

Aug. 6, 1940.

P. A. NOXON ET AL

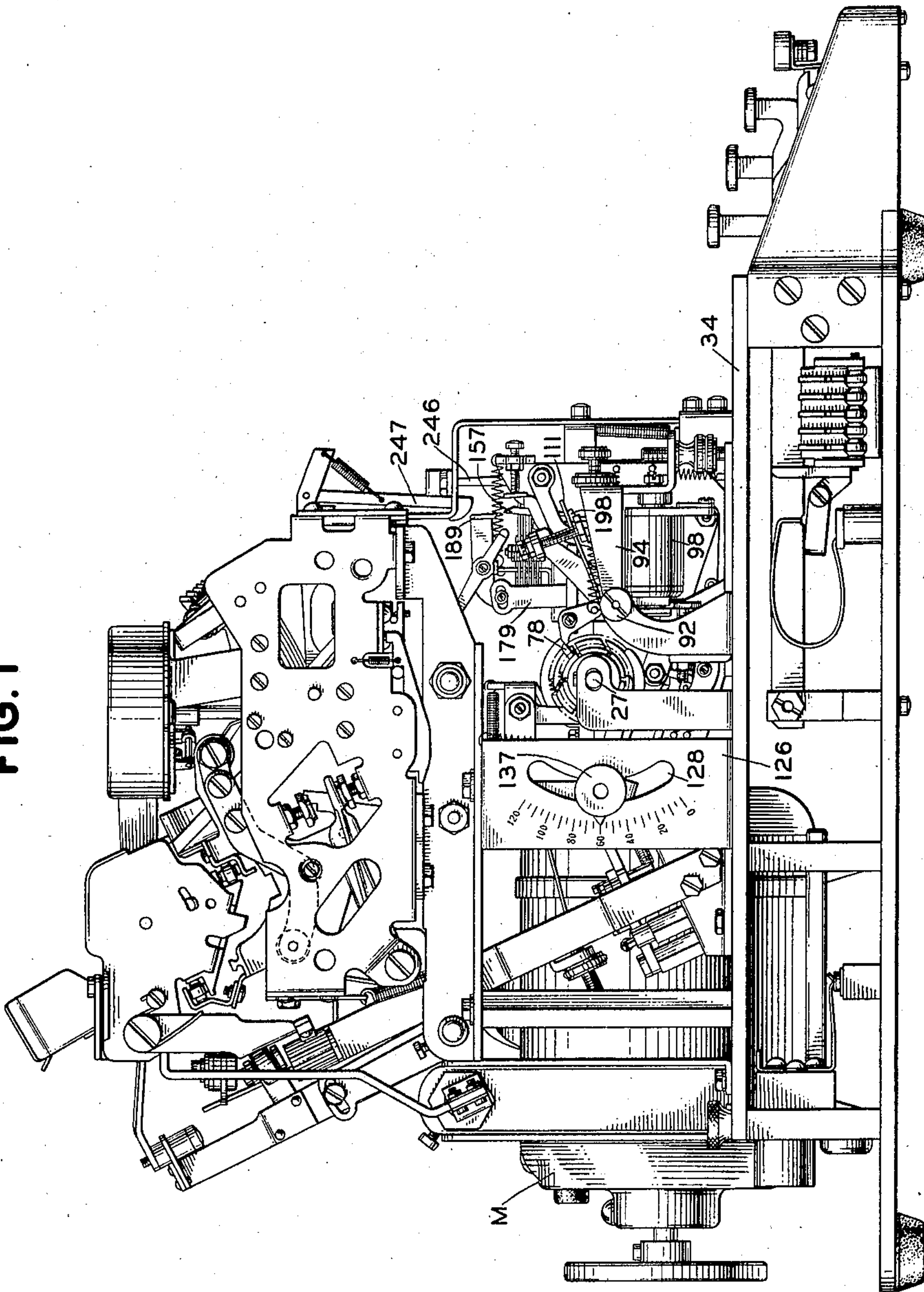
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ELECTRIC SELECTOR MECHANISM

Filed Oct. 10, 1936

6 Sheets-Sheet 1

FIG. 1



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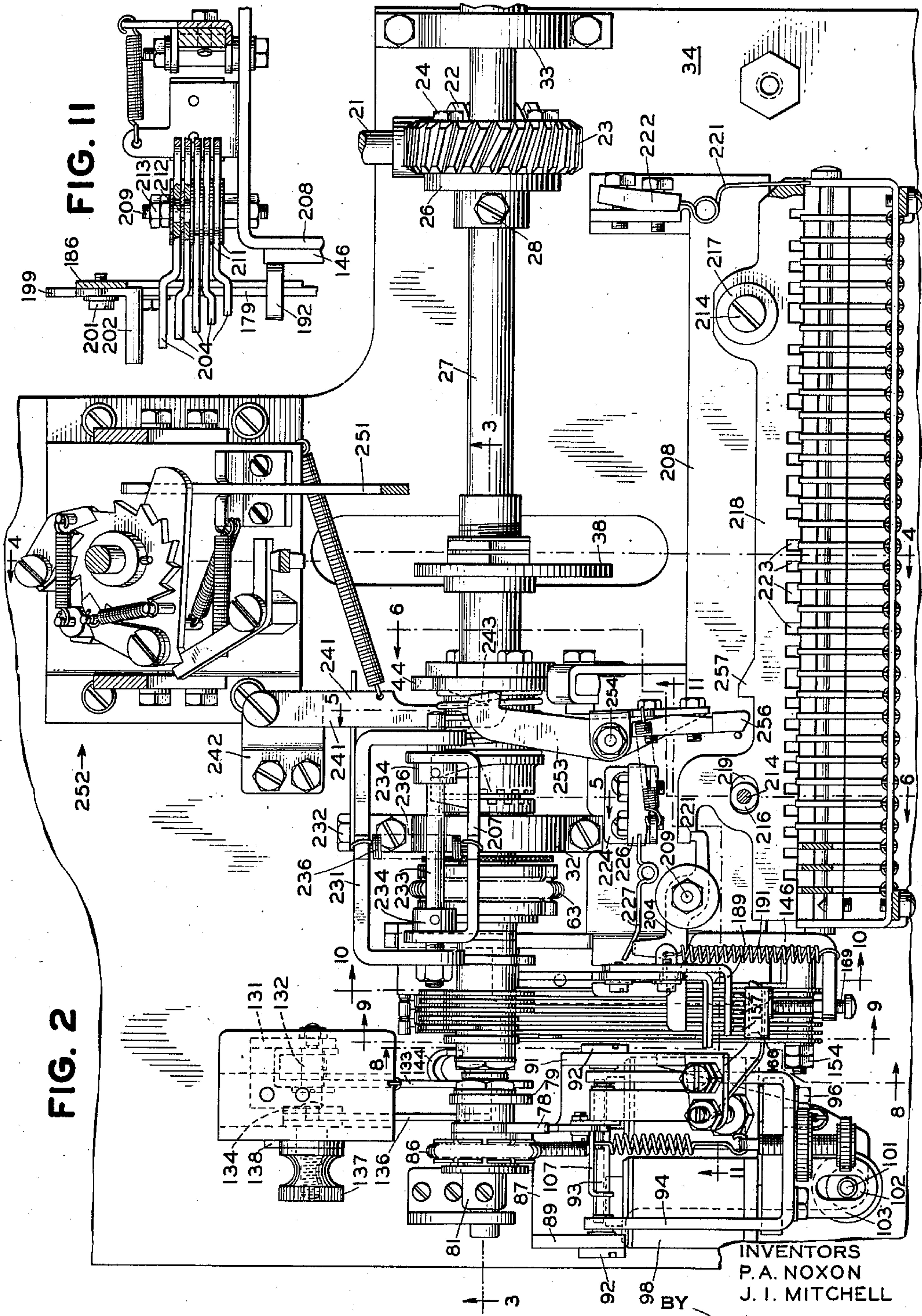
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6 Sheets-Sheet 2



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FIG. 12

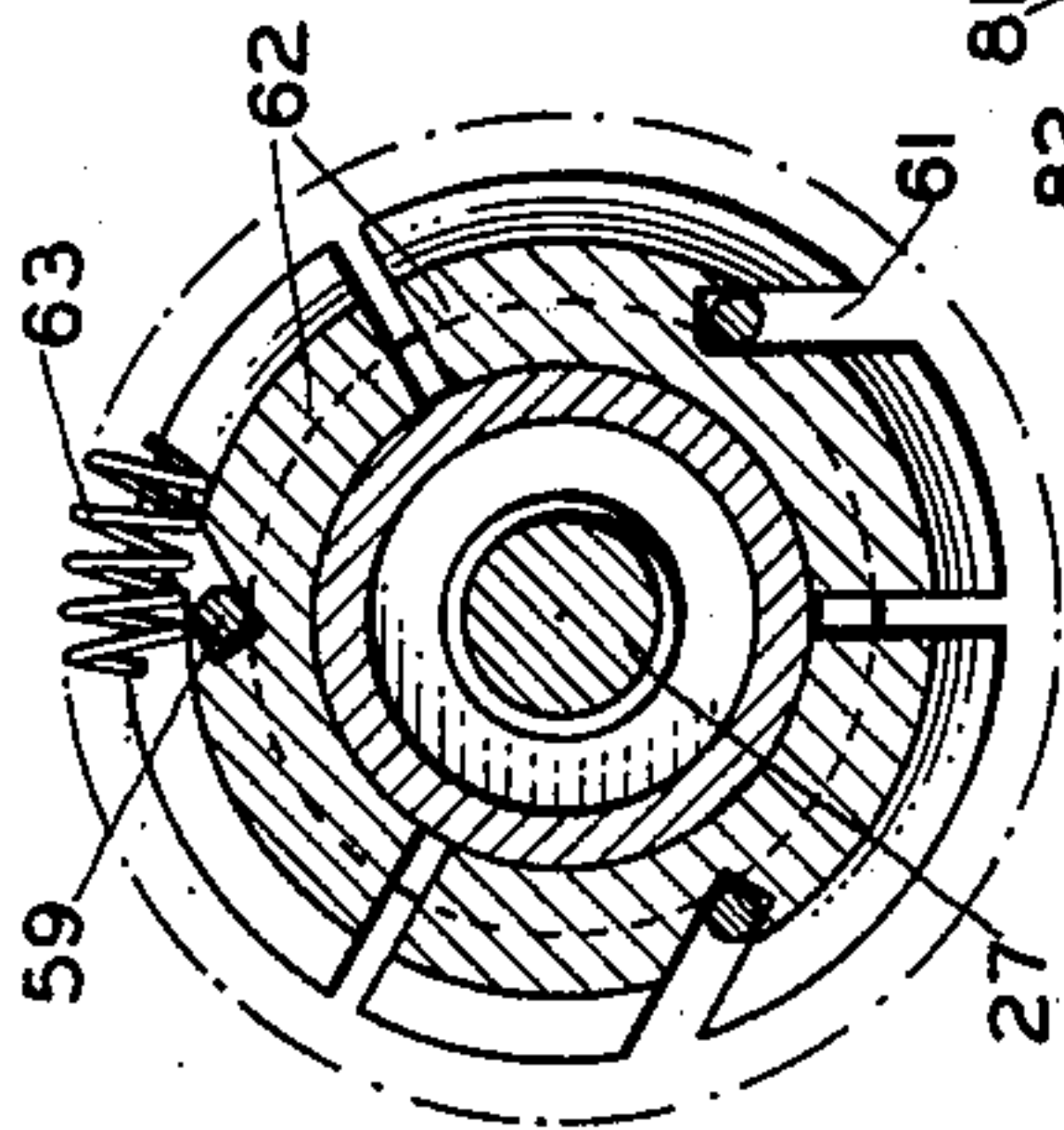
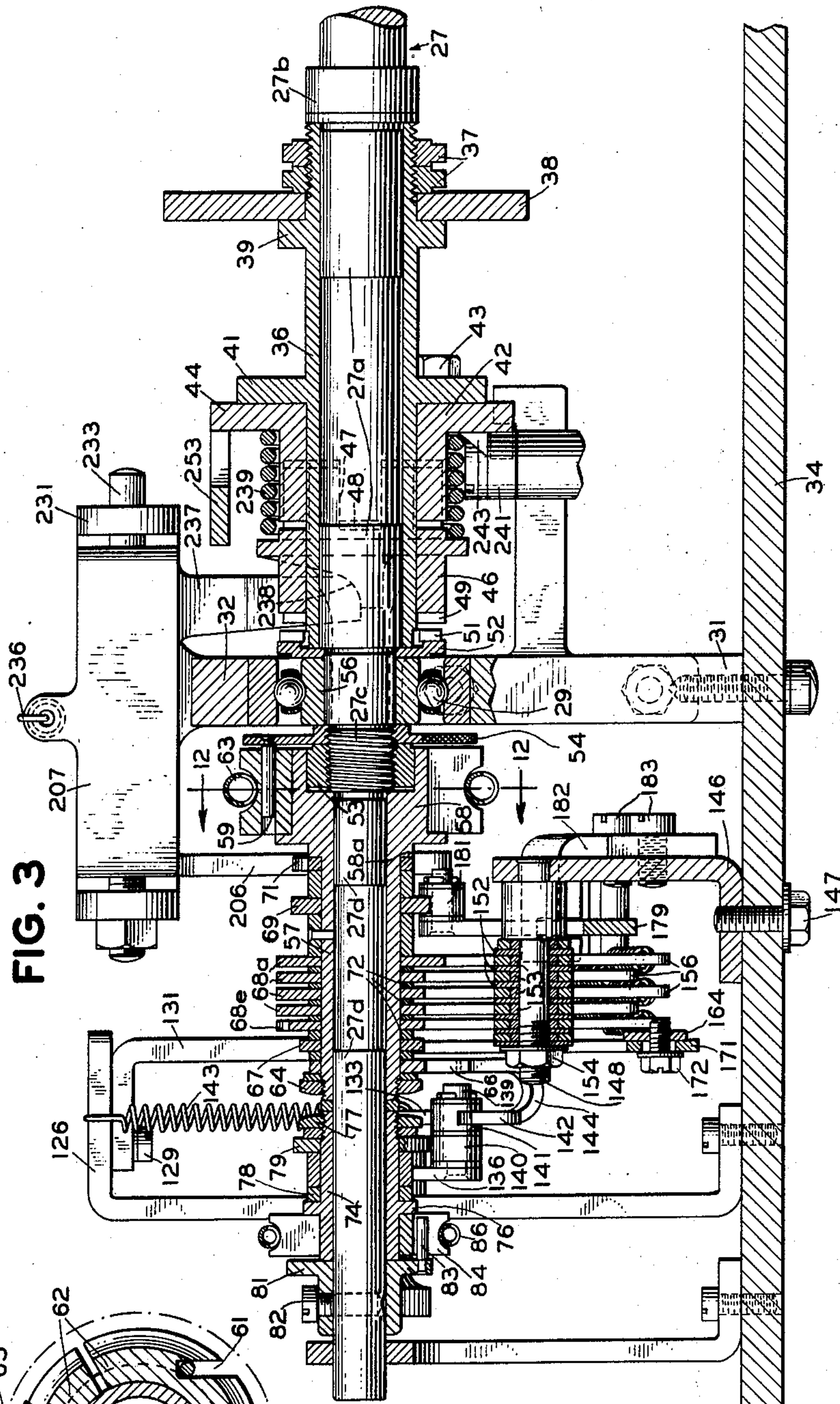


FIG. 3



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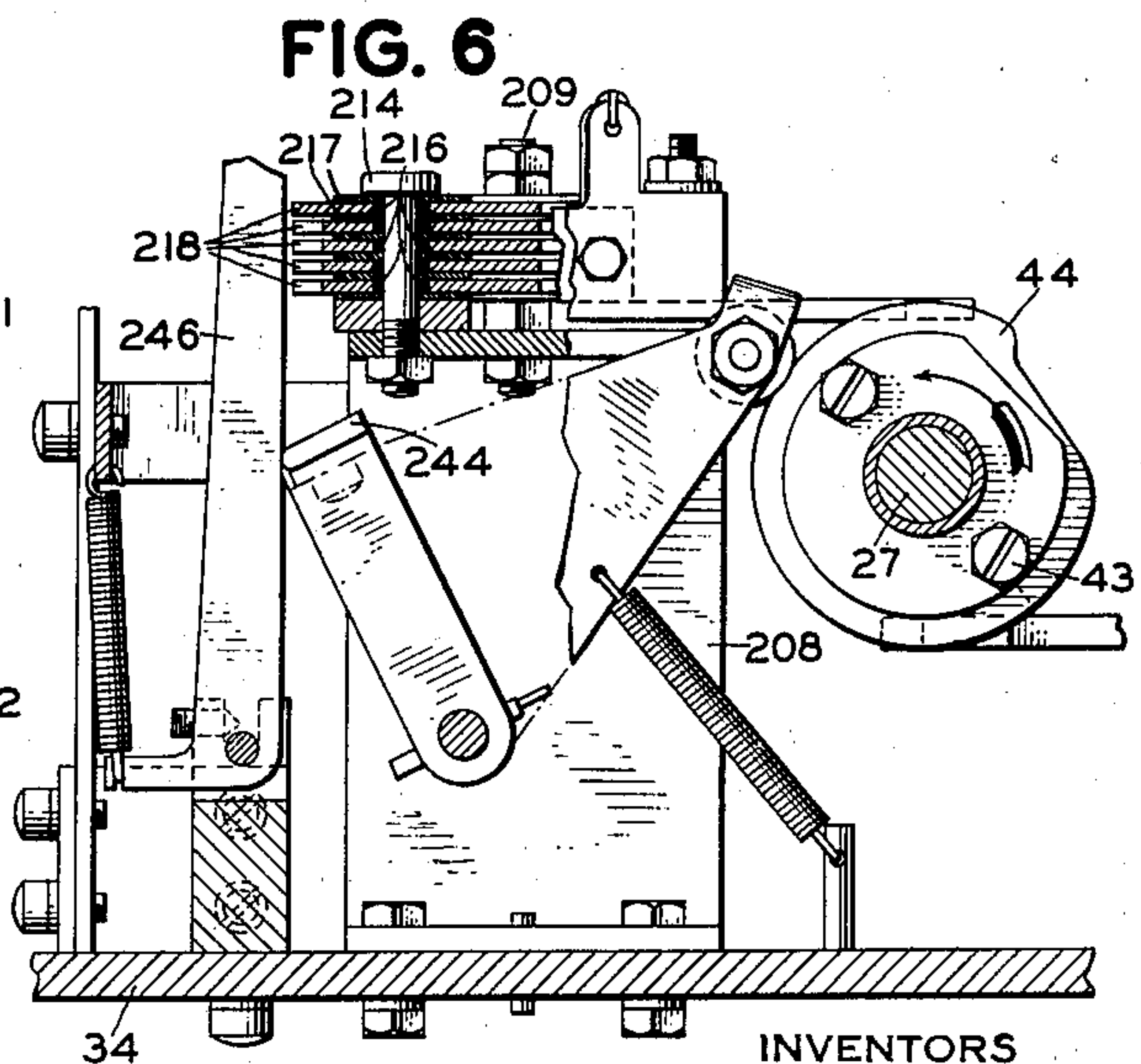
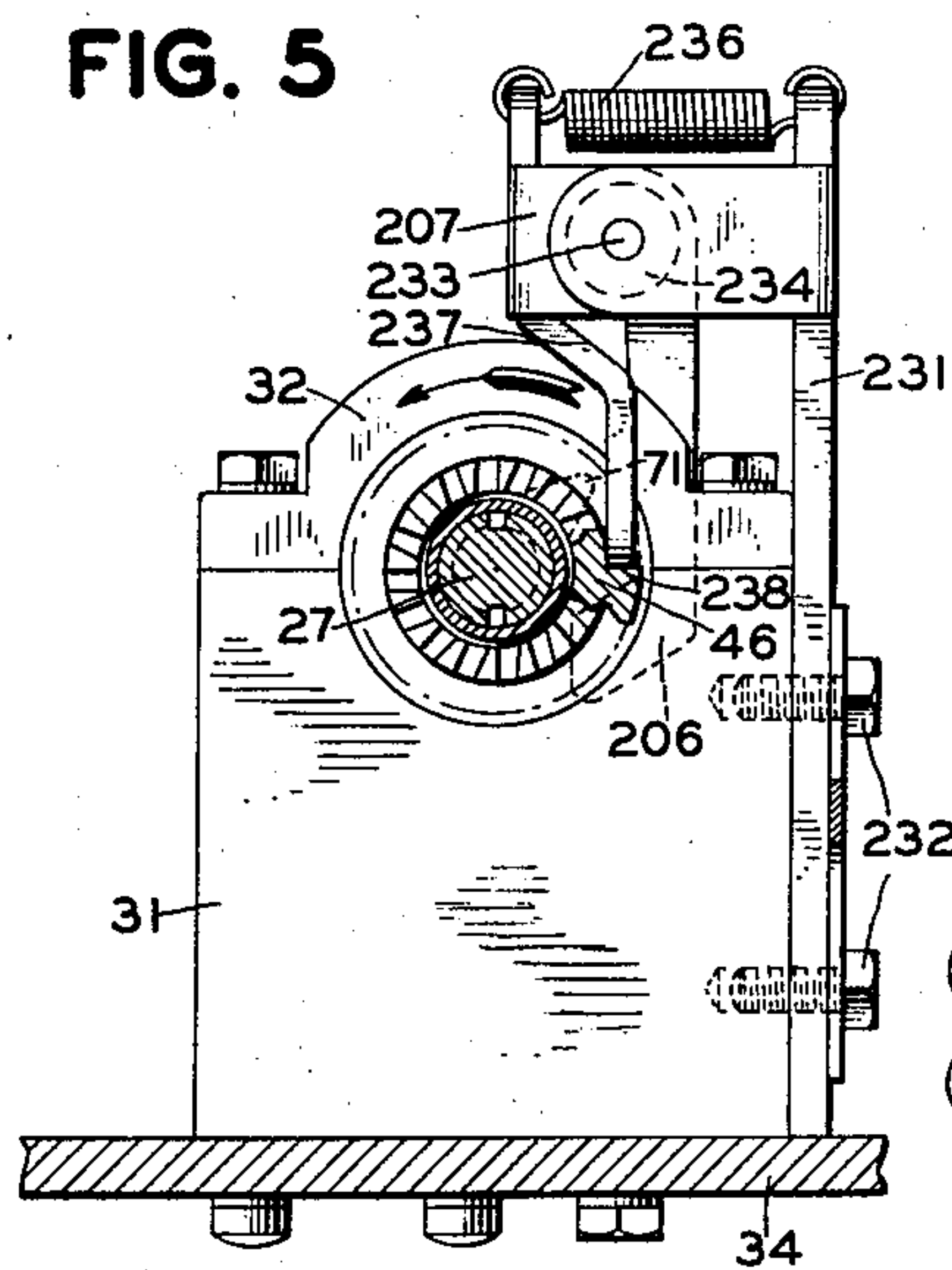
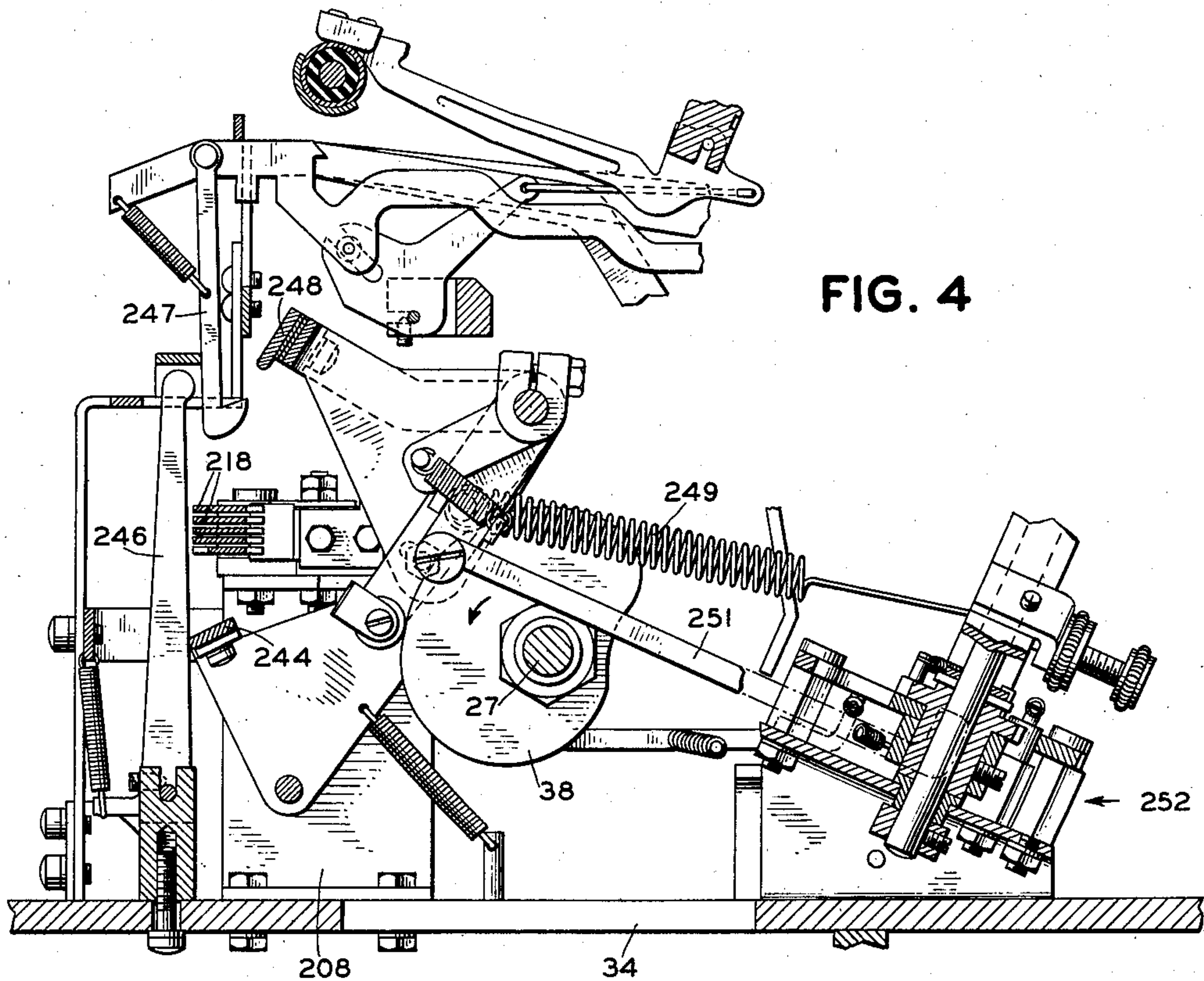
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6 Sheets-Sheet 4



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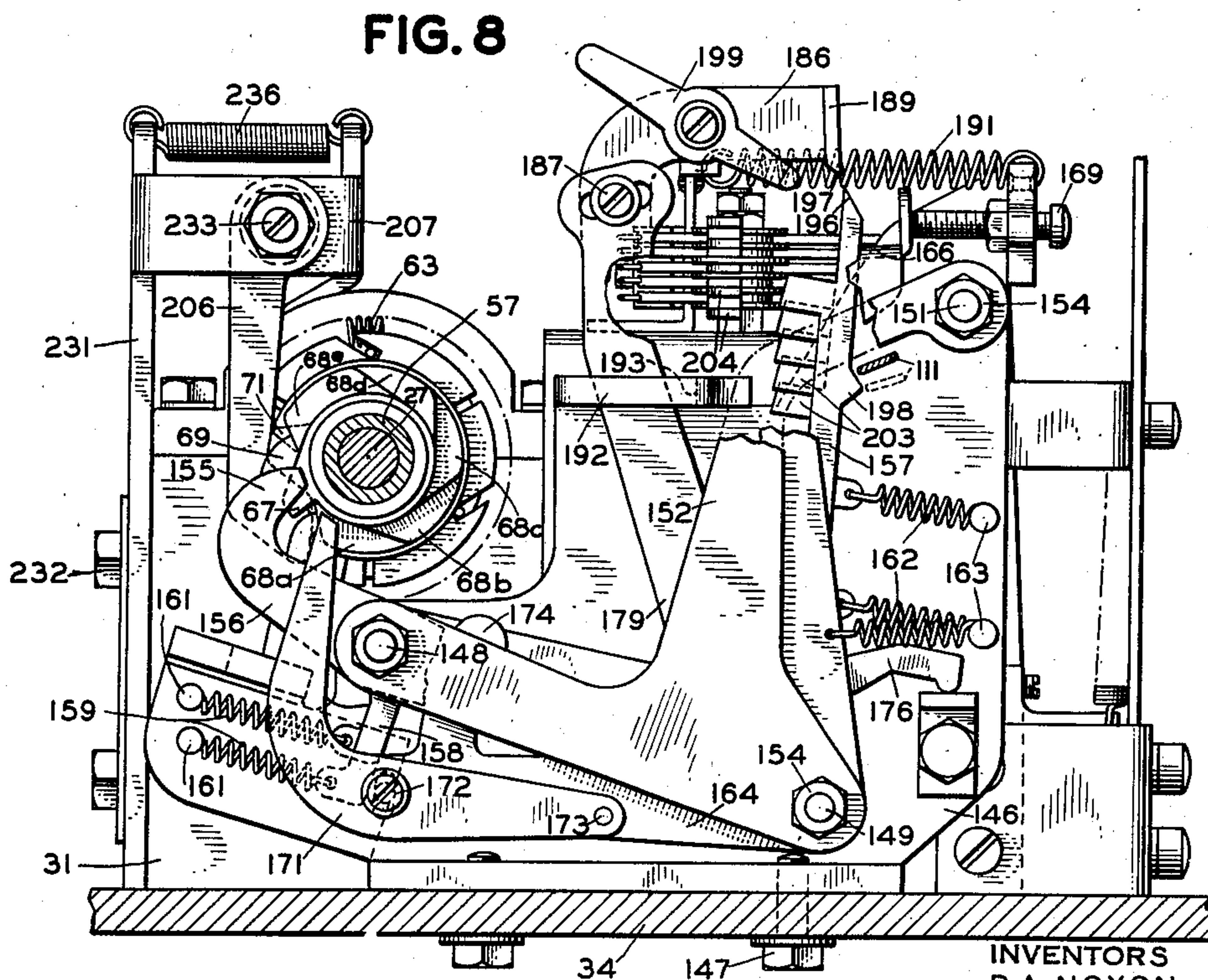
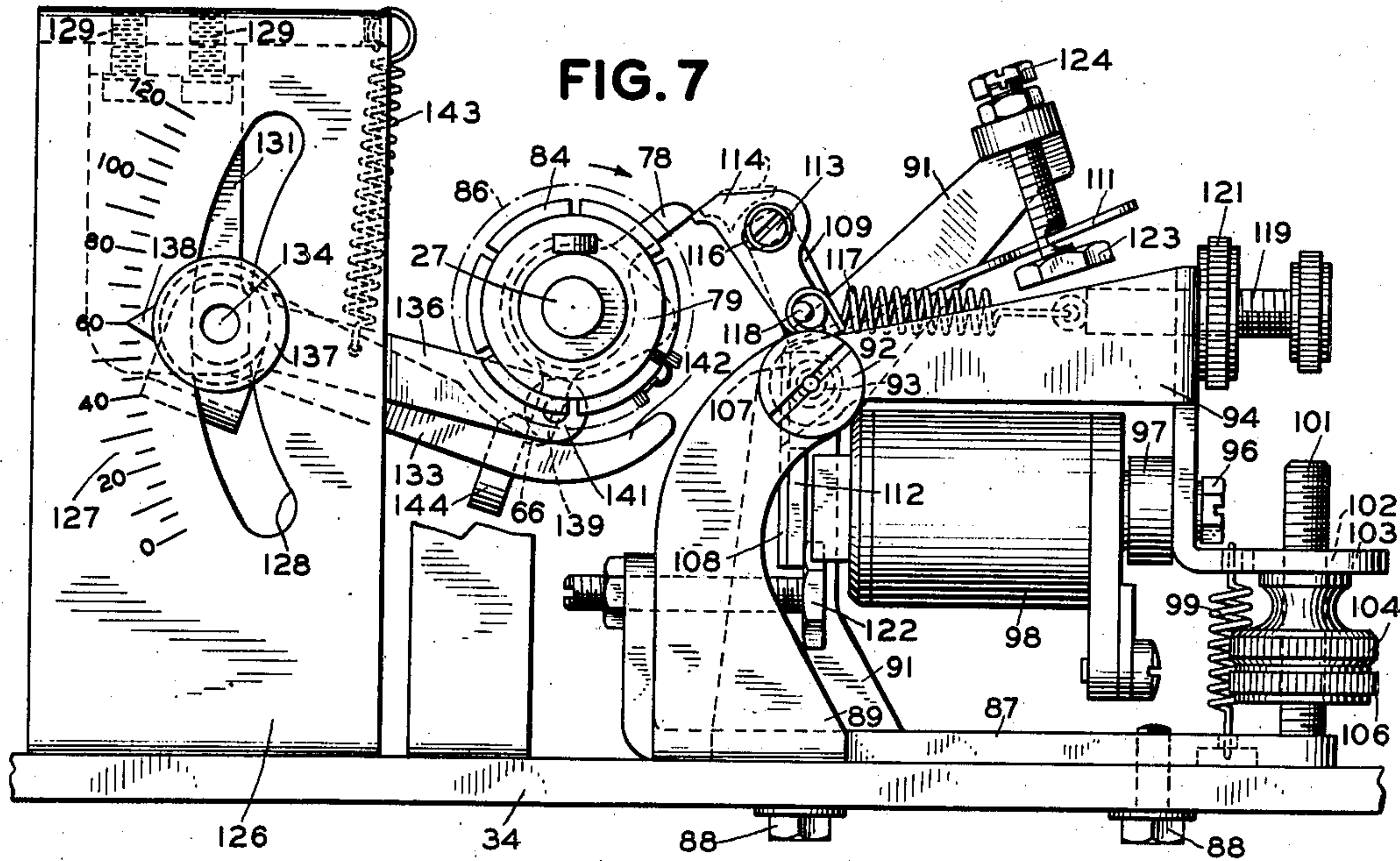
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ELECTRIC SELECTOR MECHANISM

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ELECTRIC SELECTOR MECHANISM

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6 Sheets-Sheet 6

FIG. 9

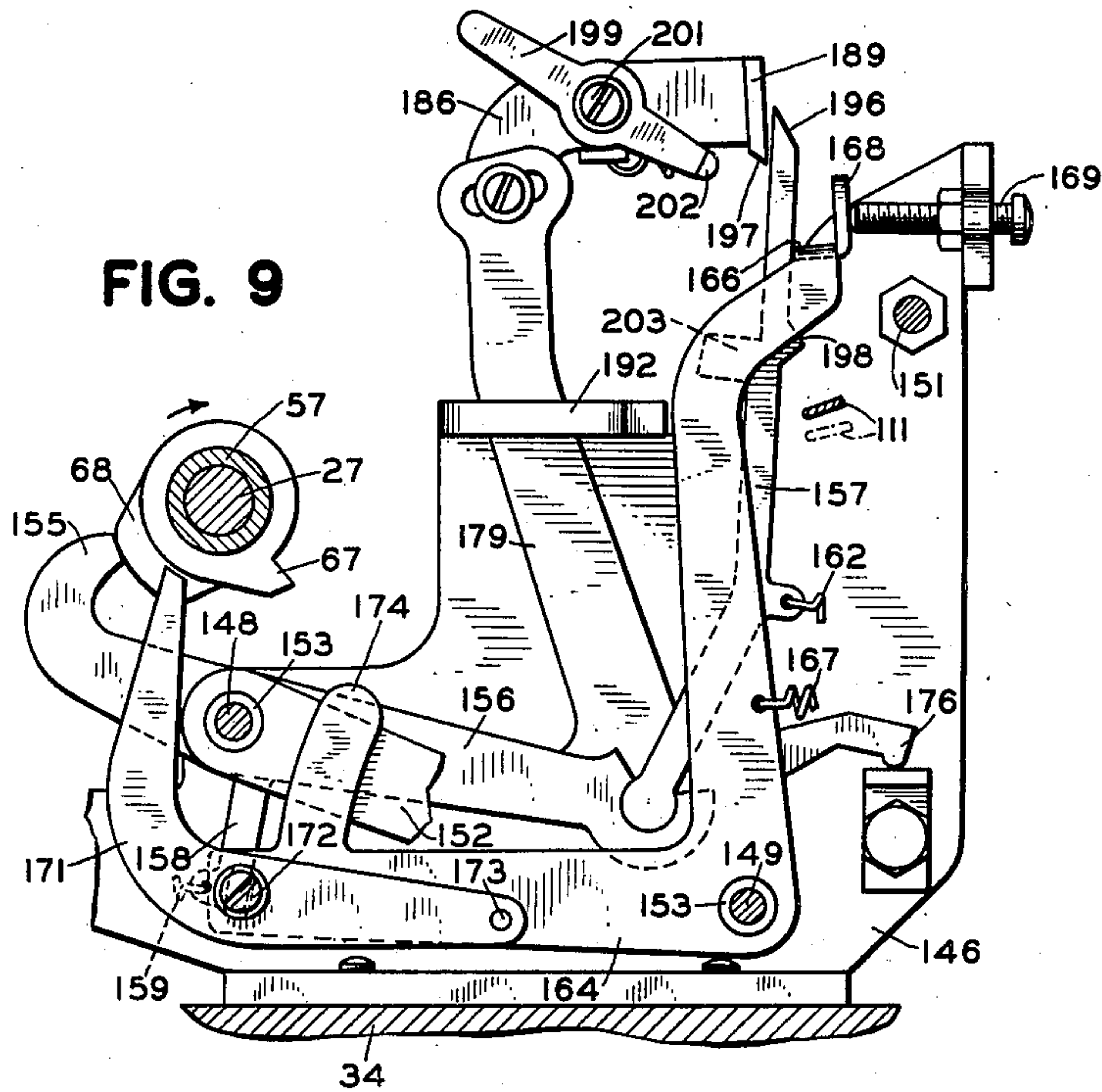
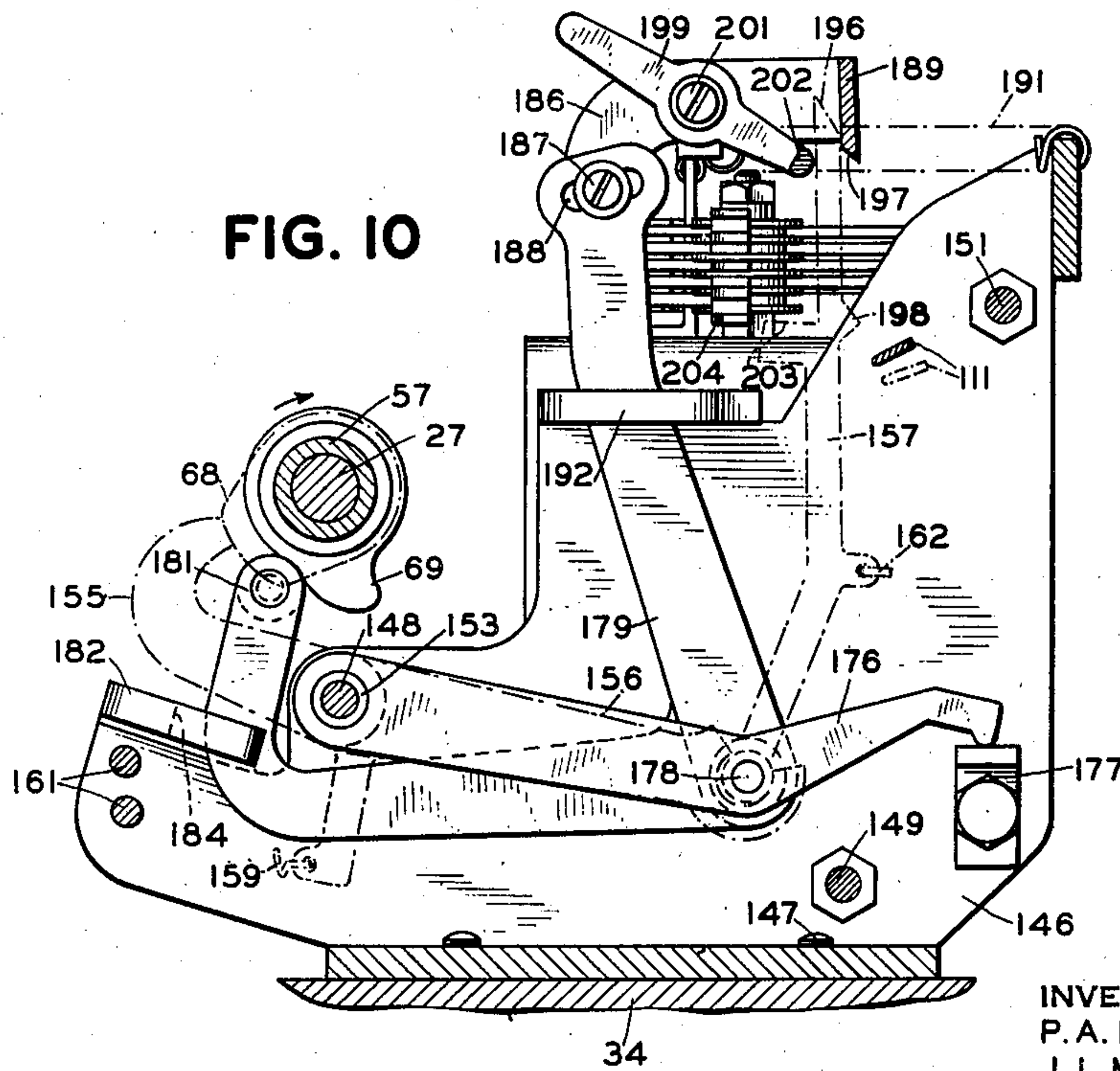


FIG. 10



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ELECTRIC SELECTOR MECHANISM

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Application October 10, 1936, Serial No. 105,102

15 Claims. (Cl. 178—33)

This invention relates primarily to electric selector mechanisms and more particularly to the type of selector mechanisms used for the selective control of telegraph receivers and like apparatus employing the Baudot code, i. e., one in which the character signals consist of two different line conditions, such as permutations of positive and negative impulses or current and no-current impulses extending throughout a definite number, usually five, time intervals or units. Such selector mechanisms usually comprise a set of selectors equal in number to the selecting intervals of the signalling code which are conditioned in various combinations in accordance with the received permutations of impulses. The novel features of the invention are particularly adaptable to the so-called "start-stop" or "simplex" systems, viz., one in which a rotatable member or distributor of the telegraph receiver is kept in step or in synchronism with the incoming signals by a start and stop mechanism that initiates the rotation of the rotatable member in response to a starting line condition, preceding each code group of impulses and arrests the rotation of the rotatable member in response to a stopping line condition following each code group of impulses or during the interval between successive code groups.

As is well known in the art, it is advantageous in all "start-stop" systems to provide means for orienting, which operation entails the changing or varying of the stop or rest position of the rotatable member to compensate for line and other conditions which may tend to vary the length and effectiveness of the start impulse so that the rotatable member is operative on the selectors during the midportion or most effective portion of respective signalling impulses. However, the practice of changing the rest position of the rotatable member also has many inherent disadvantages, the most obvious of which will be pointed out hereinafter. Besides cooperating in the positioning of the selectors, the rotatable member usually performs other auxiliary functions such as transferring the selection set up in the selectors to other elements, resetting the selectors and tripping off printing and letter spacing mechanisms, etc. Obviously, none of these functions should occur between the adjustable limits of the rotatable member and consequently the adjustability of the rest position of the rotatable member reduces the operating time of these auxiliary functions and crowds them together. Another disadvantage in this type of orienting is that unless a separate adjustable

start magnet is employed, a somewhat complicated linkage is required between the selector magnet and the stop element wherein there is apt to be lost motion which reduces the operating margin of the selector mechanism.

Although an orienting mechanism for eliminating some of the above disadvantages is shown and described in this application, the same forms the subject matter of a co-pending application of P. A. Noxon entitled "Telegraph orienting device," bearing Serial No. 223,384, filed August 6, 1938, the latter application being a division of the present application.

One of the objects of this invention is to provide a selector mechanism of simplified and novel design with few elements and capable of maximum efficiency at high speed operation.

Another object is to provide a selector mechanism with the maximum possible overlap between the selecting and printing operations without the storage of selected characters.

A still further object of this invention is to provide a novel and improved control for the rotatable member associated with the selector mechanism.

These and other objects of the invention will appear hereinafter in conjunction with the detailed description and drawings thereof and are particularly pointed out in the appended claims.

The preferred embodiment of the invention, as shown, is particularly adapted for use with and control of a typebar printer of the type fully disclosed in a copending application of P. A. Noxon et al., filed March 3, 1936, Ser. No. 66,906, and only such parts thereof will be shown and described herein as are thought necessary for a complete understanding of the invention. It is evident, however, that the use of the selector is not limited to this particular type of receiver but is readily adaptable to various other types of receivers.

As mentioned above, this selector mechanism is particularly adapted for use with the "simplex" or "start-stop" signalling code and employs five signalling impulses. As is well known, this signalling code comprises a start impulse of uniform line condition followed by the five signalling impulses in permutations of two different line conditions which in turn are followed by a rest impulse of a uniform line condition and opposite to that of the start impulse. The start and the five variable signalling impulses are of substantially uniform duration while the duration of the rest impulse is variable. Usually it is somewhat longer than any one of the other impulses and its

minimum length approaches the length of one of these impulses as the speed of the transmitting mechanism approaches its maximum.

The start-stop or orienting mechanism consists of two separate frictionally driven rotatable members, the first of which is released for rotation in response to the start condition, and the second, comprising the selector actuating members, which is released for rotation by manually adjustable means interposed between the first and second rotatable members. Thus the time interval between the release of the first and second rotatable member is adjustable to compensate for variable starting impulses and the selector actuating members on the second rotatable member are allowed to cooperate with their respective selectors during the most effective portion of their associated signalling impulses. The selector mechanism consists of five selecting fingers which are caused to be successively raised in synchronism with the received impulses by the second rotatable member and are positioned to one side or the other of a knife in accordance with the position of the armature of the selector magnet at the time they are raised. The knife is then moved and actuates those selector fingers on one side thereof to operate associated latches. The latches in turn release associated notched selector bars which allow the selection of the typebar corresponding to the received signalling impulses. The second rotatable member performs other functions such as returning the knife and selecting fingers to normal and releasing the printing and line feeding mechanisms.

A more complete and thorough understanding of the invention may be had from the following detailed description in conjunction with the accompanying drawings showing a preferred embodiment thereof, in which

Fig. 1 is a side elevational view of the hereinbefore mentioned telegraph receiver to which the selector mechanism of the present invention is particularly applicable and shows the relative location of the selector mechanism;

Fig. 2 is a fragmentary plan view of the selector and the essential parts of the receiver necessary for a clear understanding of the invention;

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2 and shows in addition a part of the printing mechanism of the receiver;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 2;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 2;

Fig. 7 is a side elevational view of the orienting device and the selector magnet;

Fig. 8 is a sectional view taken on line 8—8 of Fig. 2;

Fig. 9 is a fragmentary sectional view taken on line 9—9 of Fig. 2;

Fig. 10 is a fragmentary sectional view taken on line 10—10 of Fig. 2;

Fig. 11 is a fragmentary sectional view taken on line 11—11 of Fig. 2; and

Fig. 12 is a fragmentary sectional view taken on line 12—12 of Fig. 3.

Referring first to Fig. 1, a continuously rotating motor M supplies, through appropriate gearing and clutch mechanisms hereinafter described, all local power for operating the receiver. The motor shaft 21, Fig. 2, has on the

forward end thereof a helical gear 22 which is adapted to mesh with another helical gear 23 located above. The helical gear 23 is fixed by screws 24 to a gear hub 25 which in turn is secured to an operating shaft 27, for rotation therewith, by a screw 28. The operating shaft 27 extends substantially the width of the receiver and is journaled adjacent its left hand end as seen in Fig. 3, in a ball bearing 29 which is supported by a bearing post 31 and clamped in position by a bearing clamping member 32, best shown in Fig. 5. The right hand end of operating shaft 27 is similarly journaled in a ball bearing which is supported by a bearing post and clamped in position by a clamping member 33, only the clamping member 33 being shown in Fig. 2. Both bearing posts are secured to and supported by a plate 34 which comprises the base of the selecting and printing mechanisms and also serves as a support for various other elements.

The operating shaft 27 and the elements thereon will now be described and throughout the description various sections of the operating shaft will be referred to as sections 27a, 27b, etc. Referring to Fig. 3, a normally at rest operating cam sleeve 36 is loosely mounted on a section 27a of the operating shaft 27 abutting at its right hand end a collar 27b integral with the shaft 27. The right end of the sleeve 36 is threaded and has nuts 37 threaded thereon which clamp a print cam 38 against a flange 39 of the sleeve 36 for rotation therewith. Another flange 41, extending radially from adjacent the center of the sleeve 36, has a collar 42 clamped against the left hand side thereof for rotation therewith by screws such as 43. Integral with the collar 42 is an irregular disc 44 which comprises what will be hereinafter referred to as a drop-in cam. The operation of the print and drop-in cams will be more fully described in following paragraphs. Another collar 46 is loosely mounted on the left hand end of the sleeve 36 and is operatively engaged with the left hand end of the collar 42, by means of interengaging tongues 47 and grooves 48, shown in dotted outline in Fig. 3, formed on and in the collars 42 and 46 respectively. Thus the collar 46 is rotatable with the sleeve 36 but is slidable along the sleeve by means hereinafter described to bring teeth 49 disposed on the left hand face thereof into or out of engagement with similar teeth 51 disposed on the right hand face of a disc member 52.

A section 27c of the operating shaft 27 is threaded and has a disc 54 threaded thereon, which clamps the inner race 56 of the ball bearing unit and the disc 52 together and against the larger section 27a of the operating shaft. A lock nut 53 prevents loosening of the assembly. Thus the discs 52 and 54 are rotatable with the operating shaft 27. The disc 52 is also keyed to the shaft 27 to insure its rotation therewith.

A selector cam sleeve 57 loosely mounted on the section 27d of the operating shaft 27 has a hub 58 on the right hand end thereof which is recessed and extends over the threaded member 53 and abuts against the left hand face of the disc 54. Extending horizontally from the left hand face of the disc 54 are a series of three pins 59 spaced 120° apart. Each pin 59 is engaged in a tangential slot 61, Fig. 12, of an associated segment 62 of a segmented ring made of three segments of Bakelite or some other suitable material. A circular coiled radially contractible

spring 63 surrounds the segments 62 and holds the inner surfaces thereof frictionally engaged with the outer surface of the hub 58 of the sleeve 57. Thus as the disc 54 and the pins 59 are continuously rotated by the operating shaft 27, the segments 62 will rotate therewith and as the segments are frictionally engaged with the hub 58, it also will tend to rotate with the shaft 27. However, the sleeve 57 is normally arrested from rotation by means hereinafter described. Mounted from left to right on the sleeve 57 is a stop arm 66, a cam 67, a series of five selector operating cams 68a to 68e, a selecting finger transfer cam 69 and a trip cam 71 for controlling the printing, line feeding, etc., mechanisms, intermediate with spacers 72. All these cams and spacers are clamped together and against the shoulder 58a of the sleeve 57 by a nut 64 in threaded engagement with the threaded left hand portion of the sleeve 57. Thus all the cams are rotatable with the sleeve 57. The operation of these cams and stop arm 66 on the sleeve 57 will be hereinafter described.

A third sleeve 74 hereinafter referred to as the pilot sleeve is loosely mounted adjacent the left hand end of the operating shaft 27. A pilot sleeve stop arm 78 and a selector sleeve trip cam 79 are clamped against a flange 76 of the pilot sleeve 74 for rotation therewith, by a nut 77 in threaded engagement with the threaded right hand end of sleeve 74. The left hand end of the pilot sleeve abuts a collar 81 which is secured by a screw 82 to the operating shaft 27 for rotation therewith. Extending horizontally from the right hand face of the flange of the collar 81 are a series of three pins 83 which are engaged in radial slots in three Bakelite segments 84. A circular coiled radially contractible spring 86 surrounds the three segments and frictionally engages the inner surfaces thereof with the outer circumference of a section of the pilot sleeve 74 to the left of the flange 76. The segments 84, substantially similar to the segments 62 on the selector cam sleeve 57, serve as a friction clutch for rotating the pilot sleeve 74.

Referring now to Figs. 2 and 7 the arrangement of the selector magnet will now be described. A selector magnet mounting bracket 87 is secured to the front left hand corner section of the base plate 34 by screws 88. Extending upwardly from the bracket 87 are two supports 89 and 91 into which are threaded two hollow ended screws 92. Extending horizontally between the two screws and pivotally supported thereby is a selector armature pivot rod 93. Pivotally mounted on shoulders on the inner ends of the screws 92 is a substantially U-shaped selector magnet mounting cradle 94 which is secured thereto by screws 96 a magnet yoke 97 and the two coils of a selector magnet 98. A spring 99 attached to the cradle 94 and the base plate 34 tends to pull the cradle and selector magnet 98 in a clockwise direction as shown in Fig. 7. A threaded stud 101 extending vertically from the base plate 34 passes through a slotted hole 102 in a flat horizontal section 103 of the cradle 94. An adjusting thumb nut 104 and a lock nut 106 therefor are threaded on the stud 101 and serve as a means for adjusting the position of the cradle 94 and the selector magnet 98, whereby the magnetic air gap between the pole pieces of the magnet and the armature is varied.

Secured to the armature pivot rod 93 and pivotable therewith is an armature 107 which has three extensions 108, 109 and 111. The section

108 of the armature extends downward and has riveted thereto a magnet plate 112 in operative relation with the pole pieces of the magnets 98. The rightwardly extending projection 111 of the armature coacts with the selectors as will be hereinafter described to cause their selective positioning. The substantially vertical section 109 of the armature has secured thereto by a screw 113 a pilot sleeve stop arm striking plate 114. A slot 116 in the striking plate through which the screw 113 extends permits relative adjustment between the armature extension 109 and the striking plate 114 to vary its engagement with the stop arm 78. With the selector magnet 98 energized, which is its normal condition, the tip of the striking plate 114 is in the path of and engaged with the end of the pilot sleeve stop arm 78 and thereby normally arrests the rotation of the pilot sleeve 74. When the magnet 98 is de-energized a spring 117 secured to a pin 118 in the armature extension 109 and to an adjusting screw 119, rocks the armature 107 in a clockwise direction and withdraws the striking plate 114 out of engagement with the stop arm 78. The pilot sleeve 74 is thereupon free to rotate with the shaft 27 as will be hereinafter described. The adjusting screw 119 is supported in the selector magnet cradle 94 and has a lock nut 121 for locking it in its adjusted position. An adjusting screw 122 is supported in the bracket 87 and is so adjusted that its head serves as a stop for the magnet plate 112 when the magnet 98 is energized. Two other adjusting screws 123 and 124, supported adjacent the end of the section 91, are engageable with the extension 111 of the armature and limit its movement. Both screws 124 and 122 are employed to limit the armature in its energized position, otherwise there would apt to be bending or whip in the comparatively long and light armature extension 111, the movement of which must be accurately adjusted between comparatively small limits.

Secured to the base plate 34 at the left of the operating shaft 27 as seen in Fig. 7, is an orientation plate 126. The front side of the orientation plate 126 has a radial scale 127 etched or stamped thereon and a curved slot 128, the radius of curvature of which is equal to the distance therefrom to the center of the operating shaft 27 and whose center coincides with that of shaft 27. Attached to the horizontal top section of the orientation plate 126 by screws 129 and extending downward therefrom is a bracket 131. A shoulder screw 132 shown dotted in Fig. 2 in the lower end of the bracket 131 has pivoted thereon a lever 133 which extends beneath the operating shaft 27. Another shoulder screw 134, Figs. 2 and 7, extends through the curved slot 128 in the plate 126 and pivotally supports a lever 136. This lever 136, similar to the lever 133, is pivoted adjacent its left hand end as seen in Fig. 7 and extends beneath the operating shaft 27 and the two levers cooperate with one another to cause the release of the selector cam sleeve 57 as will be hereinafter described. The shoulder screw 134 has threaded on the front end thereof a thumb nut 137 which clamps the screw 134 in its adjusted position in the curved slot 128. An indicating member 138 movable with the screw 134 cooperates with the scale 127 to indicate the relatively adjusted positions of the screw 134. A stud 139 in the right hand end of the lever 136 pivotally supports two rollers 140 and 141, Fig. 3. The roller 140 is in operative relation with the selector sleeve trip cam 79 and the roller 141 is

in operative relation with a curved right hand section 142 of the lever 133. A spring 143 secured to the horizontal top section of the orienting plate 126 and the lever 133 holds the section 142 of the lever 133 in contact with the roller 141 and as the rollers 140 and 141 are on a common stud 139, the spring 143 acts to hold the roller 140 in contact with the periphery of the selector sleeve trip cam 79. A curved projection 144, Figs. 2, 3 and 7, extending from the lever 133 normally has the end thereof engaged with the end of the selector sleeve stop arm 66 and thereby keeps the selector sleeve 57 and its attached elements from rotating. Shortly after the pilot sleeve 74 is released for rotation in response to the start impulse which is a no-current interval and causes the deenergization of the magnet 98 as hereinbefore described, the hump section of the selector sleeve trip cam 79 operatively engages the roller 140 and forces it downward causing a clockwise pivoting movement, as seen in Fig. 7, of the lever 136 about the shoulder screw 134. As the rollers 140 and 141 are on a common stud 139, they will move down together and in so doing the roller 141 causes the lever 133 to pivot in a clockwise direction about its mounting screw 132. As the lever 133 thus pivots, the projection 144 and the selector sleeve stop arm 66 are disengaged whereupon the selector sleeve 57 is free to rotate with the main operating shaft 27 through the action of the friction clutch comprising the friction members 62 hereinbefore described. Thus the selector sleeve 57 is released for rotation in adjustable timed relation to every group of code combinations received on the selector magnet 98.

The upper surface of the section 142 of the lever 133 is concave with a radius of curvature equal to the diameter of the roller 141 plus the normal radius of the selector sleeve trip cam 79. Thus it is evident that as the left hand end of the lever 136, which has the screw 134 and thumb nut 137 attached thereto, is moved within the limits of the curved slot 128, the roller 140 will roll about a section of the selector sleeve trip cam 79 and the roller 141 will roll in the concaved section 142 of the lever 133. Throughout the adjustable position of the lever 136 the roller 140 is not engageable with the hump section of the selector sleeve trip cam 79 and therefore while the lever 136 is being adjusted there will be no movement of the lever 133 due to the adjusting of the lever 136 and the projection 144 thereof will remain engaged with the selector sleeve stop arm 66. Thus it is evident that by adjusting the left hand end of the lever 136, the rollers 140 and 141 move in an arc about the operating shaft 27 and the amount of rotation of the pilot sleeve 74 from its normal rest position necessary to cause the release of the selector sleeve 57 is varied. This compensates for the variable lengths of the start impulses due to line and other conditions and allows the selecting cams 68a to 68e to be operatively associated with their respective elements during the most effective portion of their respective signals as will be hereinafter described. The adjustment of the lever 136 can be made equally well with the selector mechanism in operation or at rest.

It can be seen from the above that the time of release of the selector cam sleeve 57 with respect to the received impulses is varied without changing the rest position of said cam sleeve. Therefore, the operations performed by the selector cam sleeve 57 can be distributed substantially throughout its complete rotation.

The speed of rotation of the shaft 27 is such with respect to the incoming line signals that the pilot sleeve 74 will complete a revolution while the rest impulse of the code combination that caused its release is being received on the selector magnet 98. This rest impulse energizes the magnet 98 and causes the striking plate 114 to be in the path of the pilot sleeve stop arm 78. When the stop arm 78 engages the striking plate 114, the rotation of the pilot sleeve is stopped and it remains at rest during the remainder of the rest impulse or until the start impulse of the following code combination of impulses. As the selector cam sleeve 57 and the pilot sleeve 74 rotate at the same speed, the selector cam sleeve 57 will be brought to rest at the completion of every revolution for a length of time equal to the time the pilot sleeve is at rest. However, with the code combinations of impulses being received in a continuous succession, the two sleeves are not at rest at the same time, since the pilot sleeve rotates a substantial amount before it causes the release of the selector cam sleeve.

From the above described arrangement of a pilot sleeve 74 and a selecting cam sleeve 57 it is apparent that the frictional force tending to rotate the pilot sleeve may be comparatively small. With a small frictional force tending to rotate the pilot sleeve 74, the striking plate 114, Fig. 7, may be more easily withdrawn from engagement with the pilot sleeve stop arm 78 and therefore the amount of work performed by the armature of the selecting magnet 98 to initiate the operation of the selector mechanism is reduced, which feature is another advantage of the above arrangement and very helpful when the selector is operating on weak signalling impulses. Furthermore, on receipt of any spacing selecting impulses, the armature is free from the starting load.

Referring now to Figs. 3, 8, 9 and 10, a bracket 146 is secured to the base 34 by screws 147 in front of the operating shaft 27 and substantially opposite the selector cam sleeve 57 and at a right angle to its axis. Extending horizontally from the vertical section of the bracket 146 are a series of studs and posts on which are pivoted and mounted the selecting elements. Figs. 8, 9 and 10 are sectional views taken progressively along the selector cam sleeve 57 and show the manner in which the various selector elements cooperate with the cam sleeve.

Supported on three studs 148, 149 and 151 extending horizontally from the bracket 146 and parallel to the operating shaft 27 are a series of guide plates 152. In order to more clearly illustrate the elements of the selector mechanism, the guide plates 152 are not shown in Figs. 9 and 10 but the arrangement thereof can readily be seen in Figs. 3 and 8. A series of collars or spacers 153 are located on the studs 148, 149 and 151 between the guide plates 152 and serve to space the guide plates along the studs. Nuts 154 in threaded engagement with the ends of the studs clamp the guide plates 152 and spacers 153 together. A series of five selector levers indicated in general at 156 in Fig. 9 are pivotally supported on the spacers 153 on the stud 148. The selector levers 156 are slightly thinner than the spacers 153 which permits free movement thereof between the guide plates 152. The left hand end 155, as seen in Fig. 9, of each of the selector levers 156 is in operative relation with one of the selector operating cams 68a to 68e, each cam having an associated lever. The right hand end of each se-

lector lever 156 is shaped to form a socket in which is carried the lower end of an associated selecting finger 157. There are five selecting fingers, one for each of the selector levers 156, and they are indicated in general at 157 in Figs. 9 and 10. A depending arm 158 of each of the selector levers 156 has attached thereto one end of an individual spring 159 which tends to pivot the levers in a clockwise direction and holds the left hand end 155 of each lever engaged with its associated cam 68. The other ends of the spring 159 are secured to posts 161. Another set of springs 162 are attached to the selecting fingers 157 and tend to pivot them in a clockwise direction. Each selecting finger 157 has an associated spring 162 and the fixed ends of the springs 162 are secured to posts 163.

Pivoted on a spacer 153 on the stud 149 between the first and second guide plates 152 and in front of the selector levers 156, as seen in Figs. 8 and 9, is a bell crank 164. Extending horizontally toward the rear from the upper part of the substantially vertical arm of the bell crank 164 is a section 166 against which the selecting fingers 157 are normally held by their attached springs 162. A spring 167 attached to the bell crank 164 and the post 163, tends to rock the bell crank in a clockwise direction and normally holds the section 168 at the upper end thereof against the end of an adjusting screw 169 which is supported in the bracket 146. Another bell crank lever 171 is adjustably secured by means of a screw 172 and pin 173 to the leftwardly extending arm of the bell crank 164. The upper section of the bell crank 171 is in operative relation with the cam 67 on the selector cam sleeve 57. A section 174 at the left of bell crank 164 extends upward and between the first two guide plates 152 and serves to keep the bell crank 171 in alignment with its associated cam 67.

A lever 176 best shown in Fig. 10 is pivoted at its left hand end on a spacer 153 on the stud 148 behind the selector levers 156. The right hand end of the lever 176 rests on an angle bracket 177 secured to the bracket 146. A pin 178 on the lever 176 pivotally supports a bell crank 179, the left hand end of which pivotally carries a roller cam follower 181 which is in operative relation with the hereinbefore mentioned selecting finger transfer cam 69. A guide plate 182 is attached to the bracket 146 by screws 183, Fig. 3, and has a slot 184 therein which guides the left hand end of the bell crank 179 to keep the cam follower 181 in alignment with its associated cam 69. Supported at its lower end on the pin 178, Fig. 10, is a knife arm 186 which is adapted to pivot with the bell crank 179. The knife arm 186 and bell crank 179 are adjustably secured to one another by a screw 187 extending through an elongated slot 188 in the bell crank 179 and threaded into the knife arm. The right hand end of the knife arm 186 has a vertical knife section 189 which is parallel to the operating shaft 27 and is located a little to the left and above the upper ends of the selecting fingers 157, in their normal or unoperated positions. A spring 191 attached to the knife arm 186 and the bracket 146 tends to pivot the knife arm and bell crank 179 in a clockwise direction and keeps the cam follower 181 engaged with its associated cam 69. A section 192 of the bracket 146 is bent horizontally and has a slot 193 therein which guides the bell crank 179 and knife arm 186.

The operation of the selector cam sleeve 57 and its associated elements will now be described. In

general the selecting operation consists of three sub-operations which are as follows: first, successively raising the selecting fingers 157 in timed relation with received signaling impulses and selectively positioning the upper ends thereof to one side or the other of the knife section 189 in accordance with the received signaling impulses; second, the transfer operation which is performed by movement of the knife section 189 which causes the selecting fingers 157 on one side thereof to trip associated latches which normally latch associated permutation bars in a normal position; and third, the reset of the knife section 189 and selecting fingers to normal.

In Fig. 8 the selector cam sleeve 57 and its associated elements are shown in their rest or normal position and in Figs. 9 and 10 some of the elements and the cam sleeve 57 are shown in their operated position. The rotation of the cam sleeve 57 is initiated as hereinbefore described by the pilot sleeve 74, Fig. 3, an adjustable length of time after the receipt of the start impulse so that the selector cams 68a to 68e are effective to cooperate with associated selecting elements to selectively position the same during the mid-portion or most effective portions of respective signaling impulses. Concomitantly with the release of the cam sleeve 57 the selector magnet 98, Fig. 7, causes the selector armature 107 and extension 111 to be positioned in accordance with the first signaling impulse, and a sufficient length of time thereafter to insure the proper positioning of the armature extension 111, the first selecting cam 68a rotates into engagement with the projection 155, Figs. 8 to 10, on its associated selector lever 156. If the first signaling impulse is a spacing or open line condition, the armature 107 will remain in the same position as it was moved to by the spacing start impulse. If the first signaling impulse is a marking or a closed line condition, the magnet 98 will be energized and causes the armature 107 to be markedly positioned. In Fig. 7 the armature 107 and extension 111 are shown in their marking position. In Figs. 8, 9 and 10 a section of the armature extension 111 is shown by full lines in its marking position and by a dot-dashed outline thereof in its spacing position as it is positioned in response to and in accordance with marking and spacing or closed and open line conditions respectively.

The operation of the first two associated selecting cams 68a and 68b, the first two selector levers 156 and the first two selecting fingers 157 will now be described, the first selecting impulse being assumed to be marking and the second spacing in nature.

As the selector cam 68a engages the projection 155 of its associated selector lever 156, it causes the lever to pivot in a counter clockwise direction, as seen in Figs. 8 to 10, about the stud 148 upon which it is mounted. The pivoting movement of the first lever 156 causes its associated selecting finger 157 which is articulated thereto at its lower end to rise with substantially a vertical and linear movement. It will be noted that, as shown in Fig. 8 with the selecting fingers 157 in their normal or rest position, the upper ends thereof are a little to the right and a little below the lower edge of the knife or knife section 189. The upper end of each selecting finger 157 has a beveled section 196 which slopes toward the right and the knife 189 has the lower edge section 197 beveled toward the left. As the first impulse is assumed to be marking, the armature extension 111 will be in its marking position during

the upward movement of the first selecting finger 157, and as the selecting finger rises a beveled projection 198 on the right hand side and adjacent the upper end thereof engages with the armature extension 111. This engagement of the projection 198 and the armature extension 111 causes a slight pivoting movement in a counter-clockwise direction of the selecting finger 157 which is sufficient to bring the beveled surface 196 on the upper end thereof beneath the beveled surface 197 on the lower edge of the knife section 189. Further upward movement of the selecting finger 157 then causes the beveled surfaces 196 and 197 to engage and the selecting finger to be positioned to the left of the knife section 189 as shown in Fig. 10, which position is the marking position of a selecting finger 157. The first selecting finger 157 thereupon remains in this position until returned near the end of the revolution of the selector cam sleeve 57, to its normal position, as will be hereinafter described. An angle member 199 adjustably secured to the upper section of the knife arm 186 by a screw 201 has a horizontal section 202 which extends parallel to the knife section 189 and a little to the left thereof. The purpose of the section 202 is to prevent overthrow of the selecting fingers 157 as they are being markingly positioned which would cause premature tripping of hereinafter mentioned associated latches.

After the positioning of the first selecting finger 157 the armature 107 and the armature extension 111 are positioned in accordance with the second selecting impulse and as this impulse is assumed to be a spacing impulse, the armature extension 111 will be moved to its spacing position, following which the high part of the second selector cam 68b starts to engage the end 155 of the second selector lever 156. This causes the second selector lever 156 to pivot about its mounting point in a counter clockwise direction and in so doing raises its associated selecting finger 157. With the armature extension 111 in its spacing position, the beveled projection 198 and the armature extension will not engage as the second selecting finger 157 rises. Thus the second selecting finger 157 slides upward on the section 166 of the bell crank 164 and the upper end thereof passes to the right of the knife section 189 as shown in Fig. 9, which position is the spacing position of a selecting finger 157. The second selecting finger 157 will remain in its spacing position until it is returned to normal as will be hereinafter described.

In a similar manner the third, fourth and fifth selecting fingers 157 are successively markingly or spacingly positioned to the right or left, respectively, of the knife section 189 in accordance with the positioning of armature extension 111 in response to the received marking and spacing selecting impulses.

The purpose of pivoting the bell crank 179 on the pin 178 in the lever 176 instead of on a fixed stud will be apparent from the following. Under normal operating conditions the lever 176 remains stationary but in the event that the tip end of one of the selecting fingers 157 in rising becomes engaged with the knife section 189 and is blocked thereat, the above arrangement allows the selecting finger to cause the bell crank 179 and lever 176 to pivot about the stud 148. When the selecting finger is subsequently lowered at the end of the signal as hereinafter described, the end of the finger and the knife will be disengaged. If the pin 178 were fixed, jam-

ming might occur, thereby tying up the recorder. Obviously, when a selecting finger 157 causes the bell crank 179 and the lever 176 to pivot, a wrong selection is likely to be made or a complete selection dropped out, but this is preferable to having the recorder jam and hence possibly out of service for an indefinite length of time.

After the selective positioning of the selecting fingers 157 to the right and left of the knife section 189, the next function of the selector mechanism is the transfer operation. This function is performed by movement of the knife section 189 and only the selecting fingers 157 on the left hand side of this knife section enter into the transfer function. Shortly after the fifth selecting finger 157 has been selectively positioned, the high part of the transfer cam 69, best shown in Fig. 10, comes into engagement with the cam follower 181 at the left hand end of the bell crank 179 and causes the bell crank and knife section 189 attached thereto to pivot in a counter clockwise direction about the pin 178 in the lever 176. As the knife section 189 moves to the left, all the selecting fingers that have been positioned on the left hand side thereof are pivoted a slight amount in a counter clockwise direction. Some or all or none of the selecting fingers 157 may be to the left of the knife section 189, their position depending on the received impulses as hereinbefore described. As the selecting fingers 157 are pivoted to the left by the movement of the knife section, individual projections 203 formed on the upper left hand sides of the selecting fingers engage associated latches 204 to trip them, as will be hereinafter described.

During the time that the knife section 189 holds the markingly positioned selecting fingers 157 to the left, the high part of the cam 67, Fig. 9, comes into operative relation with the upper end of the bell crank 171 and causes it and the attached bell crank 164 to pivot in a counter clockwise direction about the stud 149. As the bell crank 164 pivots, the section 166 thereof rocks all the spacingly positioned selecting fingers 157 in a counter clockwise direction. The pivoting movement of the spacingly positioned selective fingers is not sufficient, however, to cause their projections 203 to trip their associated latches and while the spacingly and markingly positioned selecting fingers 157 are thus held to the left by the bell crank 164 and the knife section 189 respectively, the section 155 of each selector lever 156 simultaneously passes out of operative relation with the high part of their associated selector cams 68a to 68e. Thereupon the springs 159 are effective to rock the selector levers 156 in a clockwise direction back into their normal position. This consequently causes the lowering of the selecting fingers 157 and as the fingers move downward those on the left of the knife section 189 clear it and their attached springs 162 pull them to the right into contact with the section 166 of the bell crank 164. Each of the selector cams 68a to 68e comprises a forward face or rise, which actuates its associated selector, a concentric face which serves to hold the selector levers elevated and a drop or rear face which permits the return movement of the selector levers. The rises or forward faces of the cams are offset in the direction of rotation, as shown in Fig. 8, so as to cause successive engagement thereof with the selectors 156 to elevate the selector fingers 157 in succession but the drops or rear faces of the cams 68a to 68e terminate at the same angular position so that the

selector levers are restored to normal simultaneously. The drops or rear faces of these cams 68a to 68e are arranged relative to the rise of cam 67 so that while the selecting fingers 157 are moving downward, the bell crank 164 is rocked in a counter clockwise direction to its extreme position. The function of the bell crank 164 is to rock all the selecting fingers 157 which were spacingly positioned to the left so that as they and the markedly positioned selecting fingers are lowered, the beveled projections 198 thereon will not engage the armature extension 111 if the armature extension should happen to be in its marking position. After the selecting fingers 157 are lowered, the bell crank 164 pivots in a clockwise direction and allows all the fingers to pivot to the right into their normal position concomitantly with the return of the knife section 189 to its normal position. Just before the selector cam sleeve 57 completes a revolution, the cam 71, Figs. 5 and 8, engages an arm 206 of a trip lever 207 to initiate the operation of the operating cam sleeve 36 as will be hereinafter described. As stated above, the speed of rotation of the shaft 27 is such with respect to the signalling impulses that the selector cam sleeve 57 completes a revolution in less time than is required for the receipt of a complete code combination and it is brought to rest at the completion of every revolution by engagement of its stop arm 66 with the projection 144 of lever 133. Thus the complete selector mechanism is returned to normal ready for the next selective operation.

An inverted U-shaped member 208, Figs. 2, 6 and 11, is secured to the top front section of the base plate 34 and has a stud 209 extending vertically from the top left hand section thereof. The stud 209 has thereon a series of washers 211 and bushings 212 which are clamped together by nuts 213 in threaded engagement with the end of the stud. Pivotally supported on the bushings 212 are the heretofore mentioned latches 204 and as they are slightly thinner than the bushings, they are freely pivotable thereon. Two screws 214, Figs. 2 and 6, extending vertically from the bracket 208, clamp a series of bushings 216 and spacers 217 to the top of the bracket. On the bushings 216 and between the spacers 217 are a series of five individually notched selector or permutation bars 218. Each selector bar 218 has elongated slots 219 therein and are thereby adapted to slide transversely of the machine with the bushings 216 and spacers 217 serving as guides therefor. Their normal position is to the right as seen in Fig. 2 and they are normally held there by the right hand end of the latches 204 engaging surfaces 221 of the selector bars 218. Each selector bar 218 has an associated latch 204. Five single wire springs 221 have an end of each engaged in V-shaped notches in the ends of the selector bars 218 and tend to slide the bars to the left. The other ends of the springs are supported in a block 222 adjustably secured to a vertical flange of the bracket 208. Each of the selector bars 218 has formed on the front edge thereof a series of notches 223 and as is well known in the art, the arrangement of the notches in each bar is in accordance with the predetermined code. An angle bracket 224 secured to the top of the bracket 208 has adjustably secured thereto a block 226 in which are located one end of five single wire springs 227. The other ends of the springs 227 engage grooves in an arm of the latches 204. Each latch 204 has an associated

spring 227 which tends to pivot it in a counter clockwise direction as seen in Fig. 2, and normally holds the right hand of each latch in engagement with the surface 221 on its associated selector bar 218.

Referring now to Figs. 8, 9 and 10, let it be assumed that the first, fourth and fifth of the selecting fingers 157, from the front, are selectively positioned to the left of the knife section 189, then as the knife section moves to the left, the projections 203 of these fingers will engage the ends of their associated latches 204. As the projections 203 are at different heights, the lowest being at the rear, as seen in Fig. 8, and the left hand ends of the latches 204 being of different lengths, as clearly shown in Fig. 11, the first, fourth and fifth of the latches from the top will be actuated as the knife section 189 actuates the selected selecting fingers 157. The actuated latches 204 in turn unlatch their associated selector bars 218 the first, fourth and fifth from the top as shown in Fig. 6, and allow their associated springs 221 to slide them to the left. Thus the selector bars 218 are selectively positioned in a combination which corresponds to the selective position of the selecting fingers 157.

Referring now to Figs. 2, 3, 5 and 8, a bracket 231 is attached to the bearing post 31 by screws 232. The bracket 231 supports a rod 233 upon which is pivotally mounted the above mentioned trip lever 207. Collars 234 pinned to the rod 233 prevent the trip lever 207 from moving longitudinally thereon. A spring 236 attached to the trip lever 207 and the bracket 231 tends to pivot the trip lever and normally keeps a depending arm 237, Figs. 3 and 5, thereof in contact with the periphery of the collar 46. Formed on the periphery of the collar 46 is a side cam surface 238, shown dotted in Fig. 3, which is adapted to cooperate with the end of the depending arm 237 to normally hold the collar 46 to the right with its teeth 49 out of engagement with the teeth 51 on the collar 52. When the trip lever 207 is actuated as hereinbefore described near the end of a revolution of the selector cam sleeve 57 by the engagement of the cam 71 and the arm 206, the side cam surface 238 and the depending arm 237 are disengaged. Thereupon a spring 239 coiled about the collar 42 and disposed between the flange 44 on the collar 42 and the collar 46 forces the collar 46 to the left and allows its teeth 49 to engage the teeth 51 of the collar 52. The collar 52 is constantly rotating with the shaft 27 as hereinbefore described and therefore upon engagement of the teeth 51 and 49 the collar 46 will rotate with the shaft 27 and as the operating cam sleeve 36 is operatively engaged with the collar 46 at all times, it also will rotate with the shaft 27. As soon as the cam 71 passes out of engagement with the arm 206, the spring 236 returns the trip lever 207 to its normal position and the end of the depending arm 237 rides upon the periphery of the collar 46 and in the path of the side cam surface 238. Near the end of a revolution of the collar 46 and operating cam sleeve 36, the side cam surface 238 and the end of the depending arm 237 engage and force the collar 46 to the right. This brings its teeth 49 out of engagement with the teeth 51 on the constantly rotating collar 52. A further section of the side cam surface 238 then engages the extreme end of the depending arm 237 and brings the collar 46 and operating cam sleeve 36 to a stop in their normal rest position. A horizontal hooked lever 241, Figs. 2 and 3, pivoted on a bracket 242 se-

cured to the base 34 engages with a side cam 243 formed on the flange 44 of the collar 42 and prevents rebound or rotation in a reverse direction of the operating cam sleeve 36 due to its sudden stop by the arm 237 and the side cam surface 238. The lever 241 also bears against the side of the flange 44 during rotation thereof, thus putting a load or drag on the sleeve 36, whereby its starting movement is retarded until positive engagement of the teeth 49 and 51 of its driving clutch occurs.

A brief description of the operation of the operating cam sleeve 36 will now be given and reference is made to the hereinbefore mentioned co-pending application of Noxon et al. Ser. No. 66,906 which completely shows and describes the recorder with which this modification of the selector mechanism is particularly adapted to cooperate and control.

After the operating cam sleeve 36 has rotated about a quarter of a revolution, the drop-in-cam 44 operates a bail member 244, Figs. 4 and 6, to allow a series of drop-in-bars 246 to approach the notches in the selector bars 218. With the selector bars 218 selectively positioned as hereinbefore described, a notch 223 in each bar will be in alignment with a notch in each of the other bars. Therefore, as the drop-in-bars 246 approach the selector bars 218, the one opposite the aligned row of notches will be permitted to travel further than the others. The extra travel of the thus selected drop-in-bar 246 causes it to engage an associated hook 247 and thereby place the hook in the path of a print bail 248 which is controlled by the print cam 38 and a spring 249. Following the operation of a hook 247, the print bail 248 engages the operated hook and by means of the movement thereof through appropriate linkages causes a typebar to be operatively actuated or various other printer functions to be performed according to which drop-in-bar 246 was selected by the row of aligned notches in the selector bars 218. On the return of the print bail 248 to normal, a hook member 251, Figs. 2 and 4, operates a letter space feeding mechanism, part of which is shown and indicated in general by the reference numeral 252. After the engagement of the print bail 248 with a selected hook 247 and the return of the drop-in-bars 246 to normal, the selector bars 208 are returned to normal. This function is performed by a lever 253, Fig. 2, which is pivoted on a screw 254 extending vertically from the top of the bracket 208. As shown in Figs. 2 and 3, the rear end of the lever 253 is in operative relation with the side cam 243 and the front end adjustably carries a member 256 which is in operative relation with a series of lugs 257 on the rear of the selector bars 218. When the side cam 243 engages the lever 253, it pivots in a counter-clockwise direction and the member 256 engages the lugs 257 of all the selectors 218 that are to the left in a selected position and moves them to the right. The selector bars 218 thus moved are thereupon latched in their normal position by their associated latches 204.

Although this invention is shown and described in conjunction with a typebar recorder operating on a five unit code, it is obvious, of course, that it may be adapted to control other types of recorders using either the same or a different number of selecting conditions, and that various other modifications of the apparatus shown herein may be made without departing from the spirit or essential attributes of the invention,

and it is desired, therefore, that only such limitations 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 selecting mechanism, a set of selecting fingers having a plurality of paths of motion, an electro-magnet, means for successively initiating said selecting fingers into a first path of motion, means employing said electro-magnet for interfering with the movement of said fingers in said first path of motion and thereby compel the movement thereof into a second path of motion in accordance with received code combinations of impulses, a recording mechanism and means for simultaneously actuating said fingers actuated in said second path of motion in a third path of motion to selectively control said recording mechanism.

2. In a selecting mechanism, a plurality of selectors having a normal position, an unselected operated position and a selected operated position, a plurality of pivoted selector actuators equal in number to the number of selectors for invariably and successively actuating said selectors from a normal position to a selected or unselected operated position and maintaining said selectors in said positions, an electro-magnet and means controlled by said electro-magnet for initiating the movement of said selectors into only one of said operated positions in accordance with received code combinations of impulses.

3. In a selecting mechanism, a plurality of selectors having a normal position, an unselected operated position and a selected operated position, a plurality of selector actuators equal in number to the number of selectors for invariably and successively actuating said selectors from a normal position to a selected or unselected operated position and maintaining said selectors in said positions, an electro-magnet, means controlled by said electro-magnet for preventing the movement of said selectors into a predetermined one of said operated positions and thereby initiate the movement thereof into the other of said operated positions in accordance with received code combinations of impulses, a recording mechanism, means employing said selectors in said selected operated position for selectively controlling said recording mechanism, and means for simultaneously returning all of said selectors from said operated positions to normal.

4. In a receiving selector mechanism, a plurality of selectors having normal, unselected operated and selected operated positions, an electro-magnet responsive to received code combinations of impulses, means for invariably and successively moving said selectors from said normal position to either of said unselected or selected operated positions in synchronism with said code combinations and maintaining said selectors in said positions, means actuated by said electro-magnet to cooperate with said selectors during the movement thereof to determine into which of said operated positions said selectors move, means for simultaneously returning all of said selectors to normal and means operative during the operation of said last mentioned means to prevent the engagement of said selectors and said electro-magnetically actuated means.

5. In a selecting mechanism, a plurality of selectors each having a normal and a plurality of operated positions, an electro-magnet responsive to received code combinations, means operative for successively and normally actuating said

selectors from said normal position to an unselected operated position in synchronism with said code combinations, said selector movement being substantially linear, means controlled by
 5 said electro-magnet for selectively interfering with the linear movement of said selectors and thereby producing a combined linear and pivoting movement whereby said selectors are positioned into a selected operated position, a re-
 10 cording mechanism and means operative following the selective positioning of said selectors for pivoting such selectively positioned selectors to selectively control said recording mechanism.

6. In a selecting mechanism, a plurality of
 15 selectors each having a normal and a plurality of operated positions, an electro-magnet responsive to received code combinations, means normally operative for successively actuating said selectors from said normal position to an un-
 20 selected operated position in synchronism with said code combinations, said selector movement being substantially linear, means controlled by said electro-magnet for selectively interfering with the linear movement of said selectors and
 25 thereby producing a combined linear and pivoting movement whereby said selectors are positioned into a selected operated position, a recording mechanism, means operative following the selective positioning of said selectors for piv-
 30 otting such selectively positioned selectors to selectively control said recording mechanism and means for simultaneously returning all of said selectors to normal.

7. In combination, a set of selectors, a set of
 35 permutation members having normal and selected positions, a set of latches normally latching said permutation members in normal position, an electro-magnet, means employing said electro-magnet for successively and selectively
 40 positioning said selectors in accordance with received code combinations and means for simultaneously actuating said selectors in a selected position to trip associated of said latches whereby associated permutation members are selec-
 45 tively positioned.

8. In a selector mechanism, a series of selec-
 50 tors having a normal position and a plurality of operated positions, an electro-magnet responsive to received code combinations, a rotatable member for successively actuating said selectors in synchronism with said combinations, said se-
 55 lectors normally being actuated from said normal position into a first one of said operated positions, a member selectively positioned from one of two positions to the other by said electro-
 magnet, a first cam surface on each of said selectors adapted to cooperate with said electro-
 60 magnetically operated member in one of its said positions to interfere with the movement of said selectors from said normal position into said first
 operated position and thereby initiate the move-
 65 ment of said selectors into a second one of said operated positions, a second cam surface on each of said selectors and a member adapted to co-
 operate therewith to complete the movement of
 said selectors having interfered movement into
 said second operated position.

9. In a selector, a plurality of selectors suc-
 70 cessively movable in synchronism with received code combinations of impulses from a normal position into one or the other of two operated positions, means for maintaining said selectors in said operated positions, an electro-magnet and means controlled by said electro-magnet to co-
 75 operate or not to cooperate with said selectors

during the movements thereof to thereby deter-
 mine into which of said operated positions said
 selectors are positioned.

10. In a selector, a plurality of selectors suc-
 5 cessively movable in synchronism with received code combinations of impulses from a normal position into one or the other of two operated positions, means for maintaining said selectors in said operated positions, an electro-magnet, means controlled by said electro-magnet to co-
 10 operate or not to cooperate with said selectors during the movements thereof to thereby determine into which of said operated positions said selectors are positioned, means for simultaneous-
 15 ly returning all of said selectors to normal and means to prevent the cooperation of said selectors and said electro-magnetically controlled means during the return of said selectors to nor-
 mal position.

11. In a selector mechanism, a plurality of
 20 selectors having a normal and a plurality of operated positions, individual cams for successively actuating said selectors from a normal position into one or the other of two operated posi-
 25 tions in synchronism and in accordance with received code combinations, a transfer cam and means operated thereby after the positioning of said selector into one or the other of said two
 operated positions for simultaneously actuating
 30 said selectors in a predetermined one of said two operated positions into a third operated position, a recording mechanism and means operated by the simultaneous movement of said selectors into said third operated position for selectively
 35 controlling said recording mechanism.

12. In a selector mechanism, a series of se-
 40 lectors having a normal position and a plurality of operated positions, an electro-magnet responsive to received code combinations, a rotatable member for successively actuating said selectors in synchronism with said combinations, said selectors normally being actuated from said
 45 normal position into a first one of said operated positions, a member selectively positioned from one of two positions to the other by said electro-
 magnet, a first cam surface on each of said selectors adapted to cooperate with said electro-
 50 magnetically operated member in one of its said positions to interfere with the movement of said selectors from said normal position into said first
 operated position and thereby initiate the move-
 55 ment of said selectors into a second one of said operated positions, a second cam surface on each of said selectors, a diverting member adapted to cooperate therewith to complete the movement
 of said selector having interfered movement into
 said second operated position and means to pre-
 vent jamming of said selectors and said divert-
 ing member.

13. In a selector, an electro-magnet responsive
 60 to received code combinations of impulses, an armature actuated in accordance with the energization and de-energization of said magnet, stops for limiting the movements of said arma-
 65 ture, resilient means tending to move said magnet relative to said armature and adjustable means for adjusting the position of said magnet relative to said armature against the action of
 said resilient means.

14. In a selector, a plurality of selectors each
 70 having a normal and a plurality of operated positions, an electro-magnet responsive to received code combinations, means operative for successively and normally actuating said selectors from
 75 said normal position to an unselected operated

position in synchronism with said code combinations, said selector movement being substantially linear, means controlled by said electro-magnet for selectively interfering with the
5 linear movement of said selectors and thereby producing a combined linear and pivoting movement whereby said selectors are positioned into a selected operated position, means to prevent overthrow of said selectors as they are being
10 positioned into said selected operated position, a recording mechanism and means operative following the selective positioning of said selectors for pivoting such selectively positioned selectors to selectively control said recording mechanism.

15. In a selector, an electro-magnet responsive to received code combinations, an armature actuated from one of two positions to another in accordance with the energization and de-energization of said magnet, said armature having a plurality of arms and one of said arms being substantially longer than the others, a plurality of stops for said armature and means employing more than one of said stops for preventing inertia whip or flexure of said longer arm when said
10 armature is being moved to one of its positions.

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