Jan. 12, 1954 W. J. ZENNER 2,666,095

TELEGRAPH PRINTER

Original Filed May 10, 1950 5 Sheets-Sheet 1

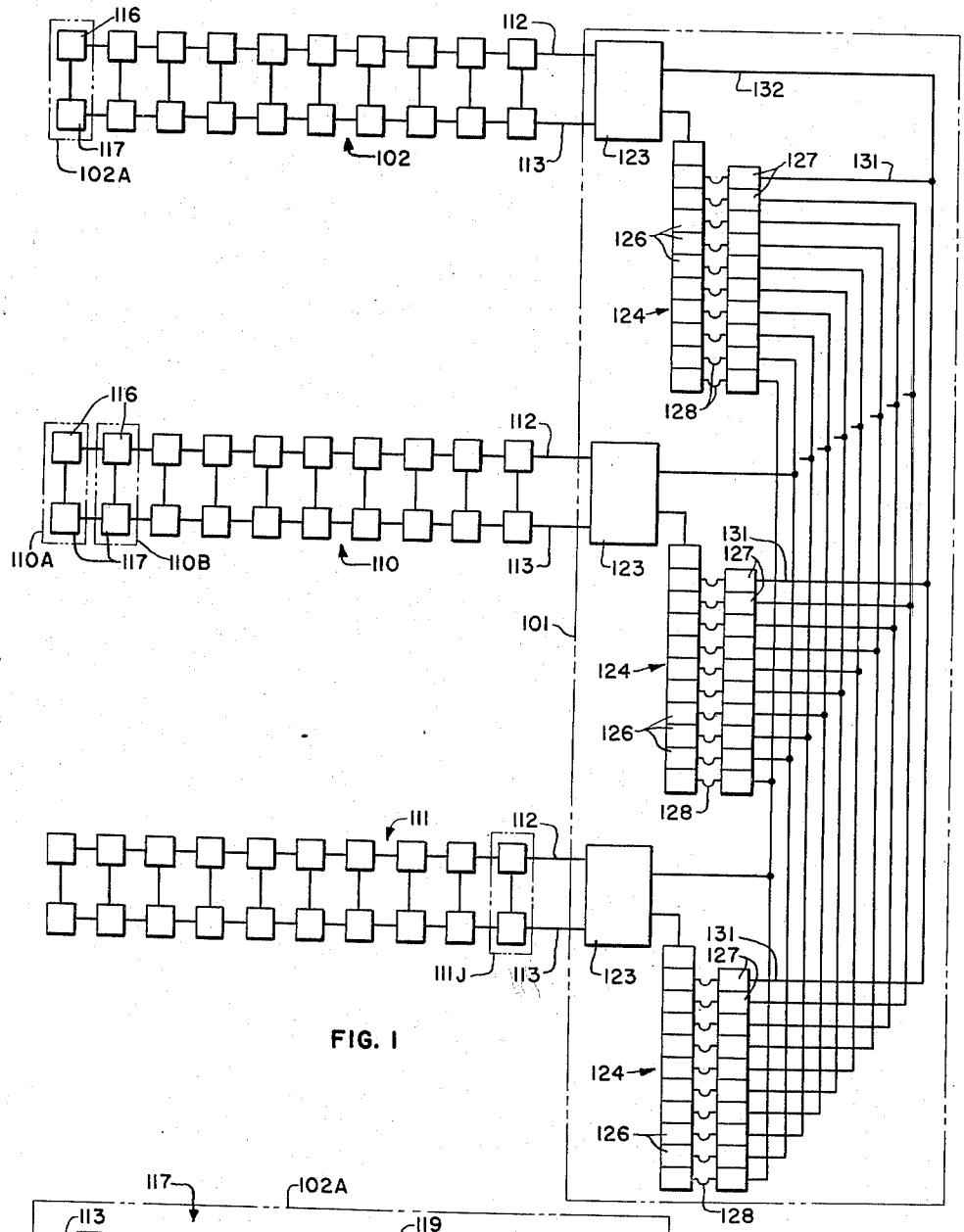

FIG. 1

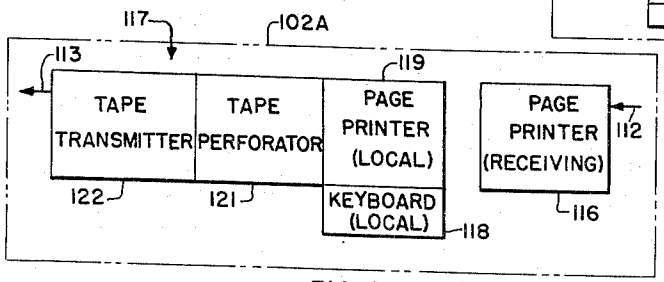

FIG. 2

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TELEGRAPH PRINTER

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FIG. 3

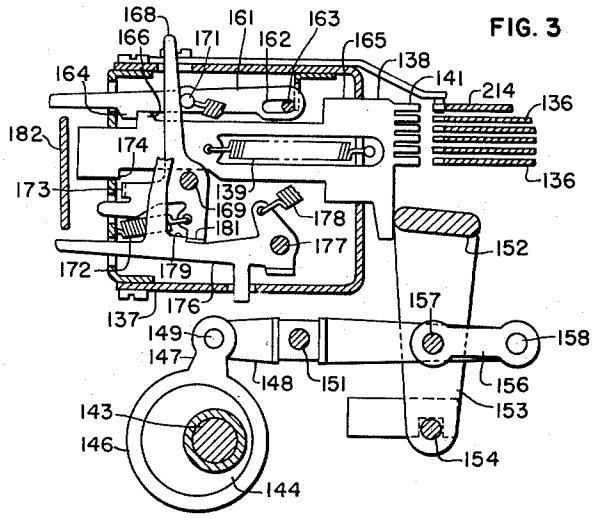
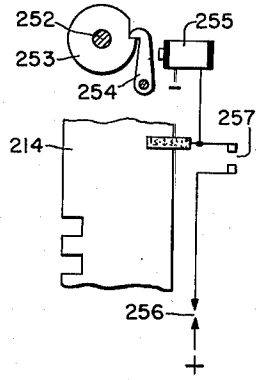


FIG. 5B



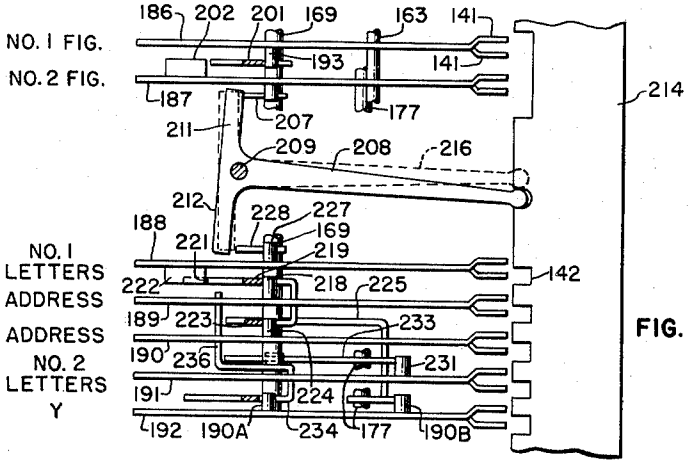


FIG. 5

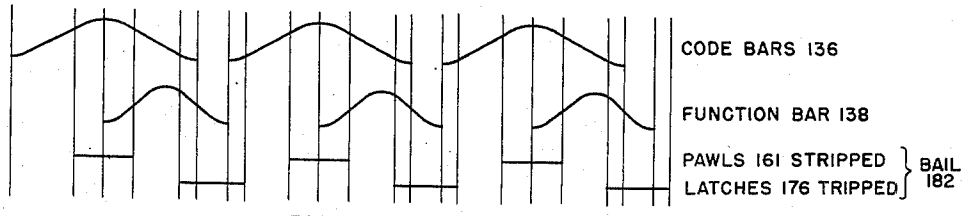


FIG. 4

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TELEGRAPH PRINTER

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NO. 1 FIG.

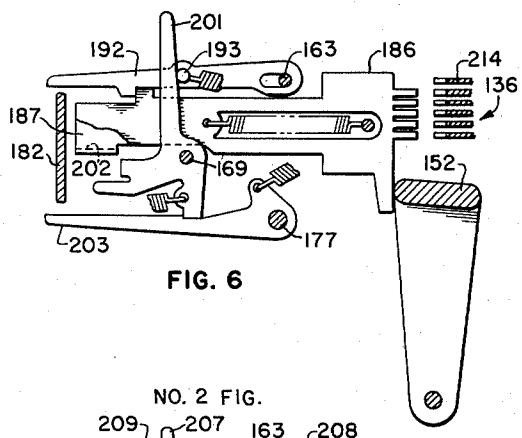

FIG. 6

NO. 1 LETTERS

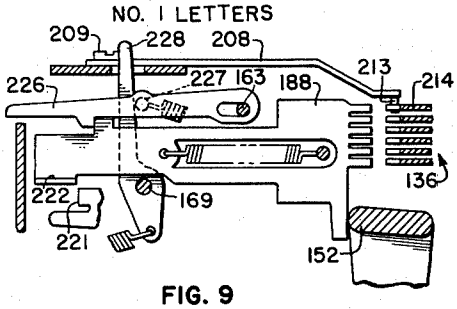

FIG. 9

NO. 2 FIG.

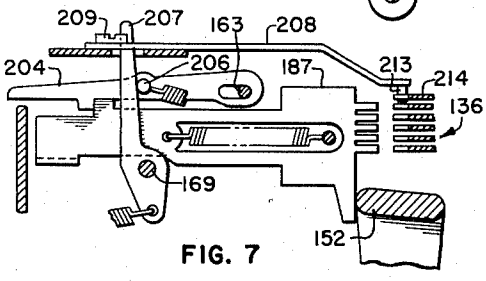

FIG. 7

NO. 2 LETTERS

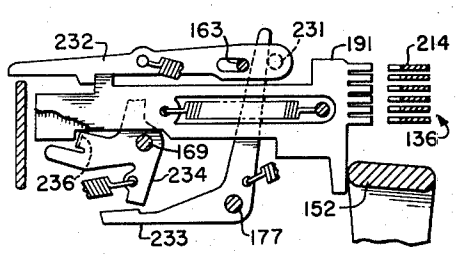

FIG. 10

ADDRESS

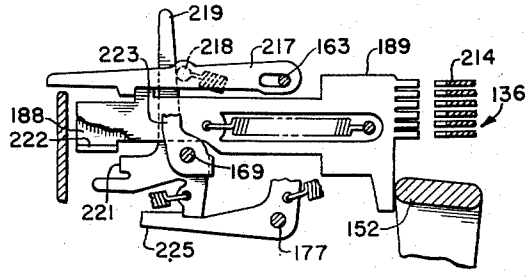

FIG. 8

Y

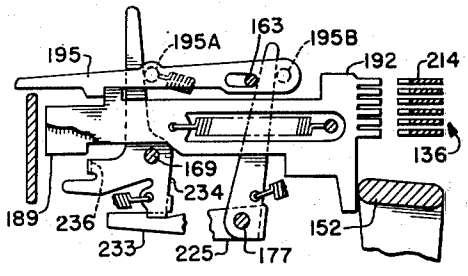

FIG. 11

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FIG. 12

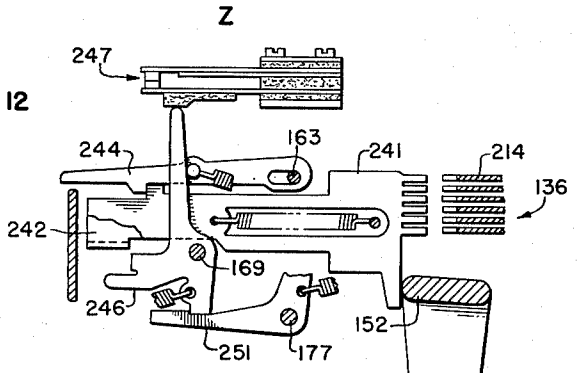


FIG. 13

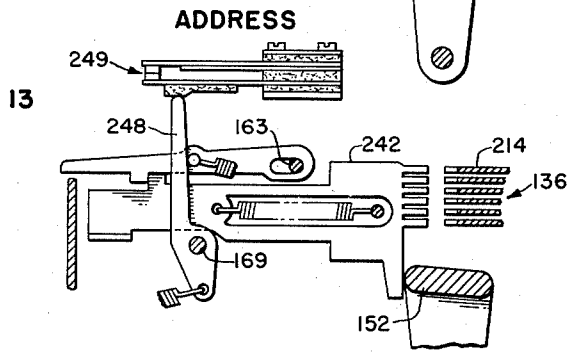
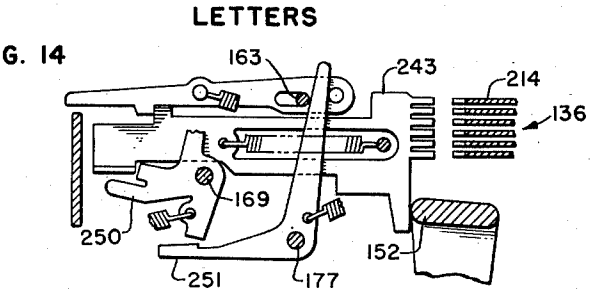


FIG. 14



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TELEGRAPH PRINTER

Original Filed May 10, 1950 5 Sheets-Sheet 5

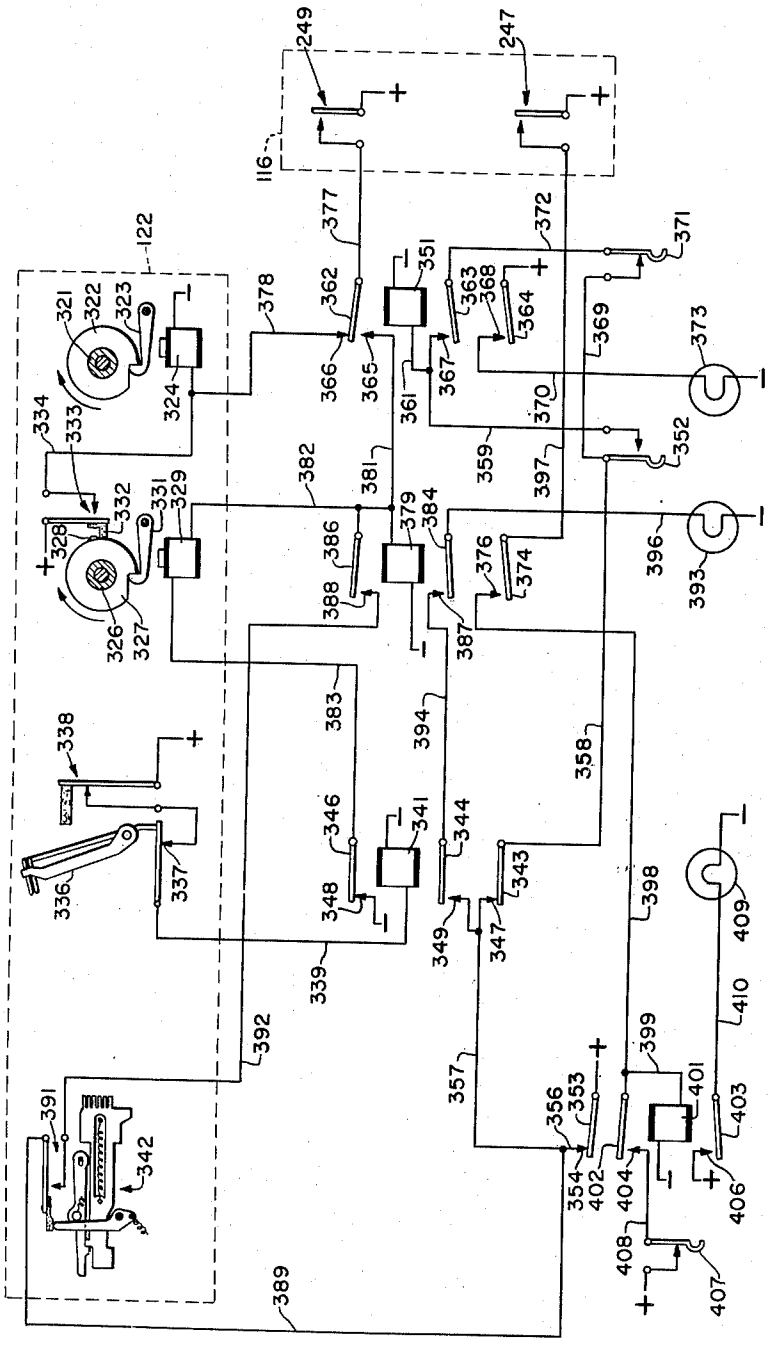

FIG. 15

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Patented Jan. 12, 1954

2,666,095

UNITED STATES PATENT OFFICE

2,666,095

TELEGRAPH PRINTER

Walter J. Zenner, Des Plaines, Ill., assignor to Teletype Corporation, Chicago, Ill., a corporation of Delaware

Original application May 10, 1950, Serial No. 161,165. Divided and this application October 6, 1951, Serial No. 250,056

5 Claims. (Cl. 178—23)

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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, 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 U. S. Patent 2,568,264 dated September 18, 1951. For a more complete understanding of the telegraph equipment mentioned above, reference should be had to the above mentioned patent and copending application, 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 on the line to which the message is addressed. Each of these receiving printers, 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 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 mechanism operates only at the station which has been conditioned for operation by the address signal, and the printing 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

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

The foregoing and other objects, features and advantages of the invention will be more readily understood from the following detailed description when read in conjunction with 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. 5B is a schematic representation of the mechanism in a station printer for suppressing printing during a switching operation;

Figs. 6 to 11 are side elevational views of the station selector function mechanism of the selective control unit;

Figs. 12 to 14 are side elevational views of the transmitter start function mechanism of the selective control unit; and

Fig. 15 is a diagram of the outlying station transmitter control circuit.

Referring now to Fig. 1 of the drawings, the basic telegraph switching system embodying the subject matter of the present 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.

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 will undoubtedly 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 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 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 or other predetermined signal. 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. 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 Patent No. 2,505,729, the disclosure of which has been incorporated herein by reference.

A set of five code bars 136 is suitably mounted within the receiving printer, which code bars are comparable to code bars 62 to 66 of said Patent No. 2,505,729. Each of said 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 of another of the function operating levers 168.

Assuming that the permutation of positions of the code 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 168 counterclockwise. This permits the unblocking of any other 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 168 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 of the function operating lever 168 to retain the function operating lever 168 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 168 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 168 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 function bar 138. 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 168 in unblocked position during the tripping of the latches 176.

Station selector function mechanism

Reference should now be made to Figs. 5–11 inclusive 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 Figs. 5–11, 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 whereas only the Address function bar 189 is shown in Fig. 8. In order to avoid complicating the drawings and description only the two separately acting Address positions are shown. 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. 6) has the usual cooperating No. 1 Fig. function pawl 192 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 192 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 152 subsequently is raised to the normal position thereof a latch 203 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 (Figs. 6 and 7) 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 204 is returned to the left with the No. 2 Fig. function bar. A stud 206 on the No. 2 Fig. function pawl 204 engages and pivots a No. 2 Fig. operating lever 207 counterclockwise (Fig. 7).

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 to suppress printer functions such as line feed and carriage return.

When the bail 152 returns to No. 2 Fig. function bar 187 and pawl 204, 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

(Fig. 8) has a cooperating function pawl 217 which carries the usual stud 218. Upon movement of the stud 218 to the left (Fig. 8) 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 186—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 (Fig. 9), 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 226 having a stud 227 thereon. As the stud 227 is moved in this manner it pivots a No. 1 Letters function operating lever 228 counterclockwise (Fig. 9) 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 (Fig. 10) 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 232 engages and pivots counterclockwise a latching member 233 to release a blocking pawl 234. The blocking pawl 234 has an arm 235 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.

Fig. 11 shows the Y function mechanism which 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 195 and also moves the pawl 195 to the left. The Y function pawl 195 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 (Fig. 8) 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 188. It will be recalled that the No. 1 Letters function bar 188 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 188 remains blocked from selection until the Address signal corresponding to either of the Address function bars 189 or 190 is received.

Station transmitter start function mechanism

A function mechanism similar to the station selector function mechanism heretofore described, is provided in each of the outlying station selective control units. This mechanism is designated the station transmitter start function mechanism and is provided in order to enable the central office to control the transmission of messages from the outlying station transmitters. The station transmitter start function mechanism is shown in Figs. 12–14, and following is a description thereof. The timing is the same as that already described with reference to Fig. 3, so further description thereof is deemed unnecessary.

As was necessary, in order to initiate selection of the proper outlying station to which a message is addressed, it is likewise similarly necessary, in order to select an outlying station transmitter, that the printer suppressor code bar 214 in the outlying station receivers be moved first to switching position. It will be recalled that Fig.-Fig. transmitted from the central office over a line causes the printer suppressor code bars 214 to be moved to switching position at all outlying stations. A complete transmitter start sequence of signals, therefore, must include Fig.-Fig. The remaining signals necessary for initiating and causing the completion of a transmitter start

sequence are, Z, Address, and Letters. Accordingly the transmitter start function mechanism includes both No. 1 and No. 2 Fig. function bars 186 and 187 as well as three additional function bars, a Z function bar 241 (shown in Fig. 12), an Address function bar 242 (shown in Fig. 13), and a Letters function bar 243 (shown in Fig. 14).

Referring first to Fig. 12 the Z function bar 241 has a cooperating Z function pawl 244 and a Z function operating lever 246. Selection of the Z function bar 241 causes the Z function operating lever 246 to be pivoted in a counterclockwise direction about shaft 169 to thereby unlatch the Address function bar 242. This pivotal movement of the Z function operating lever 246 also causes the closure of a contact pair 247, hereafter referred to as the transmitter start contact. The transmitter start contact 247 will be mentioned hereinafter in the description of the outlying station transmitter control circuits.

The Address function bar 242 (shown in Fig. 13) has a cooperating Address function operating lever 248, which, when actuated by an Address signal following a Z signal, pivots counterclockwise about the shaft 169 and causes the closure of the contact pair 249. The contact pair 249 will be referred to later in the specification as the Address contact 249 in the transmitter control circuit.

When the transmitter start sequence has been transmitted, if the transmitter whose address signal has been given has a message ready to transmit, such message will be transmitted. However, if such transmitter does not have a message ready to transmit, another Address will be transmitted by the central office, in order to test another outlying transmitter. When the central office determines that the outlying transmitter has a message to transmit, a Letters signal is transmitted over the outgoing side of the line. In response to the Letters signal the Letters function bar 243 (shown in Fig. 14) is selected which causes a latch 251 to be pivoted counterclockwise about shaft 177 to unlatch the Z function operating lever 246 and release the printer suppressor code bar 214 at all stations selected for reception at the time the Address sequence of signals was initiated.

It is to be noted that even though the function mechanism comprising the Z function bar 241 (shown in Fig. 12), the Address function bar 242 (shown in Fig. 13), and the Letters function bar 243 (shown in Fig. 14), is located in the selective control unit of each receiving printer together with the function mechanism comprising the Nos. 1 and 2 Fig. function bars 186 and 187 (shown in Figs. 6 and 7), the Address function bar 189 (shown in Fig. 8), the Nos. 1 and 2 Letters function bars 188 and 191 (shown in Figs. 9 and 10), and the Y function bar 192 (shown in Fig. 11), there is no interference between the operations of these sets of function mechanism. As has already been shown the function mechanism for selecting an outlying station to receive a message includes the function bars 188, 189, 190, 191, and 192 whereas the function mechanism for actuating an outlying station transmitter includes the function bars 241, 242, and 243. To condition either of these sets of function mechanism for operation a Fig-Fig. sequence is necessary which moves the printer suppressor code bar 214 to print suppressing position. If a station receiver is being selected, a Y signal follows the Fig.-Fig. sequence inasmuch as a different station receiver is not selected until the conclusion of a message which ends with a Fig.-Fig.-Y sequence. As has been stated heretofore the Y signal causes all Address function bars 189 and 190 to be released for selection and the No. 1 Letters function bar 188 to be blocked. The No. 1 Letters function bar 188 remains blocked until one of the associated Address function bars 189 or 190 is selected. When a station transmitter is being selected a Z signal follows the Fig.-Fig. sequence. The Z signal unblocks the Address function bar 242 (Fig. 13) and after the Address signal is received a Letters signal is received. During a station transmitter selection the Nos. 1 and 2 Letters function bars 188 and 191 (Figs. 9 and 10) as well as the Letters function bar 243 (Fig. 14) may all respond. Under this condition the No. 1 Letters function bar 188 at a station which was previously receiving a message operates to restore that station to receiving condition by moving the printer suppressor code bar 214 to printing condition whereas at all other stations the No. 1 Letters function bar 188 remains blocked by the Address function operating lever 219 (Fig. 8). The No. 2 Letters function bar 191 (Fig. 10) at all stations responds to the Letters signal but is ineffective inasmuch as the operating lever 234 associated therewith is already blocking the Address function bars 189 and 190. The Letters function bar 243 (Fig. 14) responds to the Letters signal to allow its associated operating pawl 250 to block all Address function bars 242 (Fig. 13).

Station transmitter control

Reference should now be had to Fig. 15 of the drawings wherein the control circuit for the outlying station transmitters 122 is shown. As has already been shown in the description of the transmitter control mechanism located in the selective control unit of the outlying station receiving printers 116 a transmitter start contact 247 is closed upon the receipt of the transmitter start signal Fig.-Fig.-Z and a transmitter Address contact 249 is closed upon receipt of the Address signal immediately following the transmitter start signal. Both of these contacts 247 and 249 are shown in the schematic representation of the outlying receiving printer 116 in Fig. 15.

In the schematic representation of the outlying station transmitter 122 in Fig. 15 there are shown only those elements deemed essential to a complete understanding of the invention. It will be recalled that the transmitter 122 is like that shown in the U. S. patent to E. A. Gubisch, 2,348,214 which is modified only to the extent necessary to adapt it to the purposes of the present invention. In the transmitter 122, the transmitter distributor is represented by a distributor cam sleeve 321 having a clutch release cam 322 integral therewith. Cooperable with the clutch release cam 322 is a clutch release pawl 323 which is magnetically operated by a clutch release magnet 324. Energization of the maget 324 causes the pawl 323 to be pulled away from the cam 322 to thereby release the cam sleeve 321 for rotation.

A tape reader cam sleeve 326 has a clutch release cam 327 and a distributor release cam 328 integral therewith. Energization of a magnet 329 causes it to pull up a clutch release pawl 331 to thereby release the tape reader cam sleeve 326 for rotation. The cam 328 cooperates with a contact follower 332 whereby a contact pair 333 is

closed once during each revolution of the cam 328. Closure of the contact pair 333 completes a circuit from positive battery, through the closed contact pair 333, over a lead 334, through the magnet 324 to negative battery, to thereby cause the release of the cam sleeve 321 for rotation.

The transmitter 122 is of the well known pivoted or climbing type having a pivoted tape sensing mechanism 336. The tape sensing mechanism 336 is provided with the usual extra tape sensing finger (not shown) which controls an end of tape contact 337. The tape sensing mechanism 336 is also provided with a tight tape contact 338. When a tape is positioned in transmitting position in the transmitter both contacts 337 and 338 are closed which completes a circuit from positive battery, through the closed contacts 338 and 337, over a lead 339, through a magnet 341, to negative battery. When the end of the tape is reached the contact 337 opens and when the tape becomes too tight between the perforator (not shown) and the tape sensing mechanism 336 the contact 338 is opened, in either of which cases the circuit to the magnet 341 is broken.

The transmitter 122 is also provided with a selective control unit which is represented by only a Y function mechanism 342. The purpose of this selective control unit is to monitor the messages transmitted and to recognize an end-of-message signal Fig.-Fig.-Y in the messages being transmitted. Upon recognizing this end-of-message signal the Y function mechanism 342 opens a circuit to the tape reader release magnet 329 to thereby render the transmitter 122 inoperative.

When the attendant at the outlying station 122 prepares a message for transmission, he perforates this message in a tape. In order to render the transmitter operable to transmit this tape message, the operator first places the tape in the tape sensing mechanism, which automatically closes the contact 337. Assuming that the length of tape between the tape perforator 121 and the tape sensing mechanism 336 is sufficient to prevent the opening of the contact 338, there is established at this time the aforementioned circuit from positive battery, through the closed tight tape contact 338, through the closed tape out contact 337, over lead 339, through the tape out magnet 341, to negative battery.

Energization of the tape out magnet 341 causes this magnet to pull up all of its armatures 343, 344 and 345 to thereby close contacts 347 and 348, and open a contact 349. Closure of the contact 347 prepares a circuit to a ready magnet 351. When the operator, having placed the message tape in the tape sensing mechanism 336, closes manually a normally open ready switch 352, a circuit is established from positive battery, through an armature 353 and its normally closed contact 354, over a pair of leads 356 and 357, through the now closed contact 347 and armature 343, over a lead 358, through the closed ready switch 352, over a lead 359, over a lead 361, through the ready magnet 351, to negative battery. Energization of the ready magnet 351 causes it to pull up all of its armatures 362, 363 and 364 which breaks the connection between the armature 362 and a contact 366, and makes connections between the armature 362 and a contact 365, between the armature 363 and a contact 367 and between the armature 364 and a contact 368. Closure of the armature 363 with the contact 367 completes a locking circuit for the ready magnet 351 over a circuit from positive battery, through an armature 353 and its normally closed contact 354, over a pair of leads 356 and 357, through the now closed contact 347 and armature 343, over a lead 358, over a lead 369, through a normally closed not-ready switch 371, over a lead 372, through the armature 363 and contact 367, over the lead 361, through the ready magnet 351, to negative battery. Closure of the armature 364 with the contact 368 completes a circuit from positive battery, through the closed armature 364 and contact 368, over a lead 370, through a ready lamp 373, to negative battery. The outlying station transmitter is therefore, in condition to respond to a call signal transmitted thereto from the central office. If, for some reason, the operator decides not to transmit the message in the transmitter, he depresses the not-ready switch, thereby breaking the locking circuit to the ready magnet, and the message cannot be transmitted due to the opening of armature 362 from the contact 365.

Assuming that either there is no tape positioned for transmission in the tape sensing mechanism 336 or the operator, having positioned a tape in the tape sensing mechanism 336, has not yet depressed the ready switch 352 or has depressed the not-ready switch 371, the operation of the transmitter is as follows. At this time the armature 362 and the contact 366 are closed. The central office, in calling the transmitter 122, transmits Fig.-Fig.-Z-Address. The contact 247 closes temporarily on the Z signal, as has been heretofore described, but this is immaterial for at this time the only circuit in which contact 247 is located is open at an armature 374 and contact 376. On the address signal in this sequence of signals the contact 249 closes and a circuit is established from positive battery, through the closed contact 249, over a lead 377, through the closed armature 362 and contact 366, over a lead 378, through the distributor clutch release magnet 324, to negative battery. Energization of the magnet 324 causes the pawl 323 to be pulled up thereby releasing the distributor cam sleeve 321 for rotation. At this time, due to the fact that no tape is being sensed the distributor cam sleeve 321 will cause a blank signal to be transmitted back to the central office. Such blank signal causes the central office to transmit the next Address signal in the sequence of stations on the line. Upon receipt of this next Address signal, at the receiving printer 116, a bail 182 (Fig. 3) in the receiving printer 116 is caused to strip the Address function pawl at that station from the Address function bar to thereby open the contact 249. Opening of the contact 249 causes the distributor cam sleeve clutch release magnet 324 to be de-energized which stops the rotation of the distributor cam sleeve 321 in the station transmitter 122.

Assuming that the attendant has positioned a message tape in the tape sensing mechanism 336, and has depressed the ready switch 352, the operation of the transmitter 122 is as follows. It should be recalled that under these conditions the ready magnet 351 is energized and locked up in its energized condition whereby the armature 362 and contact 365 are closed. As in the case where the ready magnet 351 is de-energized, the armature 374 is not closed with the contact 376 when the contact 247 closes in response to the Z signal of the Fig.-Fig.-Z-Address calling signal sequence, so that nothing happens on receipt of the Z signal. Upon receipt of the Address signal of the transmitter calling sequence, the contact

249 closes to thereby energize the tape reader clutch magnet 329 and a send magnet 379. The energizing circuit for the send magnet 379 extends from positive battery, through closed contact 249, over the lead 377, through closed armature 362 and contact 365, over a lead 381, through the send magnet 379, to negative battery. The energizing circuit for the tape reader clutch magnet 329 extends from positive battery, through closed contact 249, over the lead 377, through closed armature 362 and contact 365, over the lead 381, over a lead 382, through the magnet 329, over a lead 383, through the presently closed armature 346 and contact 348, to negative battery.

Energization of the magnet 329 causes the pawl 331 to be pulled up to thereby release the tape reader cam sleeve 326 for rotation. Rotation of the tape reader cam sleeve 326 causes the high part of the cam 328 to close the contact pair 333 which results in the energization of the distributor clutch release magnet 324 over a circuit from positive battery, through the closed contact pair 333, over the lead 334, through the magnet 324, to negative battery. Energization of the magnet 324 causes the pawl 323 to be pulled up to thereby release the distributor cam sleeve 321 for rotation whereby signals being sensed in the tape in the tape sensing mechanism 336 are transmitted.

Energization of the send magnet 379 causes all of its armatures 374, 384, and 386 to be pulled up to cause these armatures to make with their respective cooperating contacts 376, 387 and 388. Closure of the armature 386 with the contact 388 completes a circuit from positive battery, through presently closed armature 353 and contact 354, over the lead 356, over a lead 389, through a presently closed contact pair 391 associated with the Y function mechanism 342 of the transmitter selective control unit, over a lead 392, through the presently closed contact 388 and armature 386, over the lead 382, over the lead 381, through the send magnet 379, to negative battery. This circuit serves as a locking circuit for the send magnet 379 to thereby retain the armature 386 and contact 388 in closed relation.

Retention of the armatures 386 and contact 388 in closed relation also completes a circuit over the path described immediately above to the lead 382, and thence over lead 382, through the tape reader clutch release magnet 329, over the lead 383, through the closed armature 346 and contact 348, to negative battery. It is, therefore, apparent so long as the tight tape contact 338 and the end of tape contact 337 remain closed, that the tape reader clutch release magnet 329 retains the pawl 331 disengaged from the cam 327 and transmission of the message continues. At the end of the message a Fig.-Fig.-Y sequence of signals is monitored by the selective control unit represented by the Y function mechanism 342 in the transmitter, and the contact pair 391 is opened which immediately breaks the circuit to send magnet 379 and clutch magnet 329. At this time therefore, transmission of signals ceases due to the de-energization of the magnet 329 and resulting sustained de-energization of the distributor clutch release magnet 324.

If during transmission of a message, the tape sensing mechanism 336 runs out of tape so that the tape out contact 337 opens or the tape becomes too tight, that is if transmission from the tape takes place faster than perforation of additional tape, so that the tight tape contact 338 opens, the tape out magnet 341 is de-energized. De-energization of the magnet 341 permits the armature 343, 344 and 346 to fall back thereby causing the closure of the armature 344 with the contact 349 and the opening of the armatures 346 and 343 with their respective contacts 348 and 347. At this time the magnet 329 becomes de-energized so that transmission ceases; however, the send magnet 379 remains energized so that if the tape is repaired promptly transmission is resumed. Closure of the armature 344 with the contact 349 completes a circuit to a tape out indicator lamp 393 from positive battery, through the presently closed armature 353 and contact 354, over the leads 356 and 357, through the closed contact 349 and armature 344, over a lead 394, through the presently closed contact 387 and armature 384, over a lead 396, through the tape out indicator lamp 393, to negative battery.

When the transmitter 122 ceases transmitting without having transmitted an end-of-message signal, Fig.-Fig.-Y, an automatic timer mechanism is initiated at the central office, which, after a predetermined interval initiates a switching operation. As the signals of all outlying transmitter switching sequences are Fig.-Fig.-Z-Address, the contact 247 closes on the Z signal of all of these sequences. Due to the fact that the send magnet is energized at this time, a circuit is completed from positive battery through the presently closed contact 247, over a lead 397, through the presently closed armature 374 and contact 376, over leads 398 and 399, through a break magnet 401, to negative battery. Energization of the break magnet 401 causes its armatures 353, 402 and 403 to be pulled up to thereby break the circuit over the armature 353 and contact 354, and to close the armatures 402 and 403 with their respective contacts 404 and 406. The closure of the armature 402 with the contact 404 completes a locking circuit for the break magnet 401 from positive battery, through a normally closed restart key 407, over a lead 408, through the closed contact 404 and armature 402, over the leads 398 and 399, through the break magnet 401, to negative battery. The closure of the armature 403 with the contact 406 completes a circuit from positive battery, through the closed contact 406 and armature 403, over a lead 410, through a break indicator lamp 409, to negative battery. The attendant is thereby notified, due to the illumination of the break indicator lamp 409 and the tape out indicator lamp 393, that transmission from his station has ceased, that the cause of cessation of transmission is due either to no tape or a tight tape in the tape sensing mechanism 336, and that his transmitter is no longer the selected transmitting station. After taking care of the cause of the trouble it is necessary that the attendant depress the restart key 407 in order to de-energize the break magnet 401 to enable the closure of the armature 353 and contact 354. The attendant must also depress the ready key 352 in order to again energize the ready magnet 351 so that the message will be transmitted when the station is subsequently called.

It should be noted that depression of the not ready key 371 while a message is being transmitted does not interrupt transmission of a current message due to the fact that the send magnet 379 remains energized over its locking circuit independently of the condition of the ready magnet 351.

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 the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a telegraph printer, selector mechanism comprising a plurality of permutation bars arranged in superposed horizontal planes, a function controlling unit comprising in a unitary structure a plurality of function bars slidably mounted therein for movement toward and away from said permutation bars, the leading edge of each function bar adapted to cooperate selectively with said permutation bars, a bail member constantly contacting said leading edges to hold said function bars away from said permutation bars against the action of individual springs which normally tend to urge respective function bars toward said permutation bars, a secondary member operably associated with each function bar and disposed thereabove, spring means individually associated with said secondary member to urge said secondary members in a direction toward said permutation bars, each secondary member provided with an engaging portion adapted to be interengageable with an engaging portion on its associated function bar, means for operating said bail member periodically to enable movement of said function bars toward said permutation bars by said individual springs, whereby one of said function bars is selected according to a permuted setting of said permutation bars to effect cooperative interengagement between the engaging portions of said selected function bar and its respective secondary member, whence upon the return movement of the selected function bar by said bail, said secondary member is actuated directly and positively, a lateral projection on said secondary member, means controlled by said lateral projection to directly control a function, and periodically operated stripper means effective to disengage said secondary member from said selected function bar.

2. In a telegraph printer, selector mechanism comprising a series of permutation code bars arranged in superposed horizontal planes, a function controlling unit comprising in a unitary structure a plurality of selectable bars slidably mounted therein for movement toward and away from said permutation code bars, each selectable bar having coded projections on its leading edge confronting the coded edges of said permutation code bars, a bail member constantly contacting said leading edges to hold said selectable bars away from said permutation code bars against the action of individual springs which normally tend to bias respective selectable bars toward said permutation code bars, a pawl member operably associated with each selectable bar and disposed thereabove in a common vertical plane, spring means individually associated with said pawl members to bias said pawl members in a direction toward said permutation code bars, each pawl member provided with an integral projection adapted to be interengageable with an integral projection on its associated selectable bar, means for oscillating said bail member periodically to enable movement of said selectable bars toward said permutation code bars by said individual springs, whereby one of said selectable bars is selected according to a permuted setting of said code bars to effect cooperative interengagement between the integral projections of said selected selectable bar and its respective pawl member, whence upon the return movement of the selected selectable bar by said bail, said pawl member is actuated directly and positively, a stud on said pawl member, means controlled by said stud adapted to directly control a function, and periodically reciprocating stripper means adapted to disengage said pawl member from said selected selectable bar.

3. In a telegraph printer, selector mechanism comprising a plurality of permutation bars arranged in superposed horizontal planes, a function controlling unit comprising in a unitary structure a plurality of function bars slidably mounted therein for movement toward and away from said permutation bars, the leading edge of each function bar adapted to cooperate selectively with said permutation bars, a bail member constantly contacting said leading edges to hold said function bars away from said permutation bars against the action of individual springs which normally tend to urge respective function bars toward said permutation bars, a secondary member operably associated with each function bar and disposed thereabove, spring means individually associated with said secondary members to urge said secondary members in a direction toward said permutation bars, each secondary member provided with an engaging portion adapted to be interengageable with an engaging portion on its associated function bar, means for operating said bail member periodically to enable movement of said function bars toward said permutation bars by said individual springs, whereby one of said function bars is selected according to a permuted setting of said permutation bars to effect cooperative interengagement between the engaging portions of said selected function bar and its respective secondary member, whence upon the return movement of the selected function bar by said bail, said secondary member is actuated directly and positively, a lateral projection on said secondary member, and means controlled by said lateral projection to directly prepare an adjacent function bar for selection.

4. In a telegraph recording apparatus, a plurality of code bars, one of said code bars having a switching control position and a printing control position and the remainder being signal responsive, all of said code bars being movable to form a plurality of permutations thereof, printing means responsive to said permutations of said code bars upon movement of said one of said code bars to printing control position, a first switching means for effecting movement of said one of said code bars to switching control position in response to a switching permutation of said signal responsive code bars, and a second switching means for effecting movement of said one of said code bars to said printing control position in response to a printing permutation of said signal responsive code bars.

5. In a telegraph system, a line, a transmitting station for transmitting signals over said line, a plurality of telegraph recorders on said line for receiving said signals transmitted by said transmitting station, a plurality of code bars in each of said recorders, one of said code bars in each of said recorders having a switching control position and a printing control position and the remainder of said code bars in each of said recorders being permutably positionable in response to said signals, printing means in each of said recorders responsive to said permutations of the code bars therein upon movement of said one of said code bars therein to printing position, a first

switching means in each of said recorders for effecting movement of said one of said code bars therein to switching control position upon movement of the signal responsive code bars therein to a switching permutation, and a second switching means in each of said recorders for effecting movement of said one of said code bars therein to said printing control position upon movement of the signal responsive code bars therein to a printing permutation.

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