

Sept. 20, 1955

W. J. ZENNER
TELEGRAPH PERFORATOR

2,718,555

Filed Oct. 20, 1951

4 Sheets-Sheet 1

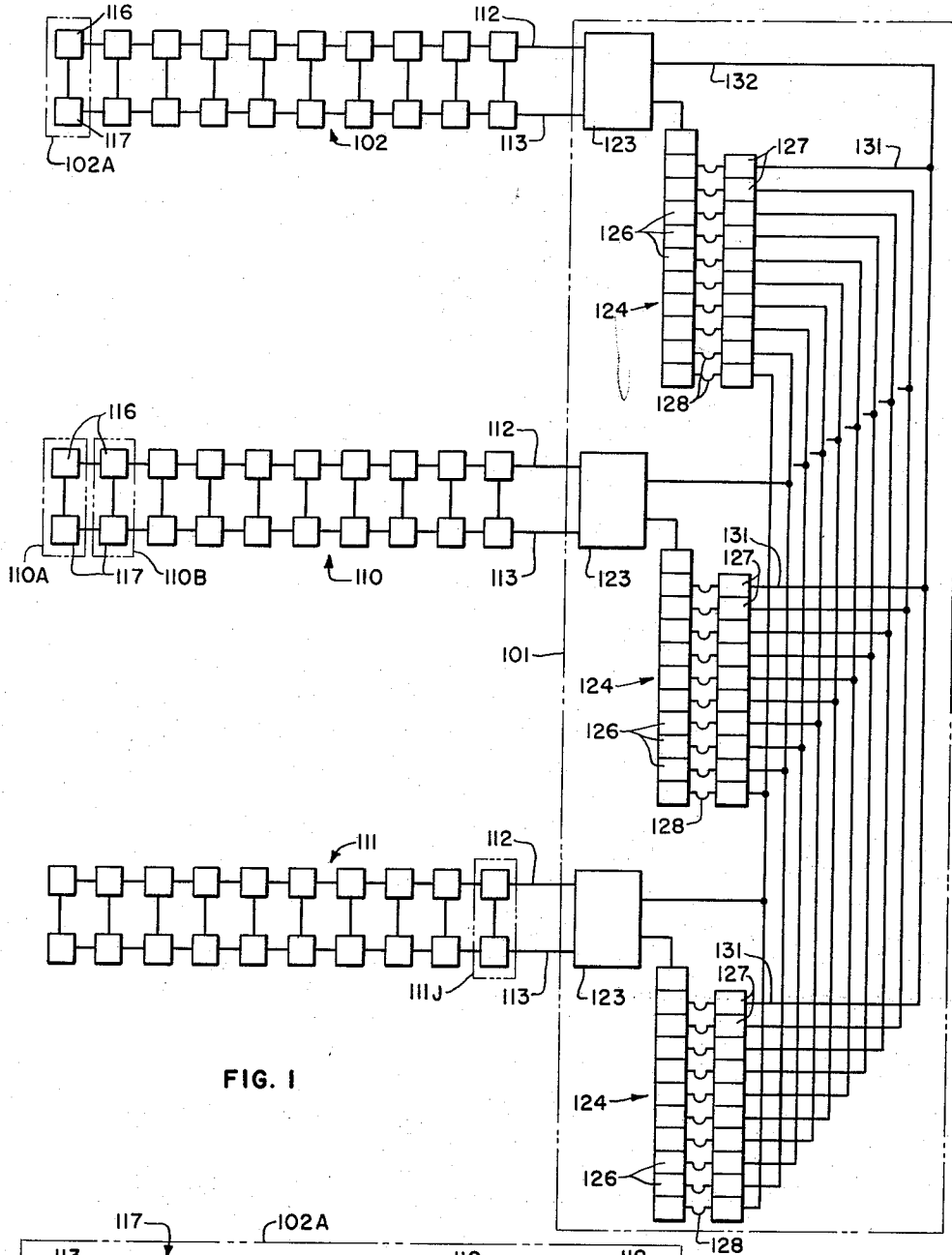


FIG. 1

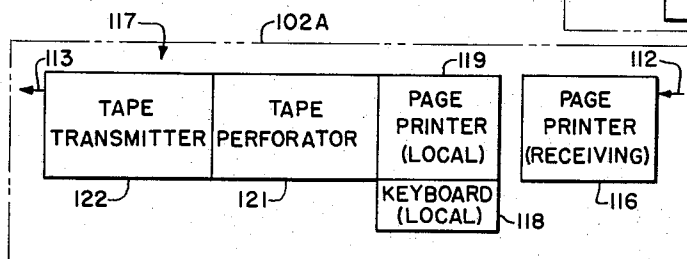


FIG. 2

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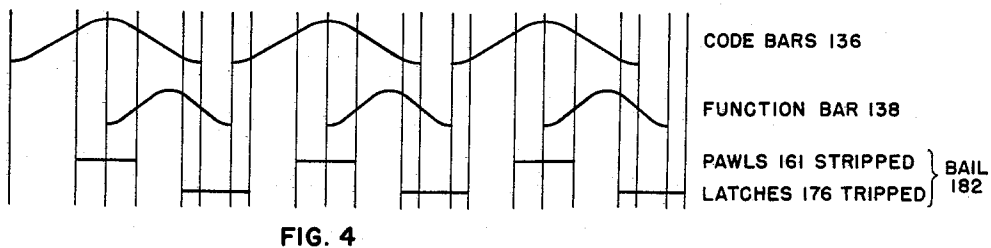
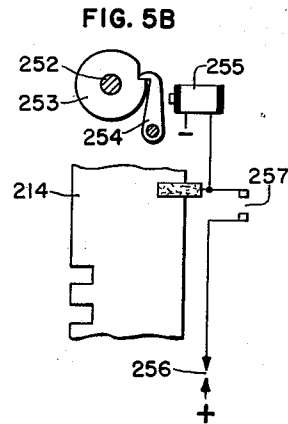
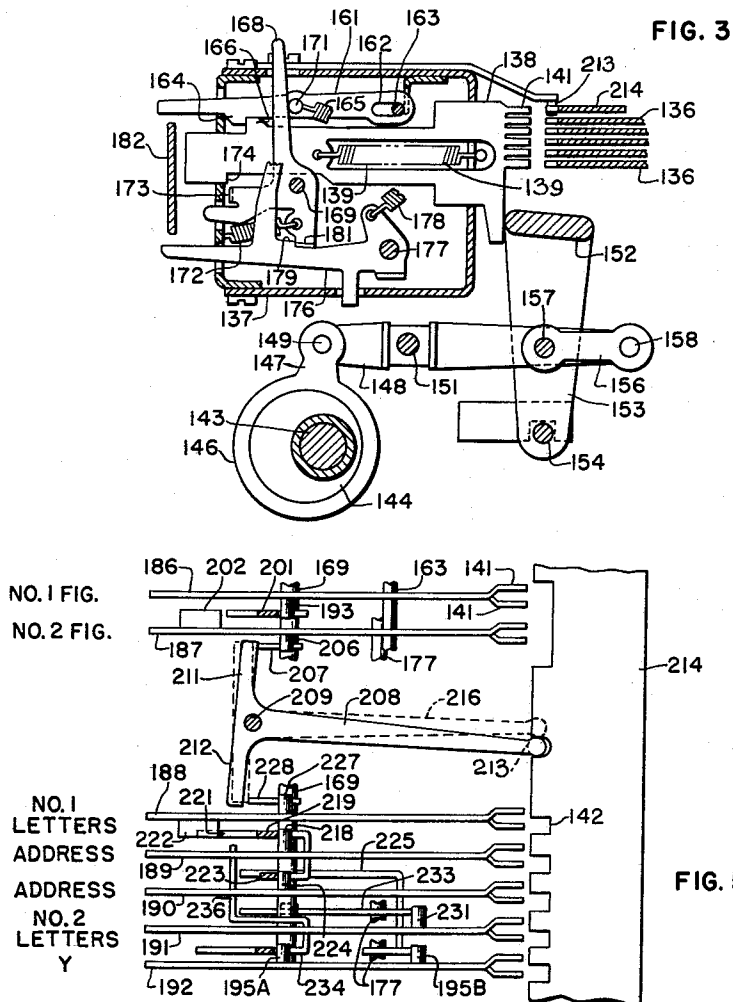
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2,718,555

TELEGRAPH PERFORATOR

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4 Sheets-Sheet 2



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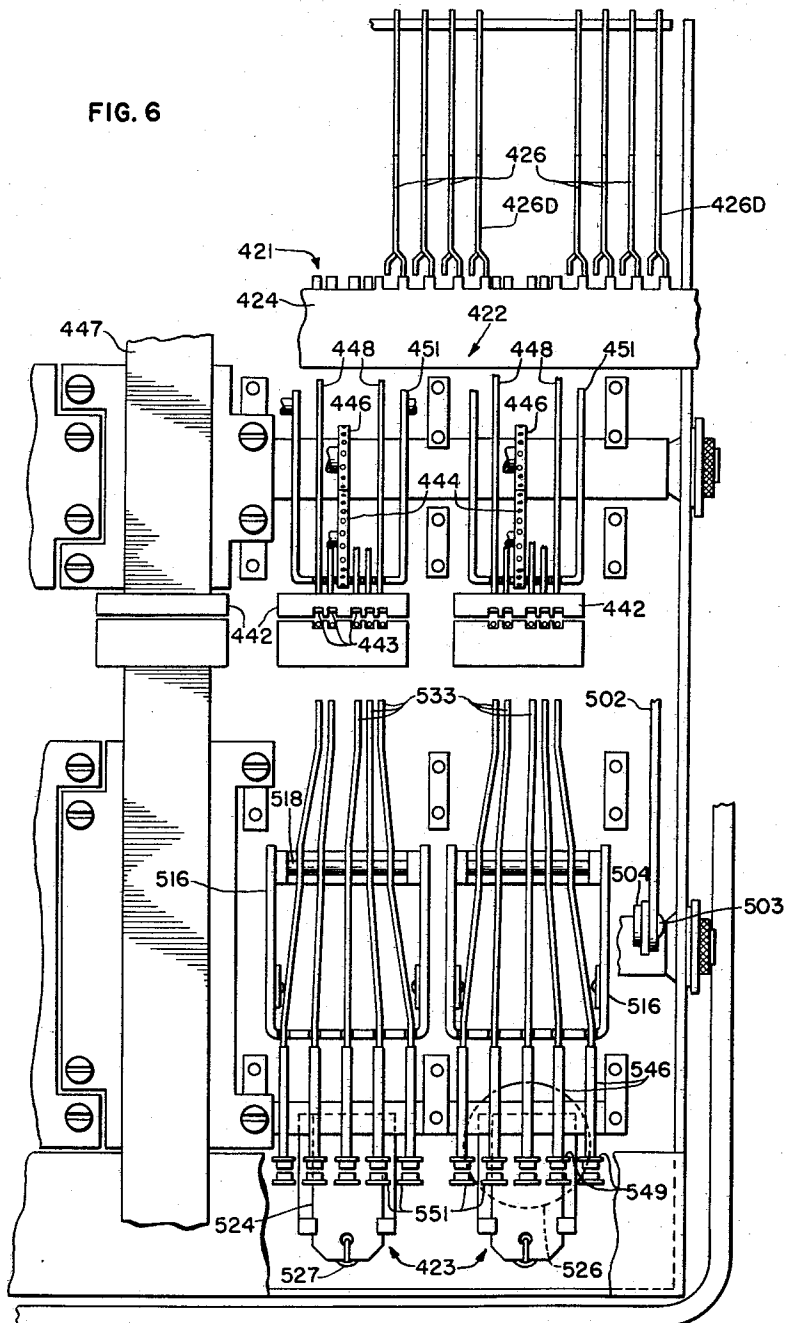
2,718,555

TELEGRAPH PERFORATOR

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4 Sheets-Sheet 3

FIG. 6



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2,718,555

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4 Sheets-Sheet 4

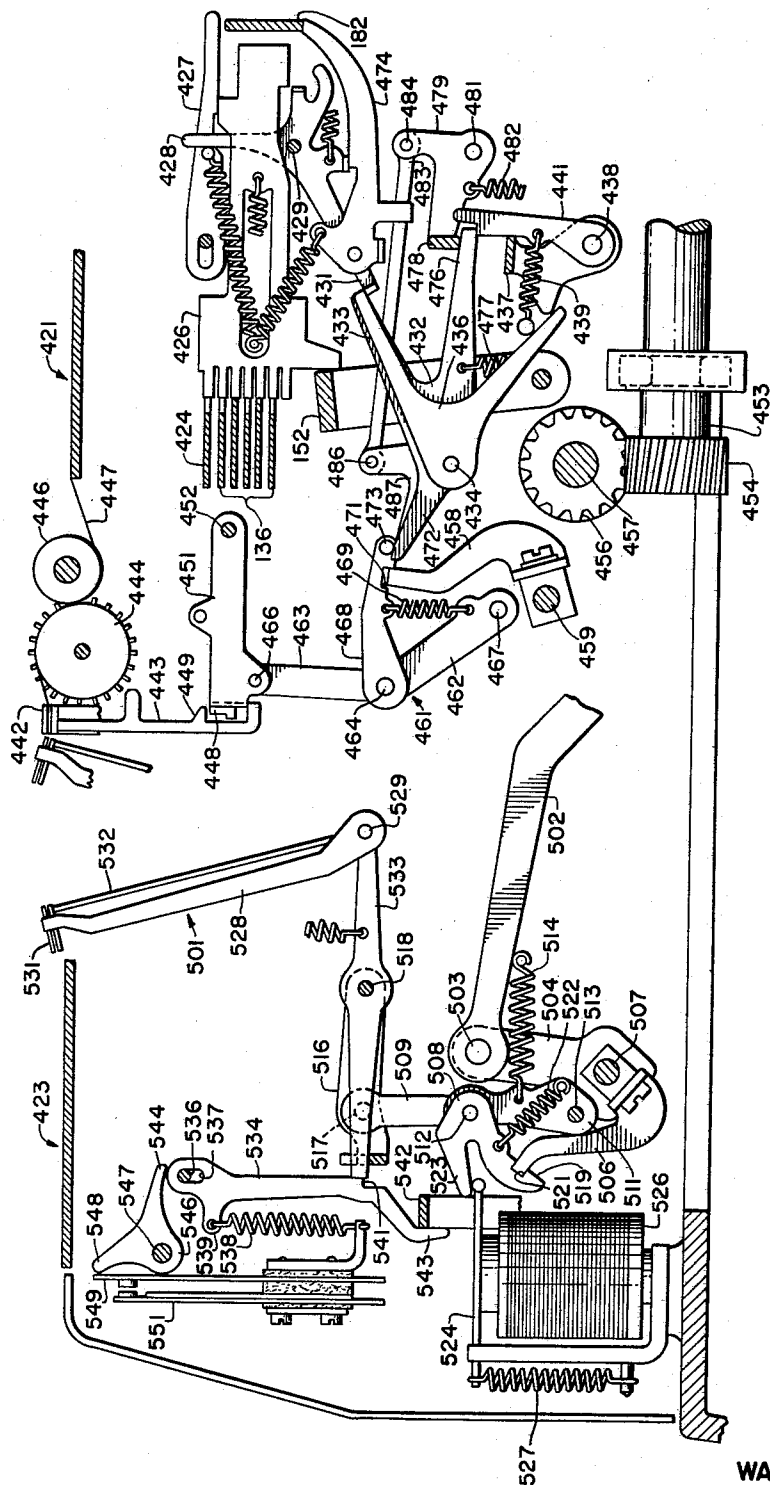


FIG. 7

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2,718,555

TELEGRAPH PERFORATOR

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Original application May 10, 1950, Serial No. 161,165, now Patent No. 2,667,533, dated January 26, 1954. Divided and this application October 20, 1951, Serial No. 252,357

5 Claims. (Cl. 178—92)

This invention pertains to printing telegraphy and more particularly to apparatus used in automatic telegraph switching systems.

This application is a division of copending application Serial No. 161,165, filed May 10, 1950, now Patent No. 2,667,533 issued January 26, 1954, by W. J. Zenner.

The system in which the apparatus according to the present invention is employed is designed to accommodate a relatively large number of telegraph transmitting and receiving stations. It is contemplated that each outlying station in the system is provided with a printing telegraph receiver, preferably of the type shown in United States Patent No. 2,505,729, granted April 25, 1950, to W. J. Zenner, on the receiving side of the line, and on the transmitting side of the line, a local printing receiver of the same type just mentioned. All of the printers on the receiving side of the line at the outlying stations are equipped with a selective control unit of the type shown in the copending application of W. J. Zenner, Serial No. 739,747, filed April 7, 1947, now Patent No. 2,568,264, issued September 18, 1951. For a more complete understanding of the telegraph equipment mentioned above, reference should be had to the above mentioned patents, all of which are hereby incorporated by reference into the present disclosure.

In the present invention the incoming message from any of the outlying stations contains an address signal corresponding to the station in the system to which the message is to be delivered. This address signal actuates a series of code bars in each receiving printer or reperforator on the line to which the message is addressed. Each of these receiving printers or reperforators, as has already been stated, is equipped with a selective control unit, and these mechanisms function in a manner whereby the printing mechanisms of each of the printers are locked out of operation. Immediately thereafter the address impulses actuate the selective control mechanism to condition for operation the printer or reperforator at the station to which the message is addressed. Subsequent signals of the message continue to actuate the code bars in all of the stations on the receiving line, however, the printing or perforating mechanism operates only at the station which has been conditioned for operation by the address signal, and the printing or perforating mechanism at all the other stations remains locked out.

The principal object of the invention is to provide in a comprehensive telegraph switching system, apparatus whereby switching operations are expedited by an economical and efficient switching system which functions automatically.

Automatic telegraph switching systems in use generally at the present time employ telephone switching methods which become highly complex and accordingly it is an important object of the present invention to materially simplify the electrical circuits utilized therein.

Another object of the invention, therefore, is to provide apparatus units designed to accomplish specific pur-

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poses thereby eliminating to a large degree the troubles caused by circuit complexity.

A further object of the invention, thus, is to provide a multiple reperforator transmitter having means for selecting one or more of the reperforators therein to reperforate a message transmitted to the multiple reperforator transmitter.

A more specific object is to provide a multiple reperforator transmitter having means therein responsive to an address signal of an incoming message for selecting one or more of the reperforators to receive such incoming message.

A still further object of the invention is to provide a multiple reperforator transmitter having an extra code bar movable in response to a first signal to permit the selection of one or more of the reperforators and movable in response to a second signal to retain the selection of the reperforators.

Another object is to provide a multiple reperforator transmitter having an extra reperforator which functions to receive all improperly addressed messages.

Another object of the invention is to provide a multiple reperforator transmitter wherein an interceptor reperforator is invariably selected upon failure of selection of any other of the reperforators.

Another object of the invention is to provide a multiple reperforator transmitter wherein the transmitters thereof transmit their stored messages only when they are selected by a selecting mechanism in a transmitter controller.

A further object of the invention is to provide a multiple reperforator transmitter wherein each transmitter has an operate magnet which, when energized, causes the transmitter to be coupled with a source of power to thereby cause the transmitter to transmit a stored message.

The foregoing and other objects, features, and advantages of the invention will be more readily understood from the following detailed description when read in the accompanying drawings wherein:

Fig. 1 is a schematic representation of the basic system utilizing the subject matter of the present invention;

Fig. 2 is a block diagram representing the telegraph apparatus at an outlying station including the apparatus according to the present invention;

Fig. 3 is a side elevational view, partly in section, of the selective control unit according to the present invention;

Fig. 4 is a timing diagram for the selective control unit;

Fig. 5 is a fragmentary plan view of the selective control unit located in the outlying station telegraph receivers according to the present invention;

Fig. 6 is a fragmentary plan view of a multiple reperforator transmitter, partly cut away to show the apparatus more clearly; and

Fig. 7 is a side elevational view showing the principal parts of the multiple reperforator transmitter.

Referring now to Fig. 1 of the drawings, the basic telegraph switching system forming the subject matter of the invention is therein shown. Reference numeral 101 represents a central office having a plurality of lines 102 through 111 associated therewith, all of which broadly forms the basic switching system of the invention. Each of the lines 102 through 111 has a message delivery side 112 and a message pickup side 113. The lines are represented as duplex channels; however, it is fully within the realm of the invention to utilize simplex lines instead, or a mixture of simplex and duplex.

Each of the lines 102 through 111 has a plurality of outlying stations, a few of which are represented schematically in Fig. 1 by reference numerals 102A, 110A, 110B, 111J. Fig. 2 represents a schematic block diagram of any one of these outlying stations and for the sake

of convenience will be considered as outlying station 102A. Each of the outlying stations has a printing telegraph receiver 116 in circuit with the delivery side 112 of the line. On the pickup side of the line each outlying station is equipped with telegraph sending apparatus 117 consisting of a keyboard 118, a page printer 119, a tape perforator 121, and a tape transmitter 122. An operator at the outlying station types out the message by means of the keyboard 118 and the tape perforator 121 perforates this message in a tape. The operator undoubtedly will desire to have a printed record of the message as it is being perforated, and for this purpose the page printer 119 may be used. Having completed perforating the message in the tape, the operator places the leading end of the tape in the tape transmitter 122 to await transmission. When the message in the tape is transmitted it is contemplated that a home record thereof will be made by the page printer 119.

The central office 101 is equipped with a plurality of transmitter controllers 123, one of which is provided for each of the lines 102 through 111 of the system. Also associated with each line is a multiple reperforator transmitter 124. The multiple reperforator transmitter 124 is provided with a plurality of individual reperforators 126, each of which has a transmitter 127 associated therewith for transmitting the messages perforated in the tape by the corresponding reperforator.

The transmitter controller 123, one of which is provided for each line of the system, controls all transmission to or from its associated line. The transmitter controller 123 is designed to sequentially call each outlying station on the line with which it is associated, and in response to this call the station responds by transmitting its message if it has one awaiting transmission, and if there is no message awaiting transmission the station responds by sending a blank signal. Obviously it is not to be construed as a limitation that a blank signal is transmitted at this time, for it is entirely within the invention and contemplated thereby that any other signal could be used for indicating that the outlying station transmitter 117 has no message awaiting transmission. When such a signal, indicating the absence of an awaiting message, is transmitted the transmitter controller 123 calls the next station in sequence.

When the outlying station transmitter 117 responds by sending an awaiting message, the first few signals of such message contain a set of address signals. One of these signals indicates the line and another indicates the station on that line to which the message is addressed. The signal indicating the line to which the message is addressed causes the reperforator 126 which is adapted to reperforate messages addressed to that line to reperforate such message in the form of a tape 128. The transmitter controller 123 associated with the line to which the message is to be transmitted sequentially establishes activating circuits to each transmitter adapted to transmit messages to that line.

At this point it should be noted that the transmitter controller 123 associated with the line 102 controls the uppermost transmitters 127 in Fig. 1 and the transmitter controller 123 associated with the line 111 controls the lowermost transmitters 127. Leads 131 from the uppermost transmitter 127 of each multiple reperforator transmitter 124 are connected to a lead 132 extending to the transmitter controller 123 associated with line 102. Similarly the rest of the transmitters 127 are connected to the proper transmitter controller 123. The leads 131 and 132 connecting the transmitters 127 with the transmitter controllers 123 are not single leads but are merely schematic representations of all of the leads between the transmitters 127 and the transmitter controllers 123.

The activating circuits for the various transmitters 127 extend over the leads 132 and 131. When one of the transmitters 127 is thus activated it transmits its message if it has one ready and if it does not have a message ready

to be transmitted the next transmitter 127 in sequence is activated. As has been stated heretofore all messages stored in the multiple reperforator transmitters 124 include an address signal at the beginning thereof which indicates the station on the line to which the message is being sent. This address signal, when received by all the stations on the line to which the message is being sent, causes mechanism in all the stations to function which operates to permit the printer 116 at the station to which the message is addressed to print the message and prevents all other station receiving printers 116 from printing the message. Mechanism in the transmitter controller 123 senses the message and in response to an end-of-message signal therein activates the next transmitter 127 in sequence.

Basic function mechanism

Referring now to Fig. 3, a description follows of the basic function mechanism located in the receiving page printers 116 at all outlying stations, in all multiple reperforator transmitters 126 and in all transmitter controllers 123. For a more thorough description of the printer with which the basic function mechanism shown in Fig. 3 is designed to be used, reference should be had to the aforementioned copending patent application of W. J. Zenner, Serial No. 739,747, the disclosure of which has been incorporated herein by reference.

A set of five code bars 136 is suitably mounted within the receiver 116, multiple reperforator transmitter 126, or transmitter controller 123. Each of the code bars 136 is movable longitudinally to one of two positions in accordance with the marking and spacing impulses of the well known Baudot code. A housing 137 for the function mechanism is also mounted suitably within the printer or other apparatus within which it is contained. A plurality of function bars 138 are mounted within the housing 137 and are urged to the right towards the code bars 136 by means of springs 139 individual to each function bar 138. Each function bar 138 has a plurality of projections 141 which cooperate with notches 142 in each of the code bars.

A continuously rotating power shaft 143 carries an eccentric cam 144. A collar 146 is mounted rotatably on the eccentric 144 and has an arm 147 to which a lever 148 is secured pivotally at 149. The lever 148 is mounted pivotally on a stationary shaft 151. A bail 152 has a pair of arms 153 which are mounted pivotally on a stationary shaft 154. A pair of toggle links 156 are secured pivotally at 157 to the arms 153, and are secured at the other ends thereof to a shaft 158 to which the lever 148 is also secured. As the shaft 143 rotates, the lever 148 is oscillated about the shaft 151 to thereby, through the toggle links 156, oscillate the bail 152. It will be noted that the bail 152 moves back and forth twice during each revolution of the shaft 143.

A function pawl 161 has an elongated slot 162 by means of which the function pawl 161 is mounted for longitudinal movement on a shaft 163. A spring 165 continuously urges the function pawl 161 to the right (Fig. 3) and counterclockwise about the shaft 163. The function pawl 161 has a latch 164 which cooperates with a shoulder 166 on the function bar 138. Normally the latch 164 rides on the top of the shoulder 166 thereby permitting the spring 165 to retain the function pawl in its right hand position. A function operating lever 168 is mounted pivotally on a shaft 169 and cooperates with a stud 171 on the function pawl 161. The function operating lever 168 is biased in a clockwise direction by a spring 172 and has a latch 173 which cooperates with a shoulder 174 on another one of the function bars 138. A latch member 176 is mounted pivotally on a shaft 177 and is urged continuously in a clockwise direction by a spring 178. The latch member 176 has a projecting portion 179 which cooperates with a shoulder 181 on another of the function operating levers 168.

Assuming that the permutation of positions of the code

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bars has been set up which corresponds to the function bar 138, the bail 152 moves to the right and all of the projections 141 are opposite notches 142. The spring 139 is thereby permitted to move the function bar 138 to the right, the projections 141 entering the notches 142, and the shoulder 166 underriding the latch 164. Thereafter as the bail 152 moves back to the left during its return stroke it moves the function bar 138 also, the function bar 138 in turn moving the function pawl 161 to the left. As the function pawl 161 moves to the left in this manner the stud 171 thereon engages and pivots the function operating lever 163 counterclockwise. This permits the unblocking of any juxtapositioned function bars 138 retained in blocked position by the latch 173. The bail 152 remains in its leftward position, thereby retaining the function pawl 161 in its leftward position, and retaining in turn, the function operating lever 163 in its unlatched position until after a bail 182 moves downwardly to trip the latch member 176. After the bail 182 returns to the position thereof shown in Fig. 3, the projecting portion 179 on the latch 176 engages the shoulder 181 on the function operating lever 163 to retain the function operating lever 163 in unblocking position. Thereafter as a new selection is being made in the code bars 136 the bail 182 moves upwardly to strip the function pawls 161 from latching engagement with their corresponding function bars 138.

Fig. 4 is a timing diagram showing the timing of the various parts in the function mechanism shown in Fig. 3. The upper row of curves represents the code bars 136 which are being positioned in accordance with signal impulses during the rise in the first curve, and remain set in this position until they are repositioned as indicated by the rising portion of the second curve. As indicated by the third set of curves, the bail 182 strips the function pawls 161 from engagement with their corresponding function bars 138 just as the code bars 136 are selected. This stripping of the function pawls 161 just as the code bars 136 are selected means that the last previous selection of one of the function pawls 161 is retained until the last possible moment. The function bars 138, indicated by the second row of curves, move forward during the rise of these curves, that is, they move to selected position at this time. The one of the function bars 138, which corresponds to the permutation of positions of the code bars 136, moves to the right until the projections 141 thereon enter the notches 142, as indicated by the peaks in the second row of curves. The bail 152 pushes the function bars 138 to the left as indicated by the fall in the second row of curves. As the function bars 138 and selected function pawls 161 are being moved to the left the bail 182 trips the latches 176 and retains them in tripped condition, as indicated in Fig. 4, until slightly after the pawls 161 and function bars 138 are moved completely to the left. The selected function pawls 161 remain in their leftward position until the bail 152 moves to the right again which is after the next selection of the code bars 136. Therefore, the stud 171 retains the function operating lever 163 in unblocking position while the latch 176 is being held tripped and when the latch 176 returns to normal position it retains the function operating lever 163 in unblocking position. If the next subsequent permutation of the code bars 136 corresponds to the function bar 138 which has been unblocked, such function bar 138 is permitted to become selected so that it can perform its assigned function. If the next subsequent permutation of the code bars 136 does not correspond to the unblocked function bar 138, then as the bail 182 trips the latch 176, such unblocked function bar 138 again becomes blocked.

It is, therefore, readily seen that the selective control mechanism shown generally in Fig. 3 enables the selection of a certain function bar 138 only if such function bar is unblocked due to the immediately previous selection of another juxtapositioned function bar 138, or, as set forth in the afore-mentioned U. S. Patent No. 2,568,264, the initial bar 138 in the address group has

been previously gated or unblocked. This principle is readily extended so that the selection of a first function bar 138 unblocks a second function bar; the selection of the unblocked second function bar unblocks a third function bar, etc. This progressive selection can be extended further and is limited only by the number of function bars in the selective control unit. It is also apparent that the progressive selection stops and the entire unit is returned to normal condition as soon as a selection is set up in the code bars 136 which does not correspond to the unblocked function bar 138. This is due to the tripping of all latches 176 by the bail 182 during each cycle. If, when the latches 176 are tripped, there are no function pawls 161 in selected position, there will be no stud 171 in a position to retain the function operating lever 163 in unblocked position during the tripping of the latches 176.

Station selector function mechanism

Reference should now be made to Fig. 5 wherein the mechanism for selecting the outlying station receivers is shown. In this connection it should be noted that certain convenient signals have been assigned, in response to which the function mechanism performs the desired switching functions. The switching signals which have been assigned in the present description have been selected with a view towards eliminating as many errors as possible which would occur, for example, if the same signals happened to be sequentially transmitted within the body of a message being transmitted. In such a case a switching sequence would be initiated and it is desirable to avoid this condition. It is to be understood however, that the particular signals chosen for switching functions have been chosen arbitrarily and it is contemplated that any other signals could just as readily be used. In this description therefore: Fig.-Fig. is the start-of-address signal, Letters is the end-of-address signal, and Fig.-Fig.-Y is the end-of-message signal. In the basic system described herein the station addresses are two-letter addresses, the first letter representing the line and the second letter representing the station on the line. The letters indicating the lines include letters from A through J, and those indicating the stations on the lines include the letters K through T. By using this selection of letters there is no problem presented in the case of multiple address messages due to the unblocking of a function bar on the second letter of one address and the selection of a station on the first letter of an immediately following address. If however, it is desired to have more than ten stations on one line or more than ten lines in the system it is only necessary to insert a signal, such as a blank, to break up any progression started by the second address letter. The last six letters of the alphabet have been reserved for switching functions according to the present disclosure; however, any other letters can be assigned for the switching functions when so desired.

Referring to Fig. 5 a No. 1 Fig. function bar 186, a No. 2 Fig. function bar 187, a No. 1 Letters function bar 188, an Address function bar 189, a second Address function bar 190, a No. 2 Letters function bar 191, and a Y function bar 192 are provided in the positions thereof as shown in Fig. 5 in the outlying station selective control units. It is to be noted that two Address function bars 189 and 190 are shown in Fig. 5. It is understood, however, that in actual practice the one Address position, as represented by the Address function bar 189, may comprise a pair of progressively acting Address function bars. Similarly, in the second Address position, represented by the Address function bar 190, there may also be a pair of progressively acting Address function bars. This second Address mechanism, represented by the Address function bar 190, is designed to operate in response to a group or broadcast signal to thereby render the telegraph apparatus responsive to a group or broadcast message.

The No. 1 Fig. function bar 186 (as shown in Fig.

5) has the usual cooperating No. 1 Fig. function pawl 161 to which is secured a stud 193. When the No. 1 Fig. function bar 186 is selected in response to the Figures permutation of the code bars 136 the pawl 161 is moved to the left as the bail 152 returns and during such movement the stud 193 pivots a No. 1 Fig. function operating lever 201 counterclockwise to unblock a bent over portion 202 on the No. 2 Fig. function bar 187. When the bail 182 subsequently is raised to the normal position thereof a latch 176 retains the No. 1 Fig. function operating lever 201 in its unblocking position.

If the next permutation of the code bars 136 is a Figures permutation both the No. 1 and No. 2 Fig. function bars 186 and 187 are selected. At this time the selection of the No. 1 Fig. function bar 186 is immaterial, but as the bail 152 returns to the left a No. 2 Fig. function pawl 161 is returned to the left with the No. 2 Fig. function bar. A stud 206 on the No. 2 Fig. function pawl 161 engages and pivots a No. 2 Fig. operating lever 207 counterclockwise.

A T-lever 208 (Fig. 5) is suitably mounted for pivotal movement on a bolt 209 and has a pair of arms 211 and 212. The T-lever 208 has a pin 213 which cooperates with a printer suppressor code bar 214. When the T-lever 208 is in the solid line position as shown in Fig. 5, the printer, with which the selective control unit is associated, is in printing condition and all of the switching function bars 188, 189, 190, 191, and 192 are blocked due to the fact that notches 142 in the printer suppressor code bar 214 are not aligned with the projections 141 on the switching function bars. When the T-lever 208 is in the dotted line position 216 (Fig. 5) the notches 142 in the printer suppressor code bar 214 are aligned with the projections 141 on the switching function bars. Under this condition the switching function bars 188-192 are selected in response to the corresponding permutations of the code bars 136.

Fig. 5B shows schematically how the movement of the printer suppressor code bar or switching code bar 214 to switching position (the position occupied by the code bar 214 when the T-lever 208 assumes its dotted position 216) suppresses printing operations in the telegraph printer. A continuously rotating shaft 252 supplies the necessary power for the printing operations through a start-stop clutch 253. Normally the clutch 253 is held stationary by a clutch lever 254, but upon the momentary energization of a clutch operating magnet 255, it pulls the clutch lever 254 from engagement with the clutch 253 thereby releasing the clutch 253 for rotation with the power shaft 252. Normally the energizing circuit for the clutch operating magnet 255 extends from positive battery through a contact pair 256, through the clutch operating magnet 255, to negative battery, so that upon closure of the contact pair 256, which occurs after the code bars have been set for a particular character permutation, the clutch 253 is released. Another contact pair 257 has been included in the clutch operating magnet circuit, the movable member of which contact pair 257 is carried by the printer suppressor code bar 214. When the printer suppressor code bar 214 occupies its switching position (as shown in Fig. 5B) the contact pair 257 is open and thus the further opening and closing of the contact pair 256 is ineffective to energize the clutch magnet 255 and thereby permit a printing cycle. However, when the code bar 214 occupies its printing position the contact pair 257 is closed and the contact pair 256 functions in its normal manner to start the clutch 253 and enable the performance of printing operations. The switching code bar 214 may also carry blocking wards or projections to suppress printer functions such as line feed and carriage return.

When the bail 152 returns the No. 2 Fig. function bar 187 and pawl 161, the No. 2 Fig. operating lever 207, pivoted therewith, engages the arm 211 on the T-lever 208 to move the printer suppressor code bar 214 into the position where printing is blocked and switching is permitted.

This position of the printer suppressor code bar 214 is hereinafter referred to as its switching position as distinguished from its printing position.

When the printer suppressor code bar 214 is thus moved to switching position the selective control mechanism is in condition to respond to address signals. The Address function bar 189 has a cooperating function pawl 161 which carries the usual stud 218. Upon movement of the stud 218 to the left an Address function operating lever 219 is pivoted counterclockwise about the pivot shaft 169 whereby a latch 221 unblocks a bent over portion 222 on the No. 1 Letters function bar 188. The Address function operating lever 219 is U-shaped (shown best in Fig. 5) and has a second upstanding arm 223 with which a stud 224 on an Address function bar 190 cooperates. Having been unblocked due to the selection of one of the Address function bars 189 and 190, the No. 1 Letters function bar 188 remains in unblocked condition because the Address function operating lever 219 is held in unblocking position by a latch member 225. It is, therefore, apparent, when the printer suppressor code bar 214 is in switching position with its notches 142 aligned with the projections 141 on the switching function bars 188-192, that permutation of the code bars 136 corresponding to either of the Address function bars 189 or 190 enables unblocking of the No. 1 Letters function bar 188.

Assuming that one of the Address function bars 189 or 190 has been selected, the next permutation of the code bars 136 in the switching sequence of signals is a Letters permutation or an end of address signal. In response to a Letters signal, the No. 1 Letters function bar 188, having been unblocked, becomes selected. On the return stroke of the bail 152 the No. 1 Letters function bar 188 in turn moves a cooperating No. 1 Letters function pawl 161 having a stud 227 thereon. As the stud 227 is moved in this manner it pivots No. 1 Letters function operating lever 228 counterclockwise which in turn pivots the T-lever 208 clockwise (Fig. 5) to thereby move the printer suppressor code bar 214 to printing position. It is readily apparent unless an Address signal, corresponding to the address of the particular station, is received that the No. 1 Letters function bar cannot be selected whereby the printer suppressor code bar 214 is not moved to printing position but remains in switching position.

Also in response to a Letters permutation of the code bars 136, the No. 2 Letters function bar 191 is selected invariably. As the No. 2 Letters function bar 191 is moved to the left by the bail 152, a stud 231 on a corresponding No. 2 Letters function pawl 161 engages and pivots counterclockwise a latching member 233 to release a blocking pawl 234. The blocking pawl 234 has an arm 236 which cooperates with shoulders on each of the Address function bars 189 and 190 to block them from being selected. The combined effect of both Letters function bars 188 and 191 is to return the printer suppressor code bar 214 to printing position only at the stations where one or the other of the Address function bars 189 and 190 have been selected, the No. 1 Letters function bar 188 causing movement of the printer suppressor code bar 214 and the No. 2 Letters function bar 191 causing blocking of further selection of any Address function bars. Therefore, at this time each station receiving printer 116 on the line is either selected for receiving the message to follow or blocked from receiving the message following.

Following the transmission of the end-of-address signal the text of the message is transmitted. Since only those printers whose address has been transmitted are in printing condition, it is only those printers which print the message. The code bars 136 in all receivers are actuated in response to the text signals but because the printer suppressor code bar 214 in all non-selected stations is in switching position, printing by these receivers is blocked. Upon completion of the text of the message an end of message sequence of signals, Fig.-Fig.-Y, is normally

transmitted. It is necessary that Fig.-Fig. be transmitted at this time in order to return to switching position the printer suppressor code bar 214 at the selected station which has been actually printing the immediately preceding message. The Y following Fig.-Fig. then effects the release of all previous selections by clearing all Address function bars and restoring the blocking pawl for the No. 1 Letters function bar.

The Y function mechanism is rendered operable in response to a Y signal following the Fig.-Fig. signal sequence. When the Y function bar 192 is moved to the left by the bail 152 after it has been selected, it latches with its function pawl 161 and also moves the pawl 161 to the left. The Y function pawl 161 has a pair of lugs 195A and 195B which engage and pivot counterclockwise the blocking pawl 234 and the latching member 225 respectively. When the blocking pawl 234 is pivoted in this manner the projecting arm 236 thereon unblocks the Address function bars 189 and 190 thereby enabling them to become selected if corresponding address signals are received subsequently. When the latching member 225 is pivoted counterclockwise it unlatches the blocking pawl 219 thereby enabling the blocking pawl 219 to be pivoted clockwise under the urging of its spring whereby the projection 221 on the blocking pawl 219 blocks the No. 1 Letters function bar 183. It will be recalled that the No. 1 Letters function bar 183 is released for selection only when one of the Address function bars 189 or 190 is previously selected and therefore it is apparent that after the Y signal is received the No. 1 Letters function bar 183 remains blocked from selection until the Address signal corresponding to either of the Address function bars 189 or 190 is received.

Multiple reperforator transmitter

Turning now to Figs. 6 and 7 a description of the multiple reperforator transmitter follows. It is to be borne in mind that one of these units is provided for each line of the system and is located at the central office. In accordance with the design of the basic system, it is contemplated that the multiple reperforator transmitter will have ten reperforator units 421 for receiving the messages addressed to any of ten outgoing lines, and an intercept reperforator 422 for reperforating all improperly addressed message. Also included in the multiple reperforator transmitter are a plurality of transmitter units 423, one corresponding to each reperforator 421 and 422, for transmitting all messages reperforated by the reperforators 421 and 422.

The multiple reperforator transmitter includes a selective control unit having the usual series of five code bars 136 which span the whole series or group of reperforators; however, the sixth code bar 424, instead of being a printer suppressor code bar, is in this selective control unit termed a punch select code bar 424. The selector mechanism portion for each reperforator comprises one or more function bars 426 adapted to respond to the appropriate setting of the code bars 136. The additional function bars 426 are provided so as to enable group or broadcast transmission or progressive selection of the reperforators in response to messages addressed with group or broadcast addresses which consist of two or more address identifying signals in the case of a more complex system. Each function bar 426 has a cooperating function pawl 427 and function operating lever 428. A Letters function bar 426D is also provided in each position. An intercept function bar (not shown separately) also is provided with an associated function pawl and operating lever.

Upon receipt of an Address signal which causes one of the function bars 426 to be selected, the intercept function bar is also selected. Selection of the intercept function bar causes a function operating lever 428 in the intercept position to be pivoted clockwise whereby

a bent over projection 431 thereon engages a bell crank 436 to pivot the bell crank 436 counterclockwise about a shaft 434. Such pivotal movement of the bell crank 436 causes the lower arm thereof to engage and pivot a bail 437 clockwise about a shaft 438 against the bias of a spring 439. As the bail 437 moves clockwise it engages and pivots a plurality of latches 441 clockwise about the shaft 438. A latch 441 is provided in each of the reperforator positions in the multiple reperforator transmitter except the intercept reperforator.

Selection of the Address function bar 426 causes an operating lever 428 in the appropriate reperforator position to be pivoted clockwise about a shaft 429 whereby a bent over projection 431 on such operating lever engages an arm 433 of a three armed lever 432 to pivot the three armed lever 432 counterclockwise about the shaft 434.

Each reperforator 421 has a punch block 442 within which five reciprocable punches 443 are mounted. A tape feed mechanism consisting of a punch wheel 444 and die wheel 446 are adapted to be rotated in a manner so as to perforate feed holes in a tape 447 and to advance it through a guide (not shown) in the punch block 442. Each reperforator is provided with a plurality of punch select fingers 448, one of which cooperates with each of the punches 443 to control the operation thereof. The punch select fingers 448 are positioned in accordance with incoming signals in a manner whereby they are in the position shown in Fig. 7 in response to a marking impulse and are moved to the right from beneath the lugs 449 in response to a spacing impulse. Each of the punch select fingers 448 is carried in a bail 451 mounted pivotally on a shaft 452.

A continuously rotating power shaft 453 has a gear 454 which meshes with a gear 456 on a shaft 457. The shaft 457 carries a cam (not shown) which is operably connected with a bail 458 mounted oscillatably on a shaft 459. Due to the continuous rotation of the shaft 457, the bail 458 is a continuously oscillating bail. A toggle 461 consisting of links 462 and 463 is provided for operably connecting the punch bails 451 to the continuously oscillating bail 458. The links 462 and 463 are fastened together pivotally at 464, the link 463 being secured pivotally to the bail 451 at 466 and the link 462 being mounted pivotally on a stationary shaft 467. Secured to the two links 462 and 463 is a link 468 which is biased in a clockwise direction by a spring 469 secured suitably at its other end to the link 462. The link 468 has a notch 471 with which the bail 458 cooperates in order to impart motion to the punch bail 451. There is a separate toggle mechanism 461 for connecting each of the punch bails 451 to the continuously oscillating bail 458.

It will be recalled that upon selection of an address function bar 426, the corresponding operating lever 428 pivots the three armed lever 433 counterclockwise. When the three armed lever 433 is moved in this manner an arm 472 thereon permits the link 468 to move downwardly into operable connection with the bail 458, the link 468 normally being retained in an upward position due to a stud 473 engaging the arm 472.

At the same time that an address function bar 426 is selected the function bar in the intercept position is also selected, which results in the pivotal movement of all the latches 441 clockwise through the medium of the bail 437, as was heretofore described. Upon selection of the address function bar 426, its operating lever 428 becomes latched temporarily by a latch 474 to thereby retain the corresponding three armed lever 432 in its counterclockwise position. When the intercept operating lever 428 is selected there is no latch thereon so that as soon as the bail 182 strips the address function pawl 427 and intercept function pawl 427 from latching engagement with their respective cooperating function bars 426, the intercept operating lever 428 immediately pivots counter-

clockwise permitting the bell crank 436 to pivot clockwise. The bail 437 is therefore pivoted counterclockwise due to the action of all the springs 439. The latch 441 is thus moved into latching engagement with a horizontal arm 476 of the three armed lever 432 to thereby permit the spring 469 to retain the link 468 in operative connection with the bail 458. The subsequent tripping of the latch 474 from engagement with the address operating lever 428 therefore has no effect on the three armed lever 432.

Whenever the operating lever 428 associated with any of the function bars 426 is actuated, the Letters function bar 426D is unblocked. In the case of messages addressed to more than one destination the address portion of the message contains address signals for each destination. Upon the receipt of the second Address signal the bell crank 436 is actuated and causes the bail 437 to pivot clockwise and thus unlatch the three armed lever 432 which had been previously latched by the latch 441. Thus the second Address signal will not be reperforated by the punch selected by the first Address. At the end of each complete Address sequence there is an end-of-address or Letters signal. In each punch position where the Letters function bar 426D has been unblocked, due to the actuation of the associated operating lever 428, such Letters function bar 426D operates upon receipt of the end-of-address signal and actuates an operating lever similar to the operating lever 428 to again cause the previously selected punch to be coupled.

In case the code bars 136 are selectively positioned in response to a signal which does not correspond to the address signal for actuating one of the reperforators 421, obviously no address function bar 426 will be selected. The intercept function bar 426 nevertheless is selected at such time and, as has been already described, the bail 437 is actuated in response thereto in order to move all the latches 441 from engagement with their cooperating three armed levers 432. The three armed levers 432 are all pivoted clockwise due to the action of the springs 477, and the arms 472 by engaging the studs 473 on all of the links 468 prevent the selection of any of the address reperforators. As the three armed levers 432 are all moved clockwise in this manner a bail 478 secured to a pair of bell cranks 479 mounted pivotally at 481 pivots counterclockwise under the urging of springs 482. A link 483 is secured pivotally at 484 to the bell crank 479 and is secured pivotally at its other end at 486 to a bell crank 487 mounted pivotally at 434. As the bail 478 pivots counterclockwise under the urging of the springs 482 the bell crank 487 is pivoted counterclockwise to thereby permit the link 468 cooperating therewith to pivot clockwise under the urging of the spring 469 in order to operably connect the intercept reperforator to the continuously oscillating bail 458.

The punch select code bar 424 is caused to move to punch select position in response to an end-of-message signal (Fig.-Fig.-Y) in an incoming message from a station on the outlying line. As a subsequent outlying station is tested for determining whether or not it has a message ready to be transmitted, the first signal in such message is an Address signal. This address signal causes one of the function bars 426 to be selected to in turn cause the selection of the proper reperforator 421. Following the Address signal in the message is an end-of-address (Letters) signal which causes the punch select code bar 424 to be restored to reperforating position whereby the selected reperforator 421 reperforates the message and all other reperforators 421 are locked out. The movement of the punch select code bar 424 to punch select or reperforating position is accomplished in the same manner as the movement of the printer suppressor code bar 214 to station selecting or station printing positions.

As has heretofore been pointed out, each reperforator 421 of the multiple reperforator transmitter has a cooperating transmitter 423 adapted to transmit the mes-

sages reperforated in the tapes 447. The details of the tape sensing portions 501 of the transmitters 423 are of the type shown in the aforementioned patent to E. A. Gubisch, 2,348,214, and will be described herein only insofar as is necessary for an understanding of the present invention.

The continuously rotating shaft 457 has a cam (not shown) which is operably connected to a link 502. The link 502 is secured pivotally at 503 to a lever 504 in order to impart continuous oscillatory motion to a bail 506 pivotally mounted on a shaft 507. The bail 506 is common to all of the transmitters 423 and is adapted to be engaged by bell crank 508 associated with each of the transmitters 423. The description following immediately hereinafter refers to only one of the transmitters 423, for the reason that the description will be simplified if they are described singularly. It is to be understood that each transmitter 423 is like the one next to it and that there is one of them provided for each reperforator 421 in the multiple reperforator transmitter unit.

The bell crank 508 is secured pivotally to a pair of links 509 and 511 by a bolt 512, which links together comprise a toggle mechanism. The link 511 is secured pivotally on a fixed shaft 513 and is biased thereabout in a clockwise direction by a spring 514. The link 509 is secured pivotally to a bail 516 by a shaft 517, the bail 516 being mounted pivotally on a stationary shaft 518. The bell crank 508 has an arm 519 having a notch 521 therein within which the bail 506 fits when the bail 506 and bell crank 508 are operably connected with one another. The spring 522 tends to retain the operable connection between the bail 506 and the toggle comprising the links 509 and 511. The bell crank 508 has another arm 523 with which an armature 524 associated with an operate magnet 526 cooperates. A spring 527 retains the armature 524 in its upward position whenever the magnet 526 is deenergized to thereby retain the bail 506 and bell crank 508 in disengaged relation.

The tape sensing mechanism 501 is of the pivoted type having a pair of arms 528 pivoted at 529 and a tape guide 531. A plurality of tape sensing pins 532 are vertically reciprocable within the tape sensing mechanism for sensing the perforations in the tape 447. A plurality of interponents 533 are mounted pivotally on the shaft 518 and cooperate with the sensing pins 532 to enable the transfer of the signals from the sensing pins 532.

A plurality of transfer levers 534 are mounted pivotally on a shaft 536 and are adapted to cooperate with the interponents 533. Each of the transfer levers 534 is provided with an elongated slot 537 whereby the transfer levers 534 are permitted to reciprocate slightly vertically. Individual springs 538 are attached to projecting arms 539 on each transfer lever 534 and operate to retain the transfer levers 534 in their lower position and biased counterclockwise slightly. The transfer levers 534 are provided with shoulders 541 which cooperate with the interponents 533 to enable the transfer of signals to the transfer levers 534. If a sensing pin 532 senses a spacing signal (no perforation) in the tape 447, the corresponding interponent 533 remains in the position shown in Fig. 7 and the transfer lever 534 and interponent 533 occupy the same relative positions as shown. If the sensing pin 532 senses a marking signal (perforation) in the tape 447, the interponent 533 pivots counterclockwise slightly on the shaft 518 to a position where the shoulder 541 is permitted to move to the right over the left end of the interponent 533. A bail 542 cooperates with a lower extremity 543 on each transfer lever 534 to retain the transfer levers 534 in the position shown until the tape 447 is sensed, and while the sensing pins 532 remain in sensing position the bail 542 moves counterclockwise to permit the transfer of the signal to the transfer levers 534. Thereafter the toggle comprising the links 509 and 511 straightens to the position shown which raises the bail 516. As the bail 516 moves up, those transfer levers 534 with their

shoulders 541 positioned on top of the interponents are also moved up whereas the interponents 533 whose corresponding sensing pins 532 have sensed spacing impulses in the tape 447 are merely moved up slidably along the corresponding transfer levers 534.

The transfer levers 534 are adapted to cooperate with horizontal arms 544 of a corresponding group of bell cranks 546 mounted pivotally on a shaft 547. The bell cranks 546 are provided with vertical arms 548 which cooperate with a group of spring contact members 549. The spring contact members 549 cooperate with fixed contact members 551 to convert the signals into electrical impulses. When the transfer levers 534 are raised the bell cranks 546 are pivoted counterclockwise to close the contact member 549 against the fixed contact member 551. Upon the completion of the transfer of the signals to the contact members 549 and 551, the bail 542 is moved to the left to strip all of the transfer levers 534 from engagement with the interponents 533.

The operate magnets 526, which control the operation of the transmitters 423, are sequentially operated under control of the transmitter controller disclosed and described in the aforementioned copending application Serial No. 161,165.

It is to be understood that the above-described arrangement is merely illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a telegraph reperforator, a plurality of signal responsive permutably positionable code bars, a punch select code bar, means invariably responsive to predetermined groups of permutations of said plurality of code bars for moving said punch select code bar from normal position to punch select position, a plurality of function mechanisms releasable upon movement of said punch select code bar to punch select position for individual response to other predetermined permutations of said plurality of code bars, a plurality of signal responsive punching devices, each of said devices being designed to punch message signals in an associated record medium and corresponding to one of said function mechanisms, a toggle means for each of said punching devices, power means common to said punching devices for operating said devices, means individual to each of said devices for selectively connecting said toggle means to said power means to thereby render the associated device responsive to said message signals, said function mechanisms being effective upon response to said other predetermined permutations of said plurality of code bars for causing the associated connecting means to selectively connect said toggle means to said common power means, and other means responsive to a different predetermined permutation of said plurality of code bars for returning said punch select code bar to its normal position to thereby render said function mechanisms unresponsive to further permutations of said plurality of code bars.

2. In a telegraph recorder, a plurality of selectively operable signal responsive recording devices, a signal responsive intercept recording device, a toggle means for each of said recording devices, power means common to all of said toggle means for causing operation of said devices, means individual to each of said recording devices for connecting said toggle means to said power means, a signal responsive selecting means including a plurality of function mechanisms individually corresponding to said plurality of selectively operable recording de-

vices, said function mechanism associated directly with the connecting means for selectively connecting said toggle means to said power means, said selecting means being responsive to predetermined signal combinations for causing said function mechanisms corresponding to said predetermined signal combinations to render said associated connecting means effective to connect the corresponding toggle means of the selectively operable recording device to said power means, and means operable in the absence of one of said predetermined signal combinations for invariably causing the connecting means individual to said intercept recording device to connect the toggle means of said intercept recording device to said power means.

3. In a telegraph reperforating apparatus, a plurality of message tape perforating devices, each of said devices having a plurality of punches for perforating an associated tape, a like number of signal responsive punch select fingers for controlling said punches, and a toggle means for each of said devices, power means common to all of said toggle means for causing operation of said devices, a plurality of signal responsive permutably positionable code bars, means responsive to predetermined groups of permutations of said code bars for selectively connecting said toggle means to said power means, whereby each of said perforating devices having its toggle means connected to said power means is effective to perforate its tape in accordance with subsequent signals received by the reperforating apparatus.

4. In a telegraph recorder, a plurality of signal responsive permutably positionable code bars, a plurality of selectively operable signal responsive recording devices each of said devices being designed to record message signals on an associated record medium, a toggle means for each of said devices, power means common to all of said toggle means for operating said devices, means responsive to predetermined groups of permutations of said code bars for selectively connecting said toggle means to said power means, whereby each of said recording devices having its toggle means connected to said power means is effective to make a record on its tape in accordance with subsequent signals received by the recording device.

5. In a telegraph reperforator apparatus, a plurality of message tape perforating devices, each of said devices having a plurality of punches for perforating an associated tape, a like number of signal responsive punch select fingers for controlling said punches, and a toggle means for each of said devices, a continuously oscillating power means common to all of said toggle means for causing operation of said devices, a plurality of signal responsive permutably positionable code bars, means responsive to predetermined groups of permutations of said code bars for selectively connecting said toggle means to said continuously oscillating power means, whereby each of said perforating devices having its toggle means connected to said continuously oscillating power means is effective to perforate its tape in accordance with subsequent signals received by the reperforating apparatus.

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