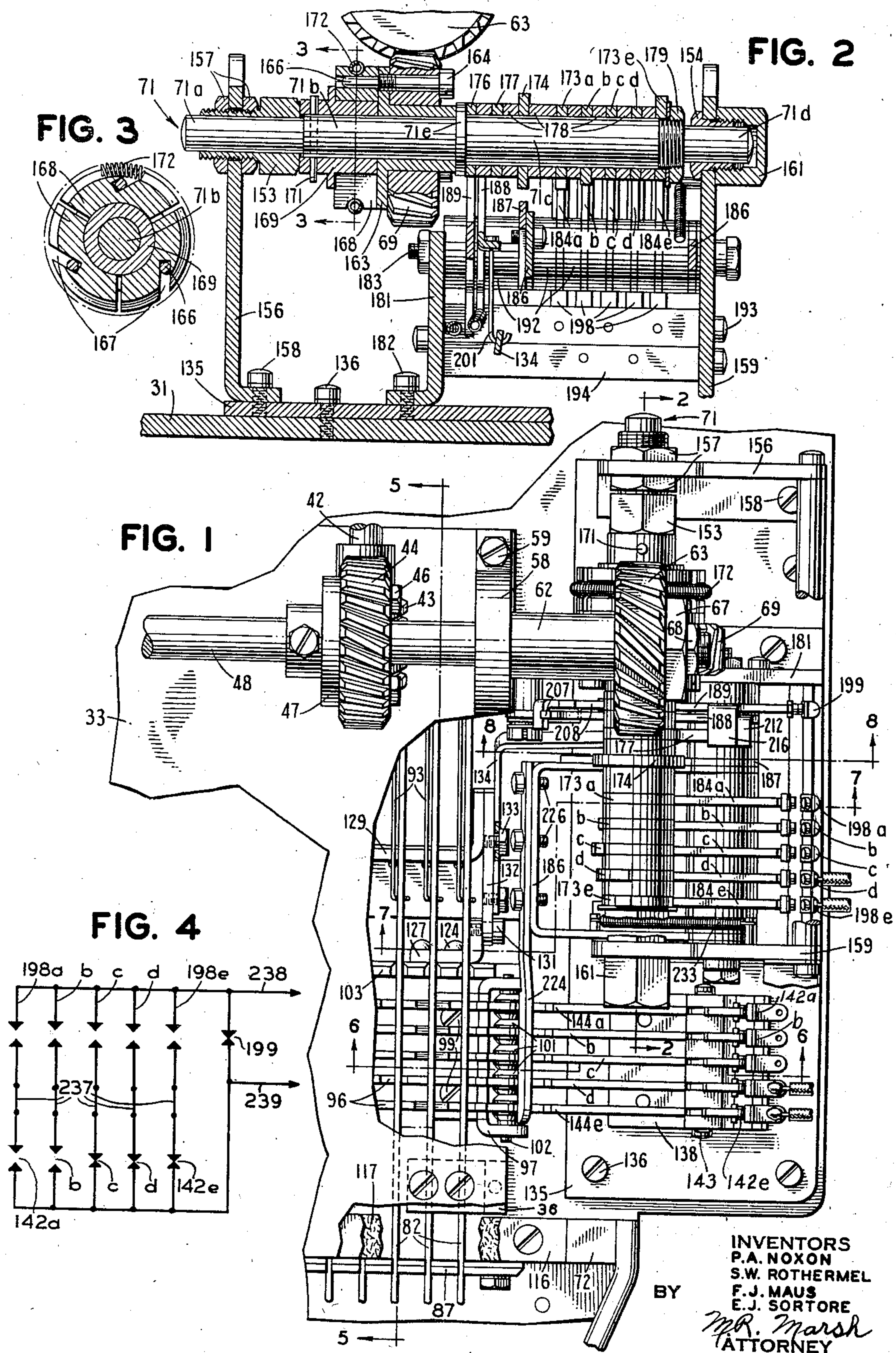


2,264,186

Original Filed March 3, 1936 2 Sheets-Sheet 1



Nov. 25, 1941.

P. A. NOXON ET AL

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TELEGRAPH KEYBOARD TRANSMITTER

Original Filed March 3, 1936

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FIG. 8

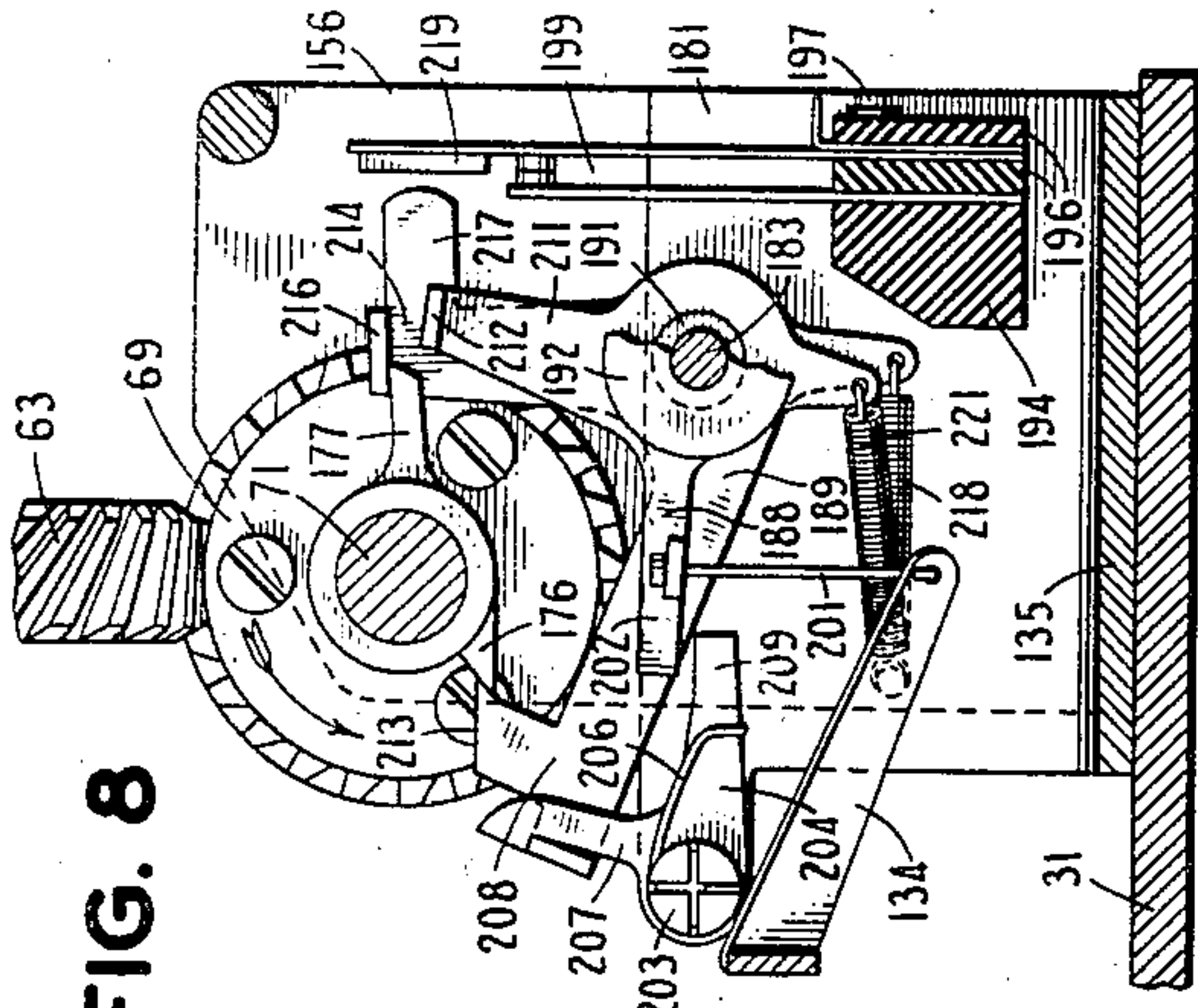


FIG. 7

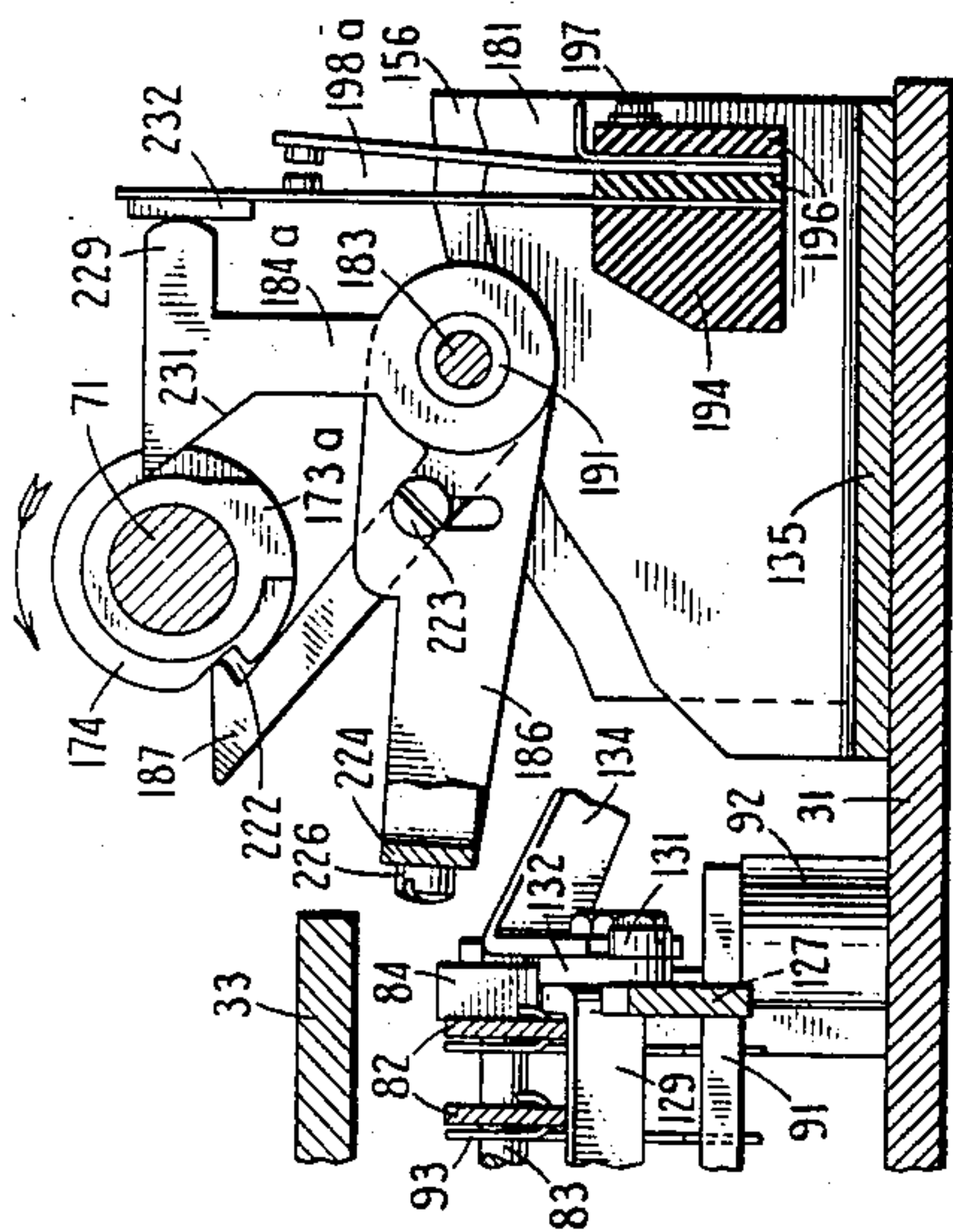


FIG. 6

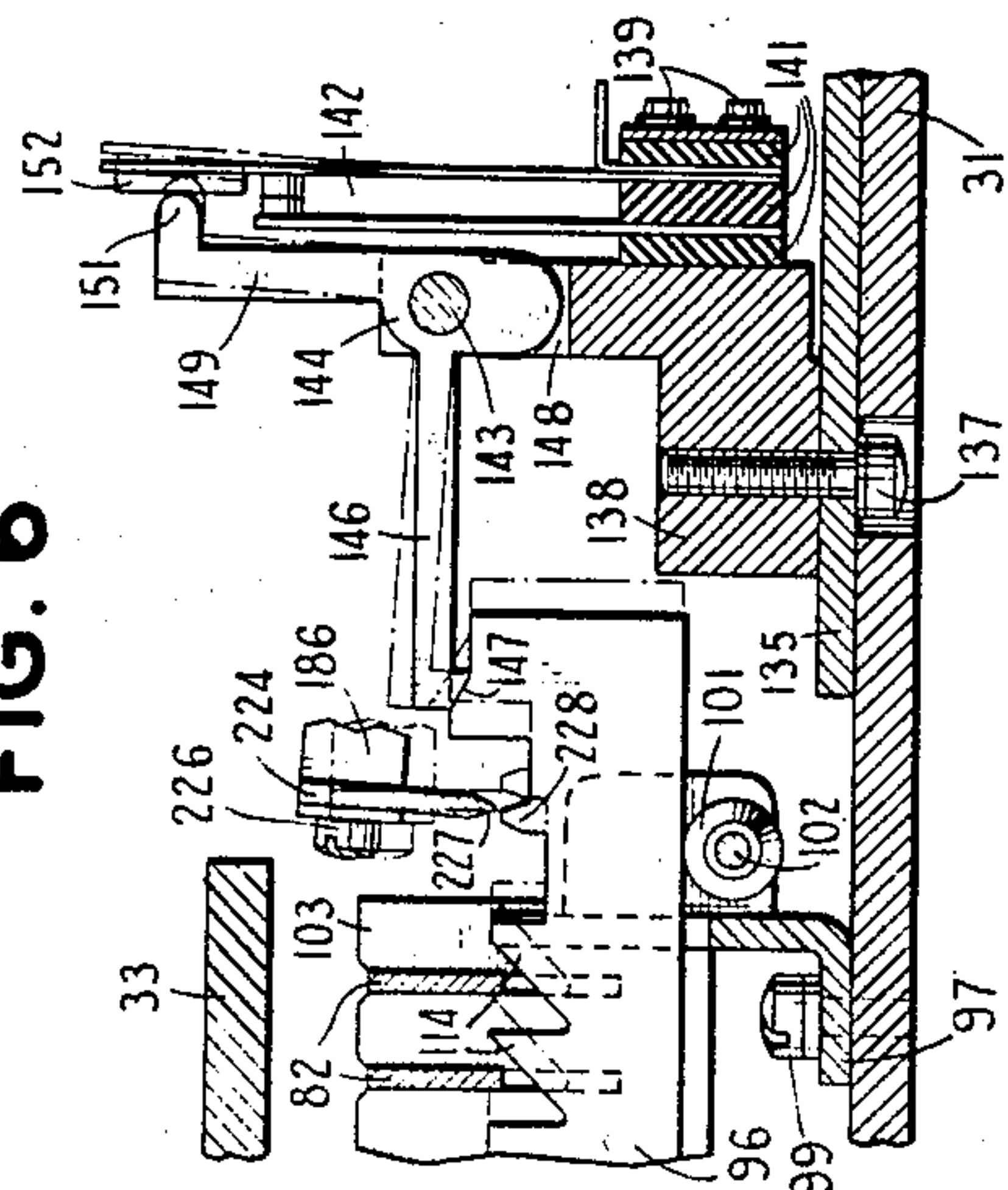
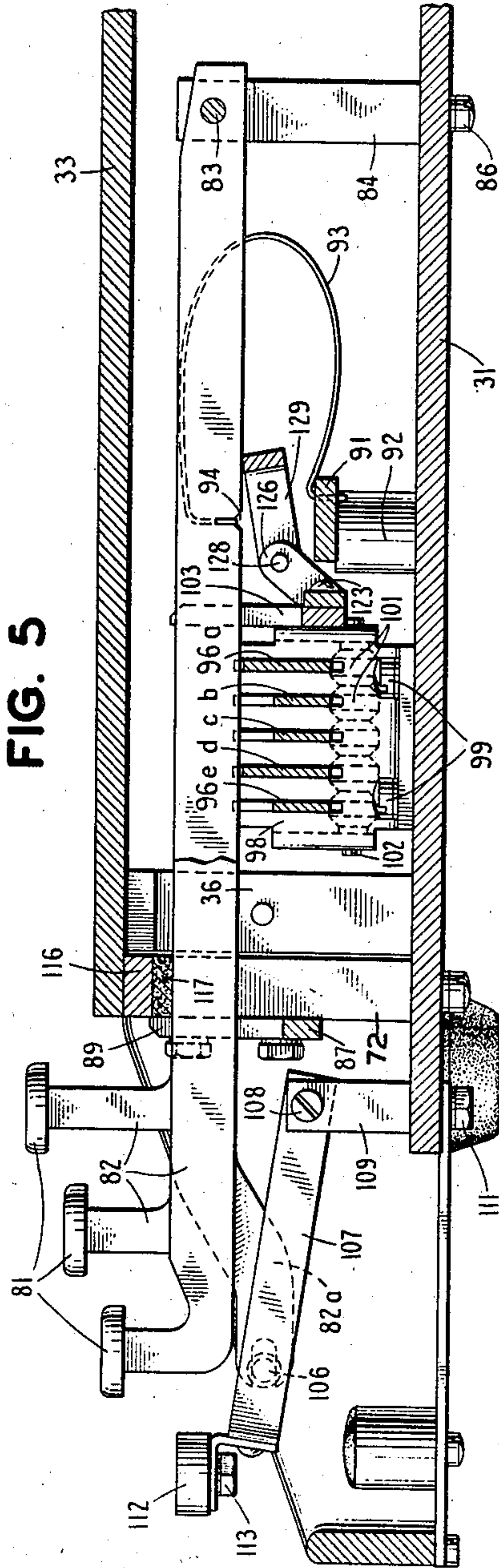


FIG. 5



BY

INVENTORS
P. A. NOXON
S. W. ROTHERMEL
F. J. MAUS
E. J. SORTORE

Mr. Marsh
ATTORNEY

UNITED STATES PATENT OFFICE

2,264,186

TELEGRAPH KEYBOARD TRANSMITTER

Paul A. Noxon, Tenaflly, N. J., Samuel W. Rothermel, Lynbrook, N. Y., and Frank J. Maus, Paterson, and Emerson J. Sortore, Westfield, N. J., assignors to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Original application March 3, 1936, Serial No. 66,906, now Patent No. 2,231,215, dated February 11, 1941. Divided and this application August 17, 1938, Serial No. 225,363

15 Claims. (Cl. 173—79)

This invention relates primarily to telegraph keyboard transmitters and more particularly to a keyboard mechanism employing a plurality of finger keys or keylevers, the actuation of any one of which at a time causes representative groups of permutation signals to be transmitted to a line circuit.

The present application is a division of a joint application of P. A. Noxon, S. W. Rothermel, F. J. Maus and E. J. Sortore, filed March 3, 1936, Serial No. 66,906, Patented Feb. 11, 1941, No. 2,231,215, and entitled Telegraph printer.

Telegraph keyboards wherein the actuation of a keylever causes groups of representative permutation signals to be transmitted to a line circuit usually operate to transmit signals of the simplex or start-stop type. These types of signals as are well known in the art comprise groups of a definite number, usually five, of two different line conditions in various combinations with each group being preceded by a start impulse which is of uniform line condition and followed by a rest impulse of uniform line condition and opposite to that the start impulse.

Accordingly it is one of the objects of this invention to provide a keyboard mechanism of the above type with a novel arrangement of transmitting the start and stop impulses accompanying each group of permutation signals.

Another object of the invention is to provide a keyboard mechanism of the above type wherein a rotary distributor member for distributing the impulses to the line circuit is invariably brought to rest for at least a predetermined length of time following each revolution thereof or the transmission of each permutation group of signals.

Another object of the invention is to provide a keyboard mechanism employing a primary set of transmitting contacts actuated simultaneously to set up signal codes therein and a secondary set of transmitting contacts actuated sequentially to transmit the signal code set up in the primary contacts.

These and other objects and advantages of the invention will be more apparent in the following detailed description.

The preferred embodiment of the invention illustrated in the accompanying drawings employs a mechanism selectively responsive to the actuation of finger keys or keylevers for controlling the operation of a set of primary current controlling contacts, set in various combinations according to the signal group to be transmitted represented by an actuated finger

key in conjunction with a rotary distributor mechanism cooperating with a secondary set of current controlling contacts for distributing current impulses representative of the setting of the first set of contacts to a telegraph circuit in the proper sequential order. The finger keys attached to associated keylevers are arranged in substantially the same manner as those of a three-row typewriter keyboard and are adapted on the actuation thereof to selectively position a series of permutation bars in various combinations which represent according to a predetermined arrangement the code combination assigned to the actuated keylever. The permutation bars are provided with beveled cuts therein in a manner well known in the art which allows the bars to be cammed from either one of two positions to the other in combination corresponding to the actuated keylever. A set of pivoted members one individual to each permutation bar and actuated thereby control the primary set of contacts in such a manner that with a permutation bar in one position the associated contact is closed and with the permutation bar in its other position the associated contact is open. The primary set of contacts are electrically connected to a secondary set of contacts and an independently rotatable distributor shaft released for rotation concomitantly with the positioning of the permutation bars sequentially actuates the second set of contacts to transmit combinations of impulses representative of the setting of the primary contacts. An auxiliary contact operated by the distributor shaft transmits a start impulse preceding each group of impulses and a rest impulse following each group. After each revolution of the distributor shaft it is brought to rest in its normal rest position for at least a predetermined length of time and in this position actuates the auxiliary contact to maintain the rest impulse.

A more complete and thorough understanding of the invention may be had from the following detailed description taken in conjunction with the accompanying drawings forming a part of this specification in the latter of which:

Fig. 1 is a fragmentary plane view of the transmitting mechanism and portions of some of the keylevers;

Fig. 2 is a vertical sectional view of the transmitting mechanism taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view of the friction clutch employed to rotate the distributor shaft

of the transmitting mechanism taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a circuit diagram showing the manner in which the primary and secondary contacts are connected together and to the sending circuit;

Fig. 5 is a vertical sectional view of the keyboard showing the arrangement of the keylevers and permutation bars taken substantially on line 5—5 of Fig. 1;

Fig. 6 is a vertical sectional view taken substantially on line 6—6 of Fig. 1 showing the right hand end of a permutation bar, a primary transmitting contact and operating member therefor;

Fig. 7 is a vertical sectional view taken substantially on line 7—7 of Fig. 1 showing a secondary transmitting contact and associated elements; and

Fig. 8 is a vertical sectional view taken substantially on line 8—8 of Fig. 1 showing the transmitting shaft releasing means and associated elements.

Referring first to Fig. 1, the local power for rotating the distributor member is furnished by a constantly rotating electric motor, only the shaft 42 of which is shown. Attached to the forward end of the motor shaft 42 is helical gear 43 which meshes with another helical gear 44 located directly thereabove. The gear 44 is attached by screws 46 to a gear hub 47 secured to a shaft 48 for rotation therewith. The shaft 48 comprises the main operating shaft of the printing unit normally associated with a keyboard of this type, but as will be evident, the keyboard with a proper power supply may operate equally well as an independent unit. A keyboard cover plate 33 which also may serve as the base for the associated printer is suitably supported above the keyboard base plate 31 by blocks such as 36, Figs. 1 and 5. The shaft 48 extends transversely of the keyboard and is journaled adjacent its right hand end in a bearing held in place by a clamping member 58 attached by screws 59 to a bearing post. At the right of the bearing cap 58 is a spacing sleeve 62 which has thereon a helical gear 63. A nut 67 threaded on the right hand end of the shaft 48, together with a lock nut 68 clamps the gear 63 and the sleeve 62 to the shaft 48 for rotation therewith. Directly beneath the gear 63 and in mesh therewith is another gear 69, Figs. 1 and 2, which is adapted to rotate the transmitting shaft 71 through a friction clutch which will be hereinafter described.

A set of keylevers 82 on the upturned ends of which are mounted key designating caps 81, are pivotally supported at their rear or right ends as shown in Fig. 5 on a pivot rod 83. The rod 83 extends transversely of the machine and is supported in a series of posts 84 which are attached to the top of the base plate 31 by screws 86. Adjacent the forward end of the keylevers 82 is a comb plate 87 which has therein a series of vertical slots 89 which guide the keylevers in a vertical plane. Supported by spacers such as 92 on the base plate 31 is a spring mounting bar 91 in which is anchored one end of single wire springs 93. Each of the keylevers 82 has an associated spring 93 which engages a notch 94 therein and the springs tend to pivot the keylevers in a clockwise direction to hold the forward ends in a normal elevated position.

Situated directly beneath the keylevers 82 at approximately the center thereof and extending in a direction at right angles thereto are a series

of five permutation bars indicated in general by reference numeral 96, Figs. 1 and 6, and individually by reference numerals 96a to 96e, Fig. 5. The permutation bars 96 are held in a vertical position and guided for transverse movement by individual vertical slots in guide brackets 97 and 98 located adjacent the right and left hand ends respectively of the permutation bars. The guide brackets 97 and 98 are attached to the base plate 31 by screws 99 and support pivot rods 102 at right angles to the permutation bars 96. A set of rollers 101 pivotally mounted on the rods 102 support the permutation bars and permit them to slide in the direction of their length with a minimum amount of friction. A second comb plate 103 attached to the guide brackets 97 and 98 has a series of vertical slots therein which keep the keylevers 82 in proper alignment adjacent the permutation bars 96. A letter space keylever 82a is arranged slightly different from the other keylevers 82 and has the free end thereof bifurcated to engage a pin 106 in a member 107. The member 107 is pivotally supported on screws 108 in blocks 109 attached to the base plate 31 by screws such as 111. Supported on the member 107 and attached thereto by screws 113 is an elongated space key 112 at the front and center of the keyboard.

Each of the permutation bars 96 have thereon, as is well known in the art, a different arrangement of upwardly extending bevelled projections 114, Fig. 6, which are so arranged that the bars slide from one to the other of two positions in various combinations as various keylevers 82 are actuated. On the actuation of a keylever, the lower edge thereof engages the bevelled projections to cause the movement of the permutation bars whereupon they assume a position representative of the actuated keylever. As is well known in the art each combination of settings of the permutation bars represents an associated keylever and the bevelled projections 114 are so arranged as to prevent the operation of more than one keylever at a time. The permutation bars 96 have no normal position but move to and fro in various combinations as various keylevers are depressed and a permutation bar will remain in its last actuated position until it is changed by the actuation of a subsequent keylever.

Extending between the spacing blocks such as 72, between the keyboard cover 33 and the base plate 31, is a bar 116 which limits the upward movement of the keylevers 82 by their springs 93. A strip of resilient material 117 such as leather is attached to the under side of the bar 116 and absorbs part of the shock of the keylevers when returning to a normal position which allows the keylevers to operate more quietly.

Attached by screws 123 and 124, Figs. 1 and 5, to the left and right hand ends of the comb plate 103 and extending toward the rear of the machine are two right angle brackets 126 and 127, respectively. A shoulder screw 128 in the bracket 126 pivotally supports one end of a universal bail 129. The other end of the universal bail 129 is attached to a lever 132 which is pivotally supported on a shoulder screw 131 in the bracket 127. Also attached to the lever 132 by screws 133 is a trip lever 134. The universal bail 129 extends beneath the keylevers 82 and is held in engagement therewith by means hereinafter described so that whenever any one of the keylevers is depressed, the universal bail is pivoted in a clockwise direction as shown in Fig. 5.

The universal bail 129 in conjunction with the trip lever 134 initiates the operation of the transmitting mechanism concomitantly with each operation of a keylever in a manner which will be hereinafter described.

The transmitting mechanism is mounted as a unit at the front right hand corner of the base plate 31 and has a mounting plate 135 which is attached to the base plate 31 by screws 136. An angle block 138 secured to the palte 135 by screws 137 has attached thereto by screws 139 a series of five spring contacts indicated in general by reference numeral 142 in Fig. 6 and individually by reference numerals 142a to 142e in Fig. 1. The springs of the contacts 142 are insulatedly mounted between strips of insulating material 141 and the tongues of the contacts normally tend to make contact with their associated stops. Supported in the angle bracket 138 is a horizontal rod 143 upon which is pivotally mounted a series of five bell cranks indicated in general at 144, Fig. 6, and individually by reference numerals 144a to 144e in Fig. 1. Each of the bell cranks 144 has a substantially horizontal arm 146, the underside of the end of which is bevelled and cooperates with a bevelled surface 147 on the end of an associated permutation bar 96. Each bell crank 144 has an associated permutation bar and is kept in alignment therewith by a row of vertical slots 148 in the angle block 138. Each bell crank 144 also has an associated contact 142 and projections 151 on the substantially vertical arms 149 are in operative relation with pieces of insulating material 152 on the tongues of the contacts 142.

Let it be assumed that a permutation bar 96 is in its left hand position as shown by the full outline thereof in Fig. 6 and a keylever 82 is actuated which causes the permutation bar to slide to its right hand position as shown by the dot-dash outline thereof. During this movement of the permutation bar the bevelled surface 147 cooperates with the bevelled surface on the end of its associated bell crank 144 and rocks the bell crank in a clockwise direction. As the bell crank 144 rocks the projection 151 thereon engages the insulating material 152 on the tongue of its associated contact 142 and causes the contact to open. The actuation of others of the keylevers 82 will cause the permutation bar 96 to move from its right hand position to its left hand position and in so doing the tongue of the associated contact 142 is allowed to rock the associated bell crank 144 in a counter clockwise direction and make contact with its stop. The permutation bars 96 are locked in the position to which they are actuated by a keylever during the transmission of the associated group of signals, as will be hereinafter described, so as to prevent the operation of a subsequent keylever until after the transmission of the signals represented by the first actuated keylever. Thus the permutation bars 96 are actuated to assume various combinations of settings representative of an actuated keylever and the contacts 142 assume an open or closed condition which corresponds with the settings of the permutation bars.

In telegraph practice it is the custom to refer to the two different line conditions comprising telegraph signals as spacing and marking intervals or impulses. Accordingly the various members of the transmitting mechanism which determine whether spacing or marking impulses are transmitted are considered to have associated spacing and marking positions. In accordance with

the signalling code employed the transmitting mechanism is so arranged that the left and right hand positions of the permutation bars 96 correspond to marking and spacing impulses respectively.

A description of the operation of the keyboard and transmitting mechanism will now be described in conjunction with the operation of a certain keylever and let it be assumed that the M keylever is actuated. The bevelled projections 114 on the permutation bars 96 are so arranged that when the M keylever 82 is actuated the permutation bars 96a and 96b are spacingly positioned and the permutation bars 96c to 96e are markingly positioned. Consequently the associated bell cranks 144 will operate the contacts 142a and 142b so that they are open and the contacts 142c to 142e will be closed.

The hereinbefore mentioned transmitting shaft 71, which operates to distribute the signalling impulses to the line, is journaled at its left and right hand ends, Fig. 2, in bushings 153 and 154, respectively. Nuts 157, threaded on the bushings 153 on either side of the bracket 156 hold this bushing in position and the right hand bushing 154 supported in a bracket 159 is clamped in position by a cap nut 161. The brackets 156 and 159 are secured by screws 158 to the top of the transmitting unit mounting plate 135. The transmitting shaft 71 has a plurality of sections 71a to 71d of different diameters and a flange or collar 71e formed integrally therewith and loosely mounted on the section 71b of the transmitting shaft, abutting the left hand face of the flange 71e is a gear hub 163 to which is attached for rotation therewith the hereinbefore mentioned helical gear 69. Pilot screws 164 secure the gear 69 to the hub 163 and the left hand ends 166 of the pilot screws engage slots such as 167 in a set of segments 168. The segments 168, Figs. 2 and 3, comprise a segmented ring and are located on the outer circumference of a collar 169 pinned to the shaft 71 for rotation therewith by a pin 171. A garter spring 172 surrounds the segments 168 and holds the inner surfaces thereof in frictional engagement with the outer surface of the collar 169. As hereinbefore stated, the motor shaft 42 is constantly rotating and by means of the described gear chain comprising the gears 43, 44 and 63, the gear 69 will be constantly rotated. The screws 164 rotate with the gear 69 and the ends 166 engaging the segments 168 and will therefore constantly rotate the segments 168. The segments 168 being frictionally engaged with the collar 169 will tend to rotate the collar 169 and shaft 71 therewith. However, the shaft is normally restrained from rotation as hereinafter described and consequently at such times the segments 168 slide about the circumference of the collar 169. Located on the section 71c of the transmitting shaft are a series of five disc transmitting cams 173a to 173e, a locking bail operating cam 174, an operating cam 176 and a stop arm 177. These cams and the stop arm are clamped in a predetermined order against the flange 71e for rotation with the shaft 71 intermediate with spacers 178 by a nut 179 threaded on the shaft. The functions and operations of these cams will hereinafter be described in conjunction with the operation of their associated elements.

Secured to the base plate 135 by screws 182 is an angle bracket 181 which, together with the bracket 159, support a rod 183. Pivotaly mount-

ed on the rod 183 are a series of contact operating levers 184a to 184e, a U shaped locking bail 186, a lever 187 and two bell cranks 188 and 189. The contact levers 184 are all similar and each one is in operative alignment and associated with one of the transmitting cams 173a to 173e. The lever 187 is in operative relation with the cam 176. These levers and bell cranks are all pivoted on bushings 191 on the rod 183 and are kept in alignment with their associated elements by spacers 192. Supported between the brackets 159 and 181 and attached thereto screws 193 is an insulating block 194. Attached to the block 194 by screws 197 together with other pieces of insulating material 196 are a group of six spring contacts 198a to 198e and 199. Contacts 198a to 198e comprise the hereinbefore mentioned secondary transmitting contacts and the contact 199 the start or auxiliary contact. As shown in Figs. 7 and 8 the contact 199 is normally closed and the contacts 198a to 198e have an associated contact operating lever 184a to 184e and the contact 199 is in operative alignment with the bell crank 189.

The above described members comprise the transmitting mechanism of the machine and the operation thereof in conjunction with the operation of a keylever 82 of the keyboard will now be described. The depressing of a keylever 82, Figs. 5 to 8, selectively positions the permutation bars 96 and concomitantly rocks the universal bail 129. As the universal bail 129 is rocked, the trip lever 134 attached thereto moves downward and a link 201 attached to the free end thereof also moves downward. The other end of the link is attached to the leftwardly extending arm 202 of the bell crank 188 and as the trip lever 124 and link 201 move downward, the bell crank 188 is rocked in a counterclockwise direction. This movement of the bell crank 188 allows the end of the arm 202 thereof to engage the rightwardly extending arm 209 of a bell crank 204. The bell crank 204 is pivotally mounted on a shoulder screw 203 in the bracket 181 and a spring 206 coiled about the screw 203 has one end anchored in the screw and the other hooked around an arm of the bell crank 204. The spring 206 tends to pivot the bell crank 204 in a counterclockwise direction and normally holds the hook at the upper end of the substantially vertical arm 207 thereof in engagement with the bent end of the leftwardly extending arm 208 of the bell crank 189. Therefore, as the bell crank 188 pivots, the arm 202 thereof engages the arm 209 of the bell crank 204 and pivots it in a clockwise direction to move the hook on the vertical arm out of engagement with the bent end of the arm 208 of the bell crank 189. Thereupon a spring 218 is allowed to pivot the bell crank 189 in a clockwise direction. The substantially vertical arm of the bell crank 189 has the end 216 bent horizontally and is in the same vertical plane as the stop arm 177 on the transmitting shaft. Normally the stop arm 177 is engaged with this bent end 216 and the transmitting shaft 71 is thereby held at rest in its normal rest position. As the bell crank 189 pivots in a clockwise direction, the bent end 216 moves to the right and out of operative engagement with the stop arm 177 whereupon the transmitting shaft 71 is free to rotate through the action of the friction clutch hereinbefore described. The vertical arm of the bell crank 189 also has a rightwardly extending projection 217 which is in operative alignment with a piece of insulating material 219 on the tongue

of the contact 199 and as the bell crank 189 pivots to release the stop arm 177, the projection 217 engages the insulating material 219 to open the normally closed contact 199.

For the following described cycle of operation of the transmitting mechanism it will be assumed that the actuated keylever 82 is released immediately after being depressed. Therefore, as the keylever 82 is returning to its normal position, a spring 221 attached to the bell crank is allowed to pivot the same in a clockwise direction which raises the link 201, the trip lever 134, and pivots the universal bail 129 back into its normal position. This allows the spring 206 to return the bell crank 204 to a position where the vertical hooked arm 207 is in position to engage the bent end of the arm 208 of the bell crank 189 near the end of a revolution of the transmitting shaft 71 as will be hereinafter described.

After the shaft 71 has rotated a few degrees from its normal rest position, it being released for rotation as hereinbefore described, the notch 222 in the cam 174 passes out of operative relation with the cam following end of the lever 187, Fig. 7, which causes the lever 187 to pivot in a counter-clockwise direction. The lever 187 is attached to the locking bail 186 by a screw 223 and as the lever 187 rocks, the bail 186 rocks therewith. Attached by screws 226 to the center of the locking bail 186 is a locking member 224 which has a section 227 extending over the right hand ends of the permutation bars 96, Fig. 6. The section 227 of the locking member 224 in operative relation with the permutation bars 96 is wedge-shaped and is in operative relation with upwardly extending wedge-shaped projections 228 on each of the permutation bars. Normally the section 227 is above the projections 228 and as the lever 187 and bail 186 pivot in a counterclockwise direction, the section 227 moves downward and engages either the left or right hand sides of the projections 228. The sides of the projections 228 that are engaged with the section 227 of the locking member 224 are determined by the position of each permutation bar 96. When the section 227 is engaged with the projections 228, the permutation bars are locked in a selected position and therefore prevent any movement of the permutation bars until the section 227 is raised near the end of a revolution of the transmitting shaft 71 as will be hereinafter described.

The contact operating levers 184, Fig. 7, are substantially T-shaped being pivoted at their lower ends on the bushings 191 on the rod 183 and having right and left hand extending projections 229 and 231 at their upper ends. Each one of the levers 184 is associated and in alignment with one of the contacts 198 of the secondary set of transmitting contacts. The tongue of each of the contacts 198 is tensioned and presses a piece of insulating material 232 thereon against the projection 229 of associated levers 184. This holds the end of the beveled projections 231 at the left hand side of the contact levers 184 against the periphery of an associated transmitting cam 173 on the shaft 71. In the normal rest position of the transmitting shaft 71 none of the high parts of the cams 173 are in engagement with the projections 231 of the contact levers 184 and therefore for this condition all of the contacts 198 are open. After the shaft 71 has rotated approximately one seventh of a revolution from its rest position, the high part of the cam 173a engages the projections 231 of its associated

contact lever 184a and rocks it in a clockwise direction. As the contact lever 184a rocks the right hand projection 229 engaging the insulating member 232 moves the tongue of the contact 198a into engagement with its back stop. The high part of the cam 173a comprises approximately one seventh of its circumference and therefore the contact 198a remains closed for substantially one seventh of a revolution of the shaft 71. As the high part of the cam 173a passes out of engagement with the contact operating lever 184a, the tongue rocks the lever in a counter-clockwise direction and the contact opens. Just as the contact 198a is opening, the high part of the transmitting cam 173b engages its associated contact lever 184b to close its associated contact 198b and it remains closed for approximately one seventh of a revolution of the shaft 71. In a similar manner the contacts 198c to 198e are sequentially closed, each for approximately one seventh of a revolution of the shaft 71. The contacts 198 are so adjusted in conjunction with their associated cams 173 that one contact, such as 173c, closes just before the preceding contact, such as 173b, opens. Just before the last transmitting contact 193e is allowed to open, the operating cam 176 engages a beveled surface 213 on the leftwardly extending arm of the bell crank 189 and rocks the bell crank in a counter-clockwise direction against the action of its attached spring 218. The movement of the bell crank 189 in this direction performs three functions which are as follows: First, the contact 199 is allowed to close by the action of its spring tongue just before the contact 198e opens; second, the arm 208 is lowered so that the upwardly hooked arm 207 of the bell crank 204 is allowed to engage the bent end of the arm 208, and as the cam 176 passes out of operative relation with the beveled surface 213, the bell crank 189 is left in its normal position; and third, the upper bent end 216 of the vertical arm of the bell crank 189 is moved into the path of the stop arm 177. This movement of the bell crank 189 occurs just before the transmitting shaft 71 completes a revolution, and the stop arm 177 engages the bent end 216 to stop the rotation of the transmitting shaft in its normal rest position after one revolution thereof. The stop arm 177 is adapted to engage the bent end 216 just after the cam 176 passes out of operative relation with the beveled surface 213. Concomitantly with the rocking of the bell crank 189 in a counter-clockwise direction, the notch 222 in the cam 174 rotates into operative relation with the end of the lever 187 which allows a spring 233 to pivot the lever 187 and bail 186 back into their normal position. This pivoting movement of the bail 186 raises the locking member 224 and disengages the section 227 thereon with the projections 228 on the permutation bars 96. Thus the permutation bars are unlocked and are ready to be repositioned by the actuation or depression of another keylever 82.

In brief review, the operation of the keyboard and transmitting mechanism is as follows: the actuation of a keylever 82, Figs. 5 to 8, selectively positions the permutation bars 96 in a combination of settings which represent the actuated keylever and concomitantly operates the universal bail 129 to cause the release of the stop arm 177 and initiate the rotation of the transmitting shaft 71. The selected positions of the permutation bars 96 are transferred to the primary set of contacts 142 by the bell cranks 144,

a contact being open for one position of a permutation bar and closed for the other position. The release of the transmitting shaft 71 occurs near the end of the downward movement of a keylever 82 so as to insure that the permutation bars 96 will be in their selected positions before the release of the transmitting shaft. The permutation bars 96 are locked in position by the locking member 224 during substantially the whole of the revolution of the transmitting shaft 71 and thus prevents the actuation of a second keylever until the shaft has completed its revolution. Actually the permutation bars 96 are unlocked just before the shaft 71 completes a revolution but as an appreciable length of time is required to actuate a keylever 82, the shaft will invariably be stopped in its rest position before another keylever can be actuated to release it again. However, if a keylever 82 could be actuated instantaneously with the unlocking of the permutation bars 96 to cause the latch arm 207 to be out of operative relation with the arm 208 of the bell crank 189, a definite pause in the rotation of the transmitting shaft 71 at its rest position would be introduced by the overthrow of the bell crank 189 when operated by the cam 176. The cam 176 actuates the bell crank 189 in a counter-clockwise direction very near the end of a revolution of the shaft 71 and if the latch arm 207 did not latch the bell crank 189 in its normal position, the bent end 216 of the arm 214 of the bell crank 189 would momentarily engage the stop arm 177 before the spring 218 could pivot the bell crank 189 in a clockwise direction to move the bent end 216 out of the path of the stop arm. Thus the transmitting shaft 71 makes one revolution at a time and is invariably stopped for at least a predetermined length of time at the end of each revolution. In the normal rest position of the transmitting shaft 71, the contact 199 is closed and at the time the shaft is released, the contact 199 is opened. There is then an interval equal to about one-seventh of a revolution of the transmitting shaft 71 when all the contacts 198 and 199 are open, following which the contacts 198 are sequentially closed each for about one-seventh of a revolution of the transmitting shaft 71 after which the contact 199 is closed for the remainder of the revolution of the shaft.

As shown in Fig. 4, one of the springs of each of the contacts 142 is connected by individual conductors 237 to associated springs of the contacts 198. The other springs of the contacts 198 are connected in parallel to a line conductor 238 and the other springs of the contacts 142 connected in parallel to the other line conductor 239. The contact 199 is connected directly between the two line conductors 238 and 239.

In a preferred embodiment of this invention so-called marking impulses represent line conditions during which current is transmitted and spacing impulses line conditions during which no current is transmitted or closed and open line conditions respectively. As hereinbefore described in the rest position of the shaft 71 the contact 199 is closed and thus the circuit between the line conductors 238 and 239 is completed. Therefore, while the transmitting shaft 71 is at rest, a closed line condition exists. It was assumed that the M keylever 82 was actuated and it caused the positioning of the contacts 142 so that 142a and 142b were open and 142c to 142e closed concomitantly with the release of the shaft 71. As described, the contact 199 is first opened

before any of the other contacts 198 are closed and during this time the circuit between line conductors 238 and 239 is open. This condition exists for approximately one-seventh of the revolution of the shaft 71 and thus an interval of no current or a spacing interval is transmitted which is the start impulse. The contacts 193 are then sequentially closed, and the condition of the contacts 142 determine whether spacing or marking impulses are transmitted. As it was assumed that contacts 142a and 142b were open and 142c to 142e closed, five impulses, the first two of which are spacing and the last three marking will be transmitted. Just as the last contact 198e is opening, the contact 199 closes to transmit a marking or rest impulse following the five signaling impulses. This marking rest impulse continues to be transmitted until the contact 199 is again open at the start of a following group of impulses. Thus a combination of impulses representative of an actuated keylever 82 is transmitted and the group of impulses is preceded by a spacing start impulse and followed by a marking rest impulse.

In the above described cycle of operation of the transmitting mechanism it was assumed that the actuated keylever was released almost immediately after being depressed or some time during the rotation of the transmitting shaft 71. The operation of the transmitter will now be described when a keylever 82 is held depressed for a longer length of time than is necessary for the transmission of its associated group of impulses. When a keylever is held operated, the universal bail 129 and trip arm 134 hold the bell cranks 188 and 204, Fig. 8, in an operated position. With the bell crank 188 in an operated position the upper bent end 212 of the arm 211 is in the path of the stop arm 177. Therefore when the stop arm 177 has nearly completed a revolution it will engage the end 212 and be brought to rest thereat a few degrees ahead of its normal rest position. The shaft 71 will remain in this position as long as a keylever 82 is held depressed and with the shaft 71 stopped in this off-normal position, the cam 176 rocks the bell crank 189 sufficiently to allow the contact 199 to close and consequently transmit the rest impulse and also bring the bent end 216 into the path of the stop arm 177. When the actuated keylever 82 is finally released, the bell cranks 204 and 188 are allowed to pivot back into their normal positions and in so doing the horizontal bent end 212 of the bell crank 188 moves out of engagement with the stop arm 177. Thereupon the stop arm 177 rotates a few degrees and engages the bent end 216 of the bell crank 189 in the path thereof and is thus brought to rest in its normal position. As the bell crank 204 pivots to its normal position, the hook shaped arm 207 hooks the bent end of the arm 208 of the bell crank 189 and thus locks it in its normal position. Thus the transmitting mechanism is returned to normal ready to be released in conjunction with the actuation of the same or another keylever.

It is obvious, of course, that various modifications of the apparatus shown and described herein may be made without departing from the spirit or essential attributes of the invention and it is desired, therefore, that only such limitation shall be placed thereon as are imposed by the prior art or are specifically set forth in the appended claims.

What is claimed is:

1. In a telegraph apparatus, a set of selectors, 75

a corresponding set of transmitting contacts, a rotary cam member having successively operative sections for effecting the operation of said contacts invariably in succession, means for impressing two different line conditions on said contacts in accordance with the setting of said selectors, a power driven start-stop member for rotating said cam member, a keyboard and solely mechanical means actuated by said keyboard for setting said selectors, for releasing said start-stop member for movement and for transmitting a uniform line condition prior to the operation of said contacts independently of said start-stop member.

2. In a telegraph apparatus, a set of selectors, a corresponding set of transmitting contacts, a rotary cam member having successively operative sections for effecting the operation of said contacts invariably in succession, means for impressing two different selecting conditions on said contacts in accordance with the setting of said selectors, a power driven start-stop member for rotating said cam member, a keyboard, solely mechanical means actuated by said keyboard for setting said selectors and releasing said start-stop member for movement whereby to transmit said selecting conditions, and means independent of said cam member for transmitting a uniform starting impulse preceding said selecting conditions.

3. In a telegraph apparatus, a set of selectors, a corresponding set of transmitting contacts, a rotary cam member having a normal rest position and a plurality of successively operative sections for effecting the operation of said contacts, key levers, means actuated by depression of a key lever for releasing said cam member and means for arresting said cam member in an off-normal rest position on continued depression of said key lever, said latter means acting on release of the said key lever to release said cam member to permit it to rotate to its normal rest position.

4. In a telegraph apparatus, a set of selectors, a corresponding set of transmitting contacts, a rotary cam member having a normal rest position and a plurality of successively operative sections for effecting the operation of said contacts, key levers, means actuated by depression of a key lever for releasing said cam member, means for arresting said cam member in an off-normal rest position on continued depression of said key lever, said latter means acting on release of the said key lever to release said cam member to permit it to rotate to its normal rest position and means for transmitting a rest condition in both said normal and off-normal rest positions of said cam member.

5. In apparatus for telegraph systems employing permutation code signals separated by space signals, each of said permutation code signals comprising a starting interval and a definite number of selecting intervals, a series of key-levers, a set of permutation bars selectively responsive to actuated ones of said keylevers, a set of primary contacts adapted to be selectively actuated by said permutation bars, a set of secondary contacts, a rotatable distributor adapted to successively actuate said secondary contact, means operable concomitantly with the selective positioning of said permutation bars for releasing said distributor for rotation and means for invariably stopping said distributor after each cycle of operation.

6. In a transmitter of the type comprising a series of keylevers, a code transmitting distributor, means to retain said distributor in non-trans-

mitting condition, means interconnecting said series of keylevers and said retaining means designed to initiate transmission from said distributor upon actuation of any lever of said series in combination with auxiliary means adapted to retain said distributor in a non-transmitting condition at a point in advance of said first named non-transmitting condition, means interconnecting said series of keylevers and said second advanced retaining means to arrest transmission from said distributor when a keylever of said series is actuated for an abnormal time, means to render said last named interconnecting means inoperable upon release of a keylever of said series, said first named normal retaining means invariably acting to retain said distributor in its normally non-transmitting position at the completion of each cycle of transmission therefrom.

7. In a telegraph apparatus, a set of selectors, a corresponding set of transmitting contacts, a rotary cam member having successively operative sections for effecting the operation of said contacts invariably in succession, means for impressing two different selecting conditions on said contacts in accordance with the setting of said selectors, a power driven start-stop member for rotating said cam member, a keyboard, solely mechanical means actuated by said keyboard for setting said selectors and releasing said start-stop member for movement whereby to transmit said selecting conditions, an independent start contact, and means independent of said cam member for opening said start contact to transmit a start pulse preceding said selecting conditions.

8. In a keyboard transmitter, a rotatable cam sleeve, a bank of keylevers, a set of selecting contacts, means operated by said keylevers for selectively actuating said selecting contacts and concomitantly initiating the rotation of said cam sleeve, a set of transmitting contacts, means controlled by said cam sleeve for actuating said transmitting contacts to transmit code combinations of impulses representative of the selective positions of said selecting contacts and means for invariably stopping said distributor at the end of each cycle of operation.

9. In a telegraph keyboard transmitter, a distributor mechanism for distributing code groups of impulses representative of actuated key levers, solely mechanical means controlled by the actuation of said key levers for releasing said distributors mechanism for operation and for initiating, independently of said distributor mechanism, the transmission of a start impulse of uniform line condition preceding the transmission of each code group of impulses and means controlled by said distributor mechanism for terminating said start impulse.

10. In a telegraph keyboard transmitter, a distributor mechanism for distributing code groups of impulses representative of actuated key levers, solely mechanical means controlled by the actuation of said key levers for initiating the operation of said distributor mechanism and, independently of said distributor mechanism initiating the transmission of a start impulse of uniform line condition preceding the transmission of each code group of impulses and means controlled by said distributor mechanism for terminating said start impulses.

11. In a telegraph keyboard transmitting mechanism, a distributor mechanism, a plurality of transmitting contacts including a start impulse transmitting contact, a plurality of primary

contacts, solely mechanical means including a set of key levers operative one at a time for selectively positioning said primary contacts and thereafter releasing said distributor mechanism to successively actuate said transmitting contacts to transmit a code group of impulses representative of the position of said primary contacts, and solely mechanical means operated by said key levers simultaneously with and independently of the release of said distributor mechanism for actuating said start impulse transmitting contact to invariably precede each code group of impulses with a start impulse of uniform line condition.

12. In a telegraph keyboard transmitting mechanism, a distributor mechanism, a plurality of transmitting contacts including a start impulse transmitting contact, a plurality of primary contacts, solely mechanical means including a set of key levers operative one at a time for selectively positioning said primary contacts and thereafter releasing said distributor mechanism to successively actuate said transmitting contacts to transmit a code group of impulses representative of the position of said primary contacts, solely mechanical means operated by said key levers simultaneously with and independently of the release of said distributor mechanism for actuating said start impulse transmitting contact to invariably precede each code group of impulses with a start impulse of uniform line condition and means including said distributor and said start impulse transmitting contact for transmitting a rest impulse of opposite line condition to that of said start impulse following the transmission of each code group of impulses.

13. In a telegraph keyboard transmitting mechanism, a normally at rest rotary distributor mechanism, a set of key levers, a transmitting circuit, a contact normally maintaining said circuit in a closed condition, solely mechanical means independent of said distributor mechanism and including said key levers for mechanically operating said contact to open said circuit and mechanically releasing said distributor mechanism for one revolution at a time, means operative a predetermined length of time following the release of said distributor mechanism for controlling said transmitting circuit from said distributor mechanism to transmit a code group of impulses representative of an actuated key lever and means including said distributor mechanism and said contact for invariably closing said circuit following the transmission of each code group of impulses.

14. In a telegraph keyboard transmitting mechanism, a normally at rest rotary distributor mechanism, a set of key levers, a transmitting circuit, a contact normally maintaining said circuit in a closed condition, solely mechanical means independent of said distributor mechanism and including said key levers for mechanically operating said contact to open said circuit and release said distributor mechanism for one revolution at a time, means operative by said distributor a predetermined length of time following the release thereof for opening and closing said circuit in a predetermined sequence according to the actuated key lever and means operated by said distributor mechanism during the last part of a revolution thereof for operating said contact to close said circuit and maintain the same closed while said distributor is at rest.

15. In a telegraph keyboard transmitting

mechanism, a rotary distributor mechanism, a stop normally arresting said distributor mechanism in a normal rest position, a latch for said stop, said stop being spring biased to a position to release said distributor mechanism for rotation, a set of key levers, a start impulse transmitting contact, solely mechanical means operative on the actuation of each of said key levers for operating said latch to release said stop, said stop thereupon independently releasing said distributor mechanism and operating said start impulse transmitting contact to transmit a start im-

5 pulse, means including said distributor mechanism operative following the release thereof to transmit a code group of impulses representative of an actuated key lever and means operated by said distributor mechanism to position said stop to arrest rotation of said distributor mechanism after one revolution thereof and transmit a rest impulse following each code group of impulses.

10 PAUL A. NOXON.

SAMUEL W. ROTHERMEL.

FRANK J. MAUS.

EMERSON J. SORTORE.