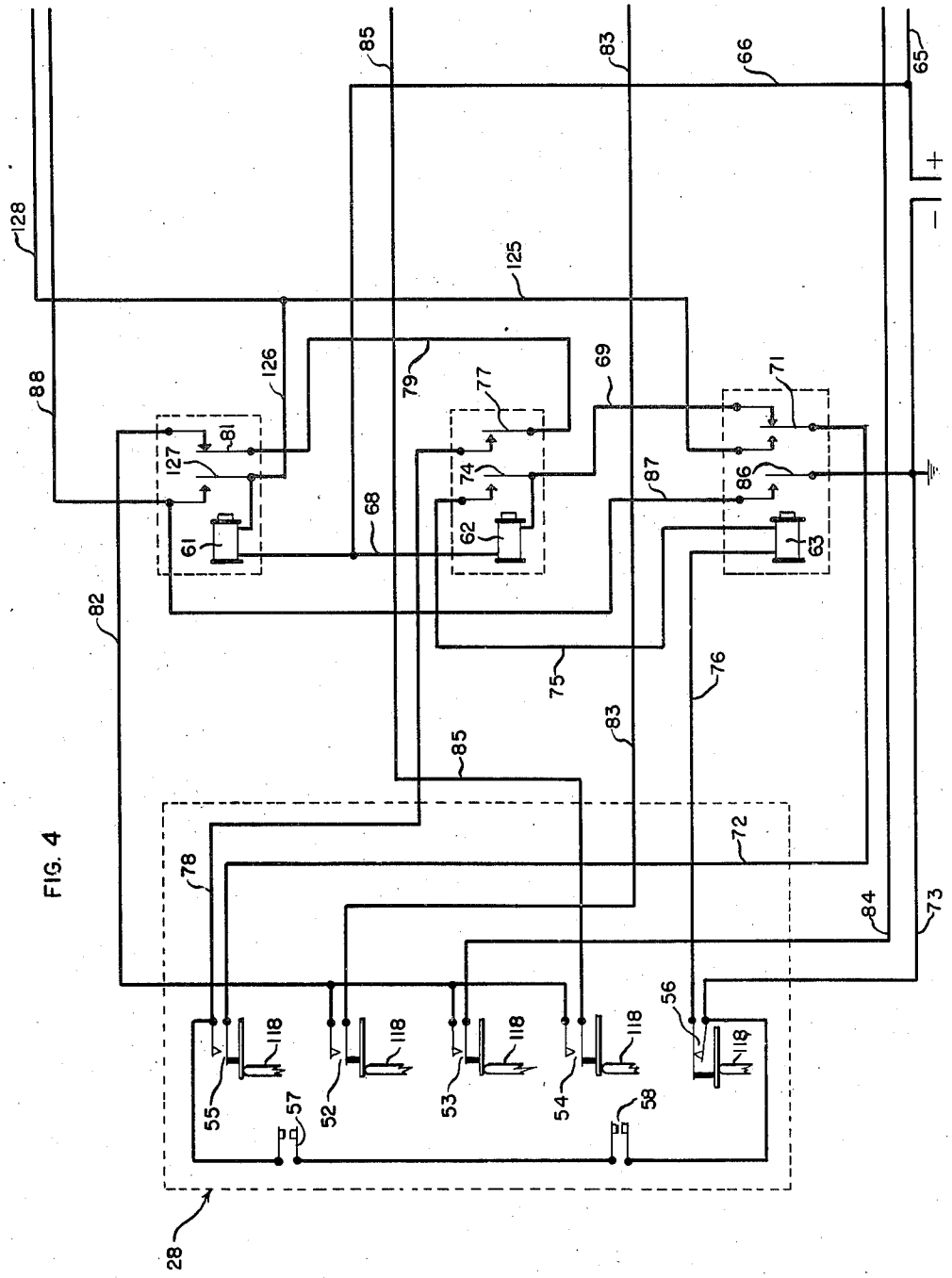


FIG. 4

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2,380,007

TELEGRAPH SWITCHING SYSTEM

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Application March 3, 1943, Serial No. 477,800

6 Claims. (Cl. 178—2)

This invention pertains to printing telegraph systems and particularly to apparatus for automatically selecting central office retransmission equipment under the control of relay station identification signals.

In a telegraph system in which outlying stations transmit intelligence to a central station where there are located several tape reperforators for preparing retransmission tape, it is desirable under some conditions of message relaying practice to be able to choose from among several outlying message broadcast stations certain ones only for particular channels of retransmission under circumstances whereby these channels will respond to limited traffic only and whereby the selection from among several outlying broadcast stations is made under the supervision of identifying signals which accompanying each message and which designate its particular originating station.

Accordingly, the primary object of the present invention is the provision of an automatic telegraph switching system by means of which transmitting stations can cause to be selected from among several transmitting or broadcasting stations those through which it is desired to relay the message.

In accordance with the present invention there is provided, at a central station, a selector mechanism which is associated with a relay unit and which is operated in accordance with preassigned identification signals received from and indicative of corresponding outlying stations. In the specific embodiment, a relay unit includes nine individual selecting relays, each of which may be selected in response to a preassigned signal received from an outlying station. The relay unit controls four shunt relays of four tape reperforators thereby supervising the operation of such reperforators. The selection of a one of the nine selecting relays enables it to select a combination of reperforator shunt relays for operation. Which reperforators are selected depends upon how a particular selecting relay is connected to the several reperforator shunt relays as will appear from the detailed description to follow. The number of selecting relays used and the number of reperforators and associated transmitters employed is an arbitrary choice and the invention is not to be limited by such specific recitals.

In practicing the present invention, it has been found preferable to utilize nonprinting or so-called function signals for station selecting purposes in order that confusion with message matter might not result. Accordingly, the station selection or control signals chosen for use in operating the present system are the carriage return, letters shift, space, blank, and line feed.

The invention will now be more completely described with reference to the accompanying drawings wherein;

Fig. 1 is a schematic circuit diagram of a system embodying the present invention;

Fig. 2 is a portion of a complete circuit diagram in which portion are shown the four reperforator shunt relays;

Fig. 3 is another portion of the complete circuit diagram in which the nine selecting relays used in the system are shown; and

Fig. 4 is a portion of the circuit diagram illustrating symbolically certain elements of a selector and three circuit conditioning relays.

Referring now particularly to Fig. 1, there is illustrated a schematic circuit diagram of the system embodied in the present invention. A plurality of outlying stations 11, 12, 13, etc., are shown connected serially over a signal line 14 to a master receiving relay 15, located at a central station 16. The operation of receiving relay 15 causes the simultaneous operation of relays 17, 18, 19, and 20 associated respectively with reperforators 22, 23, 24, and 25 and also the simultaneous operation of relays 26 and 27 associated respectively with a contact operating selector 28 and a monitor printer 29 which makes a record of all incoming signals. The circuit for this simultaneous operation is as follows: from positive battery through the windings of relays 17, 18, 19, 20, 26, and 27, over conductor 31 and through transmitting tongue 32 of the master receiving relay 15 to negative battery.

Also shown in the schematic circuit diagram of Fig. 1 is a relay unit 33 which includes four reperforator shunt relays 34, 35, 36, and 37, respectively associated with reperforators 22, 23, 24, and 25. Each of the relays 34 to 37 is provided with a shunting contact tongue 38 and a pair of shunting conductors 39 and 41 which normally provide a shunt circuit to the reperforator operating contact tongues 42 associated with the relays 17 to 20. As ones of the reperforator shunt relays 34 to 37 are selected, their associated contact tongues 38 are attracted, opening the shunt circuit to the contacts 42 and permitting the operation of said contacts 42 thereafter to effectively control their related reperforators 22 to 25. Associated with reperforators 22, 23, 24, and 25, are the respective tape transmitters 43, 44, 45, and 46 which receive the tape or control form prepared by the reperforators and transmit cor-

responding signals over the individual outgoing lines 47, 48, 49, and 51, on each of which there may be any number of subscribers' stations.

Referring now particularly to Figs. 2 and 4, the primary elements whose performance effects the selection of the reperforator shunt relays 34, 35, 36, and 37 will be described in detail. As has already been mentioned, there is located at the central station 16 a mechanical selector or contact closer 28 which exercises a selective control over a set of contact switching pull bars as described in copending application Serial No. 405,301 of W. J. Zenner filed August 4, 1941, now Patent No. 2,323,438, granted July 6, 1943. The pull bar contacts include a letters shift contact pair 52, a space contact pair 53, and a blank contact pair 54. There is also included in the selector apparatus a carriage return contact pair 55 which has a circuit conditioning function, and a line feed contact pair 56 which performs a circuit breaking function and whose pull bar differs from the other pull bars in that it breaks or opens its contact pair instead of closing it. Further, the selector 28 provides a universal bar operated contact pair 57 and a platen shift contact pair 58 which is only closed when the platen is in its letters shift position. The letters shift, space, and blank code bar contact pairs operate to perform their switching functions only when the selector apparatus is in its letters shift position.

The outlying message broadcasting stations 11, 12, and 13 will transmit prior to each message, preassigned station identifying signal code combinations which will also serve to select predetermined reperforators for operation, as will now be described. The broadcast stations will begin each message by first transmitting a carriage return signal followed by a combination of signals of the letters shift, space, and blank signals, and then a second carriage return signal.

The afore-mentioned carriage return signals control the operation of the circuit conditioning relays 61, 62, and 63, Fig. 4. The preceding of the message proper by a carriage return signal is particularly desirable inasmuch as it insures that monitoring printing equipment will always be in proper position for printing the beginning of a message.

In order to illustrate the invention, it will be presumed that an outlying station 11 is transmitting a message and that the outgoing signal lines 48 and 51 are to be the only ones of the repeaters which respond to this message. Referring to Fig. 3, there are disclosed nine selecting relays, one of which is selected for operation according to the identification signals transmitted by any of the stations, as explained above made up of the signal components, letters shift, space, and blank. Let it be supposed that space-blank is the identification signal used by station 11 so that accordingly relay 67 is operated as will appear. As already explained, the space-blank signal will be preceded and followed by the carriage return signals in order to set the conditioning relays 61, 62, and 63.

The receipt of the first carriage return signal by the selector 28 causes its associated carriage return pull bar 118 to be selected for operation and to close the carriage return contact pair 55. Since universal contact 57 is closed upon the reception of every signal combination and the letters shift platen controlled contact pair 58 is closed due to the selector apparatus being in its letters shift position, the following circuit is established for energizing the conditioning relay 62: from positive potential, over conductors 66 and 68, through the winding of conditioning relay 62, over conductor 69, through contact tongue 71 of conditioning relay 63, now unattracted due to the de-energization of relay 63, over conductor 72 through the carriage return contact pair 55 (now closed), through the universal contact pair 57 and the platen shift contact pair 58, both of which are closed, as explained, and over the conductor 73 to negative potential.

As a result, conditioning relay 62 is operated and attracts its contact tongue 74 to prepare a locking circuit for the conditioning relays 62 and 63 which is effective upon the opening of the carriage return contact 55. This circuit is traceable as follows: from positive potential over conductors 66 and 68, through the winding of relay 62, through contact tongue 74 (now attracted), over conductor 75, through the winding of conditioning relay 63, over conductor 76, through line feed contact pair 56 (normally closed) and over the conductor 73 to negative potential. When the carriage return contact pair 55 opens, interrupting negative potential thereat, the locking circuit for relays 62 and 63 which has just been traced, becomes effective as a holding circuit.

Conditioning relay 62 also attracts its contact tongue 77 to prepare negative potential for the nine selecting relays shown in Fig. 3 as follows: from negative potential conductor 73, through the platen shift contact pair 58, through the universal contact pair 57 (when closed), over conductor 78, through the contact tongue 77 of conditioning relay 62 (now attracted), over conductor 79 through contact tongue 81 of conditioning relay 61 (now de-energized) over the conductor 82 to the letters shift, space, and blank contact pairs. It is thus apparent that when either the letters shift, space, or blank contacts are closed, negative potential may be extended over their respective conductors 83, 84, or 85, for the operation of the selecting relays shown in Fig. 3.

As a result of the operation of relay 63, tongue 86 pulls up and extends negative locking potential to the nine relays shown in Fig. 3, over conductor 88 as follows: from negative conductor 73, through contact tongue 86 (now attracted), over conductor 87 to conductor 88.

With conditioning relays 62 and 63 thus operated, the description of a typical selection will be continued during which the outlying station 11 next transmits a space signal to cause the operation of space relay 89 shown in Fig. 3. The circuit for relay 89 is traceable from the negative common line 82 to which this potential was described above, the space contact 53 (now operated by its pull bar 118), over the space conductor 84, through contact tongue 91 of letters shift relay 92 (now de-energized), over conductor 93, through contact tongue 94 of blank relay 95 (now de-energized), over conductor 96, through the winding of space relay 89 and over conductor 97 to positive conductor 65.

When the relay 89 operates, it receives locking negative potential from conductor 88 over the previously described circuit as follows: from winding 89 through its armature 117 (now closed), line 116 to the intermediate of a make-before-break contact assembly of relay 115, its normally closed contact 114, line 113 to the intermediate contact of a make-before-break contact assembly of relay 112, its normally closed contact 111, line 109 to the intermediate contact of a make-before-break assembly of relay 108, its normally closed

contact 107, line 106 to the intermediate contact of a make-before-break assembly of relay 105, its normally closed contact 104, line 103, to the intermediate contact of a make-before-break assembly of relay 102, its normally closed contact 101, line 99 to the intermediate contact of a make-before-break assembly of relay 67, its normally closed contact 98 to locking negative supply line 88 already described.

The outlying station 11 will next send a blank signal code combination, since as has been presumed there is to be selected the space-blank relay 67. When this signal is transmitted, blank contact 54 is closed by its associated pull bar 118 and negative potential is extended over the blank conductor 85, through contact tongue 119 (now attracted) of space relay 89, over conductor 121, through the winding of relay 67 and over conductor 123 to the positive conductor 65. The blank impulse which normally causes the energization of the blank relay 95 is now diverted by the operation of contact tongue 119 of space relay 89 to the space-blank relay 67. Furthermore, operation of the space-blank relay 67 through the instrumentality of contactor 122 breaks the locking circuit for space relay 89 extending through make-before-break contact 98 and thereat picks up the negative locking potential provided over conductor 88 through the contact tongue 98 thus providing a holding circuit for space-blank relay 67.

With conditioning relay 62 and 63 thus energized and with space-blank relay 67 selected for operation, the transmitting station 11 will next send a second carriage return signal which will be effective to cause the operation of the third conditioning relay 61 over the following circuit, traceable from negative conductor 73, through platen shift contact pair 58, through the universal bar operated contact pair 57, through the carriage return contact pair 55 (now closed), over conductor 72, through contact tongue 71 of conditioning relay 63 (now attracted), over the conductors 125 and 126, through the winding of relay 61, over conductors 68 and 66 to the positive conductor 65.

Relay 61 is energized and attracts its tongue 127 establishing a locking circuit for itself as follows: From positive conductor 65, over conductors 66 and 68 through the winding of relay 61, through contact tongue 127, over conductor 87, through contact tongue 86 of conditioning relay 63 (now energized) to the negative conductor 73. Furthermore, the operation of the conditioning relay 61 causes the attraction of its contact tongue 81 and breaks the negative supply circuit extending to the letters shift, space, and blank contacts. The closing of contact tongue 127 by the conditioning relay 61 further extends negative potential over the conductor 128 for the shunt relays 34, 35, 36, and 37 as follows: from negative conductor 73, through contact tongue 86 of conditioning relay 63, over the conductor 87, through contact tongue 127 of conditioning relay 61 and over conductor 126 to the conductor 128. Relays 61, 62, and 63 are thus energized during message transmission.

It will now be described how the space-blank relay 67 which has been selected for operation, functions so that the accompanying message may be transmitted over the transmitting lines 48 and 51 by their associated transmitters 44 and 46. Each of the selecting relays, Fig. 3, is provided with four contact tongues 134, 135, 136, and 137 which cooperate with the reperforator shunting relays 34, 35, 36, and 37 to remove the shunt circuits therefrom. Whether or not contact operating tongues 134 to 137 will be effective to select shunt relays 34 to 37 for operation depends on whether or not the contact tongues are connected by strap conductors 138 to a common bus bar 139 which in turn is connected to either conductor 141, 150, or 151. Conductors 141, 150, and 151 lead to the conductor 128 which was conditioned to carry negative potential upon operation of conditioning relays 61 and 63 as described.

From an inspection of Fig. 3, it may be seen that contact tongues 137 and 135 of relay 67 are provided with strap conductors 138 which extend to the bus bar 139, whereas no strap conductors are found in the case of the contact tongues 134 and 136. Thus contact tongue 137 of space-blank relay 67 will function to energize reperforator shunt relay 37 to remove the shunt circuit from the reperforator 25 and to thereby permit its operation as follows: from negative conditioned conductor 128, over conductor 141, the bus bar 139, over the strap conductor 138, through contact tongue 137 (now attracted), over conductor 142, and 143, through the winding of relay 37 to the positive conductor 65.

A similar circuit for the shunt relay 35 is made through the contact tongue 135 of space-blank relay 67 as follows: from negative branch conductor 128, over conductor 141, over the bus bar 139, through the strap conductor 138, contact tongue 135 of relay 67, conductors 145, 146, and 147, through the winding of shunt relay 35, over conductors 148 and 144 to the positive conductor 65. Thus the reperforator shunt relays 35 and 37 are operated to attract their associated contact tongues 38 to remove the shunt circuits from their associated reperforators. On the other hand, shunt relays 34 and 36 remain de-energized due to the fact that contact tongues 134 and 136 of relay 67 have not been provided with the strap conductors 138 which connect to the common bus bar 139. Therefore, transmitter 44 will reproduce the signals over the outgoing line 48 and transmitter 46 will do so over the outgoing line 51.

The circuit embodied in the present system is provided primarily to transmit messages which are less than one line in length to the reperforators and, consequently, the circuit is so designed that the operation of the line feed contact 56 will cause the de-energization of the conditioning relay 61, 62, and 63 after termination of each message and return the circuit to normal. However, it is understood that messages more than one line in length may be transmitted by repeating the preassigned signal code combination for each new line of transmission. Thus, upon receipt of the line feed signal at the termination of a message which is primarily sent to effect the performance of a line feed operation on a page printer, contact 56 is opened breaking the locking circuit extending over conductor 76 to relays 62 and 63.

The de-energization of relay 63 causes contact tongue 86 to recede and, consequently, the locking circuit extending over conductor 87 to conditioning relay 61 is broken. The de-energization of conditioning relay 63 also breaks the locking circuit extending over conductor 88 for the selecting relays 67, 89, 95, etc., permitting the de-energization of the particular one of them which happened to have been selected and further causes the removal of negative potential from

the circuit 128 which is provided for the operation of the shunt reperforator relays as described.

In this manner any combination of the total available reperforators 22 to 25 may be rendered effective to prepare control forms for operating the retransmitters 43 to 46 and thereby cause the transmission of the messages over lines 47 to 51 correspondingly. By using nine shunt selecting relays 67, 89, 95, etc., there may be attained nine possible selective conditions. Where a larger variety of conditions may be desired, the described practice may be enlarged and a correspondingly greater series of shunt selector relays utilized. Each message is terminated by sending a concluding end-of-message signal consisting of the line feed combination and thereafter the system is in readiness to respond to another message including another identification or address signal.

If the space-letters shift identification signal combination is transmitted by one of the broadcast stations 11, 12, 13, etc., the space relay 89 first becomes locked up upon receipt of the space signal as has already been described. When the letters shift signal is thereafter transmitted and letters shfft contact 52 closes, a circuit is extended from negative conductor 82, as described, over line 83, through contact tongue 154 of blank relay 95, over the conductor 155, through contact tongue 163, over the conductor 157, through the winding of space letters relay 115 and over the conductor 158 to the positive conductor 65. Operation of the space-letters shift relay 115 to attract its tongue 110 enables the make-before-break contact 114 to open the locking circuit extending to the previously locked up relay 89 and at the same time enables the locking up of the space-letters relay 115, since with respect to relay 115, straps 138 are provided only for contact tongues 136 and 137. Accordingly, reperforator shunt relays 36 and 37 will be selected for operation permitting signals to be sent over the lines 51 and 49 to the exclusion of lines 47 and 48.

In this manner each one of the shunt selecting relays 67, 89, 95, etc., may be individually conditioned under the supervision of one or two of the identification signals made up of a combination of the letters shift, space, or blank signal components. If desired, these signal combinations may identify the station of origin 11, 12, 13, etc., or they may merely be an identification code for classifying the type of broadcast messages sent out. Under the latter practice, these signals may be considered as mere identification, serving to condition corresponding combinations of the shunt relays 34 to 37.

While the present invention has been explained and described with reference to a specific contemplation and circuit embodiment, as illustrated on the accompanying drawings, it is to be understood, nevertheless, that numerous modifications and variations may be admitted without departing from the essential spirit or scope thereof. Accordingly, it is not intended to be limited by the particular language employed in the foregoing detailed specification nor by the illustrations in the accompanying drawings except as indicated in the hereunto appended claims.

What is claimed is:

1. In a telegraph system, a multiple contact controller responsive to code signals over an incoming line, a series of selector relays, means responsive to divers operations of said contact controller for selectively operating one of said selector relays, a group of retransmission circuits, and a control apparatus associated with each of said selector relays for establishing communication between said incoming line and different combinations of said retransmission circuits, whereby upon the operation of one of said selector relays communication will be established with a predetermined combination of said retransmission circuits.

2. In a telegraph system, an apparatus responsive to code signals received over an incoming line for correspondingly operating a series of contacts, a set of selector relays, means responsive to divers operations of said apparatus for selectively operating one of said selector relays, a group of retransmission circuits, and a control apparatus associated with each one of said selector relays comprising a contact pair corresponding to each one of said retransmission circuits for establishing communication between said incoming line and any combination of said retransmission circuits, whereby upon the operation of one of said selector relays communication will be established with a predetermined combination of said retransmission circuits.

3. In a telegraph system, a plurality of transmitting stations serially connected, a selector mechanism responsive to function code signals transmitted by said transmitting stations, a plurality of selector relays each responsive to a predetermined combination of the function signals, and a plurality of retransmission devices connected in predetermined combinations to each of said selector relays whereby when one of said selector relays is operated said predetermined retransmission devices connected thereto will be operated.

4. In a telegraph system, a plurality of transmitting stations serially connected, a selector mechanism responsive to function code signals transmitted by said transmitting stations, a plurality of selector relays each responsive to a predetermined combination of the function signals, a plurality of retransmission devices connected in predetermined combinations to each of said selector relays whereby when one of said selector relays is operated said predetermined retransmission devices connected thereto will be operated, and means for releasing operated ones of said selector relays in response to a concluding function signal transmitted by said transmitting stations.

5. In a telegraph system, a plurality of transmitting stations serially connected, a selector mechanism responsive to function code signals transmitted by said transmitting stations, conditioning means responsive to some of the function code signals, a plurality of selector relays each responsive to a predetermined combination of other of the function signals operating after the operation of said conditioning means, and a plurality of retransmission devices connected in predetermined combinations to each of said selector relays whereby when one of said selector relays is operated said predetermined retransmission devices connected thereto will be operated.

6. In a telegraph system, an incoming line, a plurality of outgoing lines, a plurality of transmitters serially connected over said incoming line for transmitting messages each comprised of initial function code signals, intelligence code signals and a concluding function code signal, a selector mechanism responsive to the function code signals, conditioning means responsive to some of the initial function code signals, a plu-

rality of selector relays each responsive to a predetermined combination of other of the initial function signals operating after the operation of said conditioning means, a plurality of retransmission devices each connected to one of said outgoing lines and connected in predetermined combinations to each of said selector relays whereby when one of said selector relays is operated said predetermined retransmission devices connected thereto will be connected to said incoming line to transmit the intelligence code signals over its said outgoing lines, and means responsive to the concluding function code signal for releasing operated ones of said selector relays thereby disconnecting said incoming line from communication with said selected outgoing lines.

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