March 5, 1940. E. E. KLEINSCHMIDT 2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Filed April 29, 1935 5 Sheets-Sheet 1

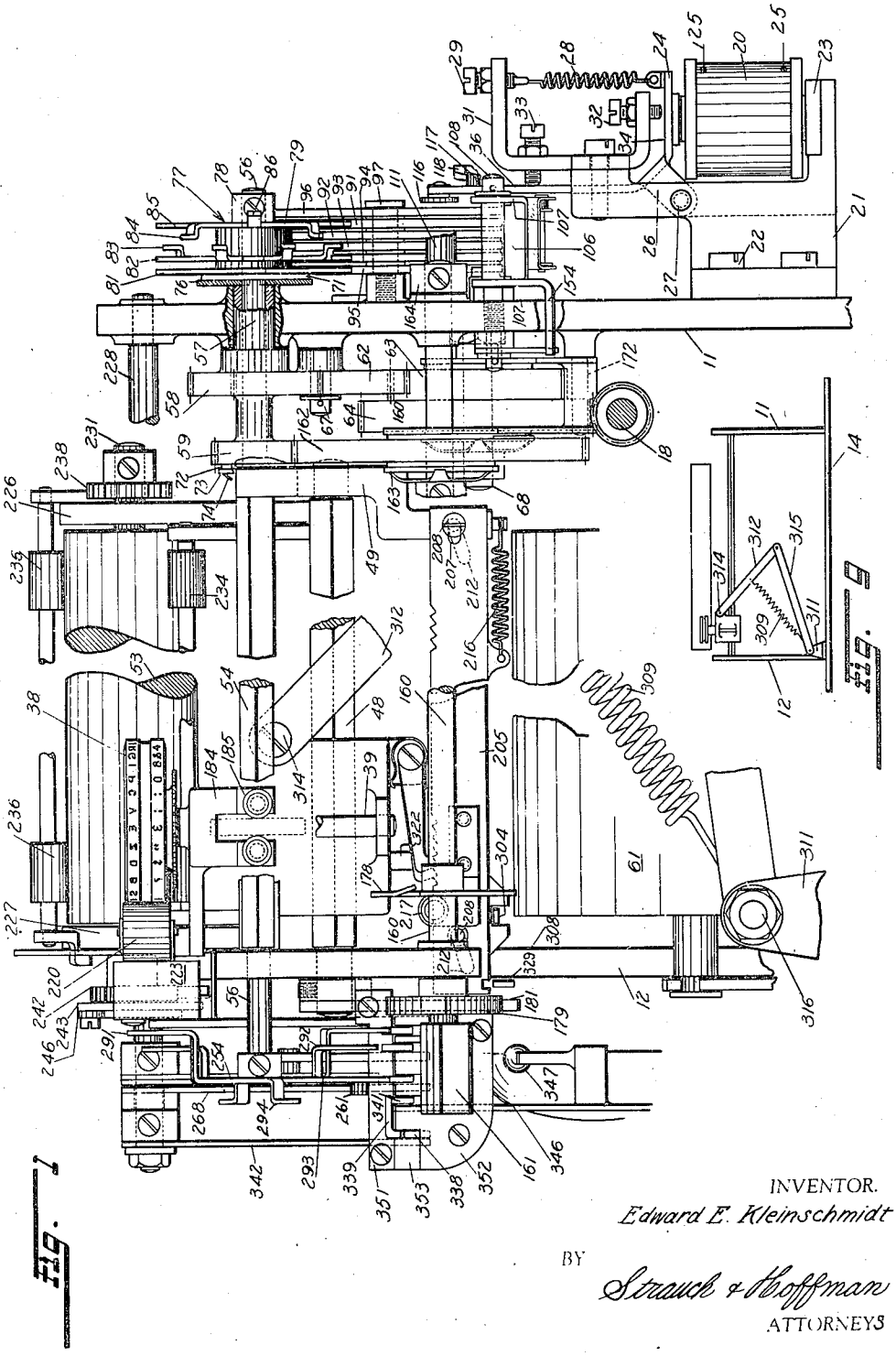


FIG. 1

FIG. 2

INVENTOR.
Edward E. Kleinschmidt

BY
Strauch & Hoffman
ATTORNEYS

March 5, 1940. E. E. KLEINSCHMIDT 2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Filed April 29, 1935 5 Sheets-Sheet 2

Fig. 1

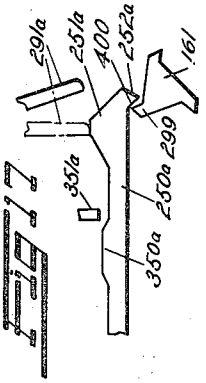


Fig. 2

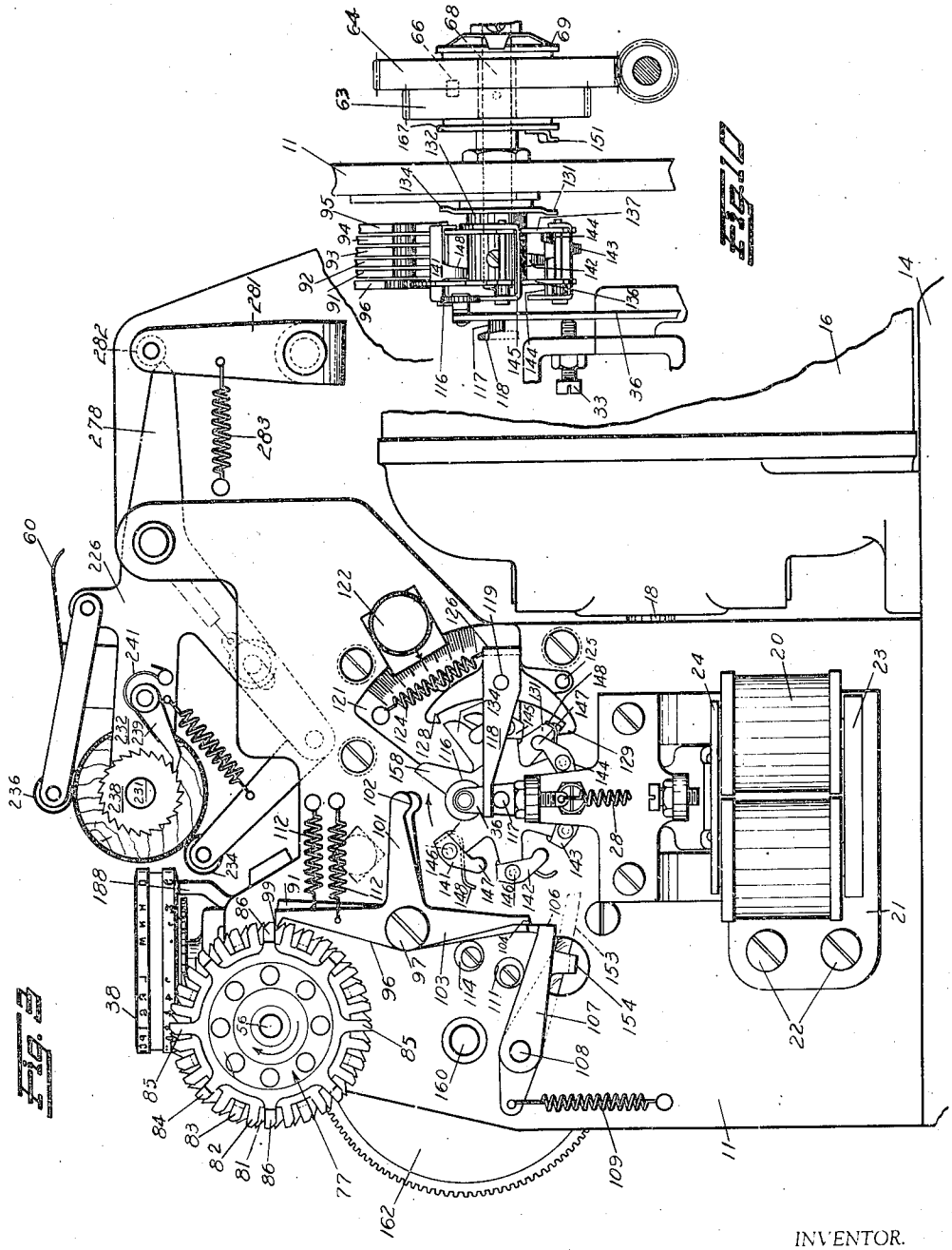
INVENTOR.
Edward E. Kleinschmidt

BY
Strauch & Hoffman
ATTORNEYS

March 5, 1940. E. E. KLEINSCHMIDT 2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Filed April 29, 1935 5 Sheets-Sheet 3



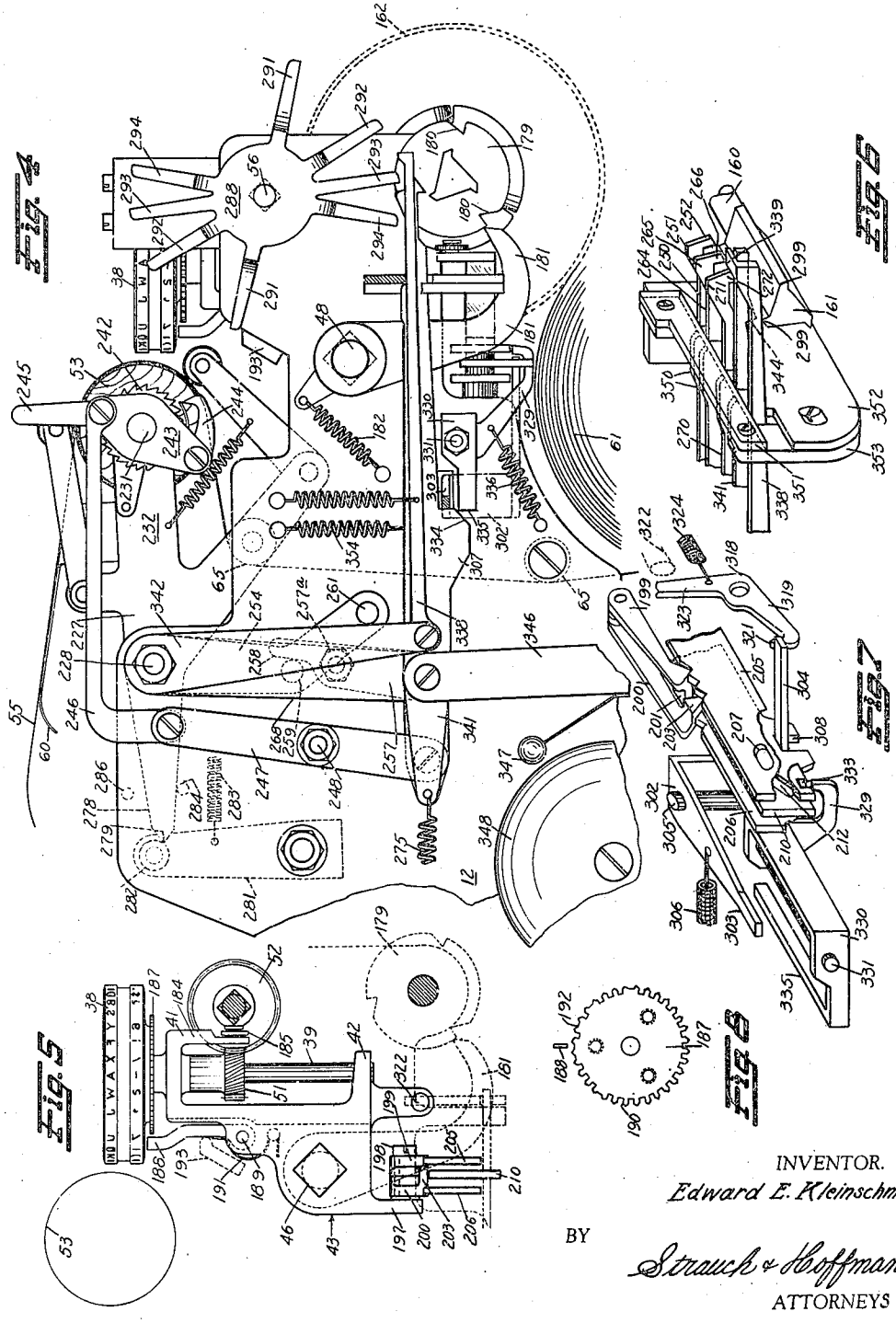
INVENTOR.
Edward E. Kleinschmidt

BY
Strauch & Hoffman
ATTORNEYS

March 5, 1940. E. E. KLEINSCHMIDT 2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Filed April 29, 1935 5 Sheets-Sheet 4



INVENTOR.
Edward E. Kleinschmidt

BY

Strauch & Hoffman
ATTORNEYS

March 5, 1940. E. E. KLEINSCHMIDT 2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Filed April 29, 1935 5 Sheets-Sheet 5

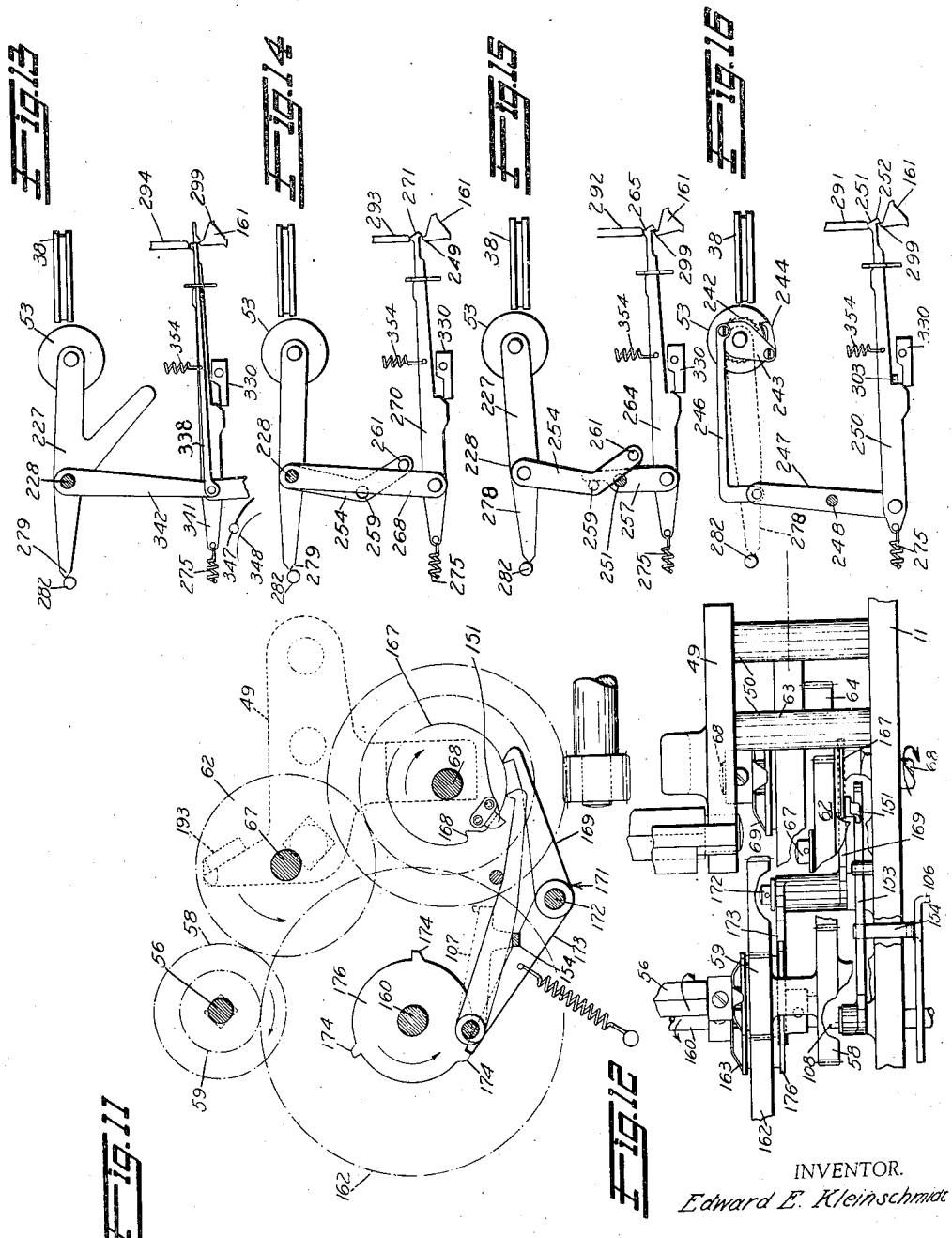


Fig. 13

Fig. 14

Fig. 15

Fig. 16

Fig. 11

Fig. 12

INVENTOR.
Edward E. Kleinschmidt

BY
Strauch & Hoffman
ATTORNEYS

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2,192,350

SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS

Edward E. Kleinschmidt, Highland Park, Ill.

Application April 29, 1935, Serial No. 18,888

64 Claims. (Cl. 178—29)

The present invention relates to selecting and printing apparatus for use in telegraph circuits and more particularly to apparatus of the type in which the selection of characters to be printed is controlled by permutation code signals.

Selective devices heretofore employed in telegraph receivers have involved mechanical or electrical complications which were inherent because of the mode of operation of such previously known devices. The selecting mechanism embodied in the telegraph printing apparatus of my present invention operates in accordance with a new principle which permits the entire apparatus to be greatly simplified and to operate positively in accordance with received signals.

Accordingly, the primary object of the present invention is to provide a form of selecting mechanism employing a new principle of operation. More specifically, an object of the present invention is to provide a simplified form of selection mechanism in which the code impulses act to affect stops that directly and progressively position a printing member so that a character is brought into the ultimate printing position when the last code signal of a code combination or group is received.

Another object of the present invention is to provide means to make the new form of selecting mechanism adaptable to high speed printer operation and to eliminate associated means for storing the selection or to provide overlap for the printing action.

A further object of the present invention is to provide a novel mechanism for automatically performing a plurality of functions after receipt of the last code signal of a code combination or group of signals.

Still further objects of the invention are to provide a simplified mechanism to select and operate the printer functions, such as shift, unshift, line space, carriage return, etc.

The foregoing and more specific objects of the invention will appear in the following disclosure of a preferred form of my invention and from the terms of the appended claims.

In the drawings:

Figure 1 is a view in front elevation of a page printer embodying the present invention, certain parts thereof being cut away for the sake of clearness of illustration.

Figure 2 is a plan view of the printer shown in Figure 1.

Figure 3 is a view in elevation taken from the right hand side of Figure 1 and shows the selecting mechanism.

Figure 4 is a fragmental view in elevation taken from the left hand side of Figure 1 and discloses details of the function of the mechanism.

Figure 5 is a detailed view of the typewheel carrier.

Figure 6 is a fragmental view showing further details of the function of the operating mechanism.

Figure 7 is a fragmental view of a portion of the "letter feed" mechanism.

Figure 8 is a detail view of the typewheel centering mechanism.

Figure 9 is a diagrammatic view in front elevation showing the relative positions of the platen, typewheel and the side frame members.

Figure 10 is a fragmental detail view of the selector as seen from the rear of Figure 1.

Figure 11 is a diagrammatic sectional view as seen from the right hand side of Figure 1.

Figure 12 is a detailed view in plan of the portion of the mechanism shown in Figure 11.

Figures 13 through 16 show diagrammatically details of the mechanism for operating the several printer functions.

Figure 17 is a fragmentary view of a modification of the function operating mechanism.

In the embodiment of my invention selected for illustration the usual five unit code is utilized to effect selective operation of the receiver. The receivers and the transmitter operate together by starting the receiver or receivers into operation at the beginning of each character signal by the transmission of a start or no current condition, the operation of the parts of the receiver mechanism being arrested following reception of the end of each signal group. While the specific embodiment of the invention selected for illustration is arranged for start stop working, the new principles employed in its operation and constituting an important feature of the present invention can be applied to receivers operating continuously in synchronism with a transmitter.

Referring to Figure 1, the supporting frame of the receiver comprises side frame members 11 and 12 which are secured to or are integral with a suitable base plate 14. The base plate 14 also serves as a support for the driving motor 16, the driving shaft of which is connected to or forms an extension of the main drive shaft 18 of the printer mechanism. The side frame members 11 and 12 serve as supports for the associated parts comprising the selector mechanism and the devices which are controlled by the selector mechanism and driven by the motor 16.

The magnet 20 which receives the line signals

and controls the operation of the printer in accordance with the signals originating at a transmitter is carried by a frame 21 (Figures 1, 2 and 3), secured to the frame member 11 in any suitable manner as by the screws 22. The two spools or coils of the magnet fit over core pieces which rise from the yoke bar 23. The armature 24 of the magnet which comprises the apertured ears 26 is mounted on a pivot 27 in the frame 21. The armature 24 is withdrawn from the pole pieces of the magnet by means of a spring 28 which is connected to a screw 29 for adjusting the tension of the spring. The member 31 in addition to carrying the tension adjusting screw 29 is provided with adjustment screws 32 and 33 which cooperate with the portions of the armature 34 and 36 respectively and serve to limit movement of the armature in both directions.

The rotatable character bearing element or typewheel 38 is secured to a spindle 39 (Figure 5) which is mounted for rotation in the arms 41 and 42 of the movable typewheel carriage 43. The frame of the typewheel carriage 43 is provided with spaced rearwardly extending arms 45 each having a squared aperture 46 that fits over a squared shaft 48 on which the carriage 43 is slidably mounted. The shaft 48 is mounted in bearings provided therefor in the bracket member 49, and the frame member 12. The bracket member 49 is suitably secured as by posts 50 to the printer frame member 11. The shaft 48 extends through and beyond the frame member 12 in which it is rotatably mounted for a purpose later to be described. The paper platen 53 over which the paper sheet or web 55 passes to receive character impressions from the typewheel 38 is supported in a manner to be described hereinafter. The paper sheet is fed from a storage roll 61 suitably suported from the main frame members 11 and 12. It is guided by suitably positioned rollers 65 and is received on a flat disc or guide 60.

Selector mechanism

Rotary movement is imparted to the typewheel 38 by means of a suitable gear 51 on the spindle 39 which is in mesh with a gear 52. The gear 52 has a squared opening in its hub and is slidably mounted upon a squared portion 54 of a rotatable shaft 56 which extends across the printer and through the frames 11 and 12 and is journaled in the frame 12. The shaft 56 is journaled in the hub 57 of a pair of constantly driven gears 58 and 59. The integrally connected gears 58 and 59 are driven from the motor 16 through an idler pinion 62 and the coaxial gears 63 and 64 which are interconnected by a pin 66 (Figure 10).

The idler gear 62 is rotatably mounted on a stud 67 secured to the frame member 11 and the gears 63 and 64 are rotatably journaled on a selector drive shaft 68, which is adapted at times to be frictionally driven through the friction device 69. The shaft 56 is frictionally driven from the motor driven gear 58 by means of a friction device which comprises friction members 71 and 72. The radial face of the driven disc 73 is pressed against the face of the gear 59 by means of a spring 74 which is secured to the shaft 56. The driven disc 76 presses the friction member 71 against the radial face of a stop finger assembly 77 which is secured to shaft 56 by means of a set screw in the collar 78.

The stop finger assembly 77 comprises a series of stop plates or discs 79 which are provided with five sets of stop fingers 81, 82, 83, 84 and 85. An additional, or sixth set of stop fingers 86 of which there are two placed diametrically opposite is provided on the stop finger assembly 77. All of the stop fingers of one set lie in the same plane and are adapted to cooperate with a pivoted stop lever. Five stop members or levers 91 to 95 are provided and are coordinated with the stop fingers in a manner to be explained. These five stop levers, together with an additional stop lever 96 are pivoted upon a stud 97 secured in a suitable boss on the side frame 11.

The stop fingers 81 to 85 are progressively doubled in number, that is, there are two stop fingers 85; four stop fingers 84; eight stop fingers 83; sixteen stop fingers 82; and thirty-two stop fingers 81. Each group of stop fingers lies in its individual plane. The individual fingers are spaced equidistant with respect to each other and the groups of stop fingers 85, 84, 83, 82 and 81 are assembled in relation to each other so that they will form sixty-four equidistant stops. The two stop fingers 86 are spaced circumferentially 90 degrees from the two stop fingers 85. This arrangement of the stop fingers 81 to 86 provides a total of sixty-four stop positions for the shaft 56. The gear 52 has twice as many teeth as the gear 51 providing a one to two ratio between these gears so that the typewheel 38 makes one complete revolution for each half revolution of the shaft 56. The typewheel 38 has two rows of type, each with thirty-two character positions. It should be noted that while the shaft 56 is driven by a frictional connection from the motor 16, the stop finger assembly 77 and the typewheel 38 rotate in a fixed and definite relationship by reason of the positive interconnection of the gears 51 and 52. As the shaft 56 and its associated parts are relatively heavy, high speed operation of the printer is facilitated by having the relatively light typewheel move through a greater angle than the shaft when a letter is positioned for printing.

The stop levers 91 to 96 are of the same form and stop lever 96 (Figure 3) will be described as an example of all of the stop levers in the set. The stop lever 96 is provided at its upper end with a tooth which provides a stop face 99 which is engaged by either one of the two stop fingers 86. Each one of the series of stop levers likewise is provided with a stop finger engaging face 99, and it will be understood that the upper end of each stop lever is adapted for engagement only with the series of stop fingers lying in the corresponding plane. The stop lever 96 is provided with a bell crank portion 101 having a cam surface 102 at its end, the purpose of which will be later explained. Also, each stop lever is provided with a downwardly extending arm 103 having an inclined face 104 adapted for cooperation with a latch bar 106 also having an inclined face, the said bar engaging the lower extremity of all of the stop levers. The latch bar 106 is provided with side arms 107 which together with the latch bar form a U-shaped member and the arms 107 are pivoted upon a stud 108 projecting from and secured to the side frame member 11. The latch bar 106 is biased upwardly by means of a spring 109 which is secured at one end to the frame 11 and to a portion of the arm 107 which extends beyond the pivot point 108. An eccentric adjustable stop 111 is provided for limiting the upward movement of the latch bar 106. Each stop lever in its normal position is out of engagement with its corresponding stop finger and the stop levers are biased to this non-engaging position by means

of springs 112 of which one is provided for each stop lever. Also in normal position, the beveled end 104 of each stop finger lies above the beveled edge of the bar 106. The beveled edge of the bar 106 is inclined as shown in Figure 1 of the drawings, being higher at its end adjacent the toe of the lever 95 and the frame member 11. The stop lever 96 has the least engagement and the lever 95 has the greatest engagement with the latch bar 106. An eccentric adjustable stop 114 is provided for limiting the movement of the stop levers under the tension of the springs 112.

The latch bar 106 and the lower extremities of the stop levers 91 to 96 are so coordinated that when a stop lever, for example stop lever 91, is operated, it presses the latch bar 106 out of engagement with a previously engaged stop lever, for example lever 96, which is therefore released and drawn out of engagement with its corresponding stop finger by a spring 112. The inclination of the top edge of the bar 106 assists this action. In this instance the stop finger 86 is released permitting the shaft 56 to turn until in the example given, one of the fingers 85 engages with the stop lever 91. It should be noted that the shaft 56 is permitted to turn one-quarter of a revolution, that is to say, it is permitted to rotate through ninety degrees, the typewheel making one-half of a revolution. If the next stop lever 92 is operated then it will release the stop lever 91 in the manner explained above and permit the shaft 56 to turn until the next successive stop finger 84 engages with the stop lever 92. This action will permit the shaft 56 to rotate an additional one-eighth of a revolution to turn the type-wheel an additional quarter of a revolution. This action may be continued progressively provided that all of the remaining levers 93, 94 and 95 are operated in succession. During this operation the typewheel will have made $\frac{31}{32}$ of a revolution.

Selective operation of the stop levers 91 to 95 will permit the typewheel to assume any one of thirty-two positions of which twenty-six are each provided with a letter of the alphabet. It will be understood that the spindle 39 carrying the typewheel 38 may be turned so that the typewheel 38 will assume any one of its thirty-one positions to which it may be moved from rest, the rest position making thirty-two selection positions. However, the typewheel will be provided with character markings only at certain positions and will assume the remaining positions during operation of the several functions in the manner to be described.

As an example of selective operation of the stop fingers 91 to 95 and the corresponding operation of the typewheel 38, it will be assumed that stop lever 95 is operated. Then, upon the operation of this stop lever, the stop lever 96 is released in the manner described above. Stop lever 95 will then be in position to engage with the first one of the stop fingers 81 encountered as the shaft 56 rotates in a counterclockwise direction as viewed from Figure 3. This will permit the typewheel to rotate $\frac{1}{32}$ of a revolution. Selection of any one of the stop levers 91 to 95 will result in the typewheel assuming a different printing position in the manner just described in connection with the operation of the stop lever 95. By operating the stop levers in different combinations, any one of the thrity-one positions of the typewheel 38 may be selected, for example, if the stop levers 92 and 95 are operated, 92 being operated first will release the stop lever 96 and permit the shaft 56 to turn until the first of the series of stop fingers 84 comes into engagement with the surface 98 of the stop lever 92, where it will remain until the stop lever 95 is operated which will act to release the stop lever 92. The lever 95 will therefore engage the next stop finger 81 which lies in its path, permitting the typewriter to make $\frac{5}{32}$ of a revolution.

From the foregoing it will be seen that by varying the setting of stop levers 91 to 95, the typewheel may be stopped in any position. The mechanism which selectively operates the stop levers 91 to 95 under control of the line signals from receiving magnet 20 will now be described in detail.

The upstanding arm 36 of the magnet 20 is provided with a roller 116 and a stud or stop 117. A start-stop control arm 118 is pivoted on a post or stud 119, said post 119 being secured to and projecting from an orientation plate 121. The plate 121 is pivotally secured to the frame member 11 of the printer at a point coaxial with the shaft 68, and this orientation plate 121 is provided with graduations which cooperate with a pointer associated with a clamping screw 122. The end of the start-stop control arm 118 is beveled as shown in Figure 10 and the stop 117 is also beveled so as to facilitate cooperation of the stop with the arm 118 in the manner to be described.

A spring 124 secured to the plate 121 and the rear cross bar 126 which is integral with the lever 118 serves to bias the lever 118 for counterclockwise rotation as viewed in Figure 3. A stop 125 is provided for the lever 118. This tendency to counterclockwise rotation of lever 118 is restrained normally by the armature of the magnet 20 when the latter is in its normal or energized position. The lever 118 is provided with two extensions 128 and 129 having hook-shaped ends. The extension 129 normally engages with an arm 131 that is attached to a rotating and frictionally driven selecting element 132 which is carried by and rotates with the shaft 68. When rotation of the shaft is permitted by release of the extension 129 from the arm 131 the shaft 68 is frictionally driven by the interconnected coaxial gears 63 and 64 through the device 69. The stop control arm 118 is restored to its normal position of engagement with the stud 117 by an arm 134 which rotates with and is carried by the rotary selecting mechanism 132. The rotating selecting device 132 comprises two spider shaped plates 136 and 137 which carry at the ends of their axially aligned spider arms five selecting transfer elements designated by reference characters 141 to 145, inclusive. These selecting transfer elements are mounted upon pivots 146 carried by the axially aligned spider arms of the plates 136 and 137 and each of the selecting transfer elements comprises a lug 147 and an upwardly extending finger 148. All of the lugs 147 are located adjacent the plate 136 and lie in one plane so as to be in the path of the roller 116 when the armature 24 of the magnet 20 is attracted and these lugs are out of the path of the roller when the armature 24 is released upon deenergization of the magnet 20. The fingers 148 are located in different planes so as to align with the ends 102 of the stop levers 91 to 95. The finger 148 of the selecting transfer element 141 will engage only the stop finger 91 and the finger 148 of the selecting transfer element 142 will engage only the stop finger 92 and the fingers 148 of the three remaining selecting transfer elements

143, 144 and 145 will engage the stop levers 93, 94 and 95 respectively. The finger of the selecting transfer element 145 which engages the arm 101 of the stop lever 95 is formed directly from the material of the inner side of the element 145.

The selector mechanism so far described performs all of the functions of the rotary switching distributor and selecting magnets or mechanical selecting devices of printing telegraph receivers known to the prior art and eliminates the necessity for selector bars or discs which are an essential part of printers known heretofore and in which the selection must be stored for printing.

The speed of the motor 16 is governed or a motor having the proper speed characteristics is chosen so that the rotating selector element 132 will rotate at such a speed as to bring the finger 148 of the transfer element 145 under the stop lever 95 as the last of the five signals of the letter signal combination is received. The arrangement of the parts as shown is for operation in a normally closed circuit five unit permutation code telegraph system, commonly designated as the Baudot code start-stop system. In such systems the receiver is usually started by a no current signal followed by five signals of various combinations to select the desired letter and further followed by a current signal which latter signal is continued between the sending of the five code combination signals. While the armature 24 of the magnet 20 is attracted, all of the mechanism of the receiver with the exception of the motor and the gears driven thereby is held stationary. When the armature 24 is released by a no current signal, the start stop bar 118 is released from the stud 117 permitting the rotary selecting element to rotate in a clockwise direction as viewed on Figure 3. It will be assumed that the code combination of signals for selecting the letter A is to be received which combination requires two current impulses followed by three no current impulses and positioning of the typewheel for selection of this letter will be described. The armature 24 of the magnet 20 will be attracted immediately after it has released the member 131 from engagement with the extension 129 and the roller 116 will engage with the first depending lug 147 of the selecting transfer element 141. While this lug 147 rides over the roller 116 which is positioned in its path, the finger 148 of the selection transfer element 141 will engage with the stop lever 91 causing the same to be placed in the path of the first stop finger 85 of the stop finger assembly 77. As previously explained, this action releases the stop arm 96 from engagement with the stop finger 86 thereby permitting the shaft 56 to revolve until the stop finger 85 engages the stop lever 91. Since the second letter combination signal received by the magnet 20 is also a current impulse, the armature 24 will remain attracted and the roller 116 will engage with the lug 147 of the selection transfer element 142 causing the finger 148 of this transfer element to position the stop lever 92 in the path of the next stop finger 84 and causing release of the stop finger 91 in the manner previously explained. The shaft 56 will revolve until the first finger 84 engages the stop lever 92. Since the third, fourth and fifth signals of the letter combination received on the magnet 20 are no current impulses, the armature 24 will be released and the roller 116 taken out of the path of the lugs 147 of the selecting transfer elements 143, 144 and 145 and no further positioning of the stop fingers takes place. The shaft 56 remains at its last position, that is, with stop finger 84 engaged by stop lever 92 and the typewheel 38 during this time will have made $2\frac{7}{32}$ of a revolution which is the position for the letter A. Printing of a character selected in this manner and other functions and operations in connection therewith will be explained hereinafter.

Just before the rotary selecting device 132 completes one revolution, the start-stop control lever 118 will be restored by the arm 134 which acts as a cam to move the member 128 to the right as viewed on Figure 3, bringing the arm 129 into the path of the arm 131. The rotating selecting element 132 will come to a stop by engagement of the arm 131 with the extension 129. The arm 118 is held in restored position by the stop 117 until the next no current start condition is received. During the last part of the rotation of the rotary selecting device 132 and after the printing of the selected letter, a cam 151 secured to a disc member of the friction device 69 (Figure 10) and rotating with the shaft 68 operates a lever 153 which is pivoted on the post 108. This lever 153 is engaged by an arm 154 which projects through an aperture in the frame member 11 into the path of the lever 153. The cam 151 moves the lever 153 downwardly and by its engagement with the lug 154 withdraws the latch bar 106 from engagement with the stop levers 91 to 96, thus permitting the last of the stop levers which was set up for a selection to be restored. During the time of the release operation of the latch bar 106 by the cam 151 and the arm 153, the stop lever 96 is pushed into stop finger engaging position by a cam 158 and held there until the latch bar 106 is again restored to its normal position by passage of the cam 151. The stop lever 96 is then held in finger engaging position.

As stated above, the angular position of the rotary selecting element at the time of release is adjustable by means of the orientation plate 121 so that the rotary cycle is started with proper orientation.

In further explanation of the metod of operation just described, let it be assumed that the type wheel and the stop finger assembly 77 are at rest and the stop lever 96 is in contact with stop finger 86. This is the normal rest position between the reception of character signals when such signals are sent intermittently as from keyboard transmission. If, however, groups of character impulses are sent to the receiver without time interval, as would be the case when transmission is from a continuously running perforated tape, then the stop finger 86 is not always in contact with stop lever 96 (depending on the setting of the stop finger assembly 77 by the previous selection) when the first signal operates the stop lever 91. In such case there will be sufficient time for the correct setting of the type wheel during the subsequent selective operation due to the fact that the stop finger assembly rotates at a higher speed than the selector 132. A satisfactory ratio between the typewheel 38 and the selector element 132 has been found by actual practice to be approximately two and one-half to one. Since the stop finger assembly rotates at one-half the speed of the type-wheel, the former will revolve at about one and one-quarter times the speed of the selector element 132.

The stop finger assembly 77 is first released for rotation by the cam 151 acting through the lever 153 to withdraw the latch 106 from engagement with one of the stop levers 91 to 96. The stop lever 96 is immediately thereafter set into

the stop position by the cam 168. All of this happens before the signals of a subsequent letter are received so that a considerable interval of time elapses between the release of the stop finger assembly 77 from a previous setting and the setting of the first stop lever for selecting the next letter.

In operation the stop lever 91, and at times the stop lever 92, do not always engage with their corresponding stop fingers during the setting operation of the stop finger element 77. This is especially true if the character selected by the previous operation is at a point on the typewheel from which it will have to turn through a large arc to its normal stop position, that is, where the stop finger 86 would engage with the stop lever 96. Under such conditions and where a selection comprising marking signals 1, 2 and 3 will follow immediately, the stop levers 91 and 92 would probably not engage with the stop fingers 85 and 84, respectively, but the stop lever 93 would fall into place behind the stop finger 84 but in front of the stop finger 83 and stop the stop finger assembly and the typewheel at the proper place corresponding to the signals received.

It is important to note that the degree of motion of the stop finger element 77 decreases progressively as the successive stop levers are operated. This feature distinguishes the present invention from prior art devices wherein the type wheel does not start rotating from its last printing position until the first signal of the following letter has been received; whereas in the present printer the typewheel starts rotating immediately after the letter is printed and before the cycle of operation representing that letter is completed so that normally, in the present invention, the typewheel is always at a zero position. This is important as by this arrangement the type wheel has more time to assume its start and subsequently its first selected position of a following letter, all of which makes possible the operation of the present machine without devices for storing the signals as they are received and without devices for overlapping the selection and printing into the following letter.

Printing

Printing of the selected characters is accomplished by the mechanism now to be described. A function operating shaft 160 (Figures 1 and 2) has a bearing in frame member 11 and extends through the frame member 12 and is driven from the motor 16 through the gear 59 and the gear 162 through the friction device 163. One end of the shaft 160 is provided with a collar 164 which serves to position the shaft with respect to the frame members 11 and 12. The collar 164 bears against the boss which provides a bearing for the shaft 160 in the frame member 11. The portion of the shaft 160 which projects beyond the frame member 12 carries the rotating ball 161 in proper relation with a series of code bars comprising a portion of the function operating mechanism later described. A cam 167 which comprises a part of the friction device 69 is provided with a notch 168 (Figure 11). This cam notch cooperates with one arm 169 of a bell crank trip lever 171 which is pivoted upon a stud 172 secured to the frame member 12. The second arm 173 of the bell crank trip lever 171 is adapted to engage any one of the three cam projections 174 formed on the cam disc 176 which is carried by and rotates with shaft 160. The cam disc 176 may conveniently be a portion of the friction device 163 previously described. A three lobed spacing cam 178 and a peripherally notched printing cam 179 are also mounted upon and rotate with the shaft 160. A printing lever 181 which serves to rock the shaft 48 is normally pressed against the periphery of the cam 179 by a spring 182 (Figure 4). The gear 52 previously described which is slidably mounted on the squared portion 54 of the rotatable shaft 56 is held in proper relative position with the gear 51 by means of a depending fork 184 of the carriage arm 41. The said fork carries rollers 185 engaging each side of the gear 52.

In operation of the printer, when any given character has been selected as explained previously by rotation of the rotary selecting device 132, the cam 167 engages the trip lever 171 when the lug 147 of the selection transfer element 145 has just passed the end 102 of the stop lever 95. At this time the end 169 of the trip lever 171 drops into the notch 168 to release the function operating shaft 160 for rotation which thereupon turns through one-third of a revolution. The function operating shaft is then stopped by the arm 173 engaging with projection or cam tooth 174 on the cam 176. During this rotation of the function operating shaft, the printing arm 181 drops into one of the three recesses 180 of the cam 179 and the action of the spring 182 rotates the squared shaft 48 slightly thereby pressing the typewheel against the record paper or sheet 55.

This action is to insure the accurate positioning of the typewheel so that a clear print of each character is had. A centering disc 187 is provided shown in detail in Figure 8 and in position on the typewheel spindle 38 in Figure 5. The centering disc is provided with deep notches 190 and shallower notches 192. A centering finger 188 is pivotally carried by a pin 189 and is biased away from the centering wheel or disc 187 by a spring 191. The centering finger 188 normally rests against the stop bar 193 which extends across the printer and is mounted on the frame member 12 and the bracket 49. When the typewheel carriage 43 is operated to print, the lever 188 fulcrums on the bar 193 forcing the former into engagement with one of the notches 190 in the centering disc 187.

It will be noted that when the typewheel carriage is operated for printing, the gears 51 and 52 are withdrawn from a complete mesh. The purpose of this construction is to provide slack between the two gears so that the centering device may correctly position the typewheel without having to force other more rigidly held parts

Letter space

The typewheel carriage 43 is spaced the proper distance between each character printed by means of the apparatus now to be described. Depending from the lower portion of the typewheel carriage 43 is an arm 197 having a post 198 on which is pivoted a spacing pawl 199 and a retaining pawl 200. These pawls are shown in detail in Figures 5 and 7 of the drawings. The end of the spacing pawl 199 is laterally elongated as indicated by the reference character 201 and the end of the retaining pawl 200 is likewise elongated as indicated at 203. These two pawls are normally held in engagement respectively with a slidably mounted spacing rack 205 and a fixed retaining rack 206, both of said racks being mounted on the frame 12 and the bracket member 49. Sliding movement of the bar 205 is

provided by the elongated slot or hole 207 at each end, which is received on the carrying pins or studs 208, one of which is secured to the frame member 12 and the other to the depending offset portion of the bracket 49. A pawl release bar 210 is mounted on the studs 208 between the bars 205 and 206 by means of sloping elongated slots 212 adjacent each end of the said bar. The slide mounting for the bar 210 provided by the inclined slots 212 causes this bar to be raised when it is moved to the right in a manner to be described in connection with the type carriage return function.

Spacing of the type carriage 43 occurs when the function operating shaft 160 rotates one third of a revolution upon release of the trip lever 171 in the manner described in connection with the printing operation. One of the lobes of the three lobe cam 178 permits the spacing bar 205 to move to the right under the influence of the spring 216 by reason of the roller 217, which is carried by the bracket 218 secured to the spacing rack, dropping into the depression provided by the lobe of the cam. As the spacing rack 205 moves to the right, the amount determined by the length of the slot 207, the typewheel carriage 43 moves with the rack 205 to a position in readiness to print the next character and it is retained in this position by the retaining pawl 200 engaging the stationary rack 206. The spacing rack 205 is returned by the lobe of the cam 178 in readiness to move the type carriage following printing of the next character. It will be noted that the notches of the cam 179 and the lobes of the cam 178 are angularly spaced with respect to each other in such a manner that the printing arm 181 is permitted to operate following which the spacing rack 205 moves to the right to position the typewheel carriage for printing the next character to be received by the pinting magnet 20. Also it will be noted that the function operating shaft 160 is stopped by a projection 174 of the cam 176 just as the arm 181 is about to enter notch 180 in the cam 179. Therefore printing of a character will occur almost immediately upon rotation of shaft 160 when it is released by the trip lever 171. The trip lever 171 in accordance with the foregoing description releases the shaft 160 for rotation of 120 degrees just as the progressive selection of a letter or character is accomplished.

In the embodiment of the invention disclosed, the typewheel is inked by an ink roller 220 which is mounted on the typewheel carriage 43. The ink roller 220 bears against the type faces on the typewheel 38 and is carried by a pair of arms 221 which are pivoted upon a lateral extension 222 of the typewheel carriage. An ink reservoir 223 is mounted on the main frame member 12 and whenever the carriage returns to the starting position the ink roller 220 will contact with a wick 224 in the ink reservoir for the purpose of replenishing the supply of ink on the roller.

Platen support

The paper platen 53 is supported in a rocking frame comprising two spaced frame members 226 and 227. These frame members are secured by set screws 229 to a rock shaft 228 which extends across the printer and is rotatably supported in the main frame members 11 and 12. The platen shaft 231 is rotatably supported in forwardly extending arms 232 of the frame members comprising the rocking platen frame. Paper guide rollers 234 and 236 are supported by arms which are pivotally connected to extending lugs of each of the frame members 226 and 227 as illustrated by Figures 3 and 4 of the drawings. The guide rollers 234 and 236 serve in the usual manner to hold the record paper or strip in contact with the printing platen. Reverse rotation of the platen 53 is prevented by a ratchet wheel 238 which is secured to the platen shaft 231. The pawl 239 is adapted to engage the teeth of this ratchet and is held in engaging position by a spring 241. A line or spacing ratchet 242 is secured to the platen shaft 231. A lever 243 is rotatably mounted over the platen shaft 231 and is provided at its lower end with a pawl 244 which is adapted for cooperation with the teeth of the ratchet 242 for rotating the platen when the lever 243 is rocked. A lever 245 is provided for setting the line space device to move the platen one or more spaces. A link 246 is pivotally connected at one end to the lever 243 opposite the point of pivotal connection of the ratchet 244 and the remaining end of this link is pivotally connected to a lever 247 which is pivoted on a stud 248 supported on the frame member 12. The end of the lever 247 opposite its connection to the link 246 is pivotally connected to a bar 250 (Figure 6), which is provided at its end with an upwardly projecting portion 251 and is notched to provide a bail engaging finger 252.

A lever 254 is secured to the platen frame supporting shaft 228 by means of a set screw 255 so that when rocking movement is imparted to the lever 254 it will rock the shaft 228 which in turn will raise or lower the platen 53 from its unshifted or lower case position to the shifted or upper case position. A lever 257 is pivotally secured on the frame 12 at 257*a* and is provided with an upwardly extending tongue 258 which is adapted to cooperate with a stop 259 which projects from the lever 254 into the path of the extension 258. The lever 254 is provided with a second stop 261 which is adapted to contact with the edge of the lower portion of the lever 268. The lower end of the lever 257 is pivotally connected to a forwardly extending pull rod 264 which is provided at its end with an upwardly projecting portion 265 and a bail engaging finger 266. The pull rod 264 operates the platen frame to its shift or upper case position in a manner to be later described. The lever 268 is rotatably mounted on the platen shaft 228 and its free end is pivotally connected to a third pull bar 270 which like the previously described pull bars is provided with an upwardly extending portion 271 and a bail engaging finger 272.

The pull bars 250, 264 and 270 thus far described are connected at the ends opposite their bail engaging fingers to springs 275 which serve to hold them in the position shown in Figure 6 of the drawings. The selection and operation of the pull bars will be fully disclosed hereinafter.

The platen carrying frame members are provided with extensions 278 which are pointed at their ends as indicated by reference character 279. A pair of levers 281, one of which is pivotally secured to each of the frame members 11 and 12, are each provided at its end with a roller 282 which engages the pointed end 279 of the platen frame extension. Each lever 281 is biased against the pointed end 279 by means of a spring 283 so as to hold the platen frame against either of the stops 284 and 286 which determine the normal and shifted position of the platen frame.

Function selecting mechanism

To operate the carriage return, shift, unshift, line feed, and other functions that may be required, a plate 288 having control fingers extended therefrom in various planes is secured for rotation with the shaft 56. From the description previously given of the operation of the stop finger assembly 77 it is to be noted that two stop fingers 86 are provided which serve to hold the shaft 56 stationary in either one of two positions and therefore the plate 288 is provided with two sets of control fingers. These control fingers (Figure 4) are numbered consecutively and are designated by the reference characters 291 to 294, inclusive. The control fingers of the complementary set which extend above the shaft 56 in Figure 4 have been given the same reference characters. It will be noted that control fingers 291 are in radial alignment and likewise the remaining three sets of fingers are in radial alignment. The radially aligned control fingers of each set lie in the same plane.

When the shaft 56 rotates the control fingers 291 of the plates 288 engage the upper projection 251 on the pull bar 250 and in a like manner the fingers 292 and 293 cooperate respectively with the projections 265 and 271 on the pull bars 264 and 270. The function of the control fingers 294 will be explained in detail hereinafter.

As the shaft 56 rotates in response to received line signals the control fingers pass over the pull bars pressing them downwardly and if the shaft 56 is stopped by transmission of a particular character combination to operate a function positioning one of the fingers over its corresponding pull bar, the bail engaging finger of this pull bar will catch upon one of the projections 299 of the bail 161 so that the selected bar will be pulled forwardly when the bail is rotated upon rotation of the shaft 160. As previously explained, the rotation of shaft 160 is initiated by release of lever 171 from the cam 176.

Line feed and carriage return

The platen 53 is rotated to advance the paper sheet or web vertically to the next line to be printed by the pull bar 250 under control of the fingers 291, the lever 247 and the link 246. A bell crank 302 (Figure 7) comprising an arm 303 and a second arm 304 at right angles thereto is pivotally mounted on a stationary pivotal mounting 305. The arm 303 is engaged by the edge of a lug 307 on the pull bar 250, and the arm 304 engages a notch 308 in the pull release bar 210. As previously explained, the bar 210 as it is moved to the right is raised by reason of the inclined slots 212 and as the bar 210 raises it engages under the lateral extension 201 and 203 on the pawl 199 and 200 respectively, thereby raising these pawls from engagement with the notches on the slidable bar 205 and stationary bar 206, permitting the typewheel carriage 43 to return to its starting position at the left. The typewheel carriage is drawn to the left by a spring 309 (Figure 1 and Figure 9) which is connected at one end to an upstanding bracket 311 secured to the base 14 of the printer. The free end of the spring is connected to an arm 312 pivotally secured at 314 to the frame of the typewheel carrier and at its remaining end to the free end of an arm 315 which is pivotally connected to the bracket 311 by a bolt and nut 316 or other suitable securing means. By this means a substantially constant force is maintained tending to draw the carriage to the left. To maintain the bar 210 in operative position to which it is moved by the pull bar 250 until the typewheel carriage completes its travel to the left, a latch device comprising a bell crank latch 318 is mounted on the main frame member 12. The arm 319 of the latch is provided with a hooked detent 321 which holds the arm 304 on the bar 210 in operative position until the lug 322 carried by the typewheel carriage strikes the arm 323 of the latch 318 thereby releasing the bell crank 302 and permitting the bar 210 to return to its normal position. A spring 324 serves to guide the latching member 318 to holding position.

The operation of the line feed and carriage mechanism in response to a received signal combination for these functions will now be described. Upon receiving a signal combination for line feed on the magnet 20, the shaft 56 will be turned by operation of the levers 91 and 96 which are selected for operation by the roller 116 on the armature 24 in the manner previously explained. The total rotation of the shaft 56 in response to this received signal will place the control finger 291 over the end of the pull bar 250 pressing it downwardly so that finger 252 adjacent its end hooks over the axial projection 299 on the bail 161. Shaft 160 is next released for rotation by operation of the pawl 171 which causes the bail 161 to be rotated in a clockwise direction as viewed on Figures 4 and 6.

The bar 250 is drawn forwardly to the right as viewed on Figure 6 and the bell crank lever 302 is rocked by reason of the bell crank lever arm 303 engaging the edge of the lug 307. Movement of the bell crank lever 302 causes its arm 304 to carry the bar 210 to the right and also to raise the bar 210 by reason of its inclined slotted connection. The pawls 199 and 200 are raised from their notches in the bars 205 and 206 whereupon the typewheel carriage 43 is permitted to move to the left under the influence of springs 309. As the bar 210 is retained in its raised position by engagement of the latching detent 321 with the arm 304 of the bell crank, the typewheel carriage continues its movement until it returns to its normal or starting position. As it arrives at its starting position the lug 322 causes the bell crank lever 302 to be released permitting the bar 210 to return to its normal or lower position whereupon the pawls 199 and 200 are again ready to function to feed the carriage to the right as successive characters are printed.

When the pull bar 250 is drawn forwardly by the bail 161, in addition to operating the carriage return mechanism, it rocks lever 247 about its pivot drawing the link 246 to the left and thus rocking the lever 243 in a counter-clockwise direction as viewed on Figure 4. During this time the pawl 244 is engaged with the tooth of the ratchet wheel 242 to feed the paper sheet or web 55 from one line to the next.

While an automatic carriage return has been disclosed and described, it will be obvious that the line feed function may be separated from the carriage return function and a separate pull bar may be provided for cooperation with a bail to return the carriage when a separate carriage return signal is received by the receiving magnet 20.

When the rotating bail 161 has nearly completed its cycle of operation, that is, has made nearly one third of a revolution, the bar 250 automatically disengages from the axial projection

299 of the bail by reason of the circular motion of the bail and the pull bar 250 is then returned to its normal position by its spring 275.

Figure shift mechanism

When a combination of signals is received on the magnet 20 to select the shift function that is to place the mechanism in position to print figures, such a signal combination will position the shaft 56 so that the control finger 292 will extend downward over the pull bar 264 (Figures 4, 6 and 15), depressing the pull bar 264 so that it is in the path of the rotating bail 161. When the shaft 160 is released and the bail 161 rotates, the pull bar 264 is pulled forwardly. The lever 257 is rocked in a counterclockwise direction as viewed on Figure 4 of the drawings, and the upwardly extending end 258 of this lever presses against the stud 259 on the lever 254 thereby causing the platen 53 to be lowered. As the platen is lowered the rollers 282 press the extensions 276 of the platen frame against the stop 286 holding the carriage firmly in its lower or figure printing position which is also known as the "upper case" position. Initiation of the figure shift operation is illustrated diagrammatically on Figure 15 of the drawings, which shows the finger 292 pressing the end of the pull bar 264 into engagement with the bail 161. Figure 14 of the drawings shows the position of the platen frame and the lever 254 after the figure shift operation has occurred.

Letter shift

The third pull bar 270 cooperates with the control finger 293 (Figures 4, 6 and 14) in the manner previously explained in connection with the "line feed" function and the "figure shift" function. When this pull bar 270 is drawn forwardly by rotation of the bail 161, the platen frame is restored to the position for printing letters from the upper row of characters on the typewheel. This is accomplished by the lever 266, which as previously explained is freely pivoted on the platen frame shaft 228, being drawn forwardly into engagement with the stud 261 on the arm 254, causing the platen to be raised until the frame extensions 276 are pressed against the stops 284 by the rollers 282.

Letter feed lock

It is obvious that when some of the functions of the printer are to be performed, movement of the type carriage must be suspended. A character will not be printed upon the paper sheet or web inasmuch as when operation of certain of the functions is selected a blank portion of the typewheel comes opposite the paper sheet or web and even though the typewheel carriage is rocked, printing does not occur. The typewheel is kept from contact with the paper by the finger 188 encountering a shallow notch 192 in the disc 187. To, at times, suspend movement of the type carriage the following mechanism is provided. An interference latch 329 (Figures 1, 4 and 7) having a body portion 330 is pivoted on the stud 331 secured to the frame member 12. The interference latch 329 engages a notch 333 in the spacing rack 205. The function pull bars are provided with cam surfaces 334 which engage the tail piece 335 of the latch 329, causing it to engage the notch 333 and prevent the spacing or letter feed operation. A spring 336 normally prevents the latch 329 from seating in the notch 333.

Signal bell control

To operate the function such as ringing a bell or to operate switching mechanism at the receiver if desired, a special arrangement for operating the function pull bars is provided, which comprises a control bar 338 (Figures 4, 6 and 13) which has a laterally extending upward projection 339. The projection 339 corresponds in function to the projection on the previously described pull bars and cooperates with one of the control fingers 294. A fourth pull bar 341 is mounted on an arm 346, said arm being secured to revolve with the platen carriage shaft and rock therewith. The pull bar 341 is thus depressed until its projection engages with the tooth 299 of the bail 161 and the bar 341 is drawn forwardly and released whereupon the clapper 347 strikes the bell 348 to give an audible signal. It will be understood that the code combination for "signal" may be the code combination for selecting any of the letters of the alphabet in which a blank space is provided on the typewheel in the upper case. After the signal has been given the platen frame can be restored by transmission of the letter or unshift signal whereupon printing of letters may be resumed.

Pull bar guide

To insure the full operation of the pull bars 250, 264, 270 and 341 and to permit the shaft 56 to revolve immediately after the function selection has been made, all of the pull bars are provided with projections 350 which are adapted to engage the underside of a plate 351 when the pull bars move forward thereby holding the pull bars in a depressed position until the pulling operation is completed. A plate 352 is placed under the pull bars so as to prevent them from dropping down and following the rotating bail 161 beyond the disengaging position. The plates 351 and 352 are supported from a bracket 353 which is secured in any suitable manner to the main frame member 12. Each of the pull bars is provided with a spring 354 to hold it in normal or raised position out of engagement with the rotary bail or cam 161.

From the foregoing complete description of the selector mechanism and printer embodying my present invention and the operation of its several parts, it is believed that its general operation in service will be understood. As each letter of a message is received by the magnet over the signal channel to which its leads 25 are connected, the signal elements of the code combination for that letter are received in succession by the magnet 20 and each signal element if it be a marking impulse sets one of the stop levers 91 to 95, advancing the typewheel driving shaft until the selected letter is in position to print. Immediately after the fifth signal impulse has been received, whether it be a marking or a spacing impulse, the rotating selector shaft 68 causes release of the function operating shaft 160 whereupon the function operating shaft is free to turn through a distance of 120 degrees, or a third of a revolution. The rotary bail or cam 161 secured to the shaft 160 also turns through a third of a revolution, but if none of the function control fingers on the disc 288 have been positioned over the function pull bars by the code combination, reception of which has just been completed, none of the pull bars will operate, but rotation of the shaft 160 automatically performs two of the printer functions, namely, letter space or feed and causes the typewheel to be pressed against the paper web or sheet 55. The automatic spacing

function occurs by reason of the movement imparted to spacer bar 205 by one of the lobes of the three lobe cam 178 acting on the roller 217. The automatic printing function is performed by one of the notches of the cam 179 permitting rocking of the typewheel 38. Rotation of the shaft 160 automatically performs the further function of restoring the parts of the printer to normal position for receipt of the next code combination of signal impulses by operating the lever 153 to release the stop finger shaft 56 and permit it to return to normal or starting position.

When a code combination for a function operation is received one of the fingers, according to the particular function selected, is positioned over its corresponding pull bar and the pull bar is moved forwardly by the bail 161 upon rotation of the shaft 160 which is initiated in the same manner as when a code combination for printing of a character is received. The selected pull bar operates the particular and desired function, but the latch 329 automatically prevents spacing or feeding of the typewheel carriage. Should the received code combination of signals select the pull bar 250 which upon operation feeds the paper upwardly a distance of one line, the carriage return function controlled by the bell crank lever 302 is automatically operated to return the carriage to its normal position ready for printing of the next line.

At any time an audible signal may be received without mutilating the message on the paper web 55 by transmitting the code combination for "figure shift" followed by an appropriate code combination for "signal," whereupon the pull bar 341 will be selected to operate the bell signal.

It will be seen from the foregoing that I have provided a simplified form of selecting mechanism in which the successive impulses of the received code combination of signals, directly and progressively position the typewheel so that the typewheel is brought to the element turning position when the last code signal is received. This mode of operation eliminates the necessity for providing a means for storing selections or to provide overlap for printing action.

Figure 17 of the drawings illustrates an arrangement whereby the springs which bias the pull bars from engagement with the bail may be eliminated. The pull bars of which pull bar 250*a* is illustrated, are provided with a tongue 252*a* having an inclined surface 400 which is adapted to be engaged by the tooth 299 of the bail 161. The pull bars are shown in their normal position by Figure 17 in which they are all in contact with the bail 161. When one of the stop fingers, for example stop finger 291*a* is positioned over the upwardly projecting portion 251*a* of the pull bar which is to be operated, the said finger causes the pull bar to be held down in engagement with the bail 161 so that when the bail is rotated the pull bar is moved by the bail. As the bar is moved, the cam surface 350*a* thereon is drawn under the bar 351*a* whereby the finger 252*a* is maintained in engagement with the tooth 299 until the bar completes its movement and is released from engagement with the bail.

The remaining pull bars which are not to be operated when the bail 161 is released for rotation are pressed upwardly by reason of the sloping cam surfaces 400 and do not operatively engage the tooth 299 of the bail. When a character is selected for printing all of the pull bars will be pressed upwardly upon rotation of the shaft 160.

An important feature of the modification just described is that the fingers on the disc 288 do not strike the lugs on the function operating pull bars while it is rotating during selection of a letter, since the pull bars are out of the path of the rotating fingers.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a printing telegraph machine, a two factor permutation code selecting mechanism, and printing means, a series of stops, one for each printing position, separately movable stop means, one for each unit of a code, and means on said stop means engaged by said selector mechanism for cooperation with said series of stops to directly and progressively control said printing means.

2. In a printing telegraph machine, a plurality of type faces, a selecting mechanism comprising a plurality of stops, one for each type face and a plurality of separately movable means responsive to a series of code signals and directly and progressively acting upon said stops, always in the same succession to position a desired type face into ultimate printing position when the last code signal is received.

3. In a printing telegraph receiver, a movable typewheel for printing characters, means for bringing said typewheel in a selected printing position including a shaft on which is mounted a member having a series of stops in different planes and progressively doubling in number, one stop for each printing position of the typewheel, a series of separately movable stop members, one for each unit of a code, and means to selectively position one or more of said stop members to thereby position the typewheel.

4. In a telepgraph receiver in which the record is printed from a typewheel, typewheel drive mechanism, means to position the typewheel comprising an electromagnet for receiving two factor permutation code signals and a permutation code selector operated thereby, separately movable stop members, one for each unit of the permutation code and operated by said permutation code selector, and a series of stops progressively doubling in number attached to the typewheel drive mechanism with which said first-mentioned stops cooperate to position the typewheel in accordance with the received signals.

5. In a telegraph receiver, a typewheel, a drive shaft for said typewheel provided with stops, one for each printing position, in a series of rows and which progressively double in number as to the rows, separately movable stop members, one for each row of said first-named stops and means to selectively operate the stop members to position the typewheel in accordance with the received code combinations.

6. A telegraph receiver in which a printed record is made from a typewheel that is connected to a drive shaft in a two to one ratio, said drive shaft being provided with duplicate rows

of stops, one row for each unit of a permutation code by which the operation of the printer is to be controlled, and stop members, one for each row of rotating stops, said rotating stops being progressively doubled in number with respect to the rows, and a magnet to set the stop members in accordance with received signals and thereby position the typewheel.

7. A telegraph receiver in which a printed record is made from a typewheel, means to position the typewheel comprising stops, one for each printing position of the typewheel, said stops being located in groups, each group having double the number of stops of the previous group, and a series of separately movable stops, one for each of said groups, and a selector mechanism to selectively operate the last-named stops to selectively position the typewheel.

8. A printing telegraph receiver comprising a magnet responsive to received code combinations of selecting conditions, each preceded by a start condition, a rotatable member, means to rotate said member in timed relation with the received code combination, means to initiate rotation of said member by said magnet upon reception of said start condition, a plurality of levers, arranged to move under the joint mechanical control of said member and said magnet, and a plurality of rotatable stop fingers in the path of and arranged to be arrested by said levers upon operation thereof.

9. In a selecting mechanism, a set of pivoted levers, a latch for holding said levers in operated position, means for operating said levers in succession, said latch being formed with an inclined face to have an increasing engagement with the successive levers to facilitate the release of a lever from operative position upon operation of another lever in said set.

10. In a printing telegraph machine, a typewheel, a rotatable shaft for driving said typewheel, a stop finger assembly comprising a set of stop fingers secured to and rotatable with said shaft, a set of pivoted levers adapted to be moved into engagement with said stop fingers, and means for moving said levers into finger engaging position, said means comprising a movable member having stop lever engaging devices thereon, a magnet cooperating with said stop lever engaging devices to cause said devices to engage said stop levers upon receipt of a signal unit as said stop lever engaging devices successively pass said stop levers.

11. In a printing telegraph receiver, a rotatable typewheel, a drive shaft for said typewheel, means carried by said shaft for bringing said shaft to a plurality of positions, and gear means for driving said typewheel from said shaft, said gear means having a two to one ratio whereby said shaft rotates at half the speed of said relatively light typewheel.

12. In a page printing telegraph machine; printing means; function mechanisms for shift, unshift, line space and carriage return; movable means common to said printing means and to said function mechanism for selectively positioning said printing means and for controlling the action of said function mechanism, said movable means comprising a stop-wheel having a plurality of rows of stops thereon that progressively double in number as to the rows; and selector means, responsive to received code signal combinations and including means for successively engaging said stops, for operating said movable means directly and progressively.

13. In a printing telegraph machine a selecting mechanism, a printing mechanism controlled by said selecting mechanism, a spacing mechanism for said printing mechanism, a normally stationary shaft, cam means on said shaft to cause a printing operation of said printing mechanism and a second cam means on said shaft for operating said spacing mechanism, said shaft being released for rotation by said selecting mechanism so that printing and spacing operations are accomplished automatically.

14. In a printing telegraph, a movable carriage, a spacing mechanism for said carriage comprising a spacing member and a spring for moving said spacing member, means to release said spacing member to move said carriage a distance of one space under the influence of said spring, a rotatable cam for restoring said spacing member to normal position against the action of said spring, and releasable means controlled in response to received signals for permitting said cam to rotate.

15. In a printing telegraph machine, a rotatable typewheel, an oscillating support for said typewheel, a gear on said support for moving a character on said typewheel to printing position, a typewheel drive shaft and a gear on said shaft meshing with said first-named gear, a notched centering device connected to said typewheel, a member operable upon oscillation of said typewheel support to enter a notch on said centering device thereby to accurately locate a selected character in printing position, said gears being withdrawn slightly from meshing engagement when said support is oscillated thereby permitting said member to move said centering device and said typewheel a slight amount independently of said shaft.

16. In a telegraph receiver in which the printed record is made from a typewheel that is connected to a drive shaft, function operating mechanism comprising fingers mounted on said drive shaft, one for each function of the receiver, a plurality of function operating means arranged for cooperation with said fingers, an operating bail for said latter means, and means to effect operation of said bail in predetermined arrangement with said fingers.

17. In a printing telegraph machine, a function operating device comprising a movable function operating member, a bail engaging finger and a projection on said member, a rotatable bail having a tooth for cooperation with said finger, a movable finger positioned in response to a received signal for engaging said projection to bring said finger into engagement with said tooth, and means responsive to said received signal for initiating rotation of said bail.

18. The combination of claim 17, wherein said movable member is provided with a cam surface, and means for cooperation with said cam surface to hold said bail engaging finger in engagement with said tooth after said movable finger is moved out of engagement with said projection.

19. A stop control mechanism for cooperation with stops on a type positioning shaft of a telegraph recorder, comprising a series of independently movable stop engaging members, an additional stop engaging member for holding said shaft in normal or start position, a latch member adapted to engage and hold any one of said members in stop engaging position, means to operate said series of stop engaging members in succession, said additional stop engaging mem-

ber being arranged to be released from stop engagement by said latch upon operation of any one of said series of stop engaging members, and means to restore said additional stop engaging member in the engaging position after an impression has been made from the positioned type but before the operating cycle is completed.

20. A stop control mechanism for cooperation with stops on a type positioning shaft of a telegraph recorder, comprising a series of independently movable stop engaging members, an additional stop engaging member for holding said shaft in normal or start position, a latch member adapted to engage and hold any one of said members in stop engaging position, means to operate said series of stop engaging members in succession, said additional stop engaging member being arranged to be released from stop engagement by said latch upon operation of any one of said series of stop engaging members, a cam driven by said means to move said latch to release a stop engaging member, and a cam to restore said additional stop engaging member to normal position when said first-named cam moves said latch, said second-named cam holding said additional member until said first-named cam passes from engagement with said latch.

21. In a printing telegraph machine, a typewheel drive shaft having a stop thereon, a pivoted member engaged by said stop to determine the normal or starting position of said shaft, a plurality of additional stops on said shaft, additional pivoted members adapted to engage said additional stops to stop said typewheel shaft in a plurality of printing positions, a latch member adapted to hold any one of said pivoted members in engagement with one of said stops, said latch member normally engaging said first-named pivoted member to hold said shaft at normal position, the cooperating portions of said latch member and said pivoted members being formed so that the latch member has an increasing degree of engagement with successive pivoted members whereby said latch releases a pivoted member previously engaged therewith upon movement of another pivoted member to stop engaging position.

22. In a printing telegraph machine, a typewheel drive shaft having a stop thereon, a pivoted member engaged by said stop to determine the normal or starting position of said shaft, a plurality of additional stops on said shaft, additional pivoted members adapted to engage said additional stops to stop said typewheel shaft in a plurality of printing positions, a latch member adapted to hold any one of said pivoted members in engagement with one of said stops, said latch member normally engaging said first-named pivoted member to hold said shaft at normal position, said latch member having an inclined edge whereby said pivoted members overlap said latch by varying amounts, said first-named pivoted member overlapping said latch the least amount.

23. In a printing telegraph machine having a case shift mechanism operable to shifted position, a function operating device operable in the shifted position of said mechanism, comprising a function operating pull bar provided with a bail engaging finger, a rotating bail, a control finger and means to position said control finger over said pull bar in response to received signals, a control bar provided with a control finger engaging projection, said projection being in the path of said control finger in the shifted position of said mechanism to cause engagement of said bail engaging finger with said bail.

24. In a printing telegraph machine having a case shift mechanism operable to shifted position, a function operating device operable in the shifted position of said mechanism, comprising a function operating pull bar provided with a bail engaging finger, a rotating bail, a control finger and means to position said control finger over said pull bar in response to received signals, a control bar provided with a control finger engaging projection, said projection being in the path of said control finger in the shifted position of said mechanism to cause engagement of said bail engaging finger with said bail and a mechanism associated with said pull bar and operated when said bail moves said pull bar.

25. A printing telegraph receiver comprising a typewheel, a typewheel drive shaft, a function operating shaft, and a selector shaft, a driving motor and driving means for said shafts comprising a friction device for each of said shafts; stops on said typewheel drive shaft a plurality of stop means for engaging said stops to stop said typewheel in a plurality of printing positions, a selector mechanism cooperating with said selector shaft and adapted to position said stop means in succession to stop engaging position under the control of received signals, means on said function operating shaft to cause said typewheel to print, and means associated with said selector shaft operable to release said function operating shaft for rotation immediately after said selector mechanism completes its operative engagement with said control fingers so that printing is accomplished immediately following selection of a character on said typewheel.

26. A printing telegraph receiver comprising a typewheel, a typewheel drive shaft, a function operating shaft and a selector shaft, a driving motor and driving means for said shafts comprising a friction device for each of said shafts; stops on said typewheel drive shaft, a plurality of stop means for engaging said stops to stop said typewheel in a plurality of printing positions, a selector mechanism cooperating with said selector shaft and adapted to position said means in succession to stop engaging position under the control of received signals, a cam on said function operating shaft having three cam notches, means to release said function operating shaft and arrest it after one-third of a revolution thereof to cause said typewheel to print, said releasing means comprising a cam associated with said selector shaft operable to release said function operating shaft for rotation immediately after said selector mechanism completes its operative engagement with said control fingers, so that printing is accomplished immediately following selection of the character on said typewheel.

27. A telegraph receiver, a typewheel, a typewheel drive shaft, function operating mechanism comprising fingers mounted on the drive shaft, a plurality of function operating bars adapted for cooperation with said fingers, a rotatable operating bail, and means to release said bail for rotation after one of said fingers is moved into position over the function operating bar associated therewith.

28. A telegraph receiver, a typewheel, a typewheel drive shaft, said drive shaft being provided with duplicate rows of stops, one row for each unit of a permutation code by which the operation of the printer is to be controlled, and

stop members, one for each row of rotating stops, said rotating stops being progressively doubled in number with respect to the rows and a magnet to set the stop members in accordance with received signals and thereby position the typewheel, function operating mechanism comprising fingers mounted on said drive shaft, one for each function, to position a plurality of function operating bars into the path of an operating bail to be operated thereby.

29. In a telegraph receiver, a stop element having a plurality of rows of stops thereon, a series of separately movable stop members arranged to engage said first stops, and means to selectively actuate the stop members to position said stop element in accordance with a desired setting, the stops on said stop element increasing in number in successive rows so that the degree of motion of said stop element as defined by said stop members decreases progressively as said stop members are operated.

30. A telegraph receiver in which a printed record is made from a typewheel, means to position the typewheel comprising stops, one for each printing position of the typewheel, said stops being located in groups, each group having double the number of stops of the previous group, a selector mechanism to selectively operate said groups of stops progressively from a smaller to a larger group to selectively position the typewheel whereby the degree of motion of said typewheel corresponding to the actuation of said last named stops decreases progressively and printing means to cooperate with said typewheel to effect printing, means to operate said printing means, and means to free said printing means from said typewheel before said typewheel positioning means comes to its normal stop position.

31. In a printing telegraph machine, a plurality of type faces, selecting mechanism comprising a plurality of stops adapted to be selectively controlled in response to code signals, means having a predetermined cycle of operation arranged to act upon said stops to position a desired type face into ultimate printing position when the last code signal is received and before a cycle of operation has been completed, printing means to cooperate with said type faces to effect printing, means to operate said printing means, and means to free said printing means from said type faces before said selecting mechanism and stop positioning means come to normal stop positions.

32. A function operating mechanism for a telegraph printer comprising a plurality of rotating function control fingers, a plurality of function operating bars corresponding to said fingers and subject to operation thereby, both said fingers and bars being individual to the functions, and a common operating bail in the path of which said operating bars are placed when operated by said control fingers.

33. A function operating mechanism for a telegraph printer comprising a plurality of rotating function control fingers, a plurality of function operating bars corresponding to said fingers and subject to operation thereby, both said fingers and bars being individual to the functions, and a common operating bail in the path of which said operating bars are placed when operated by said control fingers, and means to maintain engagement between a selected function operating bar and the common operating bail after the control finger is removed from function selecting position.

34. In a printing telegraph receiver, a rotatable typewheel, a drive shaft for said typewheel, means carried by said shaft for bringing said shaft to a plurality of positions, and gear means for driving said typewheel from said shaft, said gear means having a ratio such that said typewheel rotates at a relatively greater speed than said drive shaft.

35. A printing telegraph receiver comprising a typewheel, a typewheel drive shaft, a function operating shaft and a selector shaft, a driving motor and driving means for said shafts comprising a friction device for each of said shafts; stops on said typewheel drive shaft, stop levers for engaging said stops to stop said typewheel in a plurality of printing positions, a selector mechanism carried by said selector shaft and adapted to position said levers in succession to stop engaging position under the control of received signals, a cam on said function operating shaft having a plurality of notches, means to release said function operating shaft and arrest it after a predetermined extent of revolution thereof to cause said typewheel to print, said releasing means comprising a cam associated with said selector shaft operable to release said function operating shaft for rotation immediately after said selector mechanism completes its operative engagement with said control fingers so that printing is accomplished immediately following selection of the character on said typewheel.

36. In a printing telegraph machine, printing means, stop means for operating said printing means, selector levers for controlling said stop means, selective means to place said selector levers in controlling relation to said stop means, and means dependent on the character of signals received to render said selective means effective.

37. In a permutation code printing telegraph receiver, printing means, stop means for positioning said printing means comprising a series of rows of stops, each row being progressively doubled with respect to the preceding row, one row for each unit of a permutation code by which the receiver is to be controlled, a plurality of separately movable selector members, one for each row of stops, and means to operate said selector members and to position said printing means in accordance with the received code signals.

38. In a printing telegraph receiver; a rotatable shaft; printing means connected to said shaft for rotation thereby; function operating mechanisms; function mechanism control means fixed to and rotatable with said shaft; a stop assembly fixed to said shaft and including a plurality of rows of stops that progressively double in number as to the rows; and a selector mechanism, responsive to received code signal combinations, comprising means for successively engaging said stops, said selector mechanism being operable to directly and progressively operate said shaft for selectively positioning said printing means and said function mechanism control means in accordance with received signals.

39. In a printing telegraph receiver, function operating means and printing means, means to select said means in accordance with received signals, and universal means for operating said function operating means and said printing means.

40. In a printing telegraph receiver, function

operating means and printing means, means to select said means in accordance with received signals, means to operate said latter means comprising selector operating means, means for driving said latter means in synchronism with the received signals, and universal means driven by said driving means for operating said function operating means and said printing means.

41. In a printing telegraph receiver, printing means, function operating mechanism, selectively controlled means responsive to received code signal combinations for positioning said printing means and operating said function mechanisms, means for operating said printing means, and means for preventing operation of said latter means when a function operating signal is received.

42. In a printing telegraph receiver, a shaft, printing means connected to said shaft, function operating means, selector means connected to said shaft for positioning said printing means and selecting said function means, means for operating said printing means, and means connected to said shaft for preventing operation of said latter means when a function operating signal is received.

43. In a printing telegraph receiver, function operating means and printing means, means to select said means in accordance with received signals, and universal means for operating said function operating means and said printing means including means to operate said function operating means and said printing means prior to the completion of the cycle of said selecting means.

44. In a printing telegraph receiver, function operating means and printing means, means to select said means in accordance with received signals, means to operate said latter means comprising selector operating means, means for driving said latter means in synchronism with the received signals, and universal means driven by said driving means for operating said function operating means and said printing means prior to the completion of the cycle of said selecting means.

45. In a printing telegraph receiver, printing means, function operating mechanism, selectively controlled means responsive to received code signal combinations for positioning said printing means and operating said function mechanisms, means for operating said printing means prior to the completion of the cycle of said signal responsive means, and means for preventing operation of said latter means when a function operating signal is received.

46. In a printing telegraph receiver, a shaft, printing means connected to said shaft, function operating means, selector means connected to said shaft for positioning said printing means and selecting said function means, means for operating said printing means prior to the completion of a cycle of said selector means, and means connected to said shaft for preventing operation of said latter means when a function operating signal is received.

47. In a printing telegraph receiver, function operating means, printing means having a normal position, means to select said function operating means and said printing means in accordance with received signals, and universal means for operating said function operating means and said printing means including means to operate said printing means and permit said printing means to resume normal position prior to the completion of the cycle of said selecting means.

48. In a printing telegraph receiver, function operating means, printing means having a normal position, means to select said function operating means and said printing means in accordance with received signals, means to operate said latter means comprising selector operating means, means for driving said latter means in synchronism with the received signals, and universal means driven by said driving means for operating said function operating means and said printing means and permitting said printing means to return to normal position prior to the completion of the cycle of said selecting means.

49. In a printing telegraph receiver, printing means having a normal position, function operating mechanism, selectively controlled means responsive to received code signal combinations for positioning said printing means and operating said function mechanism, means for operating said printing means and permitting it to return to normal position prior to the completion of the cycle of said signal responsive means, and means for preventing operation of said latter means when a function operating signal is received.

50. In a printing telegraph receiver, a shaft having a normal start position, printing means connected to said shaft, function operating means, selector means connected to said shaft for positioning said printing means and selecting said function means, means for operating said printing means and permitting said printing means and said shaft to return to normal position prior to the completion of a cycle of said selector means, and means connected to said shaft for preventing operation of said latter means when a function operating signal is received.

51. In a telegraph receiver in which the printed record is made from a typewheel connected to a drive shaft, selective means responsive to received signals to select the position of said typewheel from a predetermined normal position, function operating mechanism comprising fingers mounted on said drive shaft, one for each function of the receiver, a plurality of function operating means arranged for cooperation with said fingers, an operating bail for said latter means, and means to effect operation of said bail in predetermined arrangement with said fingers prior to the completion of a cycle of said selective means.

52. In a printing telegraph receiver, function operating means, printing means having a zero position, means to select said function operating means and said printing means in accordance with received signals, means to operate said latter means comprising selector operating means, means for driving said latter means in synchronism with the received signals, and means for initiating the operation of a function after the selecting cycle is completed and before the return of the printing means to zero position.

53. In a printing telegraph machine, a two factor permutation code selecting mechanism, function operating means and printing means having a zero position, a series of stops, one for each function and printing position, stop means, one for each unit of a code, means on said stop means engaged by said selecting mechanism for cooperation with said series of stops to control said function and printing means, and means for initiating the operation of a function after the selecting cycle is completed and before the return of the printing means to zero position.

54. In a printing telegraph receiver, function

operating means, a typewheel having a zero position, a drive shaft for said typewheel provided with stops, one for each printing position, in a series of rows which progressively double in number as to the rows, stop members, one for each row of said first-named stops, means to selectively operate said stop members to position said typewheel in accordance with the received code combination, and means for initiating the operation of a function after the selecting cycle is completed and before the return of said typewheel to zero position.

55. In a printing telegraph receiver, a typewheel having a normal stop position, means for bringing said typewheel in a selected printing position including a shaft on which is mounted a member having a series of stops in different planes and progressively doubling in number, one for each printing position of said typewheel, a series of stop members, one for each unit of a code, means to selectively position one or more of said stop members to thereby position said typewheel, means to effect printing from said typewheel, and means to permit said typewheel to start for its normal stop position after printing and before completion of the selecting cycle.

56. In a printing telegraph receiver, a typewheel, a drive shaft for said typewheel, a stop wheel on said shaft provided with stops, one for each printing position, in a series of rows which progressively double in number as to the rows, stop members, one for each row of said first-named stops, means to selectively operate the stop members to position the typewheel in accordance with the received code combinations, function operating mechanism comprising fingers mounted on said drive shaft, one for each function of the receiver, and a plurality of function operating means arranged for cooperation with said fingers.

57. In a printing telegraph receiver, function operating mechanisms, selecting mechanism for said function operating mechanisms comprising a plurality of stops, one for each function operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate one of said function operating mechanisms.

58. In a printing telegraph receiver, printing means, function operating mechanisms, selecting mechanism for said function operating mechanisms comprising a plurality of rows of rotating stops, said stops progressively doubling in number as to the rows and including a stop for each printing position and a stop for each function operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said function operating mechanisms.

59. In a printing telegraph receiver, function operating mechanisms including a case shift mechanism, selecting mechanisms for said function operating mechanisms comprising a plurality of stops, one for each function operation including said case shift operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said case shift mechanism.

60. In a printing telegraph receiver, printing means, function operating mechanisms including a case shift mechanism, selecting mechanism for said function operating mechanisms comprising a plurality of rows of rotating stops, said stops doubling in number as to the rows and including a stop for each printing position and a stop for said case shift operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said case shift mechanism.

61. In a printing telegraph receiver, function operating mechanisms including a line feed and carriage return mechanism, selecting mechanism for said function operating mechanisms comprising a plurality of stops, one for each function operation including said line feed and carriage return operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said line feed and carriage return mechanism.

62. In a printing telegraph receiver, printing means, function operating mechanisms including a line feed and carriage return mechanism, selecting mechanism for said function operating mechanisms comprising a plurality of rows of rotating stops, said stops doubling in number as to the rows and including a stop for each printing position and a stop for said line feed and carriage return operations, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said line feed and carriage return mechanism.

63. In a printing telegraph receiver, function operating mechanisms including a signal function mechanism, selecting mechanism for said function operating mechanism comprising a plurality of stops, one for each function operation including said signal function operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said signal function mechanism.

64. In a printing telegraph receiver, printing means, function operating mechanisms including a signal function mechanism, selecting mechanism for said function operating mechanisms comprising a plurality of rows of rotating stops, said stops doubling in number as to the rows and including a stop for each printing position and a stop for said signal function operation, and means responsive to a series of code signals for directly and progressively acting upon said stops, always in the same succession, to position means to operate said signal function mechanism.

EDWARD E. KLEINSCHMIDT.

DISCLAIMER

2,192,350.—*Edward E. Kleinschmidt*, Highland Park, Ill. SELECTIVE SYSTEM AND PRINTING TELEGRAPH APPARATUS. Patent dated March 5, 1940. Disclaimer filed August 27, 1941, by the inventor.

Hereby enters this disclaimer to claims 30 and 31 in said specification.

[*Official Gazette September 30, 1941.*]