

June 12, 1945.

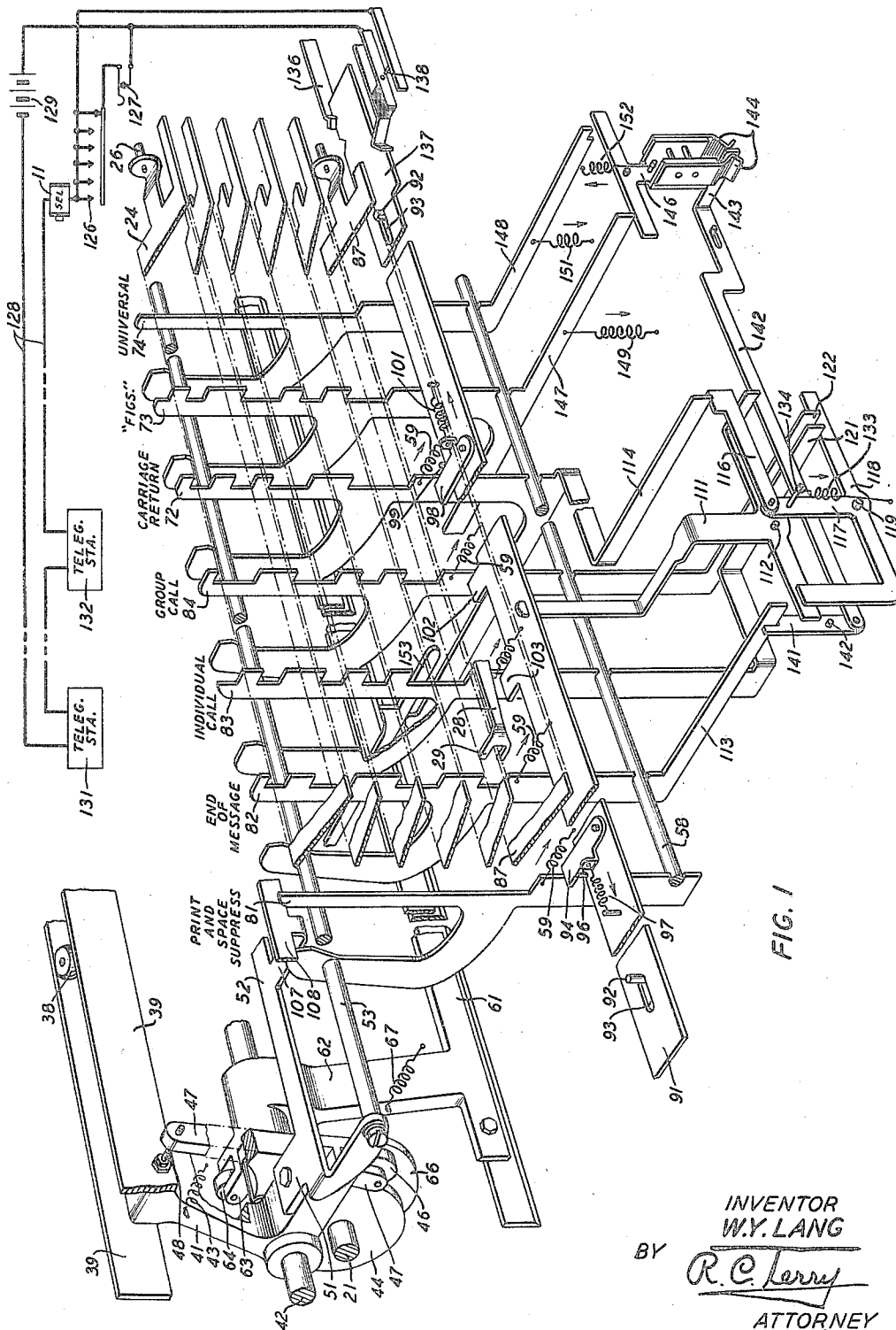
W. Y. LANG

2,377,890

SELECTIVE TELEGRAPH SYSTEM

Filed July 6, 1944

4 Sheets-Sheet 1



June 12, 1945.

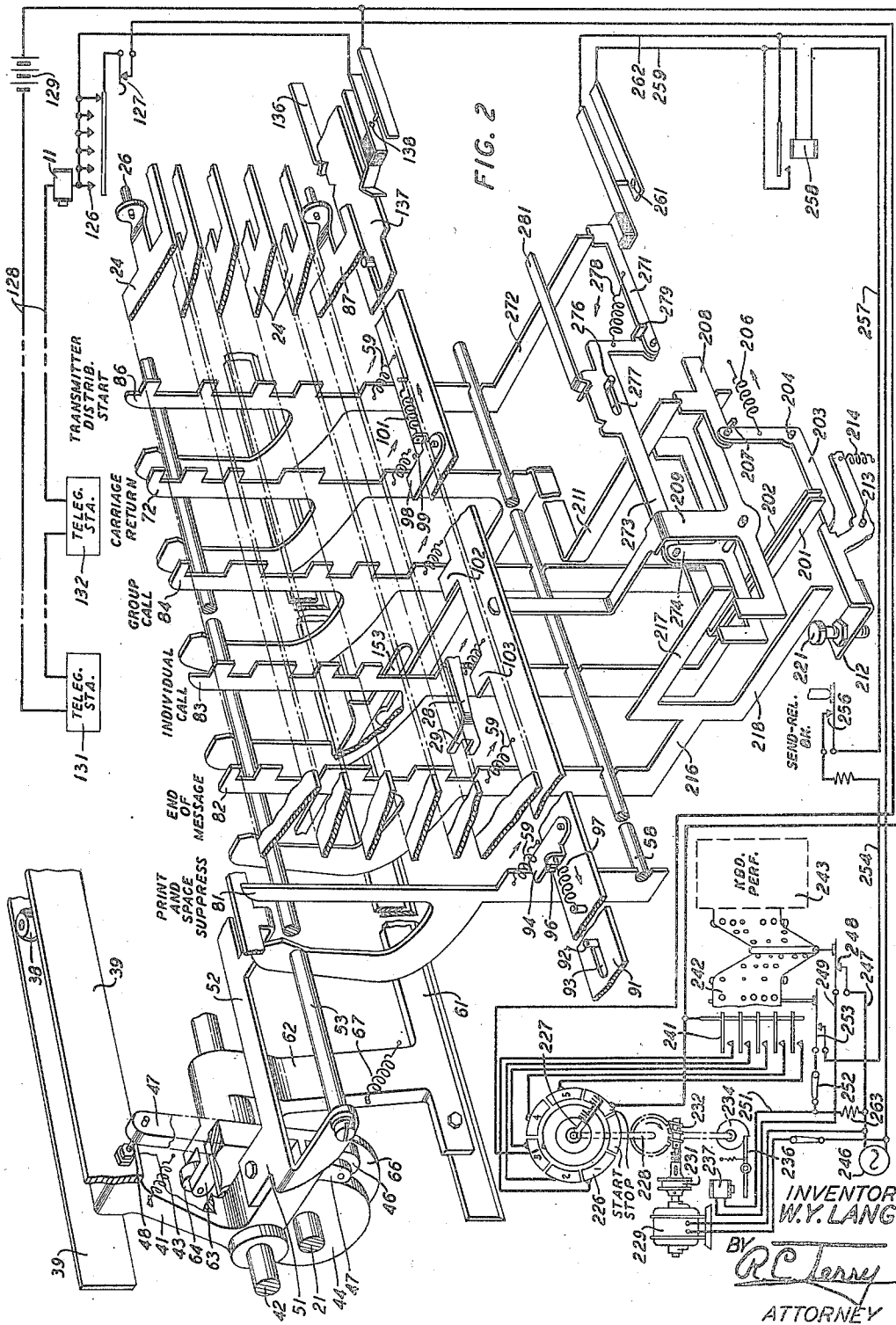
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SELECTIVE TELEGRAPH SYSTEM

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4 Sheets-Sheet 2



June 12, 1945.

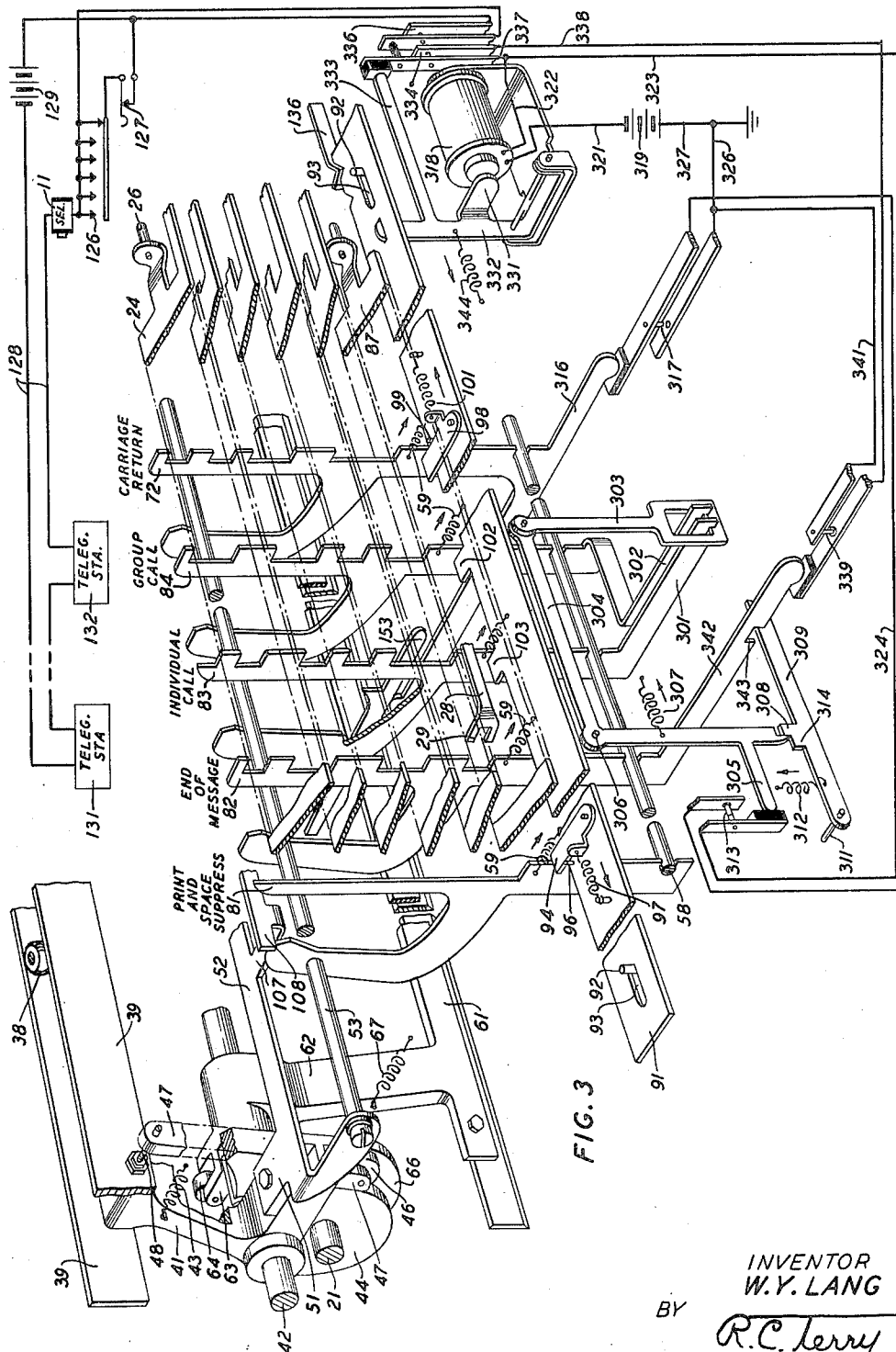
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SELECTIVE TELEGRAPH SYSTEM

Filed July 6, 1944

4 Sheets-Sheet 3



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SELECTIVE TELEGRAPH SYSTEM

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4 Sheets-Sheet 4

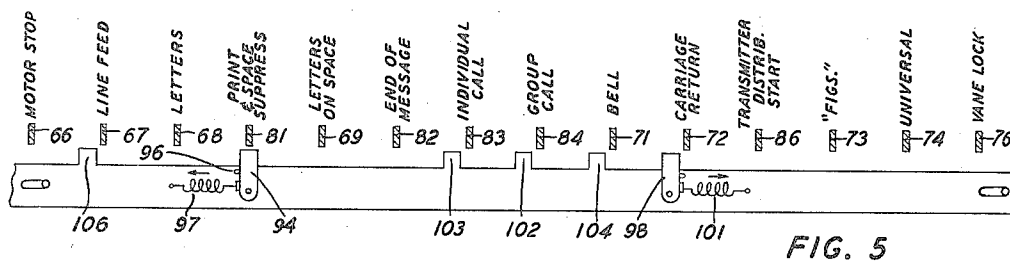
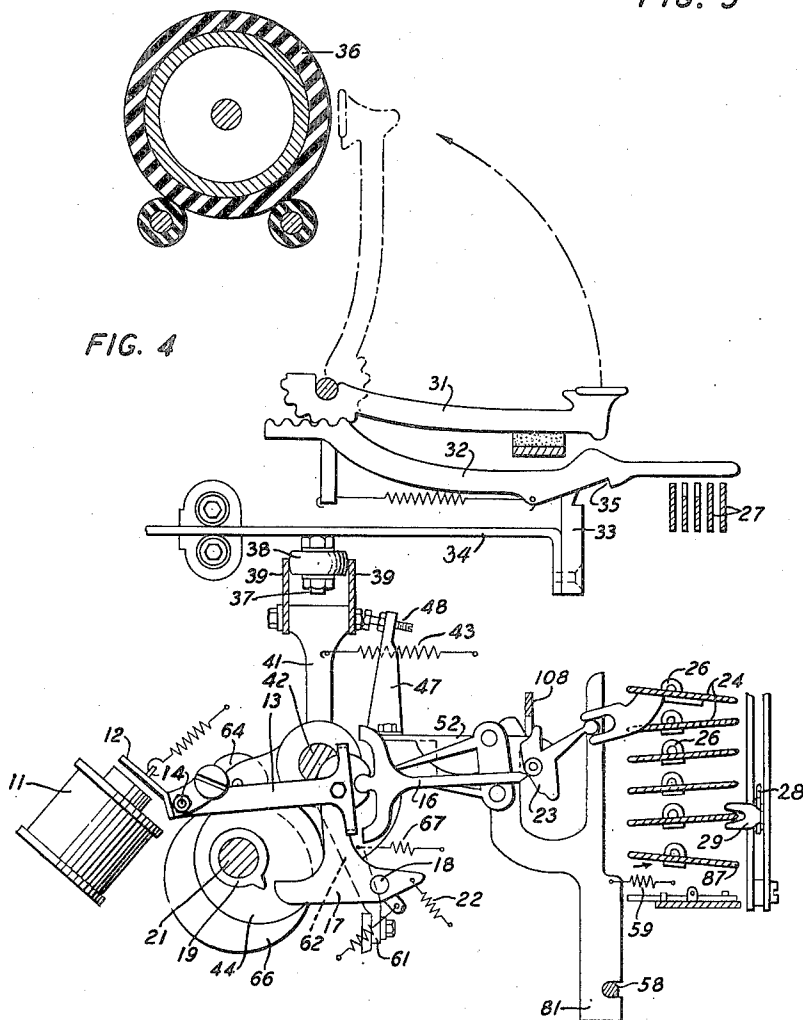


FIG. 5

FIG. 4



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SELECTIVE TELEGRAPH SYSTEM

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Application July 6, 1944, Serial No. 543,684

18 Claims. (Cl. 178—4)

This invention relates to printing telegraph apparatus and systems and particularly to printing telegraph receiving recorders for stations in a selective intercommunicating system.

An object of the invention is to provide instrumentalities in receiving telegraph recorders for rendering the recorders selectively operative or non-operative in response to signals.

Another object of the invention is to provide instrumentalities in receiving telegraph recorders for suppressing recording operations and certain functional operations.

Another object of the invention is to provide signal responsive mechanical instrumentalities in receiving telegraph recorders for selectively rendering the recording mechanism and certain of the function mechanisms non-operative in response to signals received following their selective disablement.

The invention features a receiving telegraph recorder which, while at all times responsive to signals, may be selectively precluded from performing recording operations in response to received signals, and also from performing certain functional operations, particularly those which would be undesirable when recording operations are suppressed, such as character spacing, and in the case of page printing recorders, carriage return and line feed operations.

The invention also features a selectively operable instrumentality which may be activated when printing and function operations are not suppressed, for setting in operation a storage transmitter such as a machine transmitter controlled by a perforated tape.

In accordance with the preferred embodiment of the invention the printing telegraph receiver into which the selective printing suppression and transmitter control mechanisms have been incorporated may be of the type disclosed in Patent 1,904,164 granted April 18, 1933, to S. Morton et al., and the disclosure of this patent is incorporated herein by reference as a part of this specification. The printer shown in the foregoing patent is provided with a type-basket which moves longitudinally of a cylindrical page width platen for character spacing and returns to a beginning-of-line position in response to an appropriate selective condition established by a received signal. The type-basket is provided with a set of permutation code bars for selecting the printing elements and these bars are controlled from a set of signal responsive selector vanes through the agency of bell cranks which are mounted on the type-basket and which have one

end forked to embrace and travel along the edge of the selector vanes as the type-basket moves relative to the platen.

The setting of the selector vanes in accordance with received signals is accomplished by a permutation code responsive receiving selector mechanism. The permutation code bars carried by the movable type-basket individually select pull bars that are articulated to the type bars and drop the pull bars into the path of a printing bail which is cyclically operated under the control of a main cam assembly. For the control of various functions the printing telegraph receiver is provided with a plurality of selectable function levers which have notch and lug attributes presented toward the selector vanes. The printing bail, in the initial portion of its movement, permits the function levers to move into engagement with the selector vanes and test the setting thereof. When any function lever finds the selector vanes set in accordance with its notch and lug attributes, it moves an additional distance to select or perform the function for which it is provided. Function levers not finding the selector vanes set in accordance with their notch and lug attributes are blocked against movement a sufficient distance to initiate or perform their functions.

In accordance with the present invention, a universal selectable function lever differs from the other selectable function levers in that it has no lugs by which it may be blocked against full movement by the selector vanes, so that it is movable to its full extent irrespective of the setting of the vanes. When the universal selectable lever has been moved to its fully operated position it interferes with and blocks the printing bail short of the printing stroke so that the printing bail cannot operate a pull bar which may have been selected under the control of the code bars on the type-basket and thus printing will be suppressed. The printer is provided with a slidably mounted bar which has a normal and an off-normal position. This bar is movable to its off-normal position and is restorable to the normal position under the control of certain of the selectable function levers. It is provided with a plurality of lugs for blocking selective movement of some of the selectable function levers. One of these lugs is disposed in the path of the universal selectable or print suppression lever when the slidable bar is disposed in the normal position, so that the universal selectable lever will be incapable of moving to its fully operated position and will thus be incapable of blocking the printing

ball. The other lugs or wards are so disposed on the slidable bar that they are moved into blocking relation to certain of the selectable function levers when the slidable bar is moved to its off-normal position. Among the selectable function levers which become blocked when the slidable bar is in the off-normal positions are those controlling the carriage return and line feed operations. When a plurality of telegraph stations each having a printer as described above are associated with a communication channel, any one of the stations desiring to communicate with one or more of the other stations to the exclusion of the remainder of the stations may do so by sending the proper signals to cause the slidable bar at the stations which are to be excluded to be shifted to the off-normal position. At the excluded stations the selector mechanism will respond to signals thereafter transmitted on the communication channel and those functions the selectable levers of which have not been blocked out by the slidable bar will be performed, which will be an idle operation, but message material corresponding to signals transmitted will not be printed at the excluded stations. At the conclusion of the message transmission a signal is transmitted which causes the slidable blocking bar at the excluded stations to be restored to normal condition, thus restoring the entire system to the initial condition in which any one of the stations is qualified to establish exclusive communication with one or more of the other stations.

As an additional feature of the invention any or each station may be provided with a machine transmitter such as a transmitter controlled by perforated tape. The prepared tape may include signals for selectively excluding those stations of the system for which the message material contained in the tape is not intended. Any station in the system may send signals for selectively starting the tape transmitter local to that station or located at any other station, and the tape transmitter upon being started will transmit the signals for excluding those stations which are not to receive the message material, after which the message signals will be transmitted. The tape may include signals following the message for restoring all of the stations to initial condition and may if desired, contain signals for selectively starting a tape transmitter at another station.

For a complete understanding of the invention reference may be had to the following detailed description to be interpreted in the light of the accompanying drawings wherein:

Fig. 1 is a schematic perspective view showing an all-mechanical printing suppression mechanism for affording selective intercommunication between stations of a telegraph system;

Fig. 2 is a schematic view partly in perspective showing an alternative form of all-mechanical printing suppression mechanism and including an arrangement for selectively starting a storage transmitter;

Fig. 3 is a schematic perspective view showing an electromechanical arrangement for selectively suppressing printing;

Fig. 4 is a vertical sectional view through the receiving printer into which the present invention has been incorporated; and

Fig. 5 is a diagrammatic view showing one arrangement of universal selectable lever and function lever blocking elements.

Referring now to the drawings and particularly to Fig. 4 the reference numeral 11 indicates a

selector magnet the armature 12 of which is carried by a selector lever 13 pivoted at 14. As is fully disclosed in the Morton et al. patent the selector lever 13 controls a plurality of sword levers 16 which are individually articulated to bell cranks 17 pivoted at 18 and individually rocked in counter-clockwise direction once in each receiving cycle by cams 19, one of which is shown in Fig. 4, included in a receiving selector cam assembly mounted on and frictionally driven by a power driven shaft 21. Upon being retracted by their bell crank levers 17, the sword levers 16 are rocked into extreme clockwise or counter-clockwise position depending upon the position of armature lever 13 as determined by selector magnet 11, and when they are shifted rightwardly by their bell cranks 17 as the bell cranks are restored to extreme clockwise position by their individual springs 22, the sword levers rock associated T-levers 23 into extreme clockwise or counter-clockwise position depending upon the rotative position into which the sword levers have been rocked under the control of the selector magnet. The T-levers 23 are articulated by means of disc and slot connections to individual selector vanes 24 that are pivotally supported at their opposite ends by trunnions 26 (Figs. 1, 2, 3 and 4).

A movable type-basket, full structural details of which are shown in the Morton et al. patent, supports permutationally notched code bars 27 that are individually connected to the selector vanes 24 by bell cranks 28, a portion of one of which is shown in Fig. 4. The upwardly extending arm of each bell crank 28 engages one of the code bars 27 and a laterally extending arm of each bell crank 28 terminates in a bifurcated portion 29 which straddles the edge of a selector vane and remains in engagement with the vane while moving along its edge as the type-basket moves for character spacing and carriage return operations. The type-basket pivotally supports a plurality of type-bars 31 which have rack and pinion connection with individual selectable pull bars 32 the foremost ends of which are disposed above and in close proximity to the code bars 27. The pull bars 32 are normally supported with their foremost ends just out of engagement with the code bars 27 by engagement of a sloping cam surface on the lower edge of each pull bar 32 with a blade 33 carried by a reciprocable printing bail 34 which is mounted on the type-basket. Each of the pull bars 32 is provided with a hook 35 near the upper end of the sloping cam surface so that when the printing bail 34 is reciprocated rightwardly as viewed in Fig. 4 and the right-hand end of the pull bars 32 moves downwardly into engagement with the code bars 27, any pull bar which finds an alignment of notches presented to it by the code bars will move still farther downwardly at its right-hand end into the alignment of notches, bringing its hook 35 into the path of blade 33 of printing bail 34 so that as the bail continues to move farther to the right blade 33 will engage the selected pull bar and reciprocate it rightwardly, thus rocking the associated type-bar 31 in counter-clockwise direction to bring its type-carrying face into printing engagement with the paper carried by a printing platen 36.

Printing bail 34 is provided with a depending stud 37 which rotatably supports a roller 38 disposed between a pair of blades 39 supported at the upper end of a printing bail operating arm 41. The roller 38 and blades 39 provide for operative engagement between printing bail 34

and operating arm 41 throughout the path of travel of the type-basket by which printing ball 34 is supported. Operating arm 41 which is supported on rock shaft 42 is urged in clockwise direction by a tension spring 43 which supplies the power for operating the arm 41 and thus the ball 34. A printing cam 44 which is included in the main cam assembly carried by shaft 21 is engaged by a roller 46 (Figs. 1, 2 and 3) carried by a pivoted lever 47 the upper end of which supports an abutment screw 48 which engages the right-hand side of the right-hand one of the operating arm blades 39 as viewed in Fig. 4. The cam 44 operates through lever 47 to restore operating arm 41 to extreme counter-clockwise position and to hold it in said position in the idle condition of the apparatus. When the main cam assembly is released for rotation by the receiving selector cam assembly a sharp drop off of the cam 44 permits the spring 43 to rock printing bail operating arm 41 sharply in clockwise direction to effect the printing operation, and during the remainder of the cycle of the main cam assembly the cam 44 restores operating arm 41 to extreme counter-clockwise position which in turn restores bail 34 to its unoperated position.

Although only one printing bail operating arm 41 has been referred to in the foregoing paragraph it will be understood there are at least two such arms located near the ends of rock shaft 42 and that there may be others intermediate those two. Associated with the end ones of the arms 41 are brackets 51 (Figs. 1, 2 and 3) interconnected by a bar 52 supporting the ends of the function selection control rod 53 which extends parallel to the axes of the selector vanes 24. At the rear of the vanes 24 a plurality of selectable function levers which will be identified hereinafter specifically by individual reference numerals are pivotally mounted on a rod 58. Each of the selectable function levers is provided with two spaced upwardly extending arms. The arm of each individually selectable function lever, which category does not include one or more universally selectable levers, that is nearest to the rear edges of the selector vanes is provided with permutation code combinations of lugs and notches in registry with marking or spacing positions of the rear edges of the selector vanes in inverse relation to the code to which the function lever is to be responsive. When the selector vanes are positioned in accordance with the code to which a selectable function lever is to be responsive, their rear edges are out of registry with the lugs and the function lever is not blocked but is free to rock in clockwise direction as viewed in Fig. 4. However, the rocking of the function levers is normally prevented by bar 53 carried by brackets 51 associated with the print bail operating arm. The rod 53 cooperates with a cam portion of the rear arm of each of the function levers. When the printing bail operating arm 41 is operated by spring 43 the rod 53 is moved downwardly along the cam surface of the rear arm of each function lever and permits the function lever to rock in clockwise direction as viewed in Fig. 4 to test the setting of the selector vanes 24. Any function lever which finds no selector vane blocking its lugs will be rocked in clockwise direction by its associated spring 59 to perform or initiate its assigned function as the case may be.

Those functions which require more power for

their performance than the springs 59 can supply, or the performance of which should be prolonged over a greater interval than that involved in the rocking of its function lever to the extreme clockwise position as viewed in Fig. 4, are performed by a function bail 61 supported by operating arms 62 journaled on rock shaft 42. Associated with one of the function bail operating arms 62 is a cam follower lever arm 63 which supports at its free end a roller 64 which engages cam 66 included in the main cam assembly. When the main cam assembly is rotated the function bail operating arms are positively rocked slightly in counter-clockwise direction by spring 67 under control of cam 66, then in clockwise direction as viewed in Fig. 4 by cam 66 and thereafter the function bail 61 is restored to normal, which is short of extreme counter-clockwise position, by spring 67.

A representative complete set of selectable function levers is indicated in Fig. 5. Those which are usual or standard on telegraph printers of the type shown in the Morton et al. patent are the motor stop lever 66, line feed lever 67, letters or unshift lever 68, unshift on space lever 69, audible signal (bell) lever 71, carriage return lever 72, figures or shift lever 73, universal lever 74 and vane lock lever 76. Special function levers controlling functions pertaining to the present invention are the print and space suppression lever 81, end-of-message lever 82, individual call lever 83, group call lever 84 and transmitter start lever 86. Of the levers enumerated above all have individual arrangements of coding lugs and notches for individual selection except the print and space suppression lever 81, universal lever 74 and vane lock lever 86. Levers 74 and 81 have no code lugs and may rock to the fully selected position irrespective of the setting of the selector vanes 24. As is fully disclosed in the Morton et al. patent the vane lock lever has notches opposite the marking and spacing positions of the edges of the selector vanes 24 for locking them during a selecting operation.

In addition to the five selector vanes 24, there is a sixth vane 87. This vane is not controlled by individual received signal impulses as are the vanes 24 but is controlled by the shift and unshift function levers 73 and 68, respectively. As is fully disclosed in the Morton et al. patent, when the receiving printer has been placed in the unshift or letters condition under the control of the letters function lever 68, the sixth vane 87 is presented in extreme clockwise position which is as shown in Fig. 4. When the receiving printer is placed in the shift or figures condition under the control of the shift function lever 73, the sixth vane 87 is rocked to extreme counter-clockwise position, which position corresponds to that of the lowermost of the selector vanes 24 in Fig. 4, and it remains in this position until the receiving printer is restored to the unshift or letters condition.

The purpose of the sixth vane 87 is to restrict the selection of any desired function lever to a particular case shift condition of the receiving printer. This is accomplished by providing a notch in the function lever opposite the position occupied by the edge of the vane 87, when that vane is disposed in accordance with the case shift condition of the receiving printer in which the function lever is to be selectable. For example, it may be desired that the end-of-message function lever 82 shall be selectable in re-

sponse to the upper case or shift selective condition of the letter H. The lowermost notch in this function lever will accordingly be disposed opposite the position occupied by the vane 87 when that vane occupies the extreme counter-clockwise or shift position. With the vane 87 occupying this position and the selector vanes 24 positioned in accordance with the code combination representing the letter H, the function lever 82 will not be blocked by any of the vanes 24 or 87 but will be capable of rocking to its fully selected position. When the code combination for the letter H is received, with the vane 87 rocked to its extreme clockwise or letters position, the function lever 82 will be incapable of rocking to the fully selected position in response to the selective condition presented to it by the five selector vanes 24 because it will be blocked by the sixth vane 87.

In accordance with the present invention the receiving printer is provided with a bar 91 slidably supported on pins 92 extending through slots 93. In the idle condition of the receiving printer bar 91 occupies its extreme left-hand position. Bar 91 pivotally supports in registry with the print and space suppression function lever 81, a blocking ward 94 which is drawn against stop pin 96 by spring 97 so that it is capable of rocking only in clockwise direction. Bar 91 is also provided with pivotally mounted blocking ward 98 disposed just out of registry with carriage return function lever 72 and drawn against stop pin 99 by spring 101. Pin 99 is disposed to the right of blocking ward 98 so that the ward is capable of rocking only in counter-clockwise direction. Bar 91 is also provided with fixed blocking ward 102 just out of registry with group call function lever 84, fixed blocking ward 103 just out of registry with individual call function lever 83 and fixed blocking wards 104 and 106 (Fig. 5) just out of registry with audible signal function lever 71 and line feed function lever 67, respectively. Thus with slidable bar 91 presented in the normal position only the print and space suppression function lever 81 is blocked by it and all of the other function levers are selectable in the normal manner.

Bar 52 associated with the printing bail is provided with a forwardly extending arm 107 which carries an upturned flange 108 overlying the top of the rear arm of the print and space suppression function lever 81. With function lever 81 blocked against operation by blocking ward 94, flange 108 moves down in front of the rear arm of lever 81 when the printing bail is operated, function lever 81 being prevented by ward 94 from coming forward under the control of rod 53. When blocking ward 94 is moved clear of function lever 81 under circumstances which will be described hereinafter, the function lever will be free to move forward as bar 53 rides down the sloping portion of the forward edge of the rear arm of the function lever. When rod 53 has reached the bottom of this slope on the edge of the rear arm of function lever 81, the lever will have reached its fully operated position and will have brought the upper end of the rear arm underneath flange 108 to arrest the entire printing bail structure sufficiently short of its full operating stroke to prevent blade 33 of the printing bail 34 (Fig. 4) from operating any one of the pull bars 32 which may have been selected by code bars 27. Thus the printing of a character on the type bar 31 associated with any pull bar 32 that may have been selected will be pre-

vented and printing will be suppressed. As is fully disclosed in the Morton et al. patent, character spacing is controlled by the printing bail mechanism, the type-basket carriage being moved one character space longitudinally of platen 36 for each full operation of the printing bail. Flange 108 when it engages the top of the rear arm of function lever 81 so limits the operation of the printing bail mechanism that the character spacing mechanism is not operated so that spacing is suppressed as well as printing.

Slidable bar 91 is movable rightwardly to move blocking ward 94 out of registry with function lever 81 and to move the other blocking wards into registry with their respective function levers by three-armed lever 111 pivoted at 112. The upwardly extending arm of lever 111 is disposed in a slot in slidable bar 91. The leftwardly extending arm of lever 111 is disposed beneath a forwardly extending arm 113 of function lever 82 a distance equal to the amount of travel of the free end of arm 113 of lever 82 from its unoperated to its fully operated position. The rightwardly extending arm of lever 111 has a laterally extending portion disposed below a forwardly extending arm 114 of function lever 72 by a distance equal to the width of the wide end portion of an interponent bar 116. The wide end portion of bar 116 rests on the laterally extending portion of the right-hand arm of lever 111 and the left-hand end of interponent 116 is pivoted to the upper end of arm 117 of a lever 118 pivoted at 119. The rightwardly extending arm of lever 118 is disposed beneath the forwardly extending arms 121 and 122 of individual and group call function levers 83 and 84, respectively. The leftwardly extending arm of lever 118 has an upwardly extending portion at its end which terminates at the same level as the leftwardly extending arm of lever 111 beneath the forwardly extending arm of end-of-message function lever 82.

Before proceeding with the description of the operation of levers 111 and 118 the communication system of which the receiving printer is a part will be described. The selector magnet 11 for controlling the receiving printer is connected in series with a set of transmitting contacts 126 which may be keyboard operated, and with a break key 127 in a way-wire or party line communication channel 128 which includes telegraph battery 129. The way-wire communication channel 128 may include a plurality of similar stations, two of which are indicated by the reference numerals 131 and 132. It will be apparent that with the selector magnets and transmitting contacts of all of the stations connected in the line in series, signals may be transmitted by the transmitting contacts at any of the stations and will be received by the selector magnets at all of the stations.

Assume that the system is in the idle condition and that the station having selector magnet 11 desires to communicate with station 131 to the exclusion of station 132. The attendant operates transmitting contacts 126 to transmit the code combination for the selection of the individual call function lever 83 at his own station. This function lever upon being selected rocks to its fully operated position and by means of its forwardly extending arm 121 rocks lever 118 in clockwise direction about pivot 119. An over-centering spring 133 is distended between spring post 134 carried by arm 117 of lever 118 and a fixed spring mounting, and as lever 118 rocks

to clockwise position the axis of spring 133 moves across the axis of pivot pin 119 from left to right and holds lever 118 operated to clockwise position. The upwardly extending portion of the left-hand arm of lever 118 moves upwardly and substantially closes the gap between itself and the end of the forwardly extending arm 113 of end-of-message function lever 82. The arm 117 of lever 118 moves interponent bar 116 to the right, moving the wide end portion out from between the forwardly extending arm of function lever 72 and the laterally extending portion of the right-hand arm of lever 111.

The attendant next transmits the code combination for the operation of a lever corresponding to the lever 118 at station 131. The lever at station 132 corresponding to the lever 118 is not operated. Thereafter the attendant transmits the code combination for the selection of function lever 72 and this lever is selected and operated at all of the stations. At the stations which have had their levers 118 operated to clockwise position the widened end portion of interponent bar 116 is moved away from arm 114 of function lever 72 and the arm 114 cannot import movement to the right-hand arm of lever 111 because it does not come into engagement with the narrow portion of interponent bar 116 until it has substantially reached its fully operated position. At the station 132 the interponent bar corresponding to bar 116 has remained unoperated and its widened end portion occupies the full space between arm 114 of lever 72 and the laterally extending portion of the right-hand arm of lever 111. With this condition the function lever 72 operates, through its arm 114, the wide portion of interponent bar 116 and the left-hand arm of lever 111 to rock that lever in clockwise direction and thus to shift bar 91 at station 132 to its extreme right-hand position. By this operation blocking ward 94 at station 132 is moved out of registry with the print and space suppression function lever 81 and all of the other blocking wards are moved into registry with their respective function levers. It is to be noted that the function lever 72 has the pivoted blocking ward 98. A fixed blocking ward could not be employed because function lever 72 is the instrumentality for shifting bar 91 to its extreme right-hand position and the ward would move into engagement with the left-hand side of function lever 72, thus blocking further movement of bar 91 and through it further movement of function lever 72. With the pivotally mounted blocking ward 98 the ward rocks in counter-clockwise direction, spring 101 permitting this movement, and when function lever 72, having reached its fully operated position, is retracted by rod 53 associated with the printing bail structure, spring 101 draws pivoted blocking ward 98 into position against stop pin 99, blocking function lever 72 against being selected and operated.

This completes the operations necessary to qualify any two or more stations selectively and to exclude the other stations. At the station having the selector magnet 11 and at station 131, bar 91 remains unoperated, function lever 81 remains blocked against movement into print and space suppressing position, and none of the other function levers is blocked. At station 132 and all other excluded stations, function lever 81 is unblocked, and in response to each signal combination transmitted over the line function lever 81 moves forward as the printing bail begins to operate and blocks the printing bail short of

printing and spacing operation thus preventing the printing of characters in response to received signals and also preventing character spacing operation of the type-basket carriage. The functions that are suppressed at the excluded station are carriage return, by means of blocking ward 98, line feed, by means of blocking ward 106 (Fig. 5) individual call function, by means of blocking ward 103, group call function, by means of blocking ward 102 and audible signal bell function, by means of ward 104. With line feed suppressed blank paper will not be advanced past the printing position as the paper is fed at the stations which are participating in intercommunication. With the individual and group call function levers blocked the selector mechanisms at the excluded stations are prevented from seeking to condition their receiving printers for participation in the communication in response to their selective signals occurring in the message material transmitted between the participating stations. With the carriage return function lever 72 blocked, not only are attempted carriage return operations responsive to the carriage return signal suppressed but the carriage return function lever 72 is prevented from repeatedly operating into engagement with the wide portion of interponent bar 116. A detent spring 136 cooperates with notches in the slidable bar 91 to hold the bar in either the normal or the off-normal position. Bar 91 is provided with a projection 137 which engages the operating spring of a pair of contacts 138 when bar 91 is moved to the right-hand or off-normal position to close the contacts 138. The contacts, upon being closed, short circuit the transmitting contacts and the break key so that at the excluded station operation of the transmitting contacts or the break key cannot interfere with signal transmission on channel 128.

The printers are restorable to the normal or idle condition by the operation of the end-of-message function lever 82. This function lever is selectable in response to a particular code combination and, in addition, is blocked most of the time at all stations by blocking lever 141 pivoted at 142. A link 143 has its left-hand end pivoted to blocking lever 141 and has at its right-hand end a laterally extending portion 143 disposed between leaf springs 144 carried by the vertical arm of a T-lever 146. T-lever 146 has its left-hand horizontal arm disposed under forwardly extending arm 147 of figure shift function lever 73 and has its right-hand horizontal arm disposed below the undercut end of the forwardly extending arm 148 of universal selectable lever 74 which, like the print and space suppression function lever 81, has no code notches or lugs presented toward the selector vanes 24 and the sixth vane 87, and is operable to its fully operated position in each receiving cycle of the receiving printer irrespective of whether printing is suppressed or permitted. Spring 149 for operating figures shift function lever 73 is stronger than spring 151 for operating universal selectable lever 74. When the figures shift combination is transmitted over channel 128 and is received at all stations the figures shift function levers 73 at all stations operate to their fully operated position. At the same time the universal selectable lever 74 is permitted to operate. Lever 73 seeks to operate T-lever 146 to extreme counter-clockwise position and lever 74 seeks to operate T-lever 146 to extreme clockwise position. Since spring 149 is stronger than spring 151, lever 73 prevails and rocks T-lever 146 to extreme coun-

ter-clockwise position. Lever 146 is provided with an overcentering spring 152 which holds the T-lever in extreme position in either direction. As T-lever 146 is rocked to extreme counter-clockwise position it moves link 142 rightwardly thus withdrawing the blocking shoulder of lever 141 from the operating path of arm 113 of end-of-message function lever 82. With lever 141 withdrawn from blocking relation to lever 82, the latter lever is operable in response to the end-of-message code. In operating to its fully operated position in response to that code it engages the right-hand arm of lever 111 and the right-hand arm of lever 118 and restores these two levers to their extreme counter-clockwise positions, thus restoring slidable bar 91 to normal or extreme left-hand position and restoring the wide portion of interponent bar 116 to its normal position between the arm 114 of carriage return function lever 72 and the laterally extending portion of the right-hand arm of lever 111. At the stations which had participated in the communication, only the lever 118 had been operated to extreme clockwise position, the lever 111 having remained in extreme counter-clockwise position and, accordingly, only the lever 118 is restored, the overcentering spring 133 holding it in the restored position. At the stations which had been excluded from participation in the communication, only the lever 111 had been rocked to extreme clockwise position, the lever 118 remaining in extreme counter-clockwise position and, accordingly, only the lever 111 is restored at those stations.

At the stations at which printing had been suppressed the print and space suppression function lever 81 has not been blocked and accordingly it moves to its fully operated position along with end-of-message function lever 82 as the latter restores slidable bar 91 to its left-hand or normal position. Pivoted blocking ward 94 permits the movement of slidable bar 91, by yielding as it encounters the side of lever 81 during the operation of the lever. Upon the restoration of lever 81 to unoperated position by rod 83 spring 97 snaps blocking ward 94 into blocking relation to lever 81.

It will be noted that universal selectable lever 74 operates concurrently with end-of-message function lever 82 during the restoration of slidable bar 91 to normal position. Since the figures shift function lever 73 does not operate at this time the T-lever 146 is acted upon only the universal selectable lever 74 and accordingly this lever restores the T-lever 146 to its clockwise position. Lever 146 seeks to move link 142 leftwardly to restore blocking lever 141 to blocking relation to arm 113 of end-of-message function lever 82 but as the latter lever is in process of being operated blocking lever 141 encounters the side of arm 113 of lever 82 and further movement of link 142 leftwardly is prevented. The right-hand leaf spring 144 of lever 146 yields and permits T-lever 146 to be operated fully to its clockwise position although leftward movement of link 142 is prevented. Overcentering spring 152 passes across the axis of pivotal movement of lever 146 as the lever is rocked to its clockwise position and holds the lever in that position. Upon the restoration of end-of-message function lever 82 to normal position by rod 53 the arm 113 of that lever clears the right-hand side of blocking lever 141 whereupon the right-hand leaf spring 144 completes the leftward movement of

link 142 and blocking lever 141 is moved into blocking relation to arm 113 of lever 82.

Assume now that figures shift lever 73 had been operated not in preparation for operation of end-of-message function lever 82 but that it had operated in response to figures shift signal transmitted as part of the message being transmitted between the participating stations, as for the recording of figures as part of the message. Figures shift lever 73 and the universal selectable lever 74 would operate concurrently as previously described, lever 73 prevailing over lever 74 and rocking T-lever 146 to extreme counter-clockwise position at all stations, thus unblocking end-of-message function lever 82. The next signal transmitted might represent a figure or any selected condition except that to which the end-of-message function lever 82 is responsive. Under these circumstances the universal selectable lever 74 would be operated incident to the reception of such code but the function lever 73 would not be operated. Universal selectable lever 74, in operating, would restore T-lever 146 to clockwise position and would restore blocking lever 141 to blocking relation to arm 113 of end-of-message function lever 82. If thereafter the code combination for the selection of end-of-message function lever 82 should be inadvertently transmitted while the printers remained in the shift or figures condition, selectable function lever 82 would not be operated in response to the selective condition presented to it because it would be prevented from operating by blocking lever 141. The provision of the arrangement for operation of T-lever 146 to counter-clockwise position by the differential control of levers 73 and 74 and for the restoration of T-lever 146 to clockwise position by lever 74 operating alone assures the operation of end-of-message function lever 82 only in response to a specific sequence of code combinations, namely, the figures shift code for selecting and operating its function lever 73 followed by the end-of-message code for selecting and operating end-of-message function lever 82. Should any other code intervene these two, the universal selectable lever 74 will operate in response to such code to restore T-lever 146 to clockwise position, restoring blocking lever 141 to blocking relation to function lever 82. With this arrangement it is immaterial whether function lever 82 is notched to be selectable only when the sixth vane 87 is presented in the figures shift position, in which position the edge of vane 87 presented toward the function levers is in its lower position, or whether function lever 82 is notched so that vane 87 will not block it in either position. The combination of elements comprising blocking lever 141, link 142, T-lever 146 and function levers 73 and 74 prevents operation of function lever 82 except when the end-of-message code follows the figures shift code without any other code intervening.

With slidable bar 91 restored to its extreme left-hand position detent spring 136 detents the bar in this position by engaging the outer notch and projection 137 moves away from the operating springs of contacts 138, permitting them to reopen to remove the shunt around transmitting contacts 126 and break key 127 at the excluded stations. In this way all of the stations have been restored to the initial or idle condition.

If instead of desiring to communicate only with station 131, the station which has selector magnet 11 had desired to communicate with all stations, it would not have been necessary to

transmit the individual call code combination of any of the stations. Instead, it would have been necessary to transmit only a single code combination which is the group station call and effects the selection of group call function lever 84. The notch and lug attributes of the group call function levers at all stations are identical so that those levers are selected and operated in response to the group call code combination. At each station the group call function lever 84 operates through its forwardly extending arm 122 upon lever 118 in the same manner that the differently coded individual call function levers 83 operate, to rock lever 118 to extreme clockwise position and move the wide end portion of interponent bar 116 out of motion transmitting relation between arm 114 of lever 72 and the lateral projection of the right-hand arm of three-armed lever 111. Under these circumstances it is not necessary to transmit the carriage return code signal which also serves as the lock-out or station excluding signal, as previously described, unless for the purpose of actually performing a carriage return operation at all stations, because slidable bar 91 is not to be shifted to its right-hand or off-normal position at any station and, accordingly, there is no operation to be performed by the forwardly extending arm 114 of carriage return function lever 72. As a practical matter there is no objection to providing, as a standard operating procedure in connection with individual station calling operations or group station calling operations, that the carriage return function lever 72 shall be operated as a part of the routine of setting up any communication condition, whether individual or group signaling condition.

The provision for operation of slidable bar 91 by the carriage return function lever 72 is a matter of convenient utilization of the selective possibilities of the permutation code. It is a usual custom to transmit carriage return before message transmission is started in order that the characters at all of the printers shall be brought into corresponding positions with message recording starting at the beginning of a line. By tying in the enablement of the print and space suppression function lever 81 and the disablement of certain other function levers with the carriage return function lever, it does not become necessary to allot a separate code for this purpose. Furthermore, the arm 114 of lever 72 operates idly at stations participating in communication when the carriage return function lever is operated to trip the carriage return lever 153 at the end of each line of message material transmitted, because at those stations the wide end portion of interponent bar 116 is moved out of motion transmitting relation between arm 114 and the right-hand arm of lever 111 so that the slidable bar 91 will not be shifted to disable the printers participating in the message transmission. At the excluded stations the carriage return function lever 72 is blocked by blocking ward 98 so that the carriage return operation will be suppressed although this operation, if permitted, would be idle because character spacing is suppressed by the print and space suppression function lever 81 and the carriages remain in their beginning-of-line position.

In the embodiment of the invention shown in Fig. 2, the function levers 73 and 74 are not employed in the selective exclusion of stations from participating in telegraphic intercommunica-

tion, nor in the restoration of all stations to idle condition after message transmission is concluded, these functions being controlled by the function levers 81, 82, 83, 84 and 72. The lever systems which are controlled by these function levers are considerably different from those employed in the embodiment of the invention shown in Fig. 1 and in addition the function lever 86 is employed for controlling the starting of a storage transmitter. Referring to Fig. 2 the individual station call function lever 83 and the group station call function lever 84 have individual forwardly extending arms 201 and 202, respectively, which terminate above the horizontally extending arm of a bell crank lever 203, pivoted at 204 and urged in clockwise direction by spring 206. Spring 206 normally holds the vertically extending arm of bell crank 203 against a fixed stop 207 which limits the clockwise movement of bell crank 203. At the upper end of the vertical arm of bell crank lever 203 an interponent bar 208 is pivotally connected. Interponent bar 208 rests on the laterally extending portion of the right-hand arm of a three-armed lever 209 and is provided with a wide portion disposed in motion transmitting relation between the forwardly extending arm 211 of carriage return function lever 72 and the right-hand arm of lever 209. When either of the function levers 83 and 84 is operated for individual or group station selection, bell crank lever 203 is rocked in counter-clockwise direction about pivot 204 and moves interponent bar 208 leftwardly to retract the wide portion thereof out of motion transmitting relation between arm 211 of function lever 72, and the right-hand arm of lever 209. A latch 212 for bell crank 203 is pivoted at 213 and is urged in clockwise direction against the end of the horizontally extending arm of bell crank 203 by spring 214. When bell crank 203 is operated counter-clockwise by either of the function levers 83 and 84 the free end of its horizontally extending arm moves clear of the latching shoulder of latch 212, permitting spring 214 to rock latching lever 212 clockwise and block or latch bell crank 203 in the extreme counter-clockwise or operated position. Following the selective operation of function levers 83 or 84 at the stations which are being selected for participation in message transmission and reception, the carriage return code combination is transmitted and this causes the function lever 72 to be operated at all stations. At the stations at which the bell crank lever 203 has not been operated to extreme counter-clockwise position and latched the wide portion of interponent bar 208 will be disposed between arm 211 of function lever 72 and the rightwardly extending arm of three-armed lever 209 and this lever will be rocked in clockwise direction. At the stations having their bell crank levers 203 operated to counter-clockwise position the wide portion of interponent bar 208 will be retracted out of motion transmitting relation between arm 211 of function lever 72 and the rightwardly extending arm of lever 209 and no movement will be imparted to the lever 209.

The upwardly extending arm of lever 209 is articulated to blocking bar 91 and shifts the bar from its extreme left-hand to the extreme right-hand position. This removes blocking ward 94 from blocking relation to print and space suppression function lever 81 and permits that lever to rock into blocking relation to the printing bail operating mechanism in subsequent re-

ceiving cycles. Blocking ward 103 moves into blocking relation to individual call function lever 83 and blocking ward 102 moves into blocking relation to group call function lever 84 and these levers are prevented from being selected. Blocking ward 98 moves into blocking relation to carriage return function lever 72 and prevents that function lever from being selected thereafter. If the blocking bar 91 is provided with blocking wards 104 and 106 shown in Fig. 5 for blocking bell function lever 71 and line feed function lever 67, respectively, those function levers will be prevented from responding to their selecting signals thereafter received. At the stations which have been conditioned for participation in message transmission and reception, at which the blocking bar 91 has not been shifted, only the print and space suppression function lever 81 will be blocked and this function lever will not interfere with the normal printing operation.

The stations may be restored to the normal or idle condition by the transmission of the end-of-message code combination to which function lever 82 is responsive. The forwardly extending arm of this lever is provided with two parallel arms, one of which is disposed above the upwardly extending free end of the right-hand arm of three-armed lever 209 and the other of which is disposed above an adjustable abutment screw 217 carried by latching lever 212. Upon the operation of end-of-message function lever 82 the upper arm 217 thereof restores three-armed lever 209 to extreme counter-clockwise position, thus shifting blocking bar 91 to its left-hand position at those stations which have been excluded from participation in message transmission. The lower arm 218 of function lever 82 rocks latching lever 212 in counter-clockwise direction to release the bell crank lever 203 for restoration to normal position by its spring 206 at stations which have been participating in the message transmission. With bell crank lever 203 so restored the wide portion of interponent bar 208 is restored to effective position between arm 211 of function lever 72 and the right-hand arm of three-armed lever 209.

As shown in the lower right-hand corner of Fig. 2 the station may have in addition to keyboard transmitter 126 a tape transmitter distributor 226. This unit may be of the type shown in Patent 2,055,567, granted September 29, 1936, to E. F. Watson. The disclosure of the Watson patent is incorporated herein by reference as part of the present specification. The distributor comprises a ring of segments and a continuous or collector ring bridged by interconnected brushes carried by a brush arm 227. Brush arm 227 is secured to distributor shaft 228 which is driven from motor 229 through friction clutch 231 and gears 232 and 233. Shaft 228 has secured thereto a stop cam 234 which is engageable with armature lever 236 of start magnet 237 for arrestment of cam 234 and shaft 228 when the start magnet 237 is deenergized. The transmitter of this unit comprises tape sensing contact tongues 241 which sense perforations in a perforated tape 242 and selectively engage transmitting contacts connected to the segments of the distributor, under the control of the perforations in the tape. Tape for controlling the transmission of signals may be prepared by means of keyboard perforator 243 which may be of the type shown in Patent 1,182,179, granted May 9, 1916, to C. L. Krum et al. The disclosure of the Krum et al. patent is incorporated herein by reference as part of the present specification.

A conductive path including start magnet 237 is traced from the upper terminal of a source of power 246 through conductor 247, taut tape contacts 248 which are assumed to be closed if a supply of tape is disposed between keyboard perforator 243 and tape transmitter distributor 226 awaiting transmission, conductor 249, winding of start magnet 237, conductor 251, manually operable switch 252 which is assumed to be closed, tape out contacts 253 which are closed if a supply of tape is awaiting transmission, conductor 254, send-receive-break contacts 256 which are normally closed but which open upon reception of a break signal, conductor 257, winding of relay 258, conductor 259 to one of the contact springs of a normally open pair of contacts 261. From the other spring a path is traced through conductor 262 to the lower terminal of power source 246. A path to the lower contact spring of contact 261 is also traced from the upper terminal of power source 246 through resistor 263, manually operable switch 252, tape out contacts 253, conductor 254, send-receive-break contact 256, conductor 257, winding of relay 258 and conductor 259 to the lower contact spring 261.

Contacts 261 are closable momentarily by a transmitter starting function lever 86 when the wide portion of an interponent bar 271 is disposed between the forwardly extending arm 272 of function lever 86 and the upper contact spring of contacts 261. Interponent bar 271 is pivoted to the end of a link 273 which is pivoted to the upwardly extending arm of a three-armed lever 274 and is supported near its right-hand end by a pin 276 disposed in slot 277. Interponent bar 271 is urged in counterclockwise direction by spring 278 against a stop 279 carried by link 273. Interponent bar 271 is thus capable of rocking in clockwise direction upon its pivotal mounting on link 273 under the control of transmitter starting function lever 86 to close contacts 261 while link 273 remains in a fixed plane.

The right-hand arm of three-armed lever 274 is disposed under the forwardly extending arm 211 of carriage return function lever 72 without any intermediate interponent link, so that three-armed lever 274 will invariably be rocked in clockwise direction when function lever 72 is operated, to move link 273 rightwardly, thereby moving the wide portion of interponent bar 271 out of motion transmitting relation between arm 272 of function lever 86 and contact 261. The left-hand arm of three-armed lever 274 is disposed beneath the upper arm 217 of end-of-message lever 82 so that three-armed lever 274 will be restored to extreme counter-clockwise position upon the transmission of end-of-message signal, thus restoring link 273 to its leftward position and restoring the wide portion of interponent bar 271 to motion transmitting relation between arm 272 of function lever 86 and contact 261. A detent spring 281 cooperates with either of two notches in link 273 to retain the link in its left-hand or right-hand position until the link is moved to the other position by three-armed lever 274.

The transmitter starting function lever, exemplified by lever 86, is individually coded at each of the stations associated with communication channel 128 so that the tape transmitter distributors at two stations cannot be started simultaneously in response to a single selecting code combination. The transmitter starting function levers will be effective to operate contacts 261 only when the system is in the idle condition with the blocking bars 91 at all of the sta-

tions shifted to their left-hand positions, because upon the operation of carriage return function lever 72 following the qualifying of certain stations by the selective operation of their function levers 83 or 84, three-armed lever 274 will be rocked to extreme clockwise position at all stations to shift link 273 rightwardly and remove the wide portion of interponent bar from effective relation between arm 272 of function lever 86 and contacts 261. With the stations in the idle condition any one of the stations may transmit a code combination to start its own tape transmitter distributor or that of any other station. Assume, for example, that at the station shown in detail in Fig. 2, a message has been perforated in tape 242 which is to be transmitted to station 231 and that switch 252 has been closed, the tape has been placed in the transmitter-distributor so that tape out contacts 253 are closed and that there is a sufficient loop of tape between keyboard perforator 243 and the transmitter to permit taut tape contacts 248 to be closed. Keyboard transmitter 126 may be operated to effect the transmission of codes for the selection of individual call function lever 83 in Fig. 2 and the selection of the corresponding function lever at station 131. Thereafter the transmitting contacts 126 are operated to effect the selection of function lever 86 at the station shown in detail in Fig. 2. This function lever operates and rocks interponent bar 271 in clockwise direction to close contacts 261 momentarily. These contacts complete the energizing circuit for start magnet 237 of transmitter distributor 226 and relay 258 in series with manually operable switch 252, tape out contacts 253 and taut tape contacts 248. The armature and front contact of relay 258 close a path in shunt with contacts 261 and in substitution therefor to hold relay 258 and start magnet 237 energized upon the opening of contacts 261.

The first code combination in tape 242 should be the carriage return code combination which is used as the lock-out or disabling function and which causes three-armed lever 209 to be rocked in clockwise direction at all stations except that shown in detail in Fig. 2 and the station 131, and which also causes three-armed lever 274 to be rocked to clockwise position at all stations. At the excluded stations the blocking bar 91 is shifted to the right to effect the suppression of printing and to block certain other functions as previously described and at all stations wide portion of interponent bar 271 is shifted out of alignment with arm 272 of function lever 86 and contacts 271, so that the operation of function lever 86 at any station in response to a code combination occurring as part of the message to be transmitted will not start another tape transmitter distributor. Thus it is not necessary to provide a blocking ward on blocking bar 91 for function lever 86 and even if the blocking bar 91 should be provided with a blocking ward for function lever 86 such blocking ward would not suppress the operation of the transmitter starting function lever 86 at stations participating in message transmission and reception because blocking bar 91 remains in its extreme left-hand position at those stations. By virtue of the shifting of interponent bar 271 out of effective position before message transmission begins code combinations representing message characters may be assigned to the selection of the function levers 86 at the several stations because the function levers 86 are disqualified against starting their associated

transmitter distributors before message transmission actually begins.

If during transmission from the tape transmitter distributor 226 the loop in tape 42 should be taken up by the transmitter, which may occur if the operation of keyboard perforator 243 lags behind the operation of the transmitter distributor 226, the taut tape contacts 248 may be opened. These contacts will open the energizing circuit for start magnet 237, but resistor 263 is connected in shunt with start magnet 237 and taut tape contacts 248, so that the energizing circuit for relay 258 will be maintained through resistor 263, manually operable switch 252, tape out contacts 253 and the armature and front contact of relay 258. As soon as a supply of tape is again available, as a result of further operation of the keyboard perforator 243, taut tape contacts 248 will reclose and reestablish the energizing circuit for start magnet 237. By virtue of the provision of resistor 263, relay 258 is not released to preclude further transmission when a taut tape condition occurs, but is only released upon the opening of manually operable switch 252 or of tape out contacts 253.

At the end of the message perforated in the tape 242 the end-of-message signal should be perforated and if there is to be no further transmission from this particular tape transmitter distributor the tape may be severed from the supply in the keyboard perforator. When the end-of-message combination reaches the tape sensing position that signal will be transmitted, causing the end-of-message function lever 82 to be operated at all stations. This will cause the three-armed lever 209 at the stations which were excluded and the three-armed lever 274 at all stations to be restored to their extreme counterclockwise positions. As the severed end of tape 242 runs through the tape sensing mechanism it causes the tape out contacts 253 to open. In this way the energizing circuit for start magnet 237 and relay 258 is interrupted, transmitter distributor 226 is stopped, relay 258 interrupts its holding circuit and the transmitter distributor cannot be restarted except by operation of contacts 261.

Another way in which the system may be operated is to provide ahead of the message code perforations in tape 242 the station calling code combinations for the station call function lever 83 at the station from which the message is to be transmitted and at the stations which are to receive the message, or the common group calling code combination for operating the function lever 84 at all stations may be perforated in the tape. It is then necessary to transmit by means of the keyboard transmitter 126 only the code combination for selecting the transmitter starting function lever 86, which will effect the closure of contacts 261 and the starting of tape transmitter distributor 226. The code combinations for selecting the local station and the stations that are to receive the message will be transmitted by the tape transmitter distributor 226. These code combinations should be followed in the tape by the carriage return code combination which is effective to exclude all other stations and to prevent the starting of a tape transmitter distributor at any other station. The tape transmitter distributor will continue to operate, with the exception of possible interruptions under the control of taut tape contacts 248 if the preparation of tape in keyboard perforator 243 lags behind the transmission of signals from the tape, until the

end of message signal is transmitted at the end of the message. This signal will cause all stations to be restored to the idle condition and if the tape has been severed as previously described and runs out of the transmitter the tape out contacts 253 will open to stop the transmitter and release relay 258.

It will be apparent that the tape transmitter distributor at any station may be started under the control of any other station upon transmission therefrom of the proper transmitter starting code combination provided that manually operable switch 252, tape out contacts 253 and taut tape contacts 248 are closed at the station at which the function lever 86 is operated. Thus any one of the stations might be designated as a principal or central station to transmit in rotation or roll call manner at stated intervals the transmitter starting code combinations for the several stations. Upon transmitting the transmitter starting code the station having its transmitter starting function lever 86 responsive to that code will momentarily close its contacts 261. If tape is contained in its transmitter distributor awaiting transmission and the manually operable switch, tape out contacts and taut tape contacts are closed, the transmitter distributor will be started. At the station which transmitted the transmitter starting code combination one of three things will happen. The receiving printer will be conditioned to receive the message if the message is intended for that printer alone or along with other printers and this will inform the attendant that the called transmitter had tape awaiting transmission and has begun transmission. In the event that the printer at the station which initiated the transmitter calling signal is to be excluded from receiving the message the selector mechanism of that printer will operate but printing will be suppressed. This will indicate to the attendant that the called transmitter had tape awaiting transmission but that the message was not intended for his station. Finally the selector mechanism of his printer may remain idle. This indicates that the called transmitter had no tape awaiting transmission and the attendant may then transmit the transmitter calling signal of the next station in the roll call and this procedure may be continued until a tape transmitter responds to the calling signal and begins to transmit.

When the tape transmitter distributor 226 has once been activated by energization of the relay 258, it continues to transmit until it is disabled by opening of manually operable switch 252, by opening of tape out contacts 253 or by opening of the send-receive-break contacts 256. Tape 242 may contain several messages intended for different stations or different combinations of stations. Each of the several messages in the tape should be preceded by the calling or activating code combination of the printer at that station and of the stations which are to receive the message and the carriage return lock-out code combination, and should be followed by the end-of-message code combination. At the completion of transmission of any one of the messages the end of message signal will cause all of the stations to be restored to the idle condition, the station calling signals will cause the several stations to be conditioned for message reception and the carriage return signal will exclude the stations which are not to receive the message. When the message end signal at the end of the last message has been transmitted the tape if severed

will run out and effect the release of the transmitter and its controlling relay 258 as previously described.

It will be noted that whereas in the embodiment of the invention shown in Fig. 1 only the selector magnet 11 and the keyboard transmitter 126 are in series with the line 128 at any station, in the embodiment shown in Fig. 2, the distributor of tape transmitter distributor 226 is added to this series of elements so that the line circuit may be interrupted either by the keyboard controlled transmitting contacts 126 or by the segments of the distributor. As previously stated, when the blocking bar 91 is shifted to its right-hand position it closes contacts 138 which short-circuit the transmitting contacts 126 and prevent the opening of the line at those contacts. At the station shown in Fig. 2 the contacts 138 are connected in such a way that when closed they short-circuit the tape transmitter distributor as well as the keyboard transmitter, so that neither can effect the opening and closing of line 128 when contacts 138 are closed. It follows from this that when a tape transmitter is placed in operation the receiving printer at that station must be one of those conditioned to receive the transmitted message because if the printer is excluded from printing the message by the shifting of blocking bar 91 to its right-hand position contacts 138 will be closed and the signals which the tape transmitter distributor 226 attempts to generate will not be impressed upon the line.

The break contacts 127 have been so located in the station circuit that they are not effective to open the line circuit when the contacts 138 are closed. This prevents excluded stations from interfering with or interrupting transmission. If it is desired that any station whether participating in message transmission or excluded, shall be capable of transmitting a break signal, this may be accomplished by placing the break key 127 in a different position in the portion of line 128 associated with the station, such as ahead of selector magnet 11. With the break key 127 so located the short-circuiting contacts 138 for the transmitter do not short-circuit the break key and it is always effective to interrupt the line for effecting the transmission of a break signal.

The inclusion of the send-receive-break contacts 256 in the energizing circuit of relay 258 permits a station which is receiving a message from the tape transmitter distributor to stop transmission from the tape in order to gain control of the line for the purpose of transmitting a rush message or for requesting the repeated transmission of a portion of the message which may have been lost. The Morton et al. patent hereinbefore identified discloses contacts corresponding to the contacts 256 which are operated in response to the reception of a break signal for stopping a tape transmitter. These contacts upon being opened release the relay 258 and the start magnet 237 in the same way that the tape out contacts 253 release them and thus stop the transmitter and prevent it from being restarted, except in the manner hereinbefore described. The station which transmitted the break signal may then transmit the request for repeated transmission of a part of the message, or if it has a rush message to transmit, may transmit the end-of-message signal, thus restoring all stations to normal, after which the signals for qualifying stations to which the rush message is to be transmitted and for excluding all other stations may be transmitted. Thereafter the rush message

may be transmitted and this message should be followed by the message end signal for restoring all of the stations to normal condition.

When tape transmitter distributor 226 is to be restarted, it is necessary for all stations to be in the normal condition in order that contacts 261 may be actuated. If the break signal was transmitted for the purpose of permitting transmission of a rush message such message would ordinarily be followed by the message end signal as described in the foregoing paragraph so that the stations will be restored to the normal condition. If the break was transmitted for the purpose of requesting retransmission of a part of the message from the tape, the request could have been transmitted from one of the participating stations without restoring the system to normal. Under these circumstances the attendant at the station where tape transmission has been interrupted, such as at the station shown in detail in Fig. 2, should transmit the message end signal by means of keyboard transmitter 126 in order to restore three-armed levers 209 and 274 to extreme counter-clockwise position. It is then necessary to transmit the code combinations for qualifying the local printer to record the message material which is about to be transmitted and the call signals for the other stations that had been receiving the message. Thereupon the taut tape lever should be lifted manually to open contacts 248, and the transmitter starting code combination should be transmitted from keyboard transmitter 126 followed by the carriage return signal which effects the lock-out function. The opening of contacts 248 permits relay 258 to become energized through contacts 261 and resistor 263 and to establish its holding circuit through its armature and front contact without energizing start magnet 237. It is necessary to delay the energization of the start magnet until after the lock-out code combination has been transmitted from the keyboard transmitter because the tape transmitter is probably to be restarted in the middle of a message and the tape would contain no lock-out signal at that point. If the tape transmitter should be started immediately and the lock-out signal should be transmitted from the keyboard transmitter 126, that code combination and one or more of the code combinations in tape 242 would be mutilated. After the lock-out code combination has been transmitted from transmitter 126, the taut tape lever may be lowered to reclose the taut tape contacts 248 whereupon start magnet 237 will be energized and transmission from the tape transmitter distributor 226 will be resumed in the same manner, that transmission is resumed when the tape 242, having become taut due to slow operation of keyboard perforator 243 relative to the speed of operation of the tape transmitter distributor, becomes slack as a result of accelerated operation of the keyboard perforator.

Another embodiment of the invention is shown in Fig. 3. In this embodiment, the individual call function lever 83 and the group call function lever 84 have their forwardly extending arms 301 and 302 respectively, disposed in a stirrup carried at the lower end of a link 303 which is pivotally supported at the end of the horizontally extending arm of a bell crank lever 304 pivoted at 306. Bell crank lever 304 is urged in counter-clockwise direction by a spring 307 to engage the undercut portion of the free end of its downwardly extending arm with a stop lug 308 carried by a latching lever 309 pivoted at 311

and urged in counter-clockwise direction by spring 312. The downwardly extending arm of bell crank lever 304 has a laterally projecting finger 305 which is arranged to open normally closed contacts 313 when bell crank lever 304 is rocked in clockwise direction by either of the station call function levers 83 or 84. Upon the rocking of bell crank lever 304 in clockwise direction by either of the station call function levers, contacts 313 are opened and the free end of the downwardly extending arm of the bell crank lever moves clear of a latching shoulder 314 of latching lever 309, permitting spring 312 to rock the latching lever in counter-clockwise direction to retain bell crank lever 304 in the operated condition and thereby to hold contacts 313 open.

The carriage return or lock-out function lever 72 has a forwardly extending arm 316 for momentarily closing a pair of normally open contacts 317. An electromagnet 318 has an energizing circuit traced from the negative terminal of battery 319 through conductor 321, the winding of the magnet, conductors 322 and 323, contacts 313 when closed, conductor 324, lock-out contacts 317 when momentarily closed and conductors 326 and 327 to the positive terminal of battery 319. Electromagnet 318 is provided with an armature 331 carried by an armature lever 332 which is articulated to blocking bar 91. Armature lever 332 has a laterally extending arm 333 which closes a pair of contacts 334 and a pair of contacts 336.

When the station call code combination or the group code combination is transmitted from any transmitter in the system, one or the other of the function levers 83 and 84 is operated to rock bell crank lever 304 to its clockwise position through link 303, and the bell crank lever 304 becomes latched in the operated position and opens contacts 313. After the codes have been transmitted for calling all of the stations that are to participate in message transmission and reception, the carriage return and lock-out code combination is transmitted, which causes the selection of function lever 72 at all stations, thereby momentarily closing contacts 317. Electromagnet 318 will become energized at all stations which do not have their contacts 313 open and at those stations blocking bar 91 will be shifted to its right-hand position and contacts 334 and 336 will be closed. Upon the closure of contacts 334 a holding circuit for electromagnet 318 is traced from the negative terminal of battery 319 through conductor 321, the winding of the electromagnet, conductors 322 and 323, contacts 334, conductor 338, normally closed contacts 339, and conductors 341, 326 and 327 to the positive terminal of battery 319. The electromagnet will be held energized over this circuit when contacts 317 reopen and will hold the station locked out against message reception and the performance of certain functions by means of the blocking wards on blocking bar 91 which carry the same reference numerals as those shown in Figs. 1 and 2. Contacts 336 correspond to contacts 138 in Figs. 1 and 2 and are effective to short-circuit the keyboard transmitter 126 so that the keyboard transmitters, if operated at the locked-out or excluded stations, will not interfere with message transmission on telegraph channel 120.

At the conclusion of message transmission the end-of-message code combination is transmitted and this code causes the end-of-message function levers 82 at all stations to be operated momen-

tarly. Function lever 82 has a forwardly extending arm 342 which has a notch 343 in its lower edge disposed above latching lever 309, and which has its free end disposed in operating relation to normally closed contacts 339. Notch 343 in arm 342 of function lever 82 provides a clearance permitting latching lever 309 to rock in counter-clockwise direction when bell crank 304 is rocked in clockwise direction without imparting any movement to function lever 82. Upon the operation of function lever 82 contacts 339 are momentarily opened at all stations and latching lever 309 is rocked in clockwise direction at those stations where contacts 313 are being held open, the latching lever in rocking in clockwise direction permitting latching shoulder 314 to move clear of the undercut end of the downwardly extending arm of bell crank lever 304 so that the bell crank lever may be restored by spring 307 to its normal position engaging the lug 308 of latching lever 309 and permitting contacts 313 to reclose. Contacts 339 are opened momentarily to interrupt the previously traced holding circuit for electromagnet 318 so that the armature of the electromagnet is released and the armature lever, under the influence of spring 344, restores blocking bar 91 to its left-hand position at the stations which were locked out, and permits contacts 334 and 336 to reopen. Electromagnet 318 will not be reenergized upon the reclosure of contacts 339 because the holding circuit will be open at the contacts 334. In this way all stations are restored to their normal condition.

The recitation herein of the employment of certain code combinations for performing certain functions involved in the selection of stations to receive messages or the disqualification of stations, such as the use of the carriage return signal and function lever to perform the lock-out function, is by way of illustration only and is not to be interpreted as specifying the combining of the lock-out with the carriage return function nor in any way limiting the disclosure to the assignment of particular code combinations to particular station selecting, disqualifying or restoring functions. It will be understood that the code combinations may be assigned to the various functions entirely in accordance with convenience and may differ in different installations of systems in accordance with the several embodiments of the invention.

Although certain specific embodiments of the invention have been shown in the drawings and described in the foregoing specification, it will be understood that the invention is not limited to such specific embodiments but is capable of modification and rearrangement without departing from the spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of selectable elements individually selectable by said selector mechanism, a plurality of printing members associated individually with certain of selectable elements, means for operating said printing members following the selection of their selectable elements, normally disabled means for withholding said printing member operating means from operating and means controlled by one of said selectable elements for precluding enablement of said withholding means.

2. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of se-

lectable elements individually selectable by said selector mechanism, a plurality of printing members associated individually with certain of said selectable elements, means for operating said printing members following the selection of their selectable elements, normally disabled means for withholding said printing member operating means from operating, means controlled by one of said selectable elements for precluding enablement of said withholding means, and means controllable by another of said selectable elements provided said precluding means is unoperated for enabling said withholding means whereby to suppress printing.

3. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of selectable elements individually selectable by said selector mechanism, a plurality of printing members associated individually with certain of said selectable elements, means for operating said printing members following the selection of their selectable elements, normally disabled means for withholding said printing member operating means from operating, means controlled by one of said selectable elements for precluding enablement of said withholding means, means controllable by another of said selectable elements provided said precluding means is unoperated for enabling said withholding means whereby to suppress printing, and means controlled by another of said selectable elements for restoring said withholding means to disabled condition.

4. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of selectable elements individually selectable by said selector mechanism, a plurality of printing members associated individually with certain of said selectable elements, means for operating said printing members following the selection of their selectable elements, normally disabled means for withholding said printing member operating means from operating, means controlled by one of said selectable elements for precluding enablement of said withholding means, means controllable by another of said selectable elements provided said precluding means is unoperated for enabling said withholding means whereby to suppress printing, and means controlled by another of said selectable elements for restoring said withholding means to disabled condition, each of said other selectable elements having no printing member associated therewith.

5. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of printing members individually selectable by said selector mechanism, means for actuating said printing members upon selection thereof, means permissibly operable by said printing member actuating means for restricting said printing member actuating means short of printing member actuation, means for blocking restricting operations of said restricting means, a plurality of other members selectable by said selector mechanism, and means controlled by one of said other members for operating said blocking means to ineffective relation to said restricting means, whereby to cause said restricting means to operate to suppress printing.

6. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of printing members individually selectable by said selector mechanism, means for actuating said printing members upon selection thereof, means permissibly operable by said printing member actuating means for restricting said printing mem-

ber actuating means short of printing member actuation, means for blocking restricting operation of said restricting means, a plurality of other members selectable by said selector mechanism, means controlled by one of said other members for operating said blocking means to ineffective relation to said restricting means whereby to cause said restricting means to operate to suppress printing, and means associated with said blocking means for blocking a plurality of said other members upon being operated to ineffective relation to said restricting means.

7. In a printing telegraph receiver, a signal responsive selector mechanism, a plurality of printing members individually selectable by said selector mechanism, means for actuating said printing members upon selection thereof, means permissibly operable by said printing member actuating means for restricting said printing member actuating means short of printing member actuation, means for blocking restricting operation of said restricting means, a plurality of other members selectable by said selector mechanism, means controlled by one of said other members for operating said blocking means to ineffective relation to said restricting means whereby to cause said restricting means to suppress printing, and means controlled by another of said other members for causing said blocking means to be restored to blocking relation to said restricting means.

8. In a printing telegraph set, a signal responsive selector mechanism, a plurality of printing members individually selectable by said selector mechanism, means for actuating said printing members upon selection thereof, means permissibly operable by said printing member actuating means for restricting said printing member actuating means short of printing member actuation, means for blocking restricting operation of said restricting means, a plurality of other members selectable by said selector mechanism, means controlled by one of said other members for operating said blocking means to ineffective relation to said restricting means whereby to cause said restricting means to suppress printing, a transmitter, and means operable in conjunction with operation of said blocking means to ineffective relation to said restricting means to disable said transmitter.

9. In a communication system, a communication channel, a plurality of telegraph stations associated with said channel, means at a minimum of one of said stations for impressing telegraph signals on said channel, a signal responsive selector mechanism at each of said stations, a plurality of selectable elements individually selectable by each of said selector mechanisms, a plurality of printing members individually associated with certain of said selectable elements, means for operating said printing members following the selection of their selectable elements and means at each of said stations mechanically controlled by certain of said selectable elements for withholding said printing member operating means from operating whereby to suppress printing in response to message signals thereafter impressed on said channel.

10. In a communication system, a communication channel, a plurality of telegraph stations associated with said channel, means at a minimum of one of said stations for impressing telegraph signals on said channel, a signal responsive selector mechanism at each of said stations, a plurality of selectable elements individually se-

lectable by each of said selector mechanisms, a plurality of printing members associated individually with certain of said selectable elements, means for operating said printing members following the selection of their selectable elements, normally disabled means at each of said stations for withholding said printing member operating means from operating, and means at each of said stations controlled by a differently coded selectable element for precluding enablement of said withholding means.

11. In a communication system, a communication channel, a plurality of telegraph stations associated with said channel, means at a minimum of one of said stations for impressing telegraph signals on said channel, a signal responsive selector mechanism at each of said stations, a plurality of selectable elements individually selectable by each of said selector mechanisms, a plurality of printing members associated individually with certain of said selectable elements, means for operating said printing members, following the selection of their selectable elements, normally disabled means at each of said stations for withholding said printing member operating means from operating, means at each of said stations controlled by a differently coded selectable element for precluding enablement of said withholding means, and means at each of said stations controlled by a commonly coded selectable element for enabling all others of said withholding means whereby to suppress printing.

12. In a communication system, a communication channel, a plurality of telegraph stations associated with said channel, means at a minimum of one of said stations for impressing telegraph signals on said channel, a signal responsive selector mechanism at each of said stations, a plurality of selectable elements individually selectable by each of said selector mechanisms, a plurality of printing members associated individually with certain of said selectable elements, means for operating the printing members following the selection of their selectable elements, normally disabled means at each of said stations for withholding said printing member operating means from operating, means at each of said stations controlled by a differently coded selectable element for precluding enablement of said withholding means, means at each of said stations controlled by a commonly coded selectable element for enabling all others of said withholding means whereby to suppress printing, and means at each of said stations controlled by another commonly coded selectable element for restoring said enabled withholding means to disabled condition.

13. In a printing telegraph receiver, a signal responsive selector mechanism, a printing mechanism controllable thereby, a plurality of selectable elements individually selectable by said selector mechanism, a universal selectable element operable to stop printing operation of said printing mechanism, blocking means operable between normal and off-normal position having a blocking ward normally presented in blocking relation to said universal selectable element and having other blocking wards normally presented out of blocking relation to certain of said individually selectable element, means controlled by one of said individually selectable elements for operating said blocking means to off-normal position to cause said universal selectable element to be unblocked and said certain of said individually selectable elements to be blocked by said block-

ing wards, and means controlled by another of said individually selectable elements for restoring said blocking means to normal position.

14. In a printing telegraph receiver, a signal responsive selector mechanism, a printing mechanism controllable thereby, a plurality of selectable elements individually selectable by said selector mechanism, a universal selectable element operable to estop printing operation of said printing mechanism, a blocking bar operable between normal and off-normal positions having a blocking ward normally presented in blocking relation to said universal selectable element and having other blocking wards normally presented out of blocking relation to certain of said individually selectable elements, means controlled by one of said individually selectable elements for operating said blocking bar to off-normal position to cause said universal selectable element to be unblocked and said certain of said individually selectable elements to be blocked by said blocking wards, and means controlled by another of said individually selectable elements for restoring said blocking bar to normal position, certain of said blocking wards being yieldably mounted on said blocking bar to accommodate movement of said blocking bar while the selectable elements served by said yieldably mounted wards are operating.

15. In a printing telegraph set, a transmitter, a signal responsive selector mechanism, a printing mechanism controllable thereby, a plurality of selectable elements individually selectable by said selector mechanism, a universal selectable element operable to estop printing operation of said printing mechanism, a blocking bar operable between normal and off-normal positions having a blocking ward normally presented in blocking relation to said universal selectable element, and having other blocking wards normally presented out of blocking relation to certain of said individually selectable elements, means controlled by one of said individually selectable elements for operating said blocking bar to off-normal position to cause said universal selectable element to be unblocked and said certain of said individually selectable elements to be blocked by said blocking wards, means controlled by said blocking bar upon operation thereof to off-normal position for disabling said transmitter, and means controlled by another of said individually selectable elements for restoring said blocking bar to normal position.

16. In a printing telegraph set, a storage transmitter, a signal responsive selector mechanism, a printing mechanism controllable thereby, a plurality of selectable elements individually selectable by said selector mechanism, a universal element operable to estop printing operation of said printing mechanism, a blocking bar operable between normal and off-normal positions having a blocking ward normally presented in blocking relation to said universal selectable ele-

ment, means controlled by one of said individually selectable elements for operating said blocking bar to off-normal position to cause said universal selectable element to be unblocked, means controlled by another of said individually selectable elements for restoring said blocking bar to normal position, and means controllable by another of said individually selectable elements when said blocking bar is in the normal position for setting in operation said storage transmitter.

17. In a printing telegraph set, a tape transmitter, a signal responsive selector mechanism, a printing mechanism controllable thereby, a plurality of selectable elements individually selectable by said selector mechanism, a universal selectable element operable to estop printing operation of said printing mechanism, a blocking bar operable between normal and off-normal positions having a blocking ward normally presented in blocking relation to said universal selectable element, means controlled by one of said individually selectable elements for operating said blocking bar to off-normal position to cause said universal selectable element to be unblocked, means controlled by another of said individually selectable elements for restoring said blocking means to normal position, means controllable by another of said individually selectable elements when said blocking bar is in normal position for setting said tape transmitter in operation, and means associated with said transmitter for preventing the setting in operation thereof when said transmitter is without a tape containing signals awaiting transmission.

18. In a telegraph system, a communication channel, a plurality of telegraph receivers associated with said channel, at least one keyboard transmitter and at least one storage type transmitter also associated with said channel, a signal responsive selector mechanism in each of said receivers, printing mechanism controllable by said selector mechanisms, a plurality of selectable elements selectable by said selector mechanisms, a universal selectable element operable to estop printing operation of said printing mechanisms, a blocking bar operable between normal and off-normal positions having a blocking ward normally presented in blocking relation to said universal selectable element, means controlled by one of said selectable elements for operating said blocking bar to off-normal position to cause said universal selectable element to be unblocked, means controlled by another of said selectable elements for restoring said blocking bar to normal position, and means controllable by another of said selectable elements upon response of said selector mechanisms to an appropriate signal transmitted by said keyboard transmitter and provided said blocking bar is in the normal position for setting in operation said storage type transmitter.

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