

May 5, 1942.

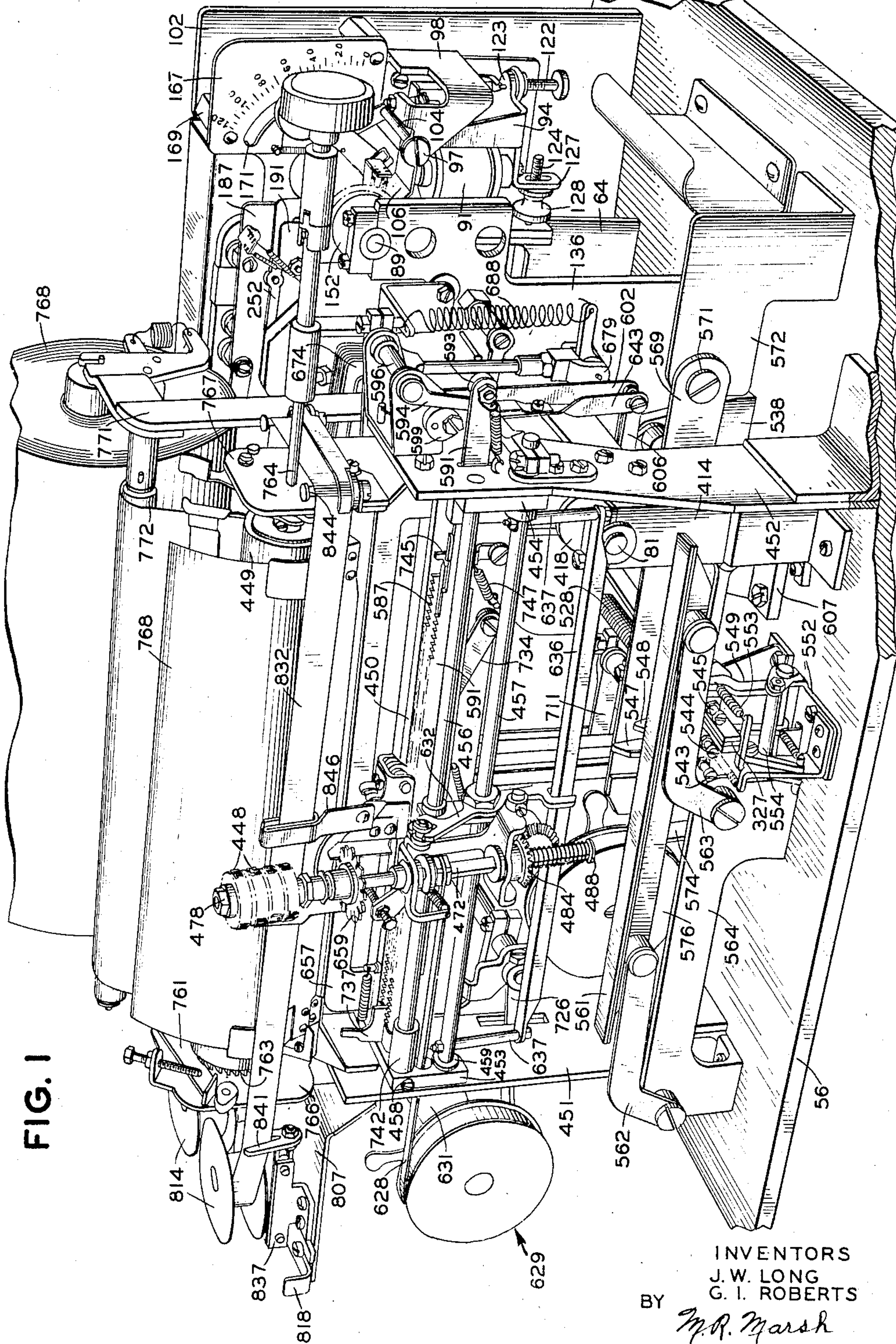
J. W. LONG ET AL.

2,281,775

TELEGRAPH PRINTER

Filed Sept. 13, 1938

16 Sheets-Sheet 1



INVENTORS
J. W. LONG
G. I. ROBERTS

BY

M. R. Marsh
ATTORNEY

ATTORNEY

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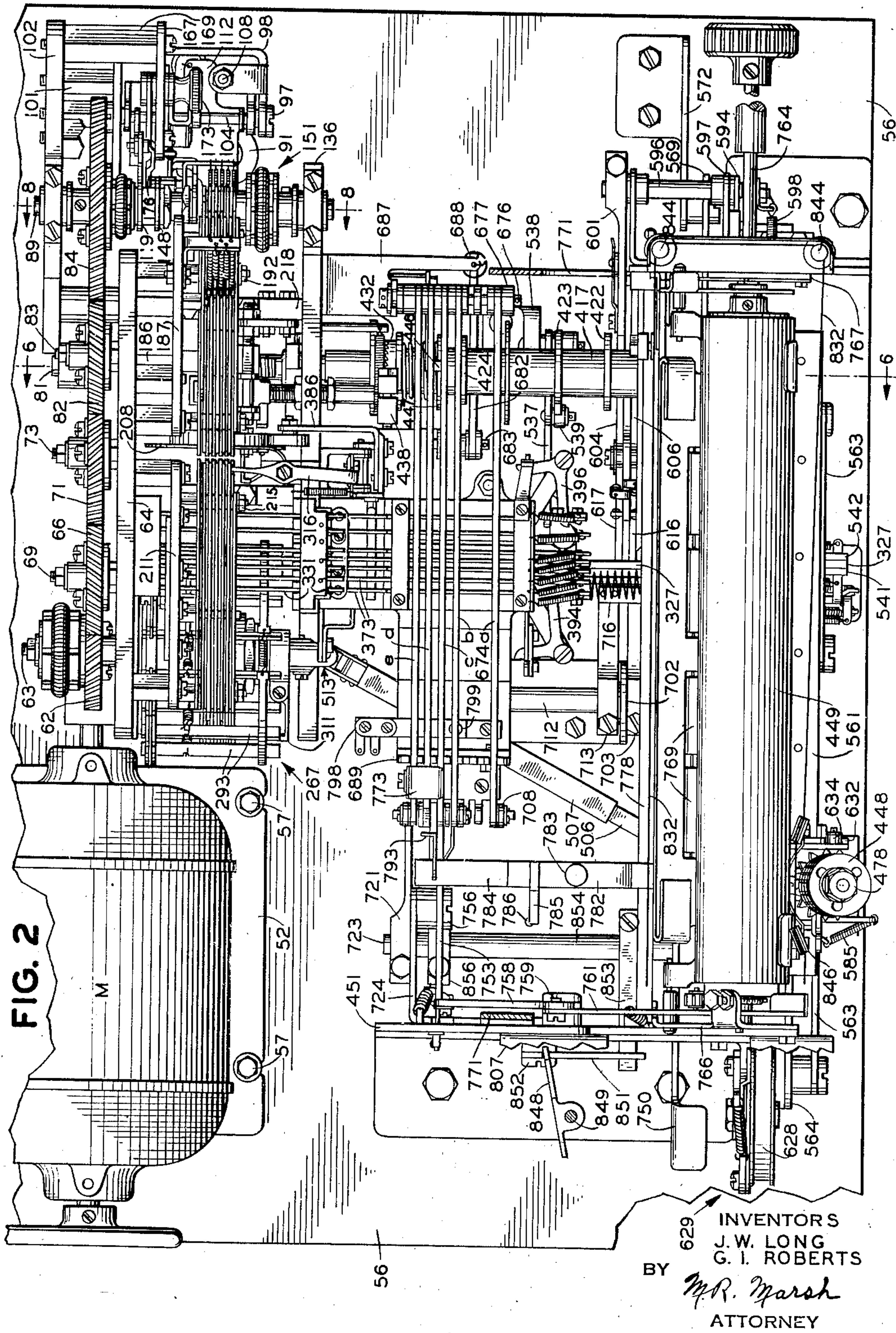
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TELEGRAPH PRINTER

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16 Sheets-Sheet 2



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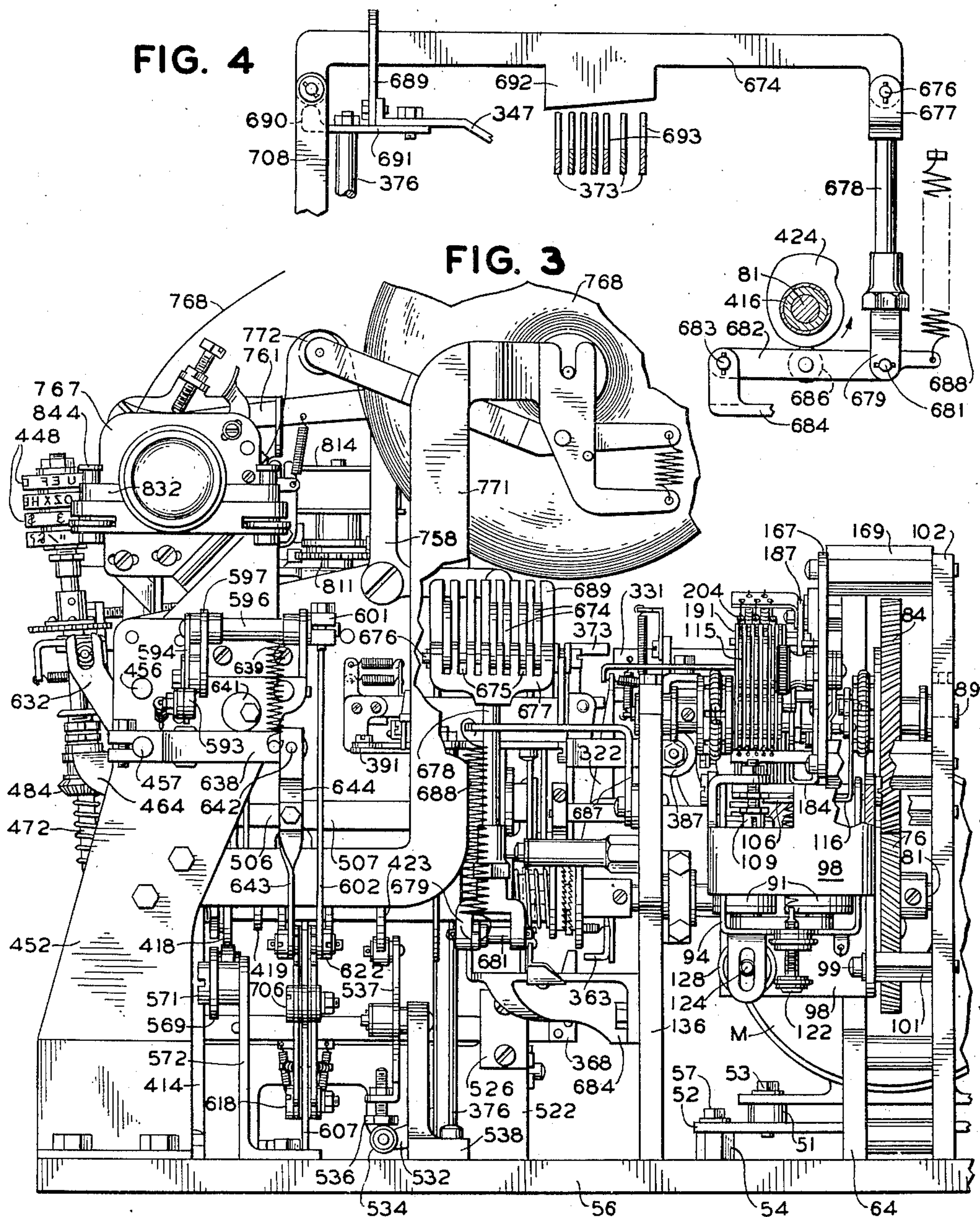
J. W. LONG ET AL

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TELEGRAPH PRINTER

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16 Sheets-Sheet 3



INVENTORS
J. W. LONG
G. I. ROBERTS
BY *M. R. Marsh*
ATTORNEY

May 5, 1942.

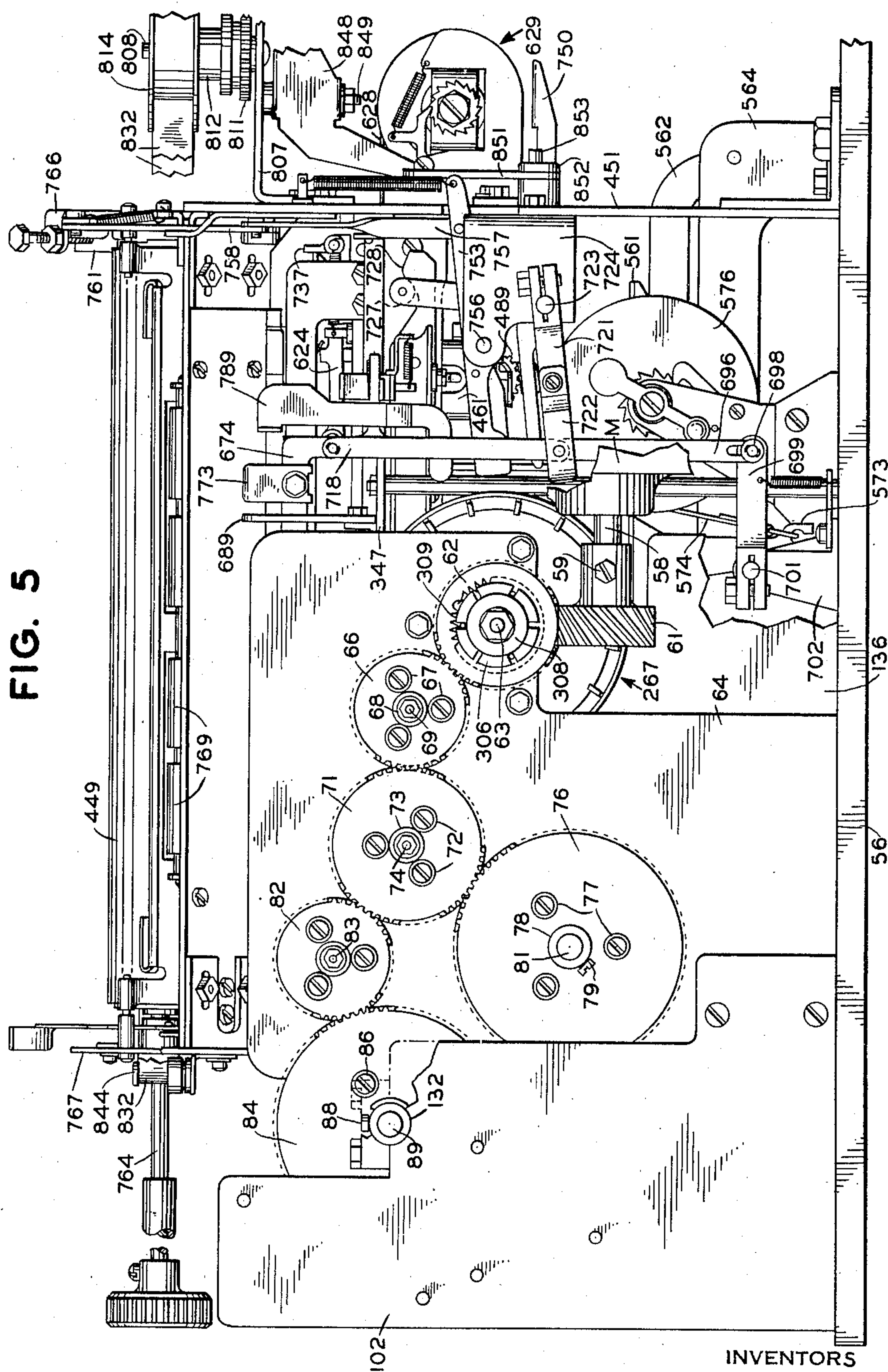
J. W. LONG ET AL

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16 Sheets-Sheet 4

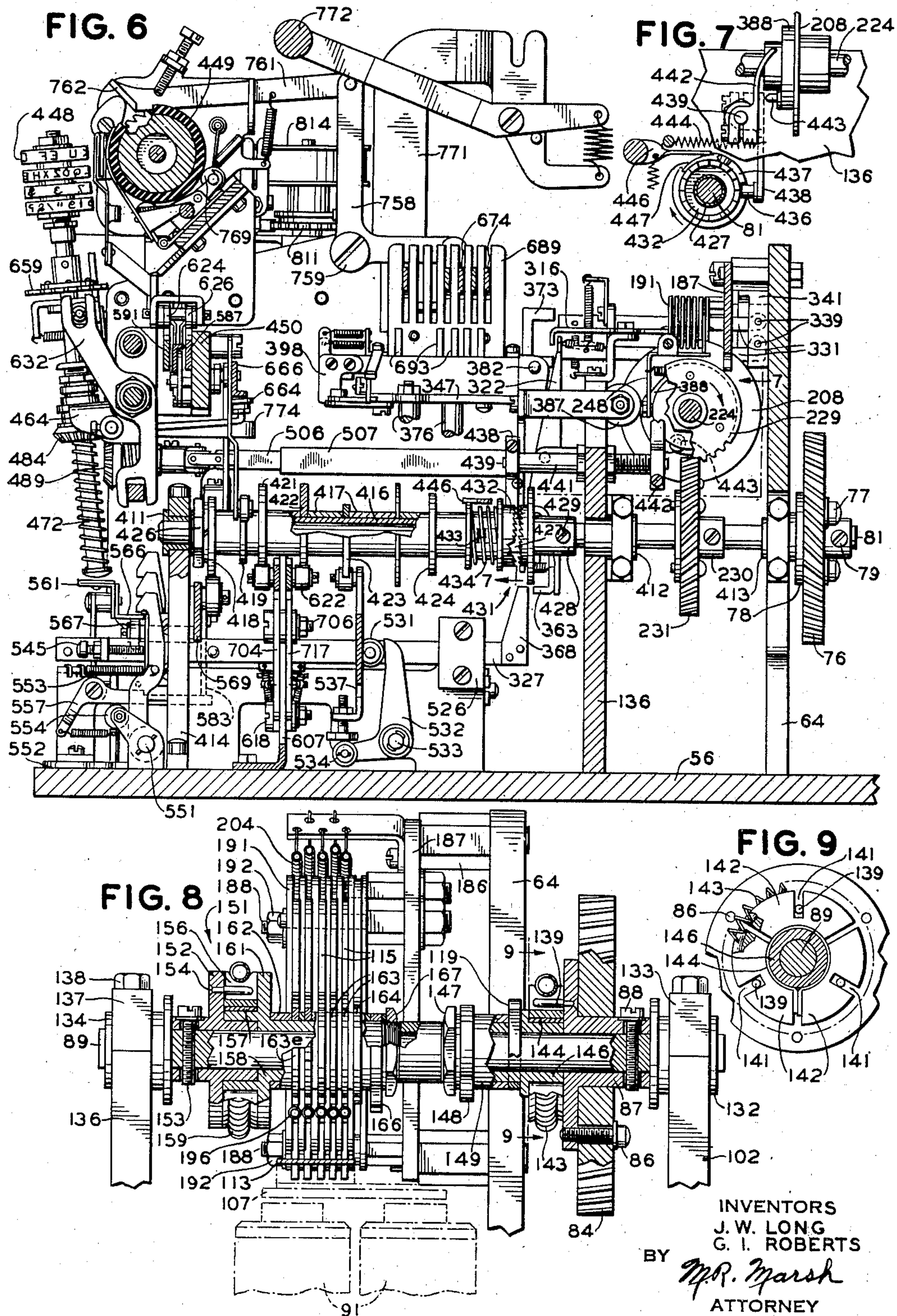


INVENTORS
J. W. LONG
G. I. ROBERTS
BY *M. R. Marsh*
ATTORNEY

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FIG. 7



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FIG. 10

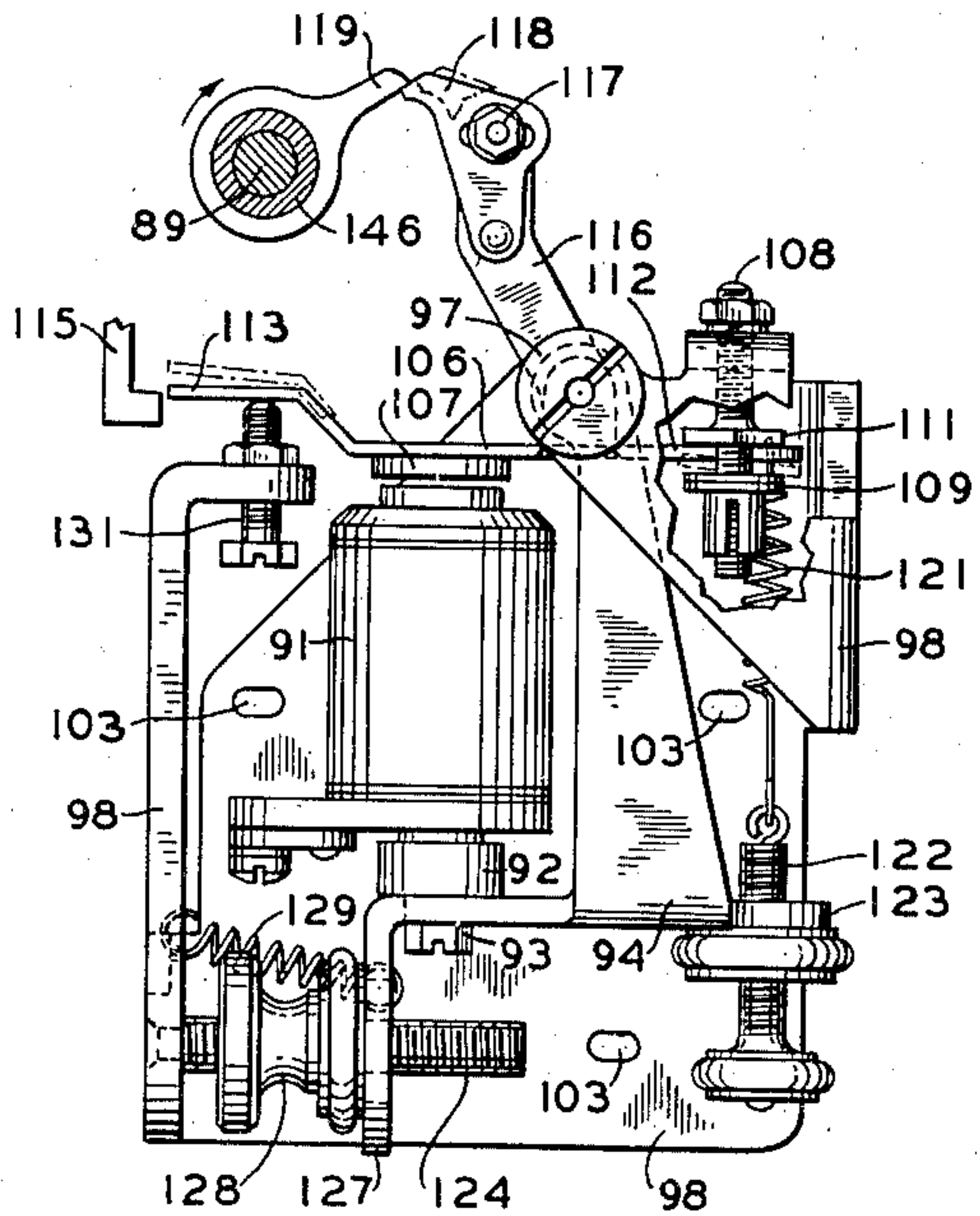


FIG. 11

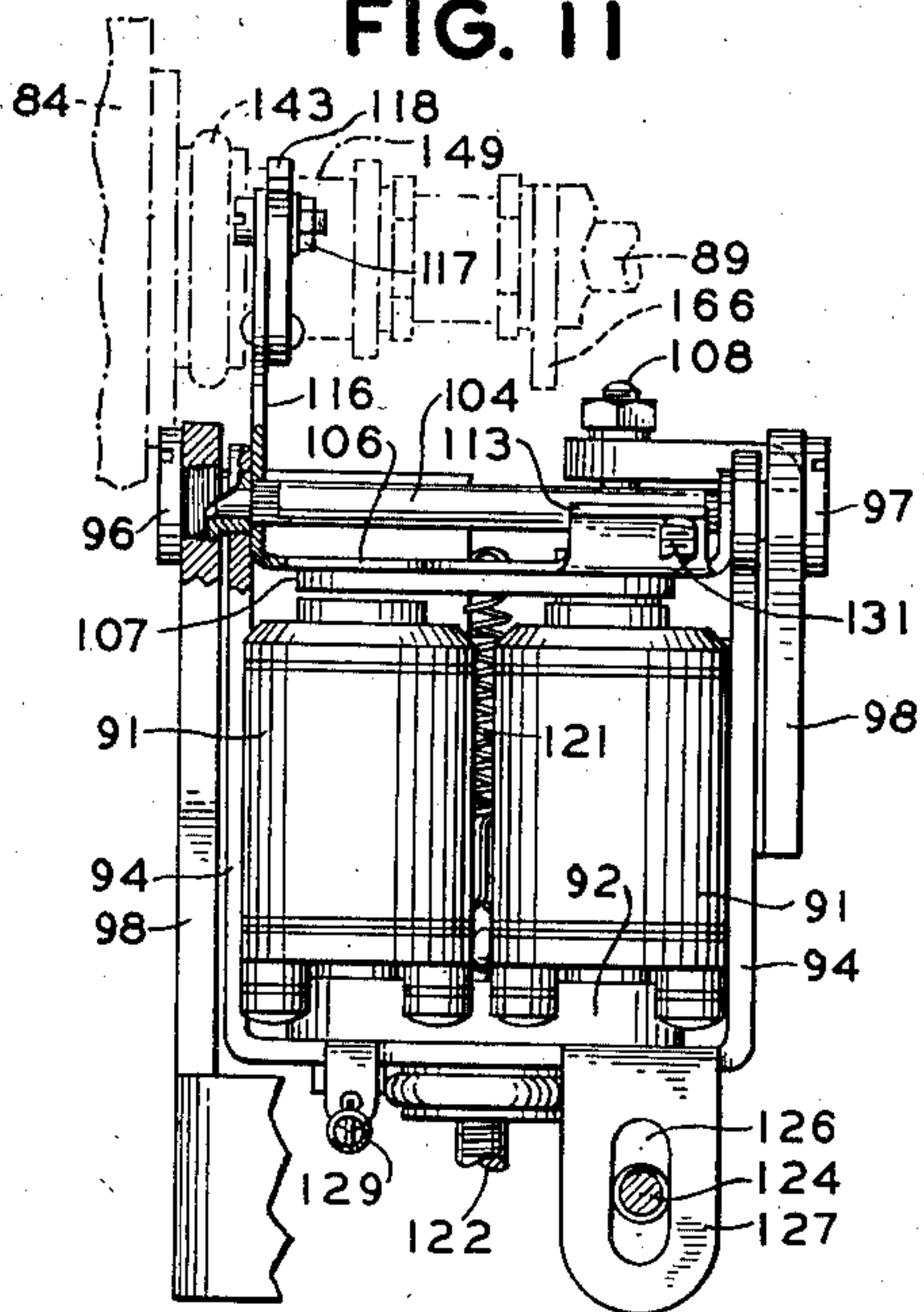


FIG. 12

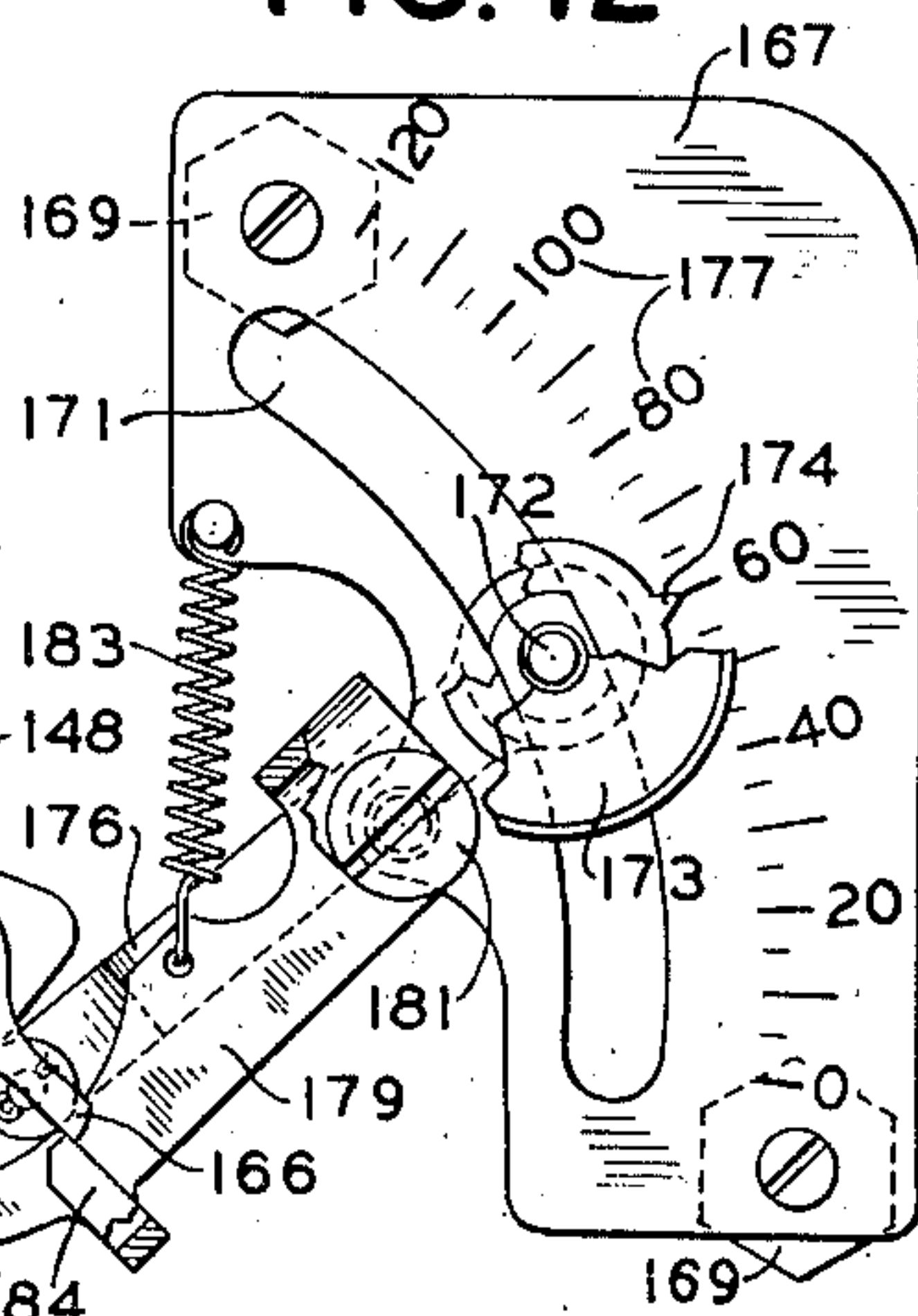
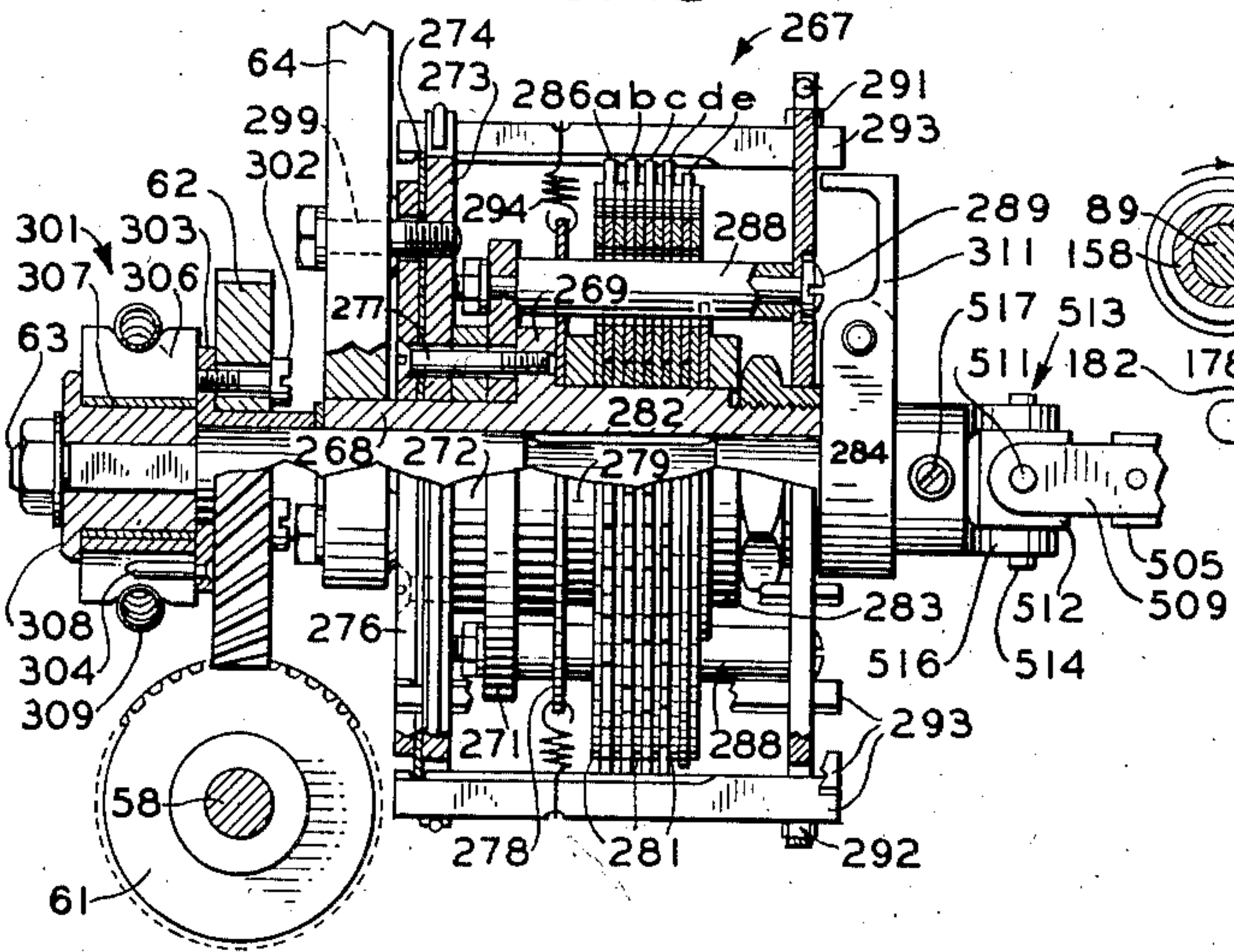


FIG. 13



INVENTORS
J. W. LONG
G. I. ROBERTS

BY *M. R. Marsh*
ATTORNEY

May 5, 1942.

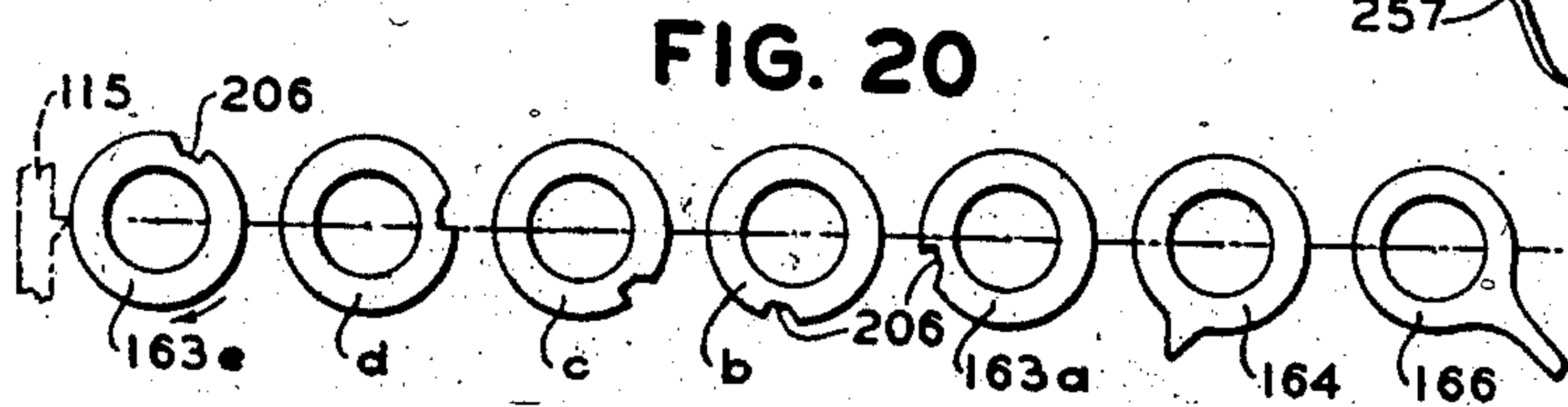
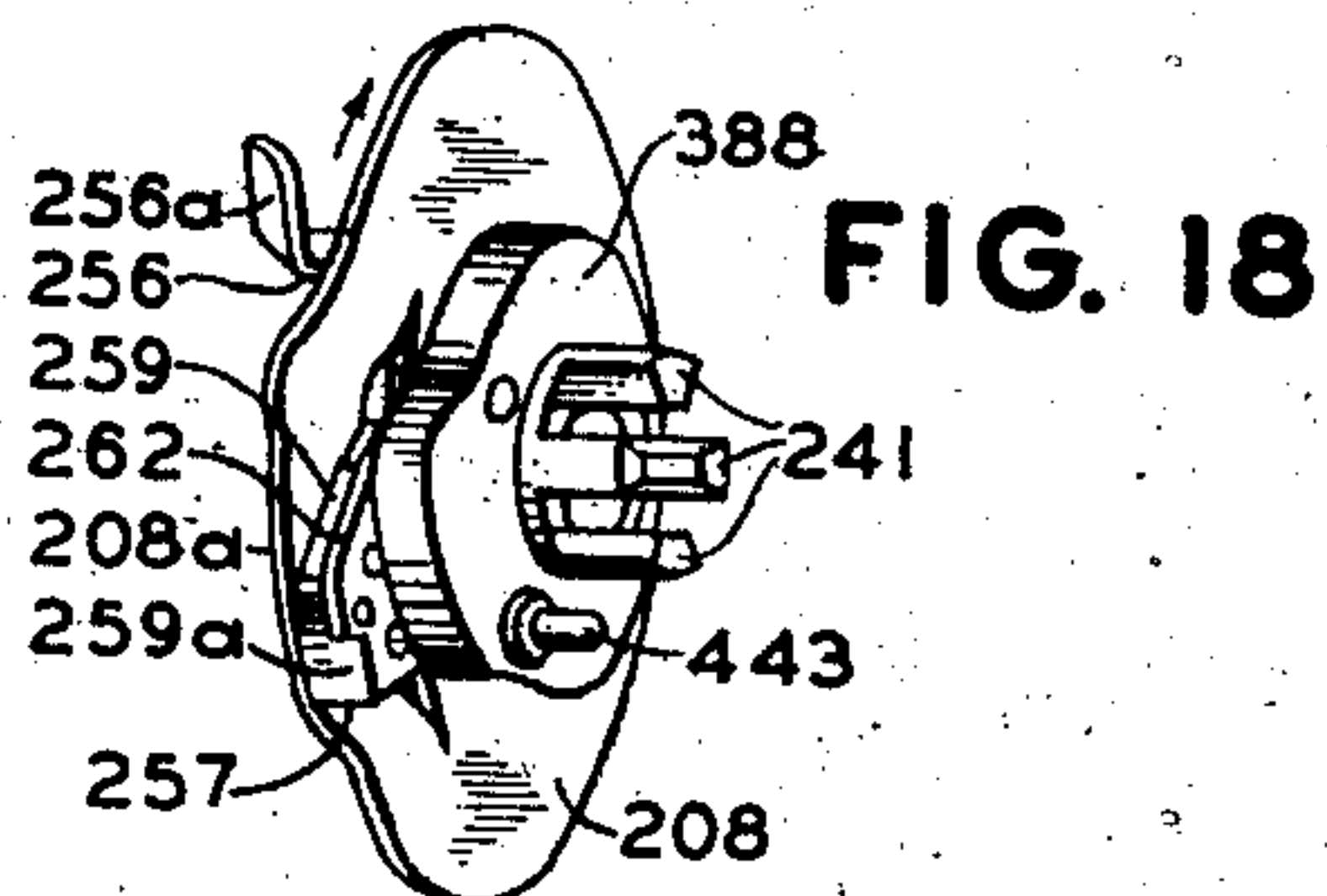
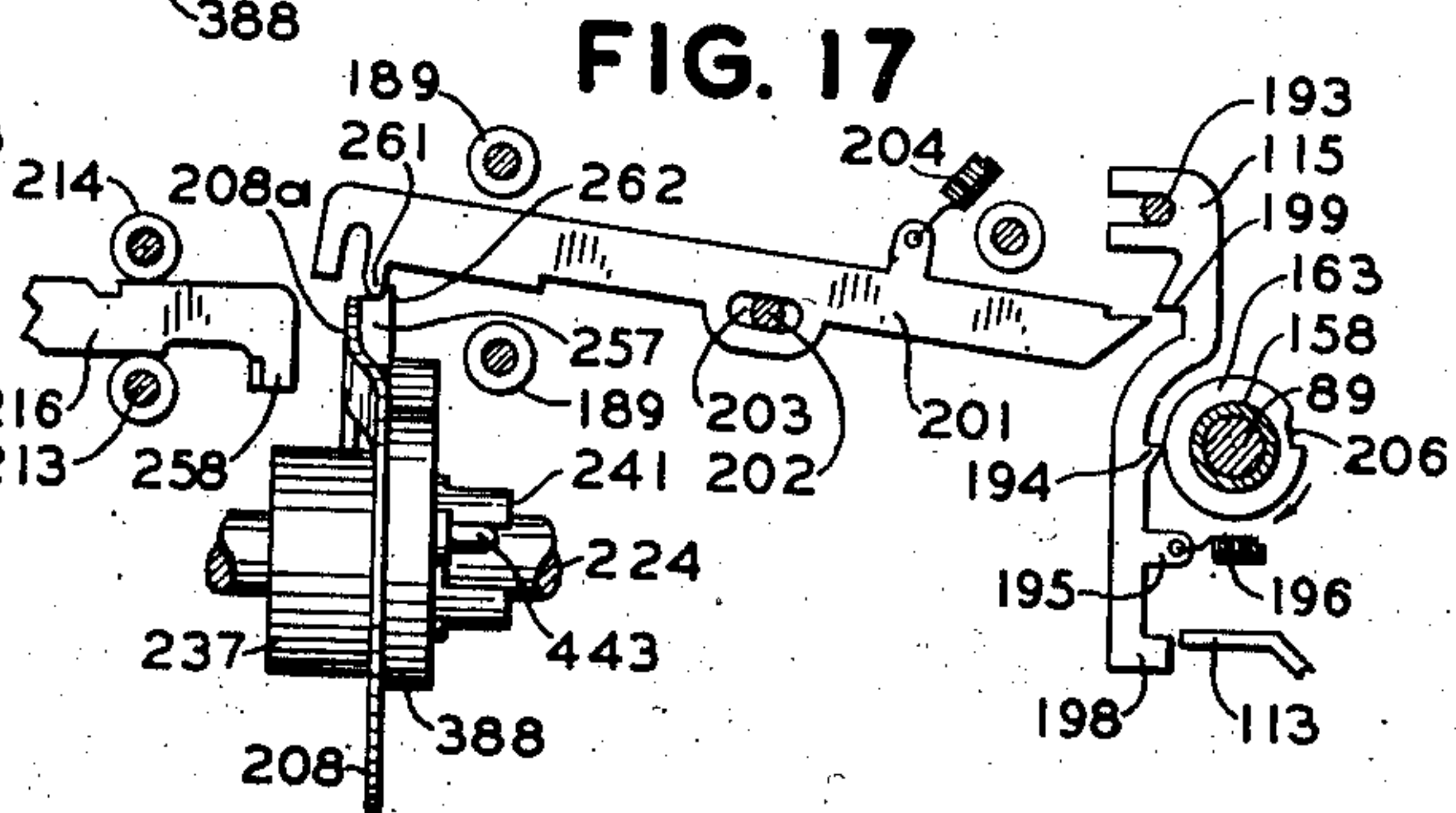
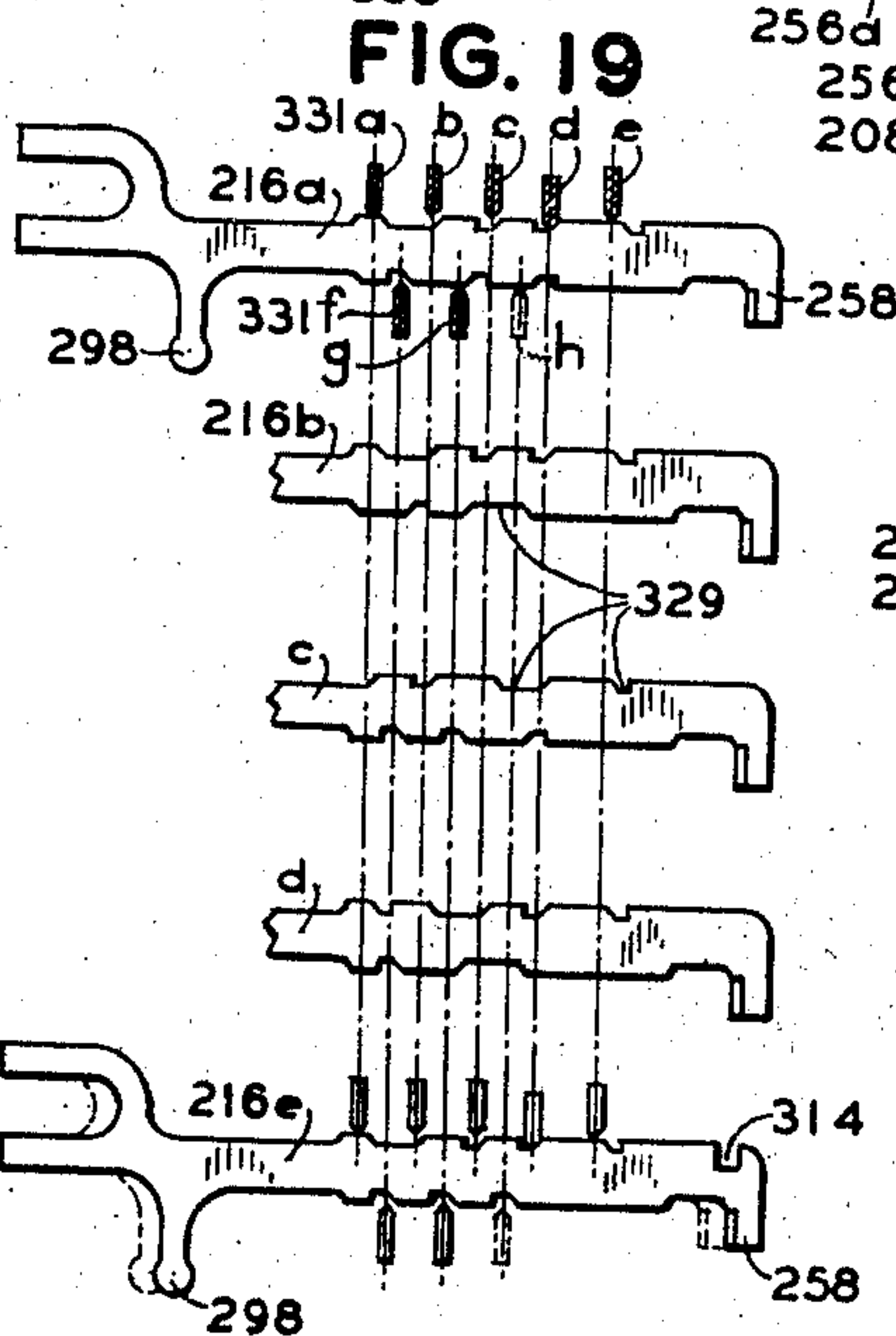
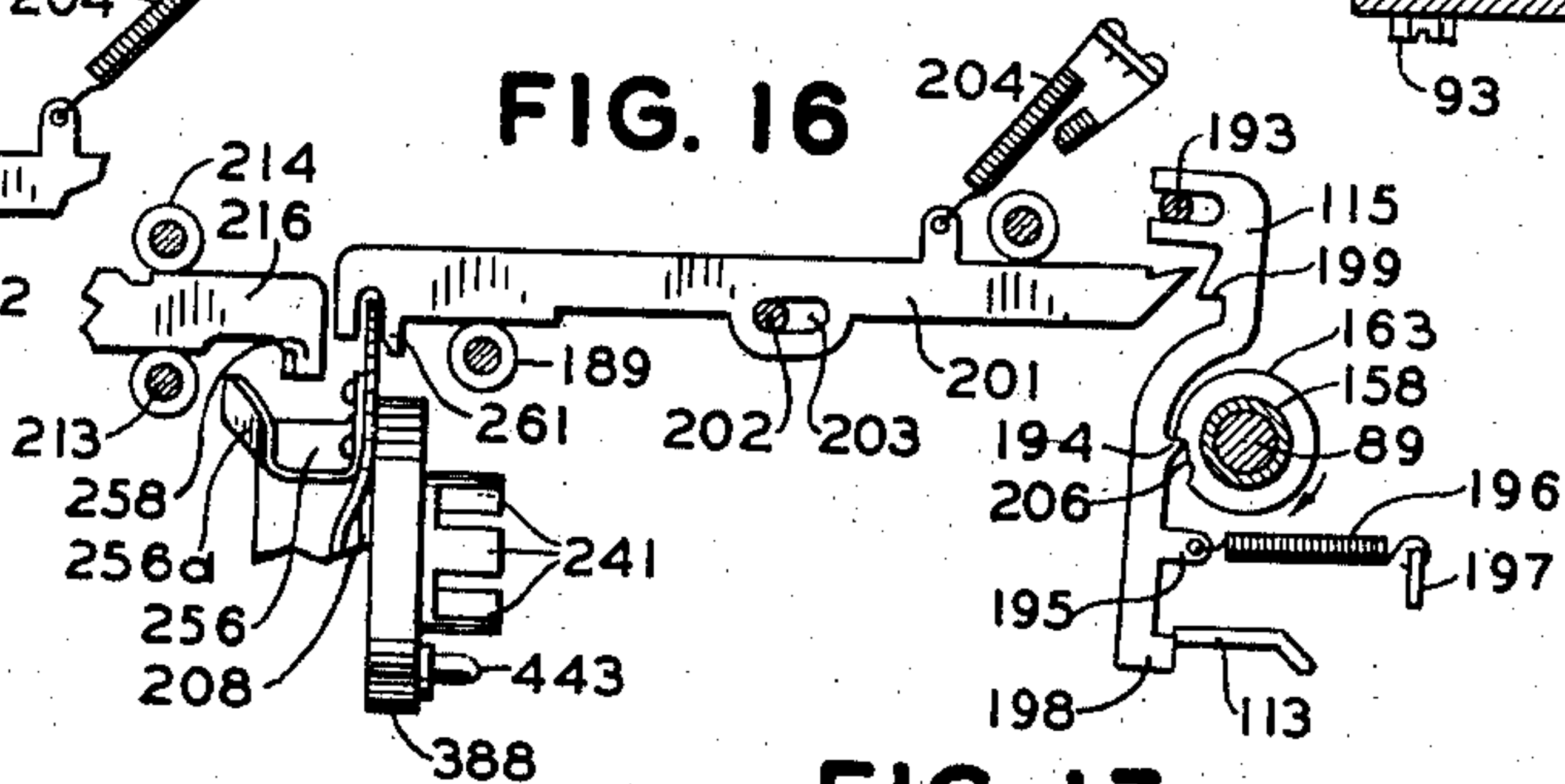
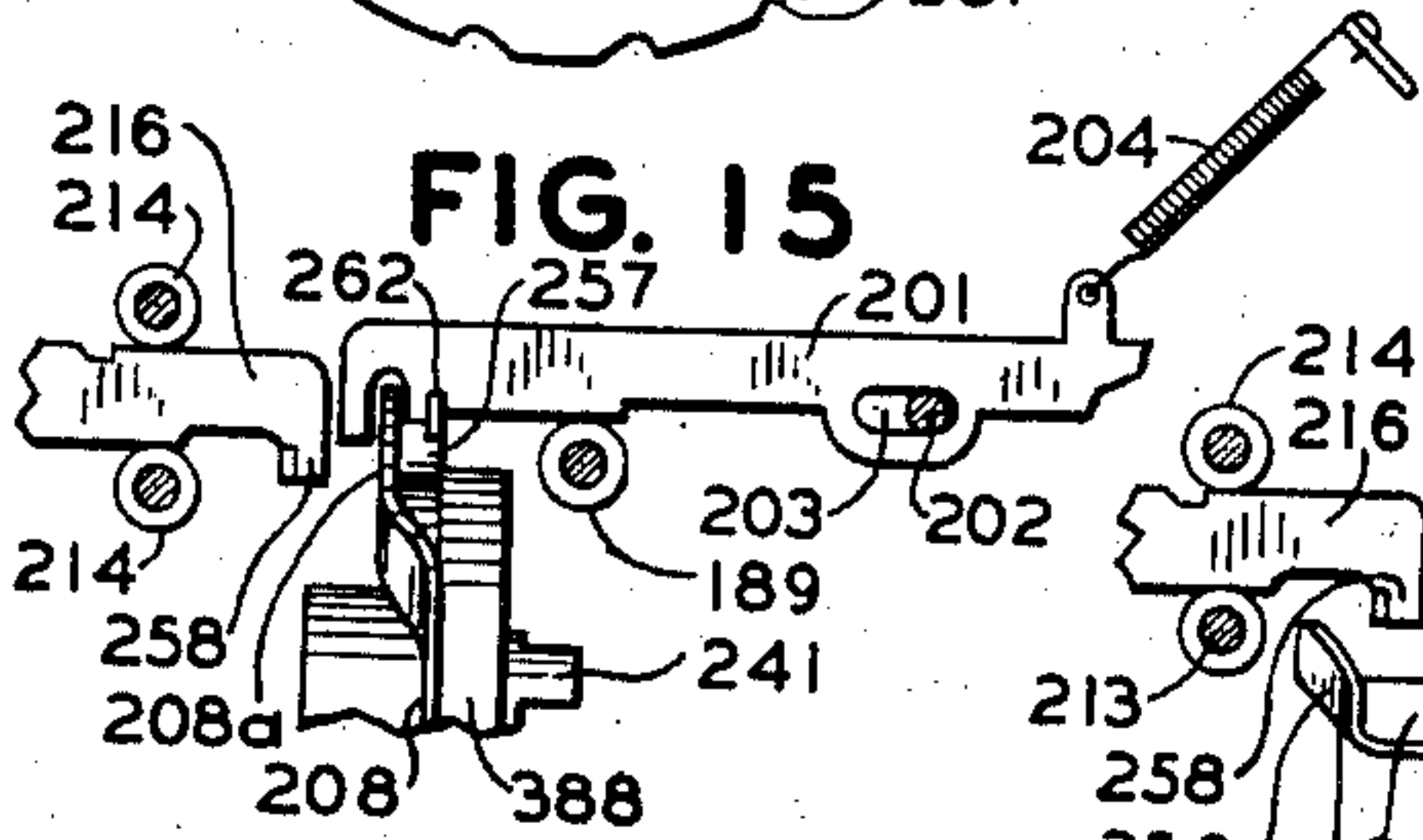
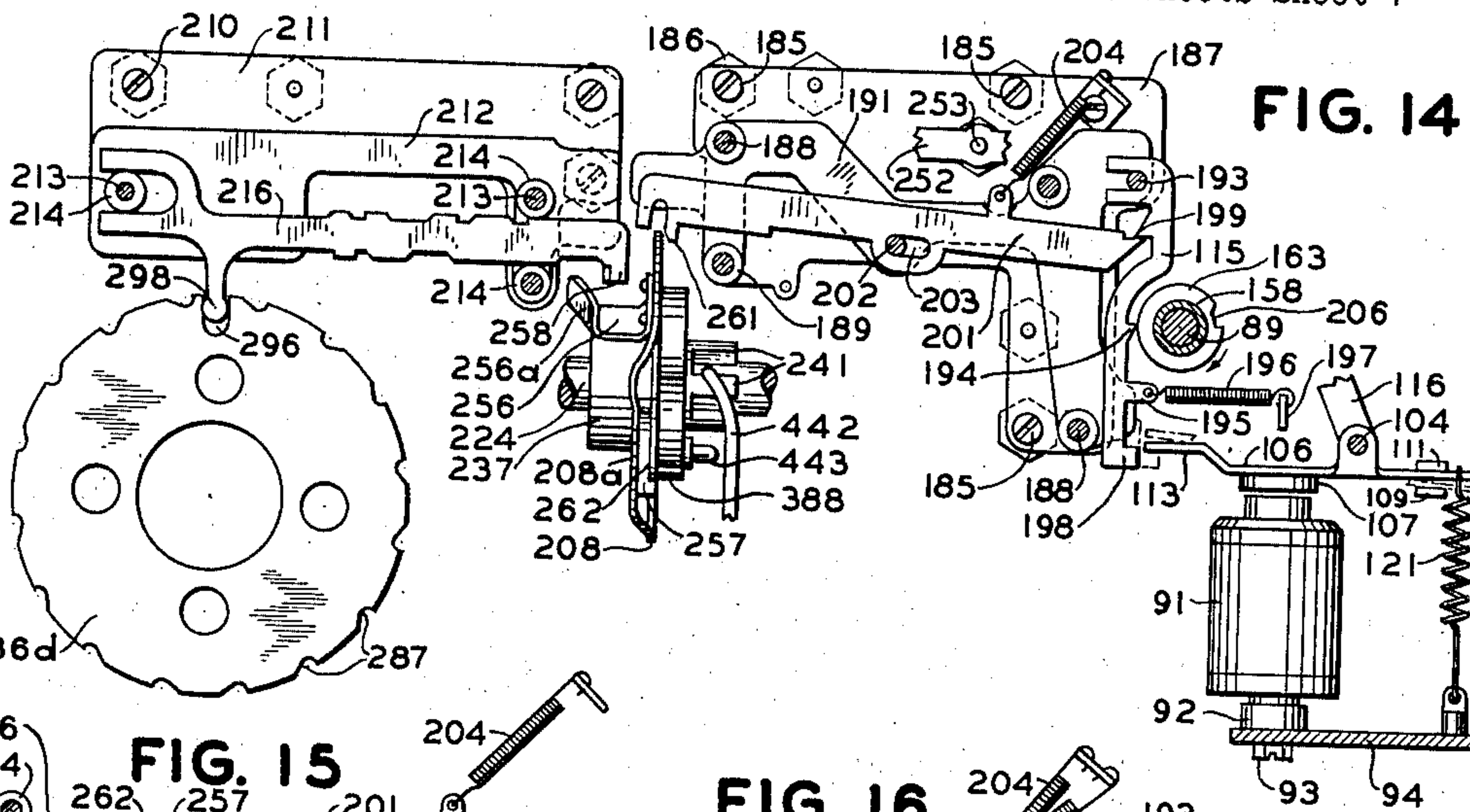
J. W. LONG ET AL

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TELEGRAPH PRINTER

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16 Sheets-Sheet 7



INVENTORS
J. W. LONG
G. I. ROBERTS

G. I. ROBERTS

and milk

BY

W.R. Marsh
ATTORNEY

May 5, 1942.

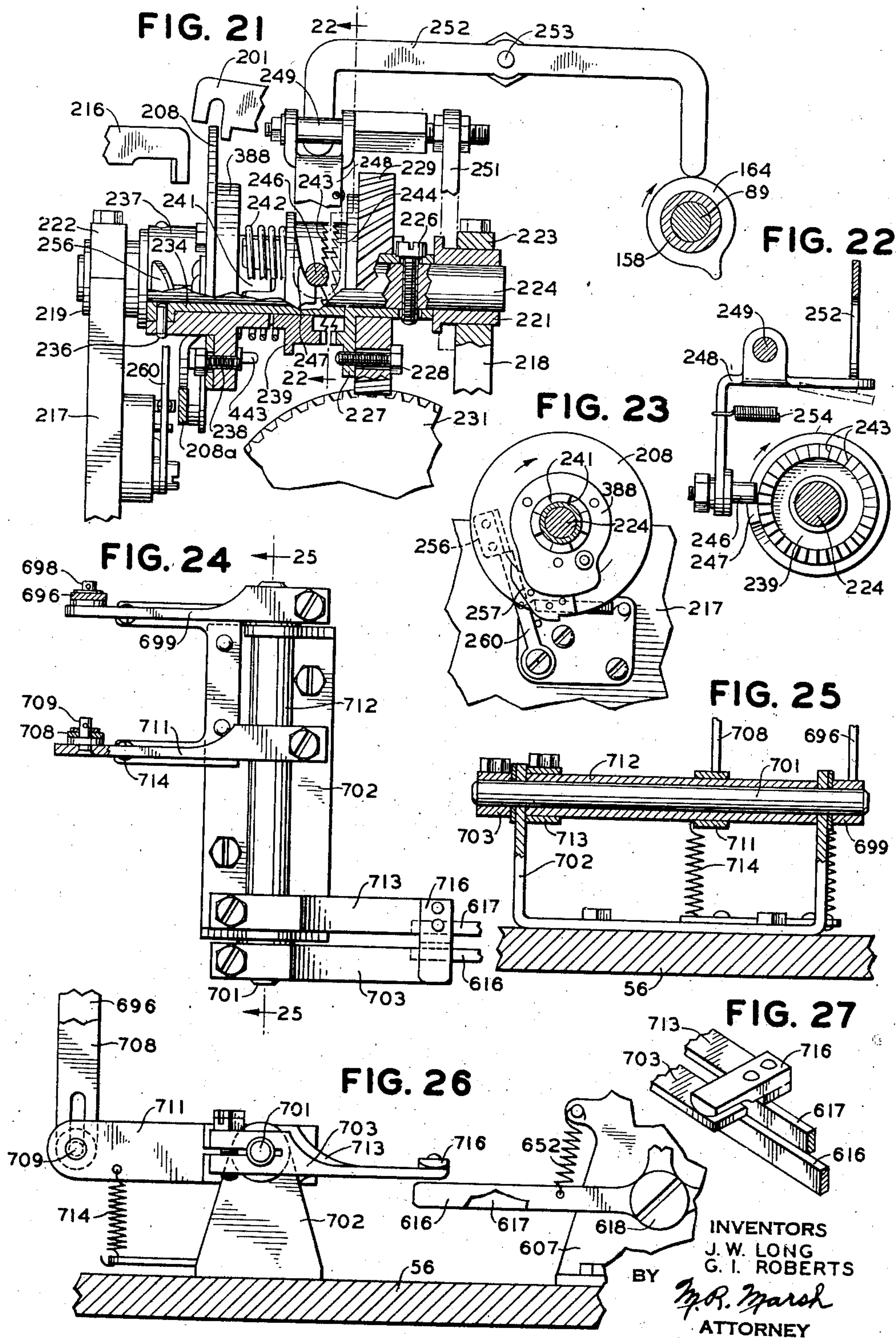
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FIG. 28

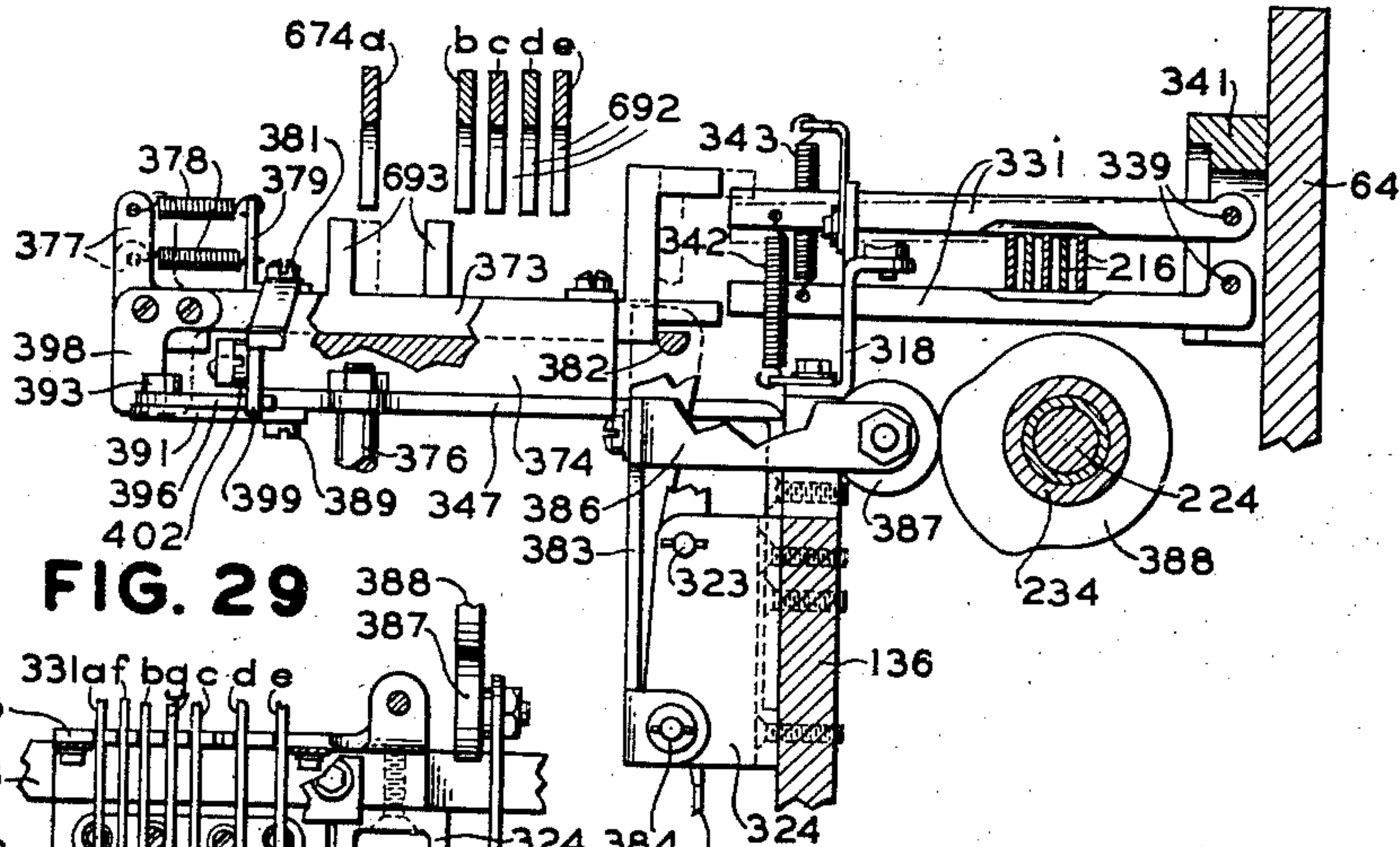


FIG. 29

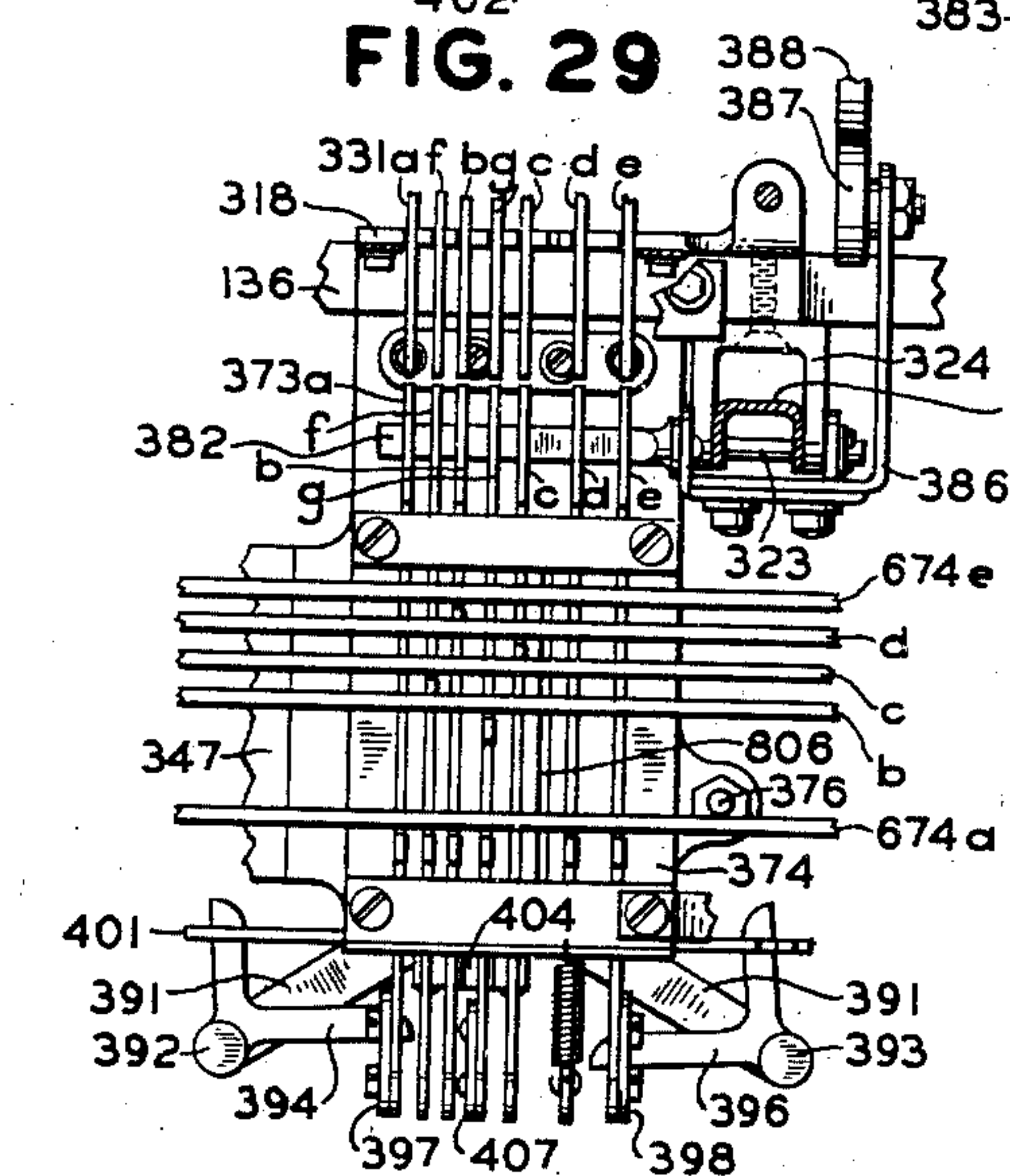


FIG. 30

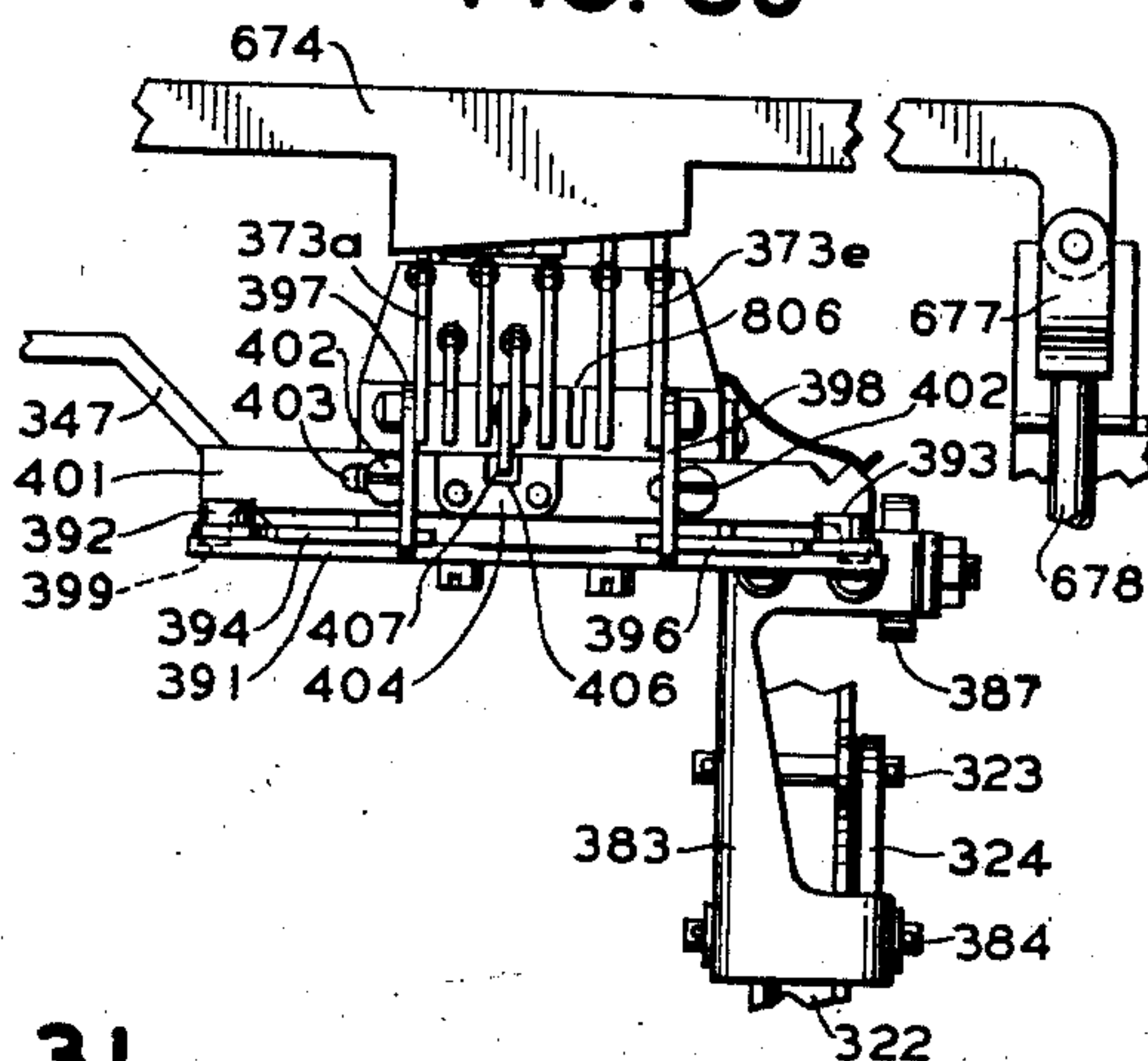
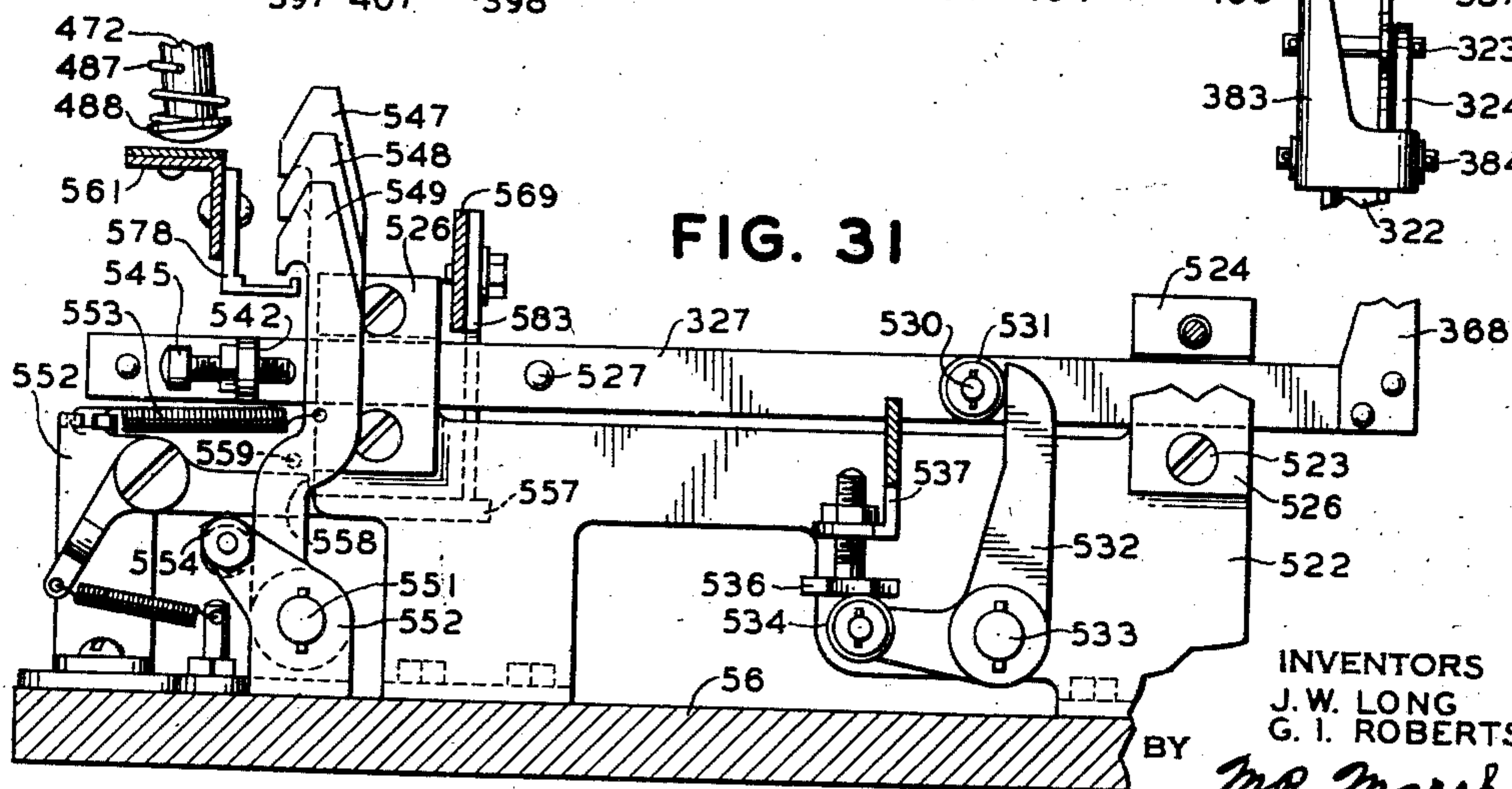


FIG. 31



INVENTORS
J. W. LONG
G. I. ROBERTS

BY *M. R. Marsh*
ATTORNEY

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FIG. 33



FIG. 38

FIG. 39

INVENTORS
J. W. LONG
G. I. ROBERTS
R. Marsh
ATTORNEY

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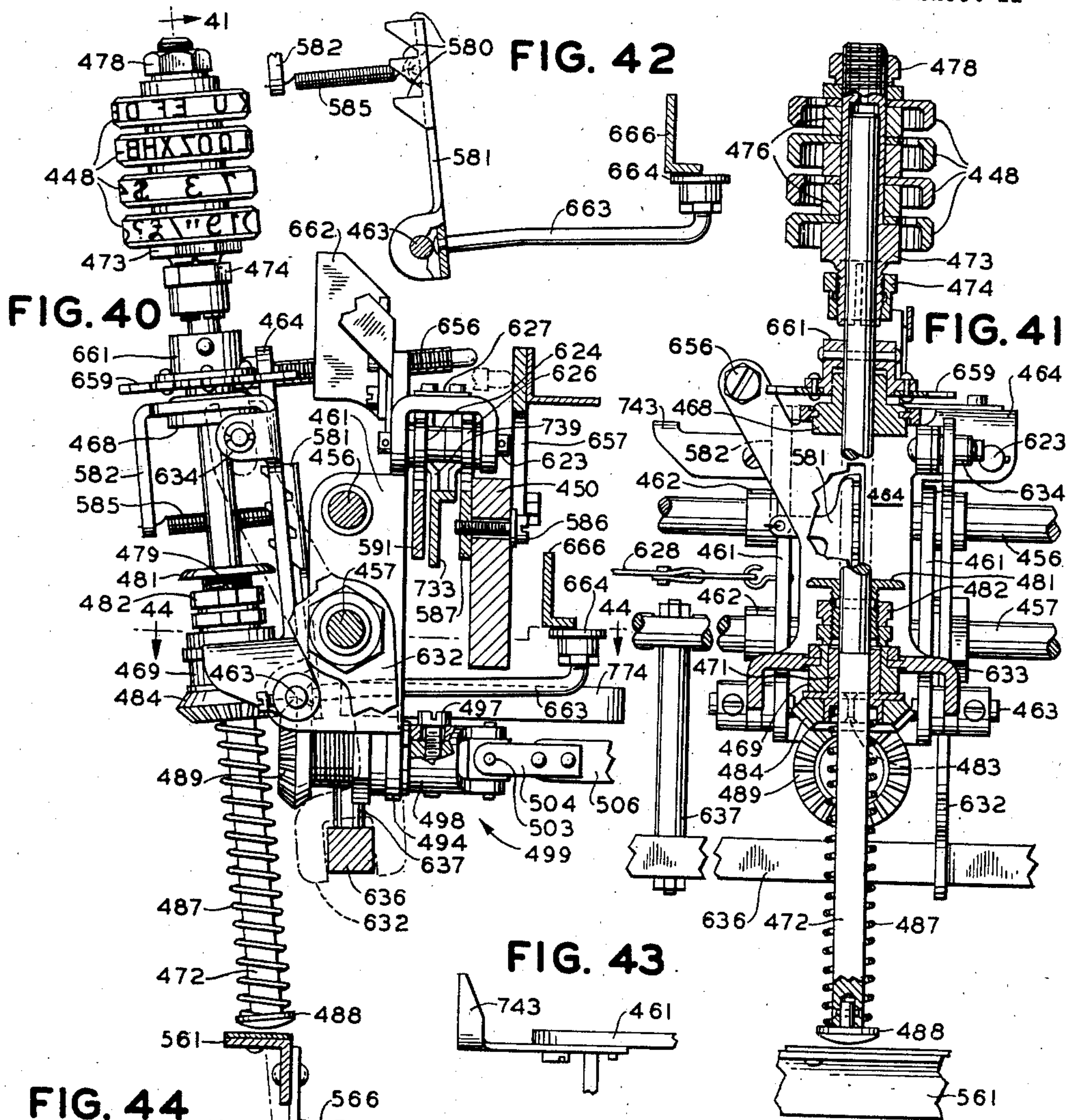


FIG. 43

FIG. 45

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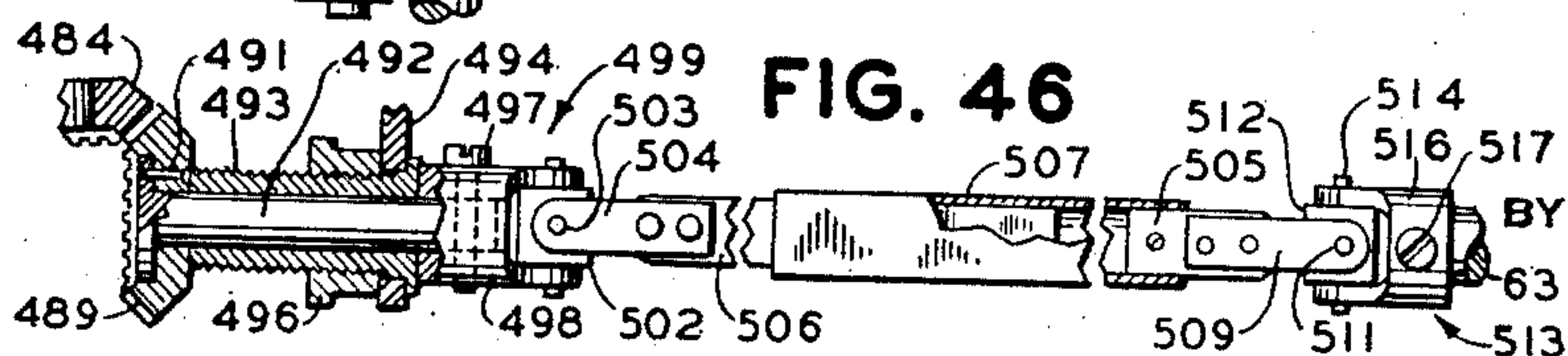


FIG. 46

INVENTORS
J. W. LONG
G. I. ROBERTS

BY
M. R. Marsh
ATTORNEY

May 5, 1942.

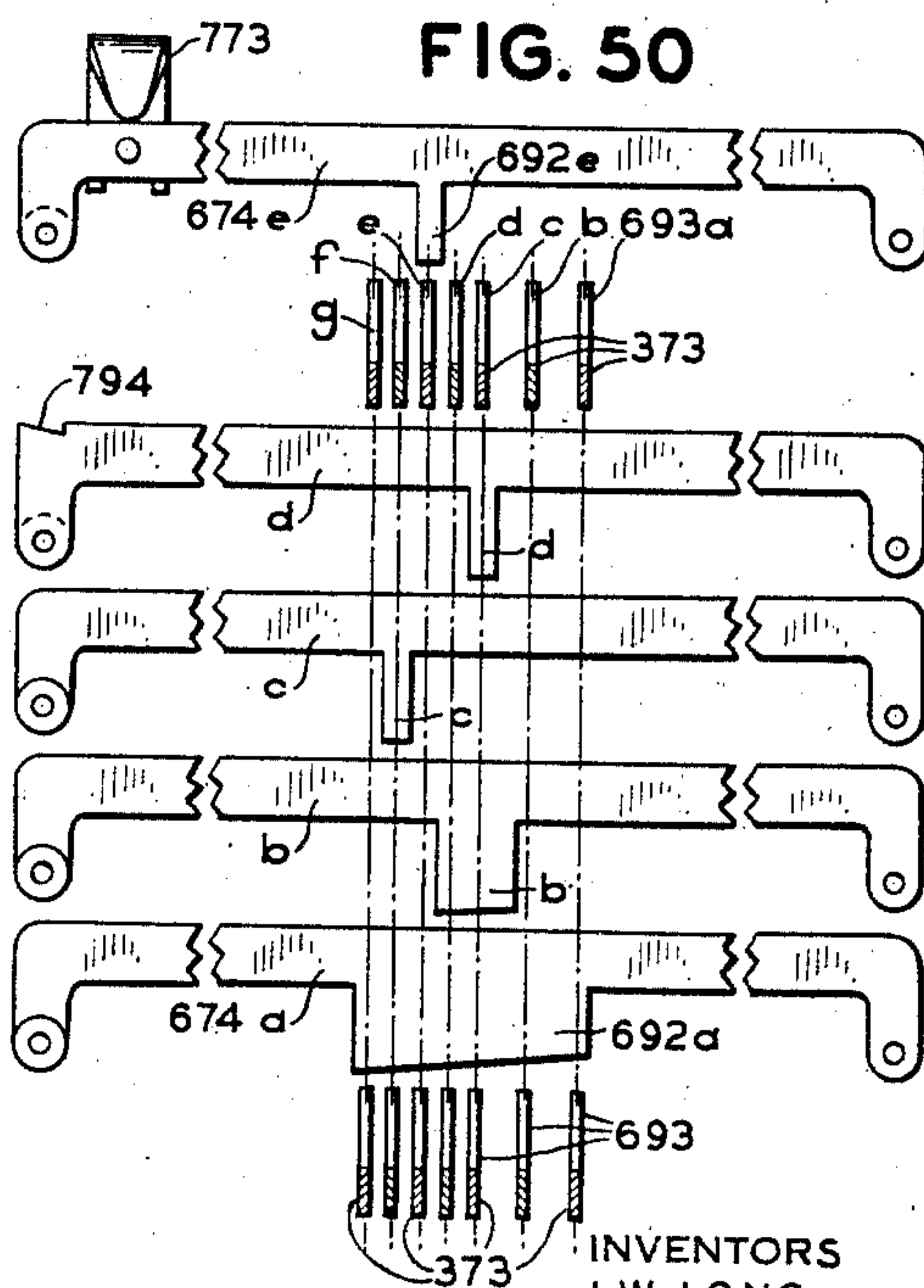
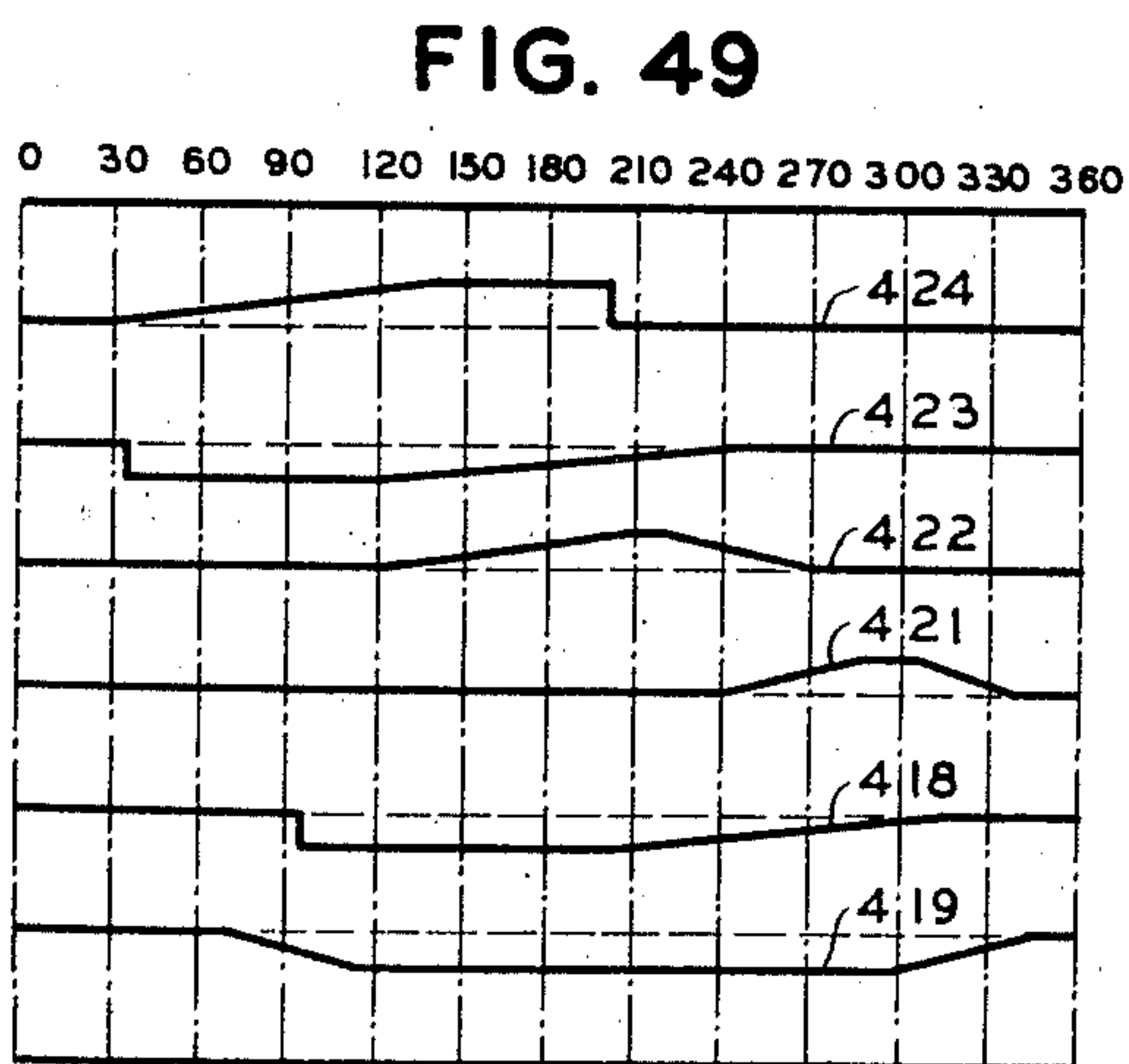
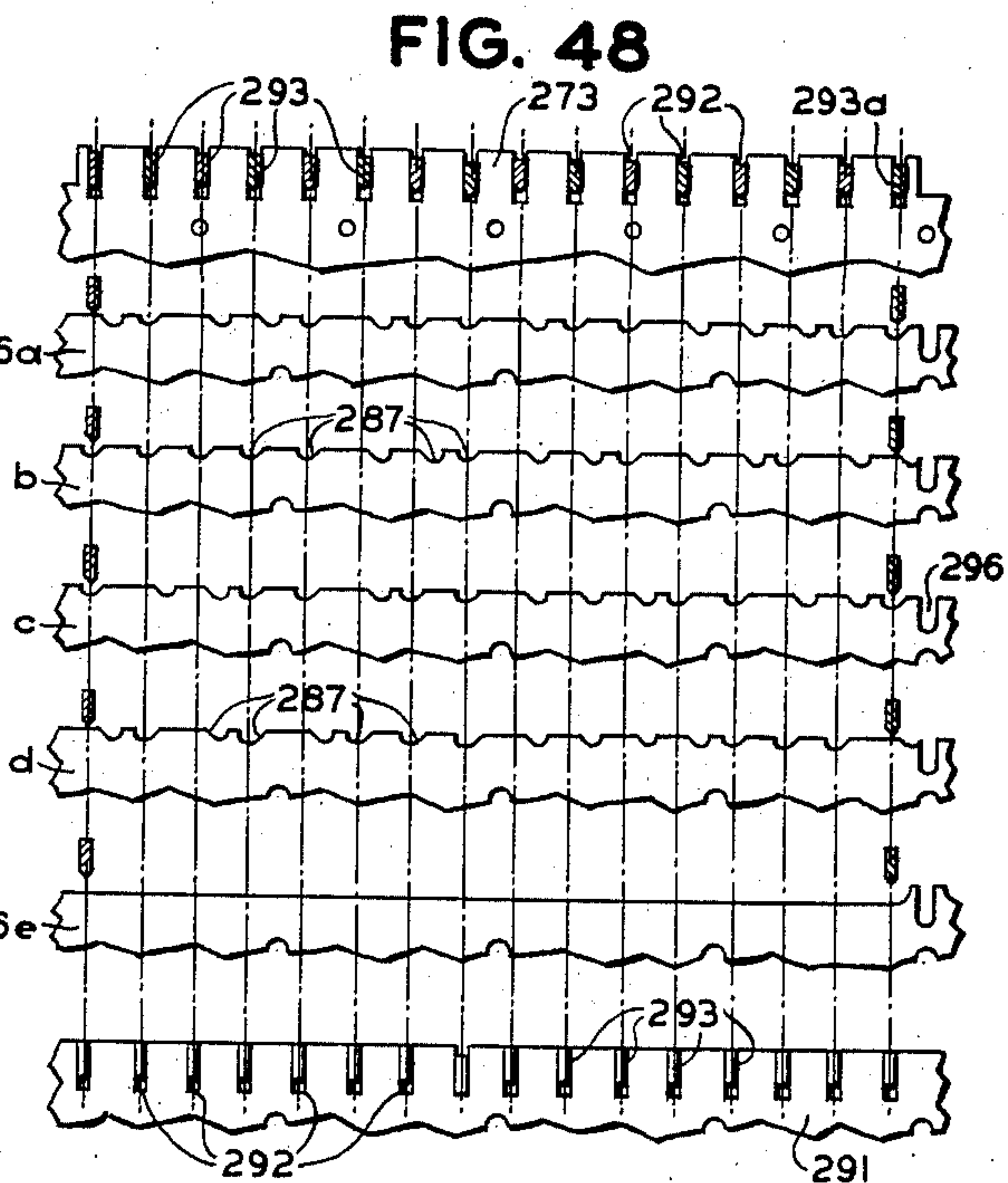
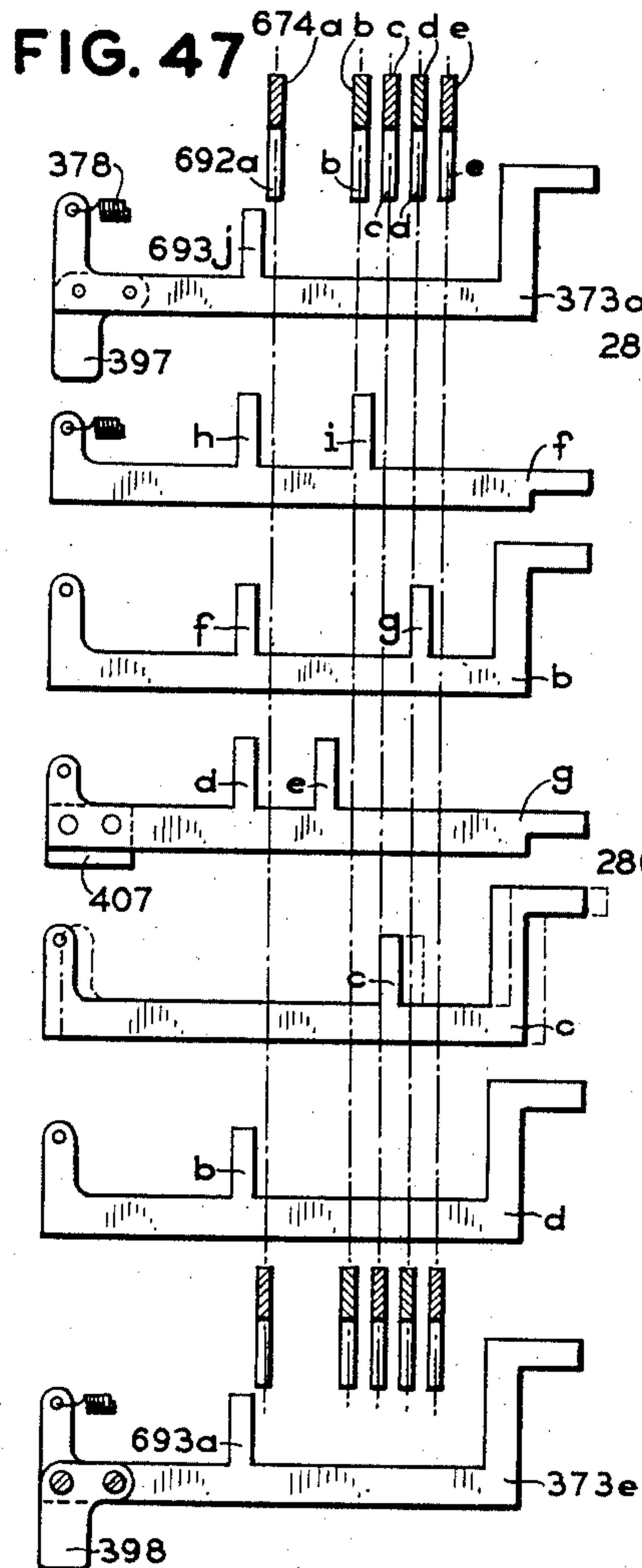
J. W. LONG ET AL

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INVENTORS
J. W. LONG
G. I. ROBERTS
BY *M. R. Marsh*
ATTORNEY

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FIG. 51

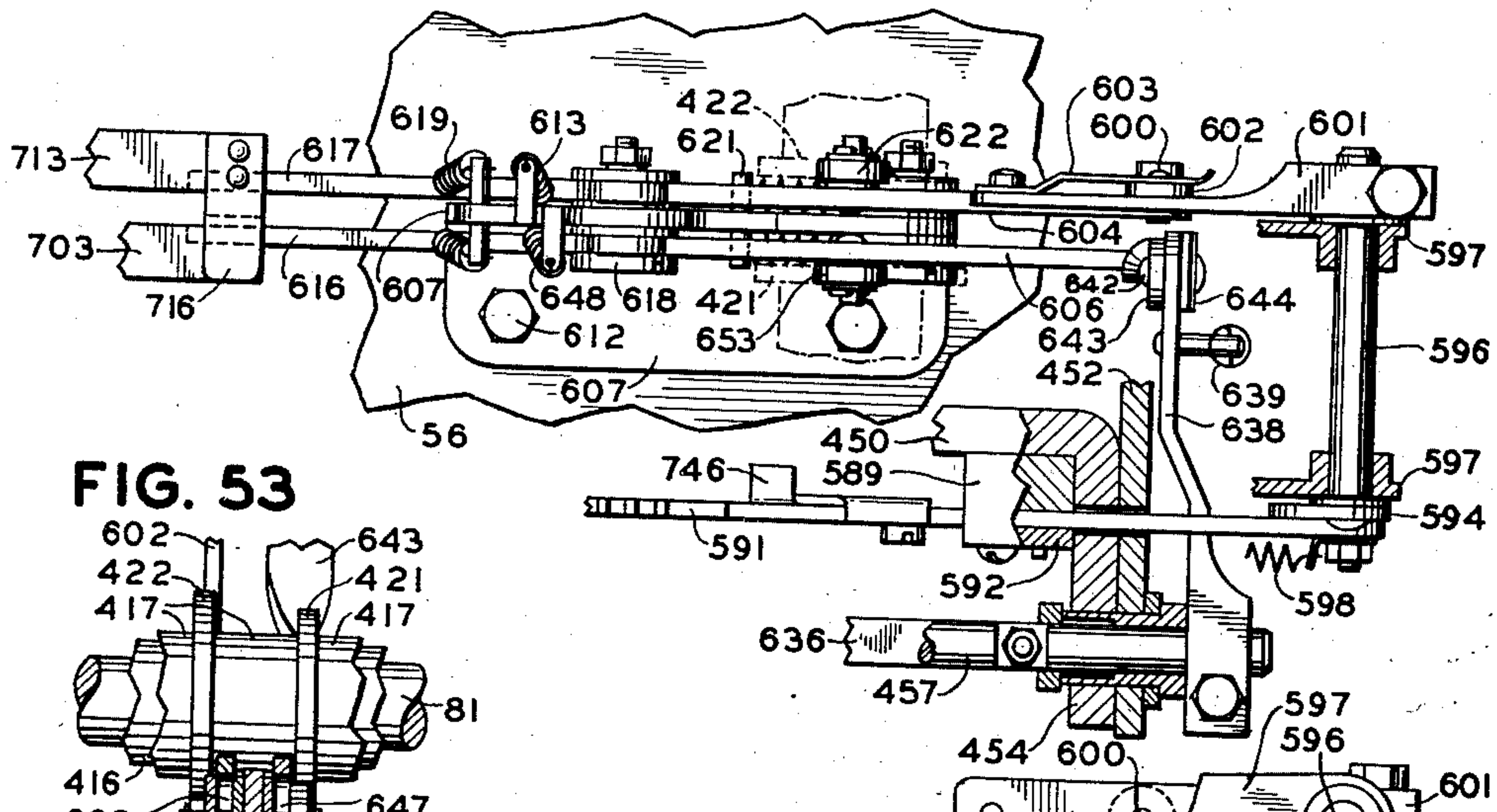


FIG. 53

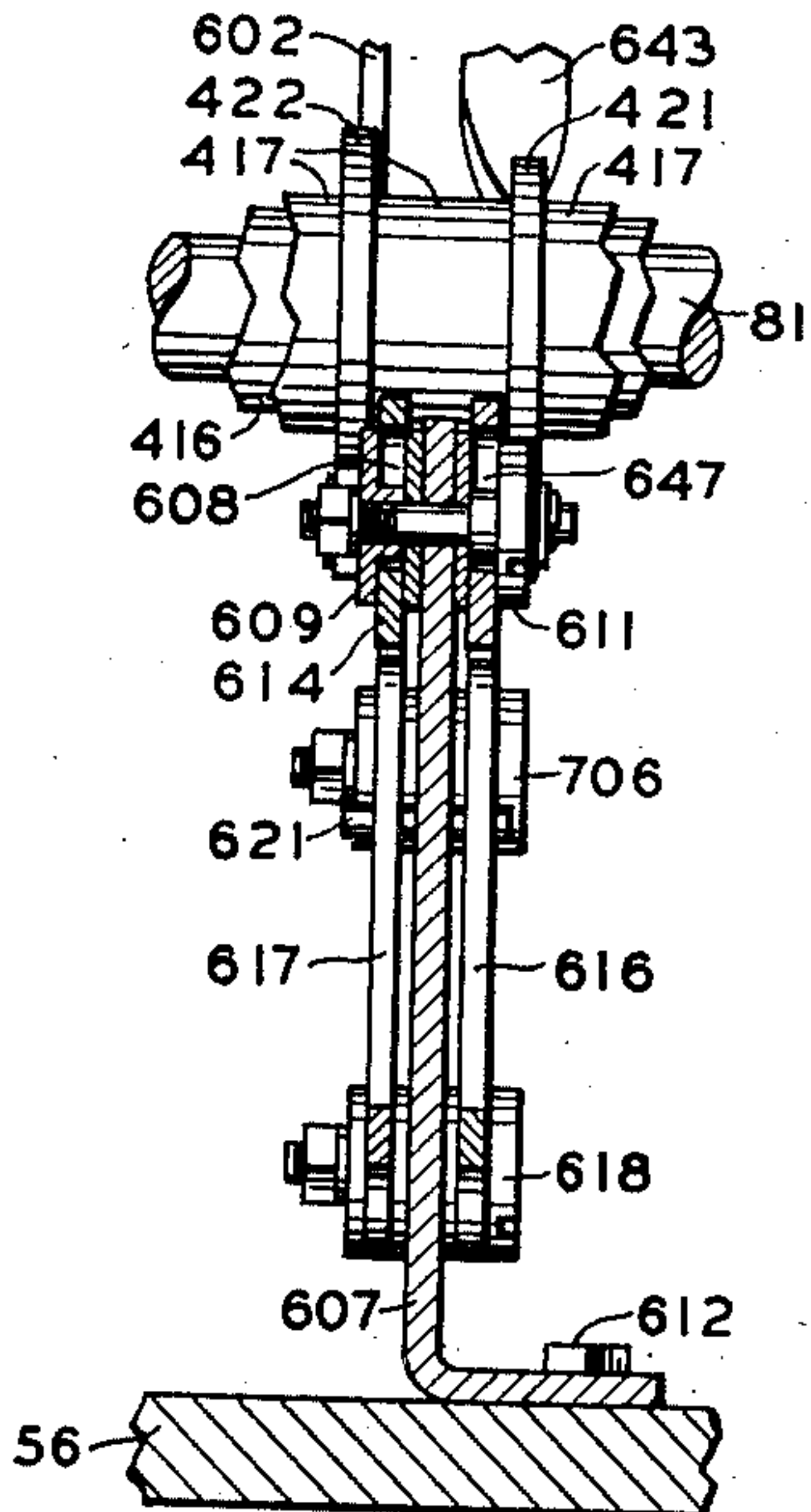
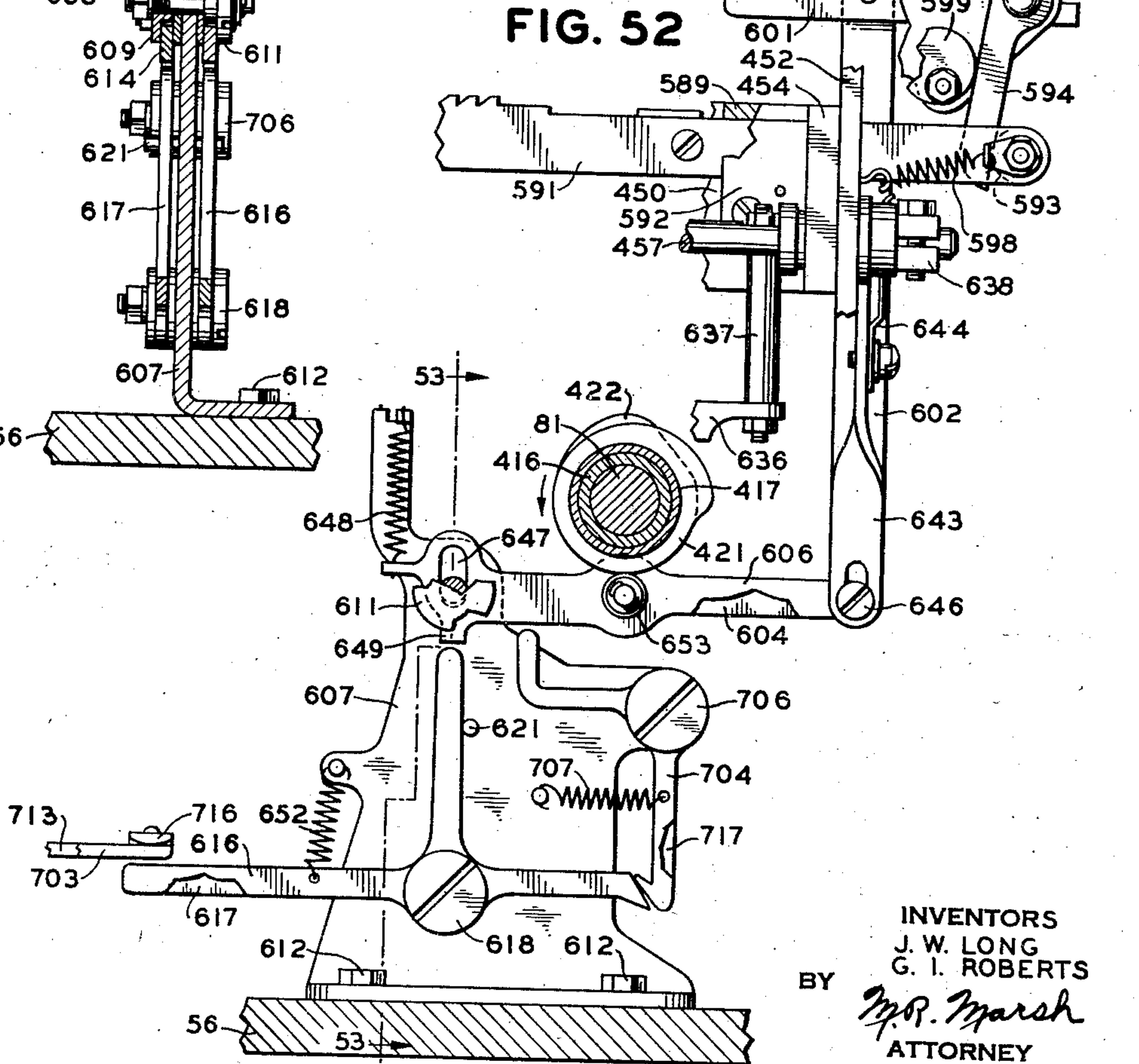


FIG. 52



INVENTORS
J. W. LONG
G. I. ROBERTS
BY *M. R. Marsh*
ATTORNEY

May 5, 1942.

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FIG. 54

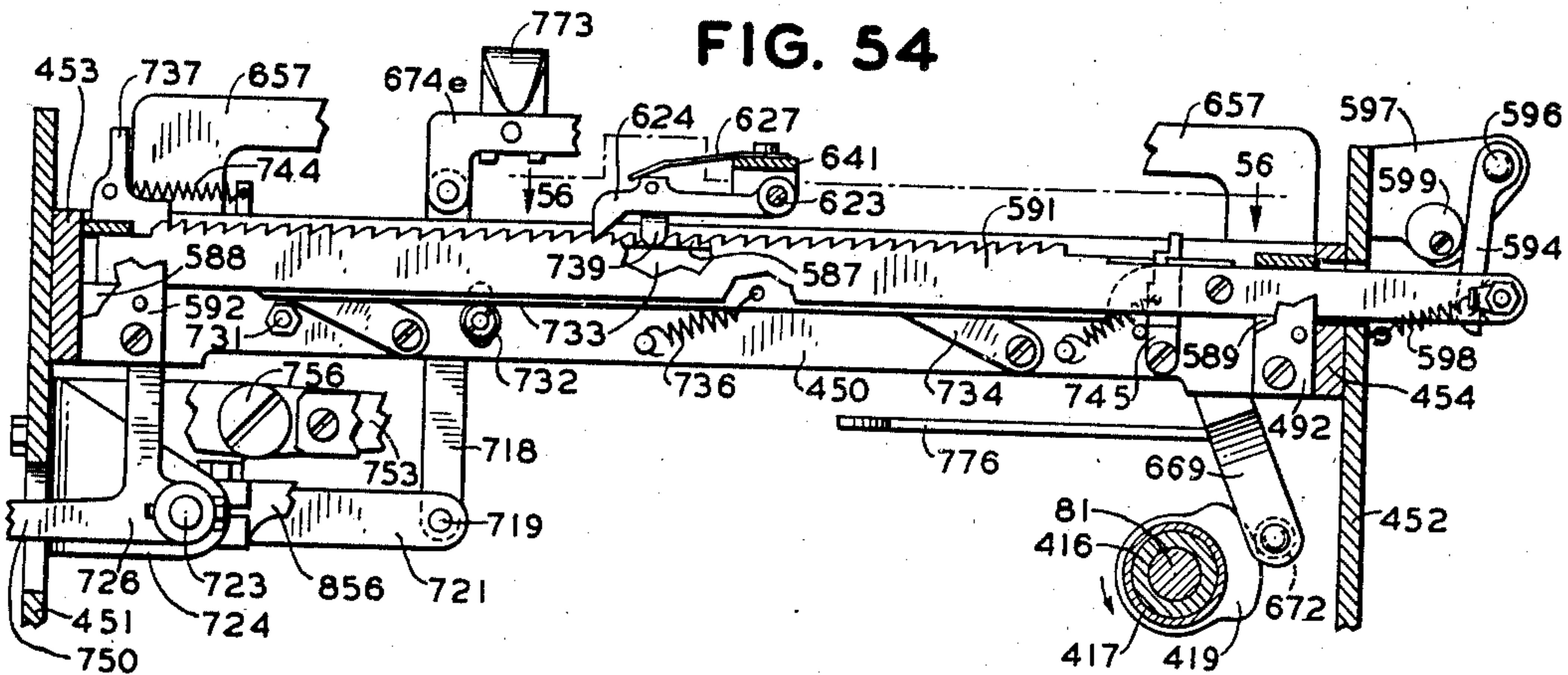


FIG. 55

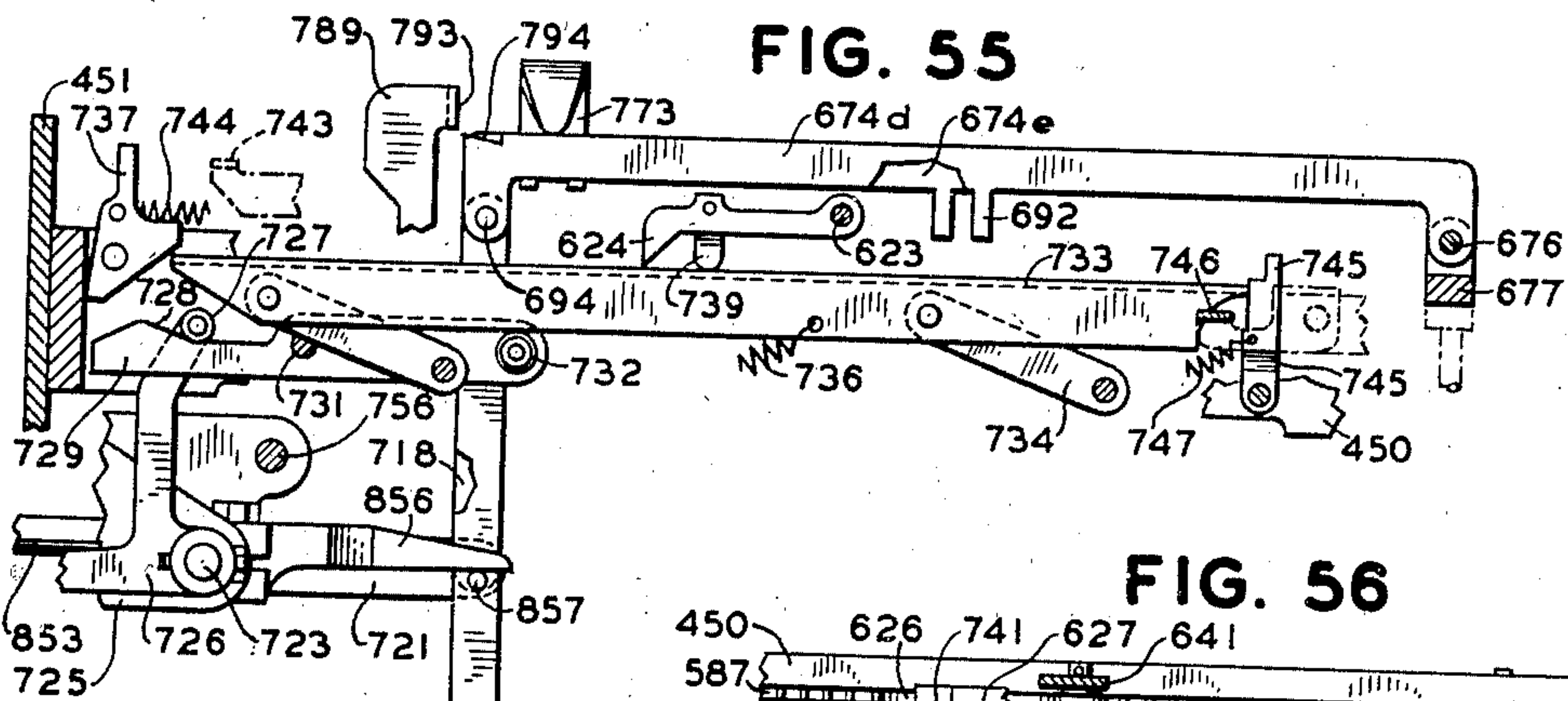


FIG. 56

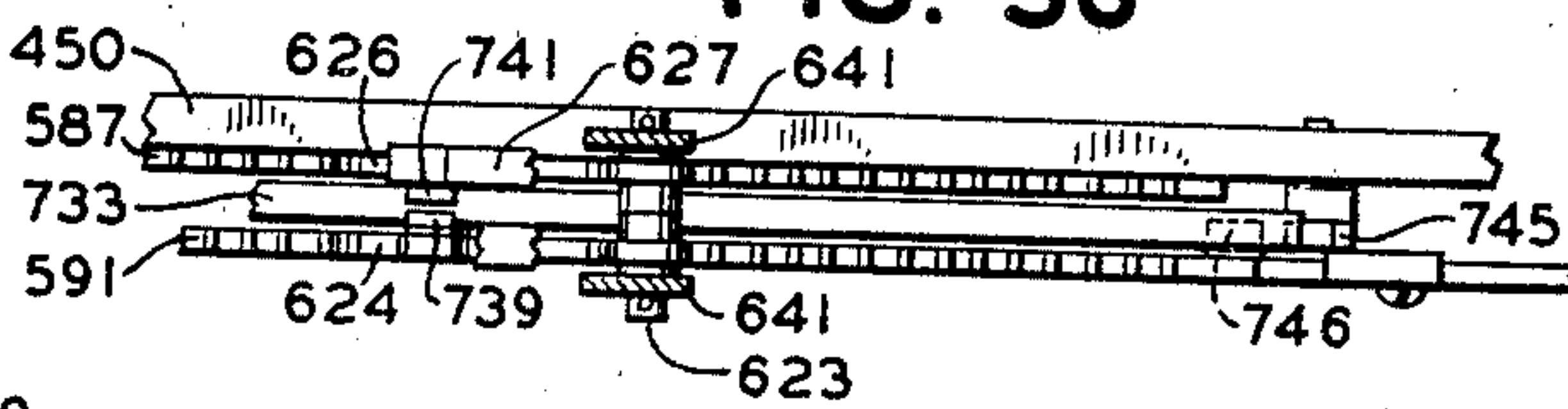


FIG. 57

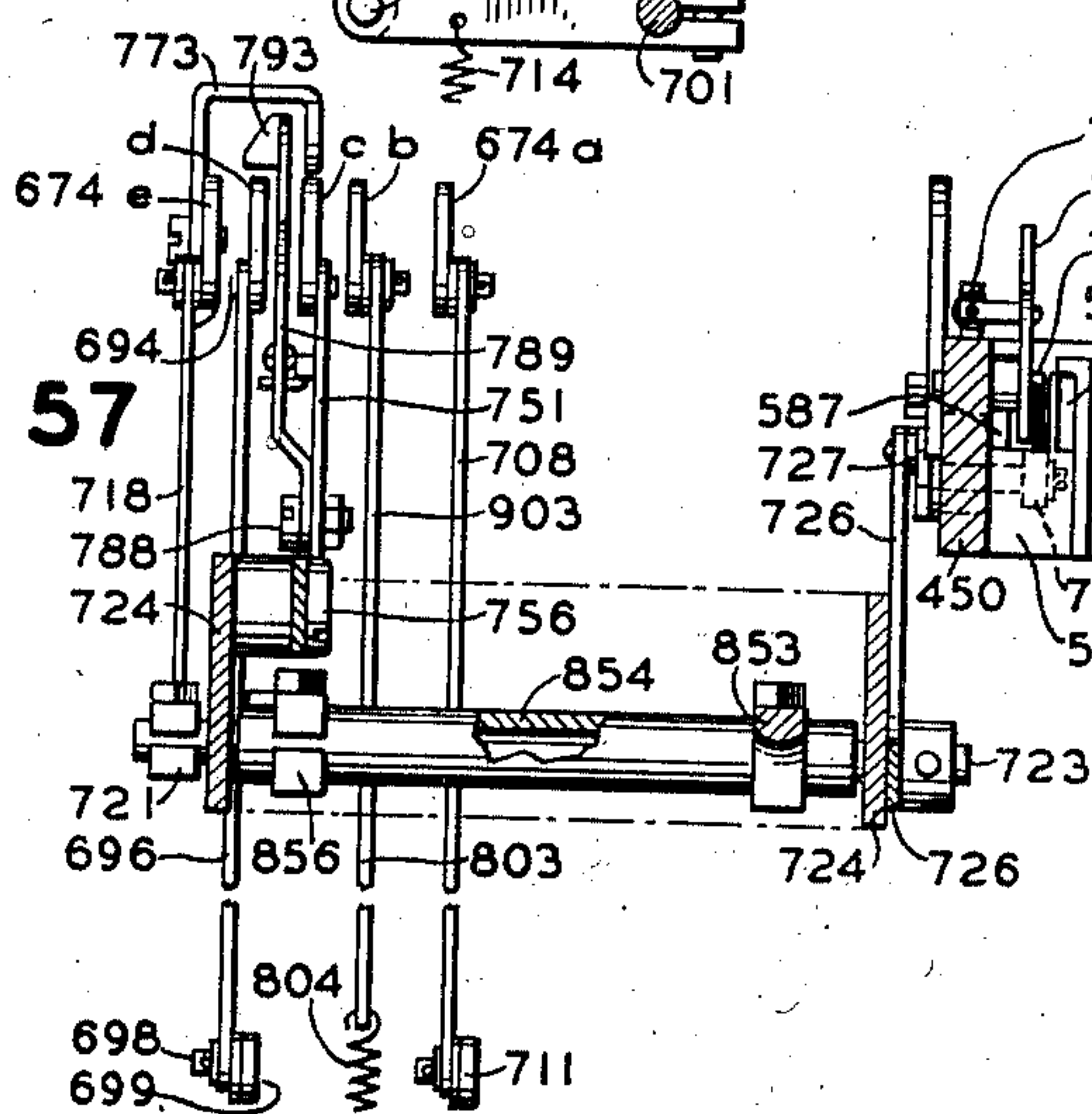
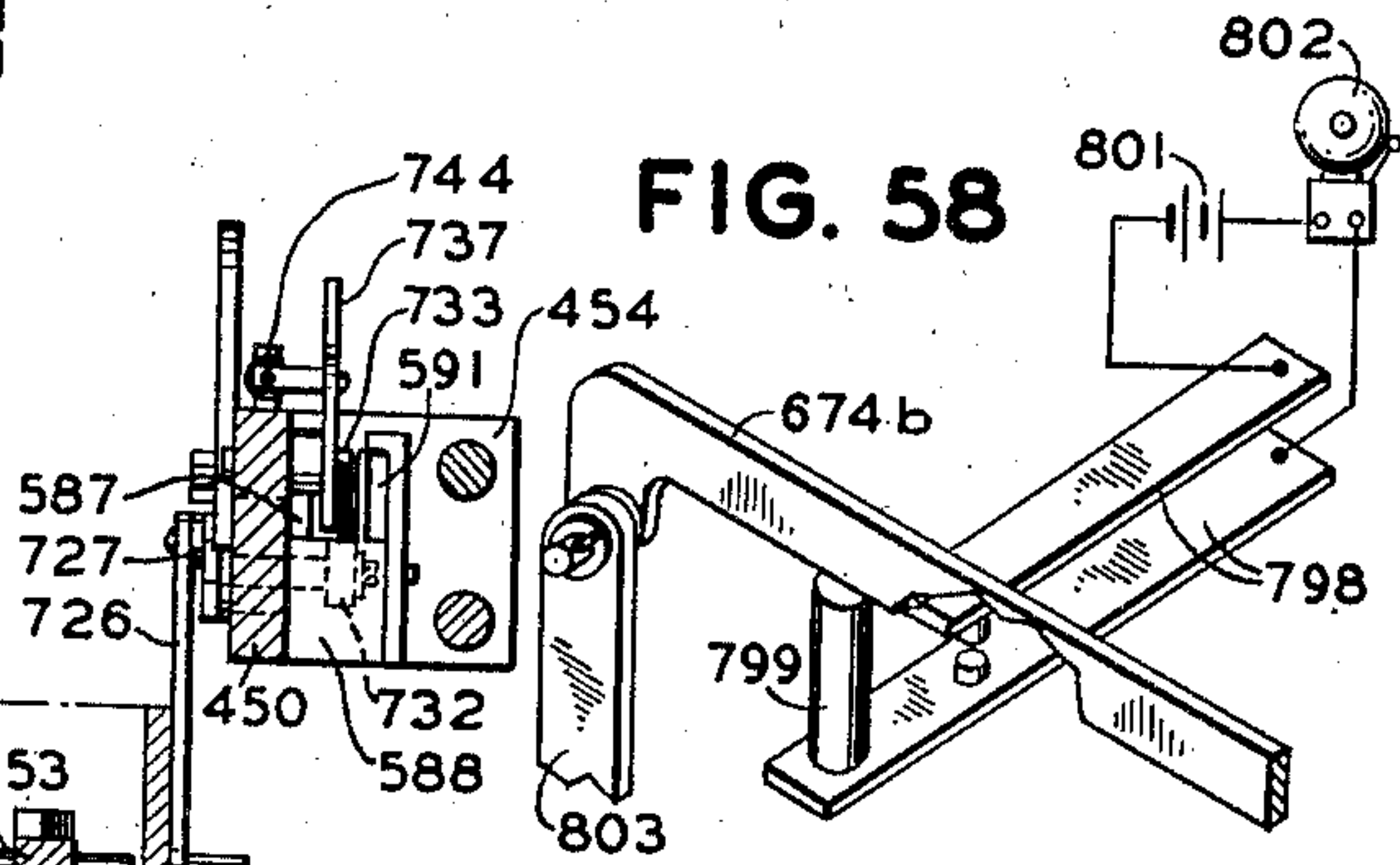


FIG. 58



INVENTORS

J. W. LONG

G. I. ROBERTS

BY

E. R. Marsh
ATTORNEY

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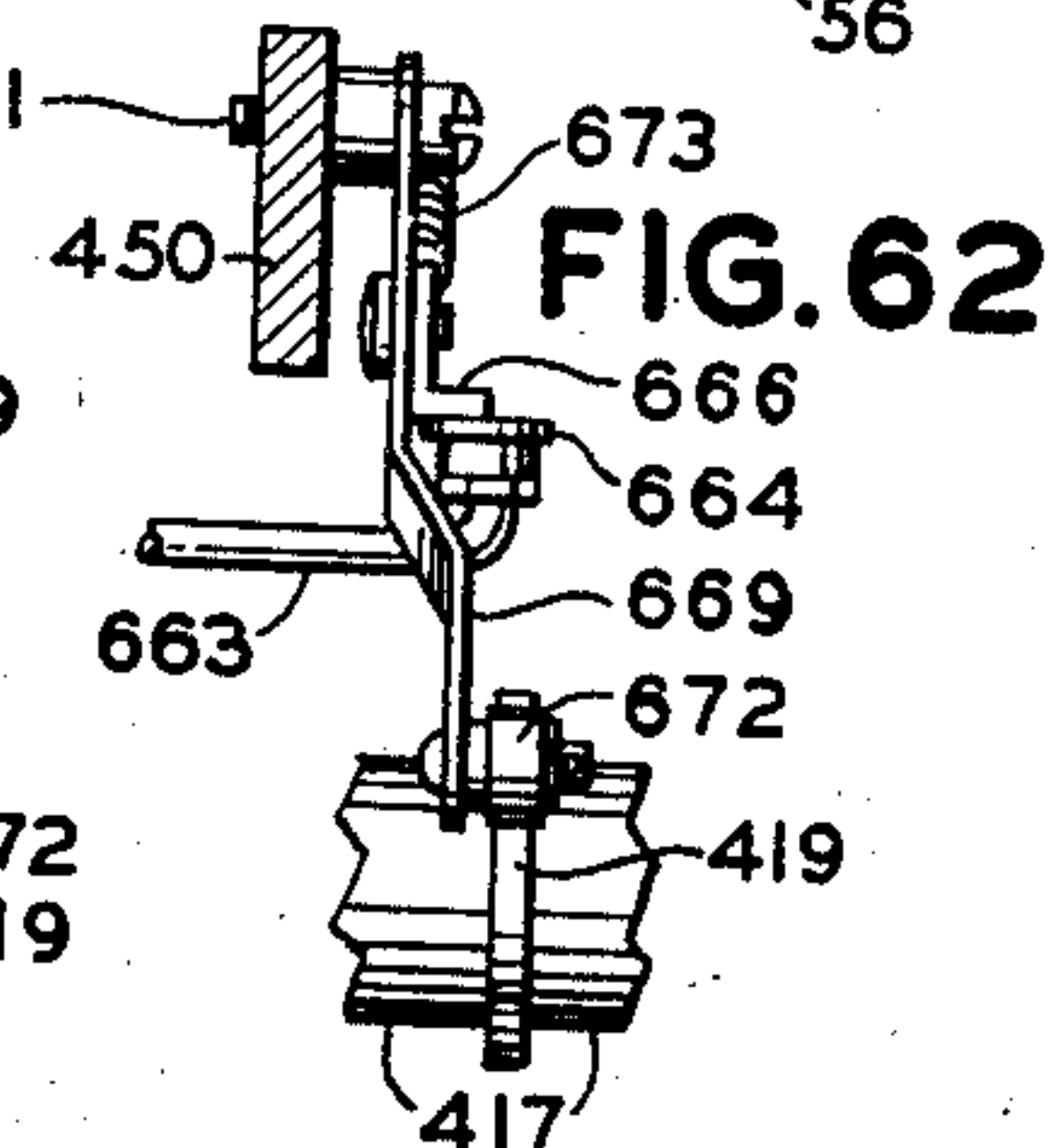
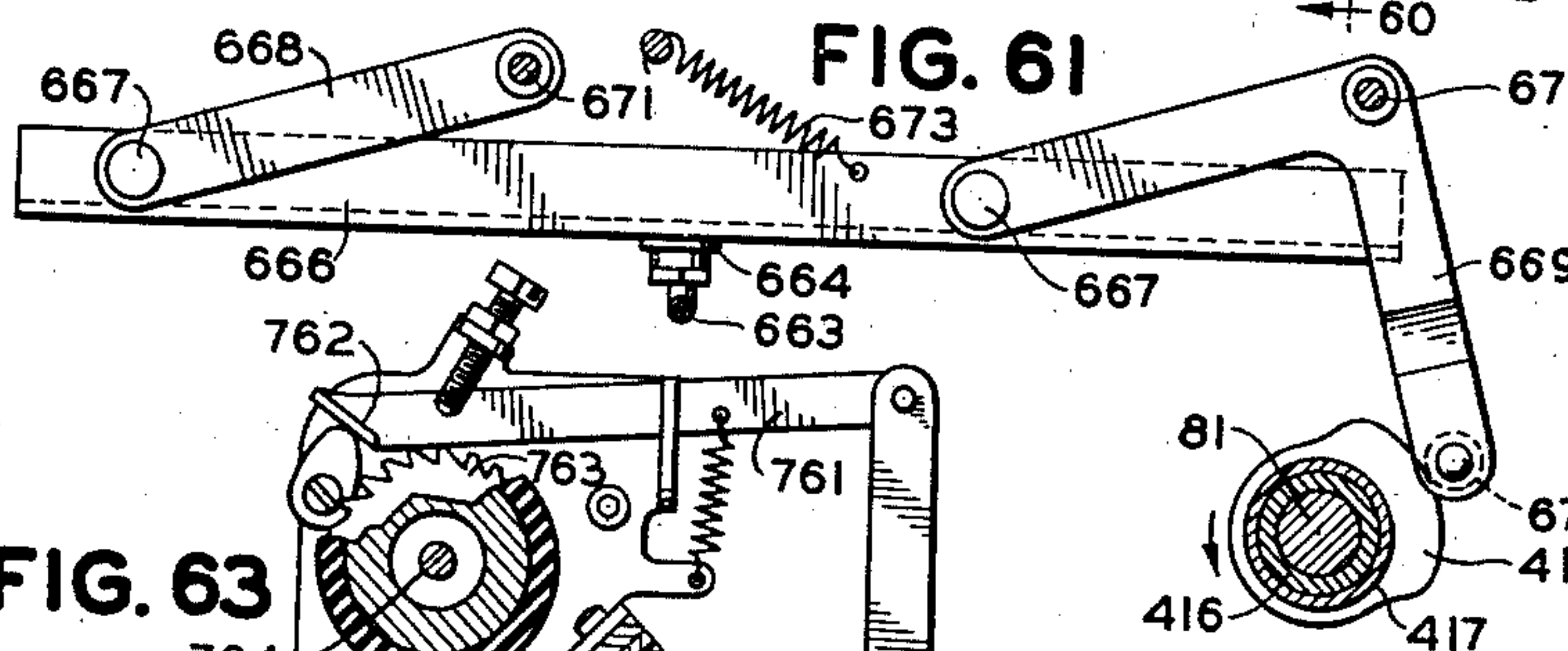
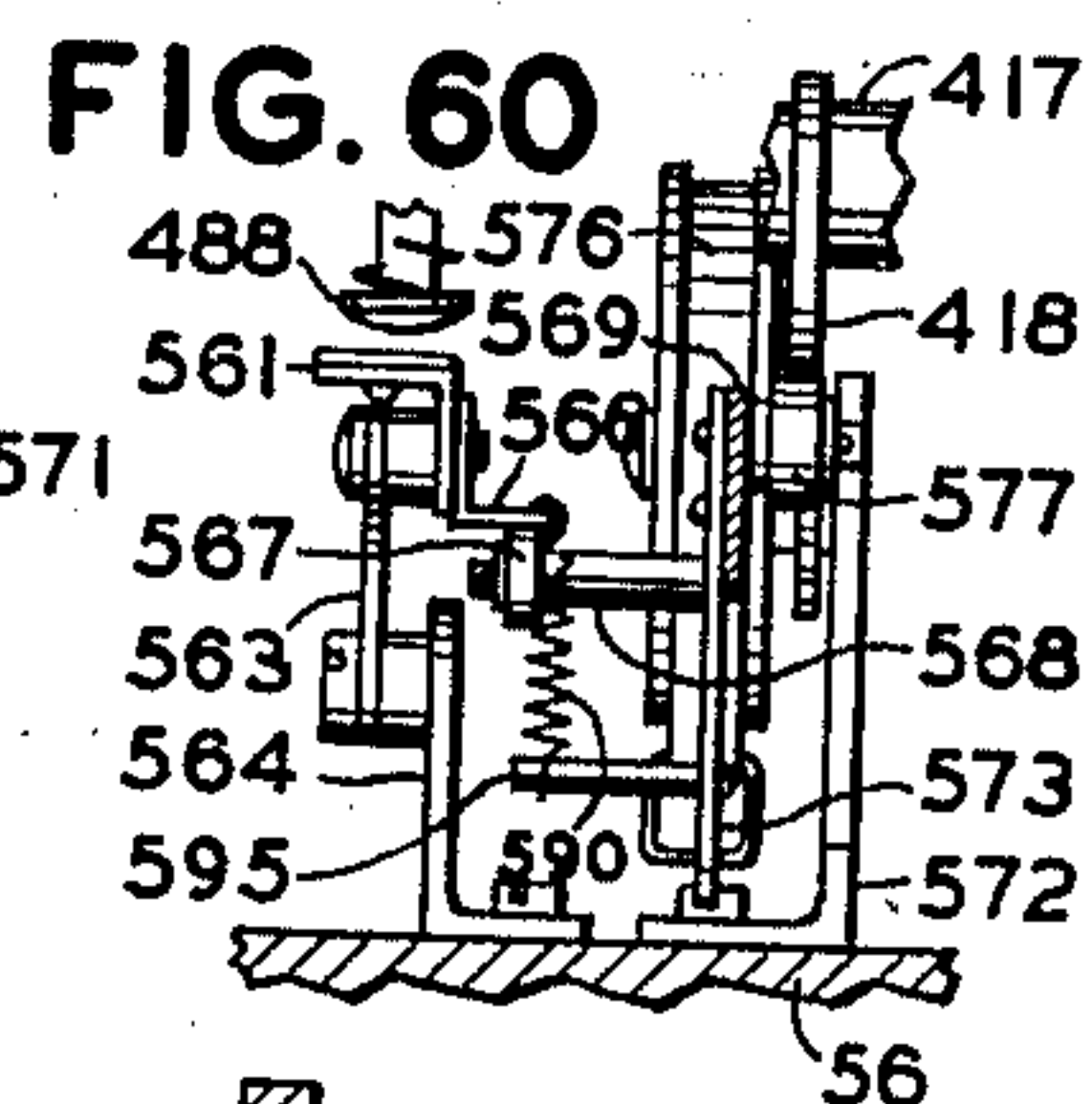
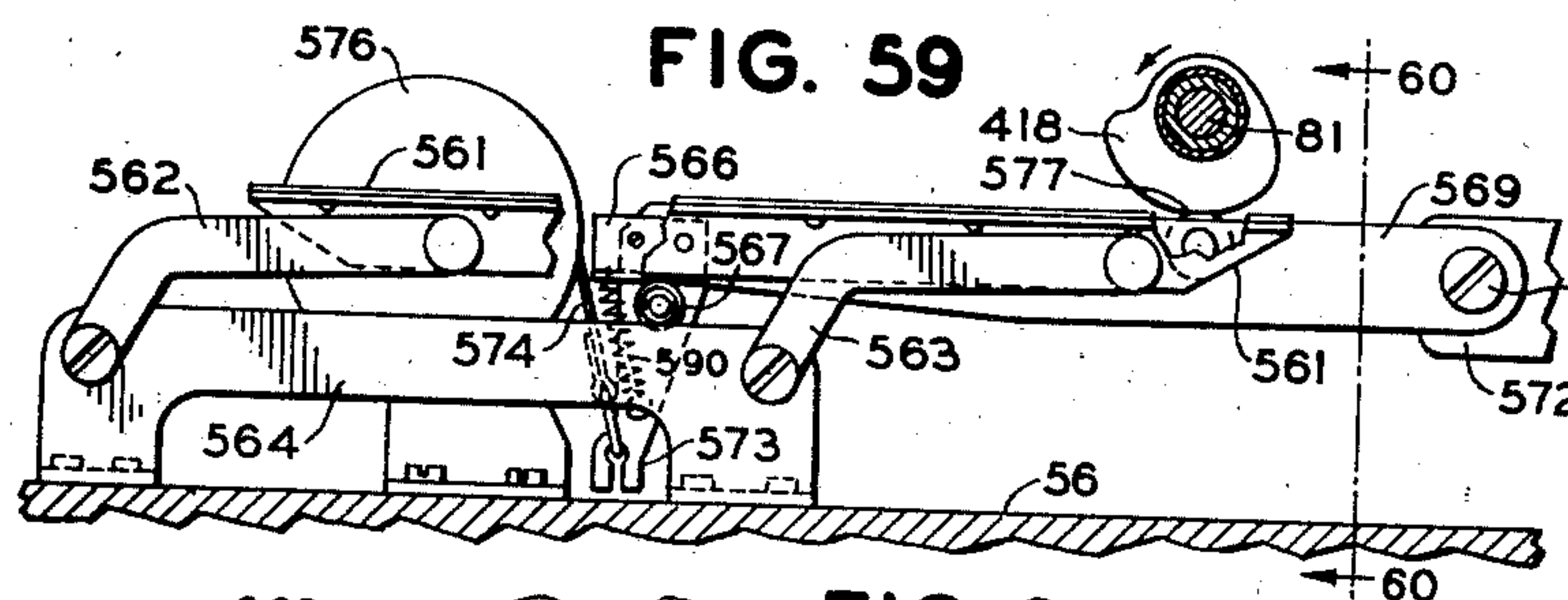
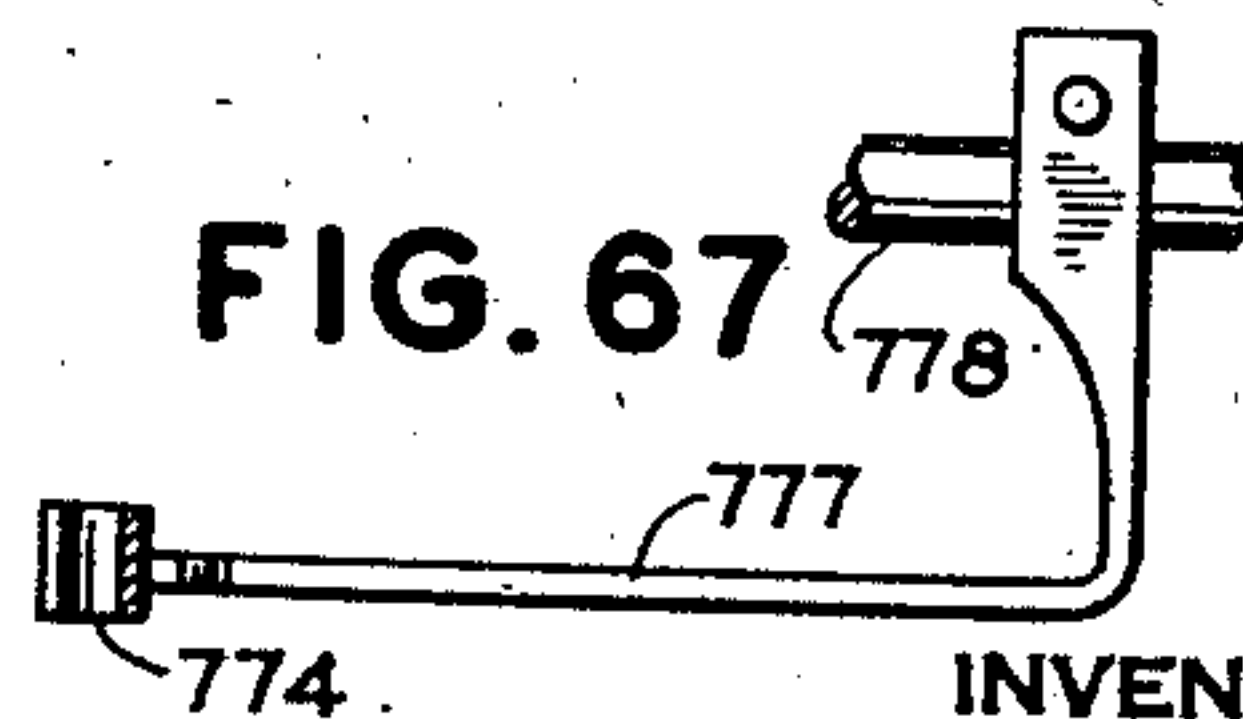
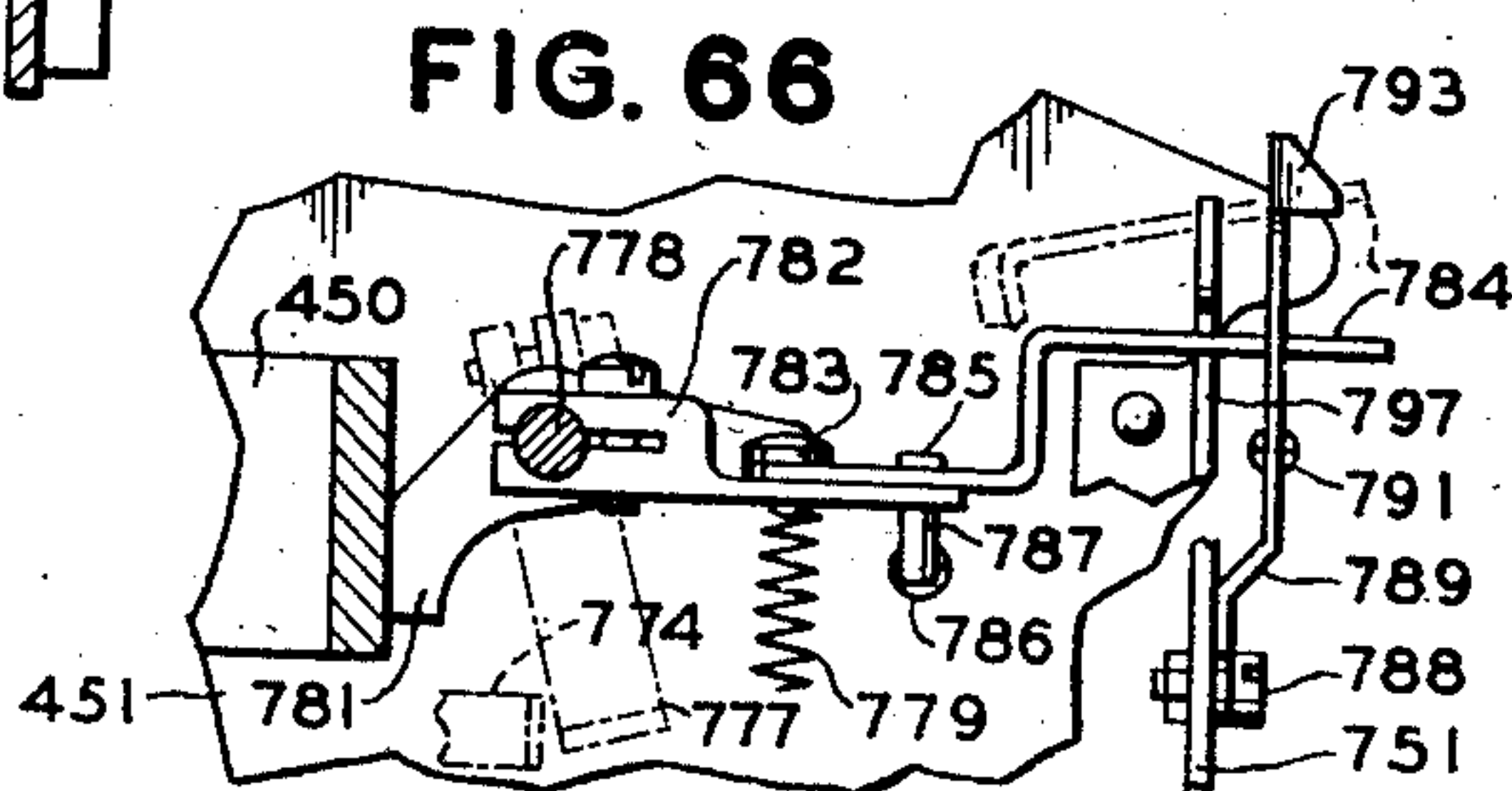
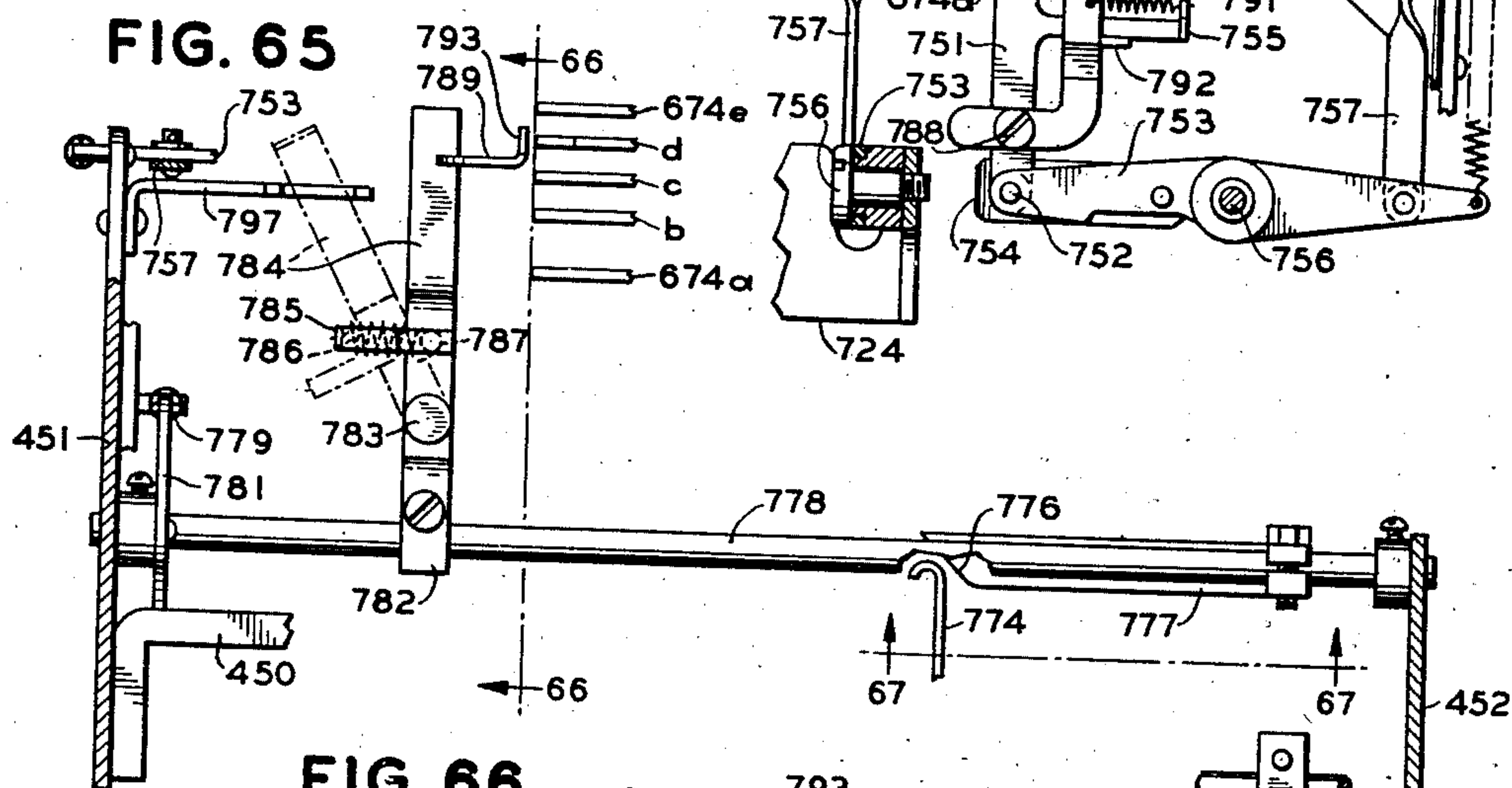
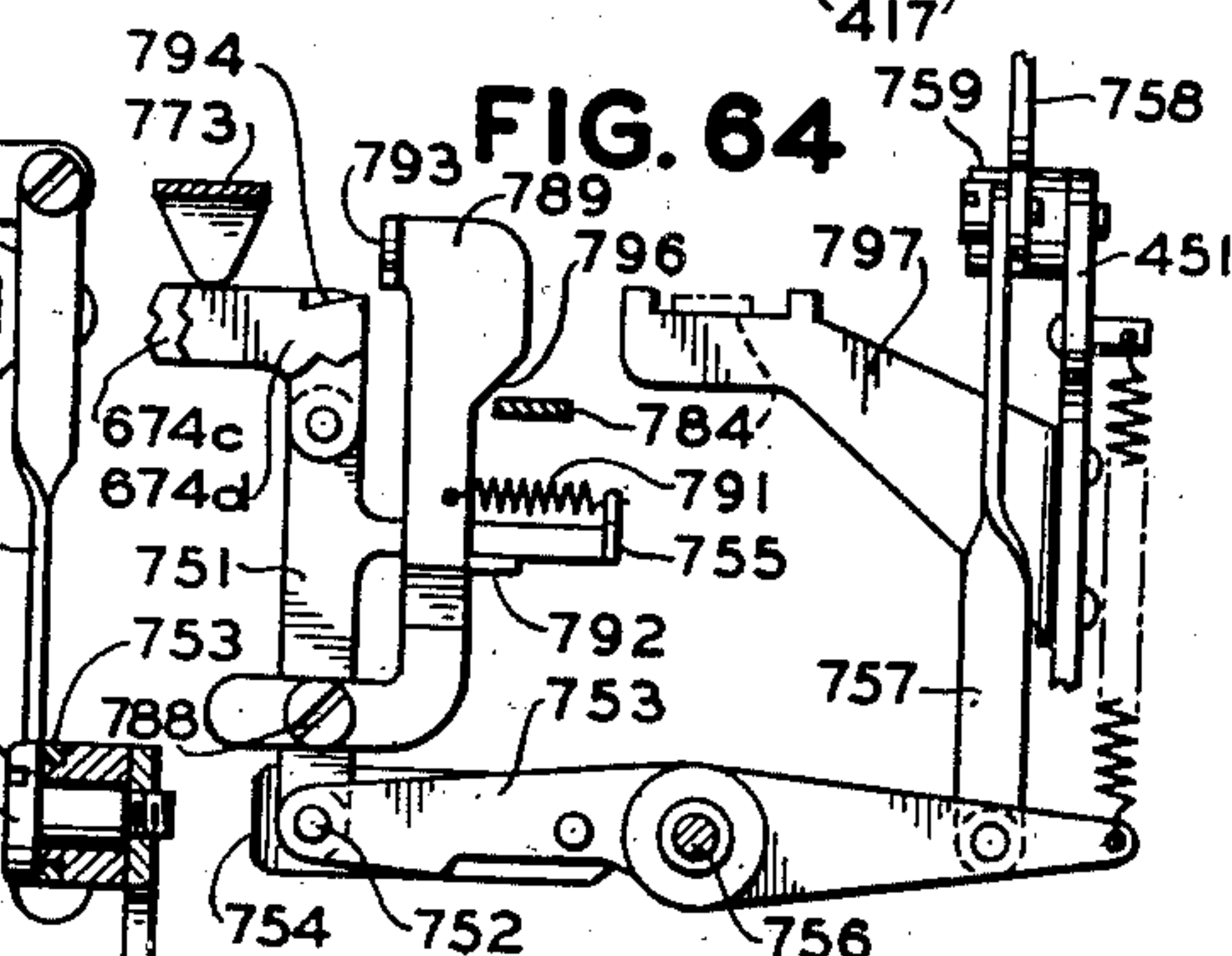
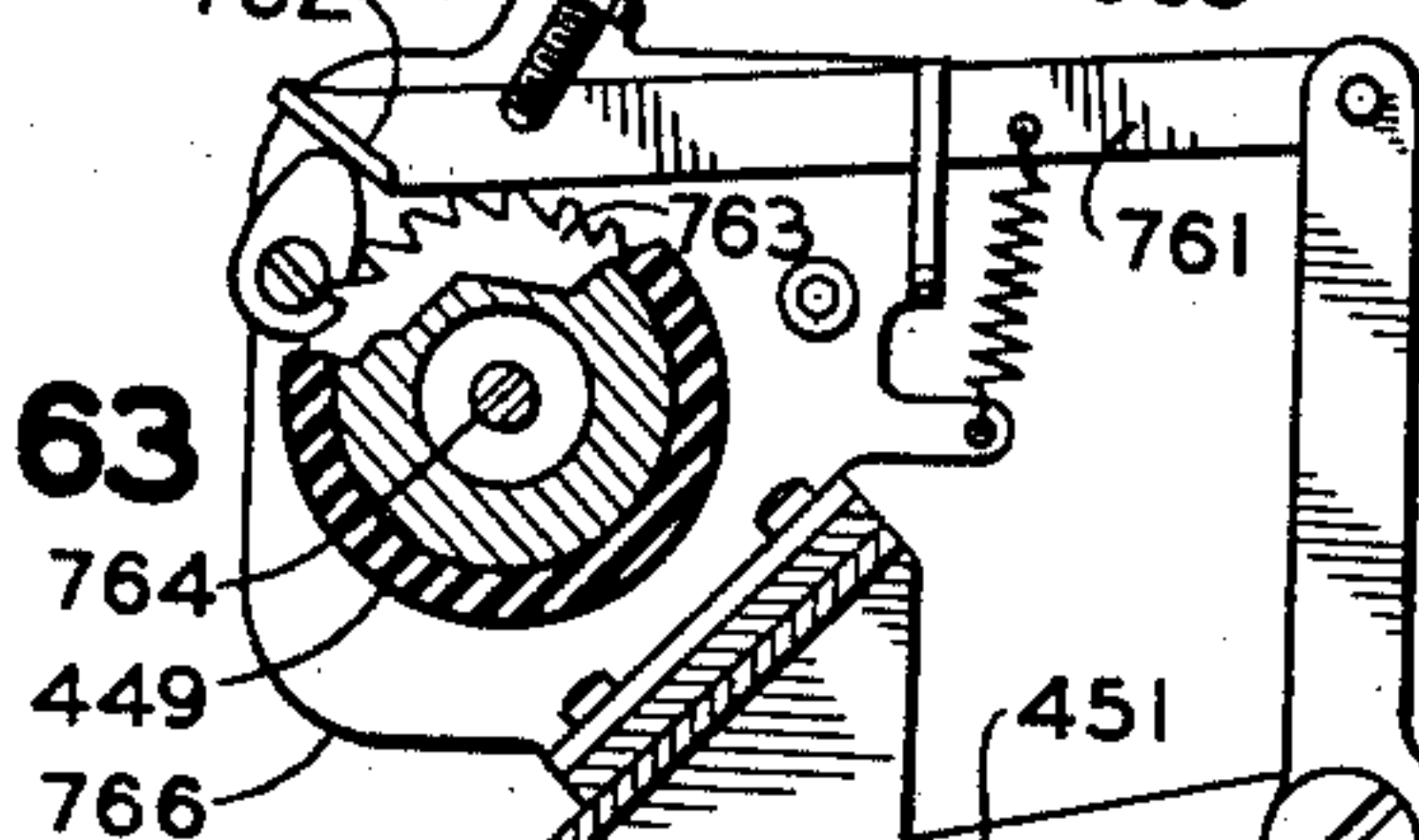


FIG. 63



INVENTORS
J. W. LONG
G. I. ROBERTS
BY *J. R. Marsh*
ATTORNEY

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TELEGRAPH PRINTER

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FIG. 68

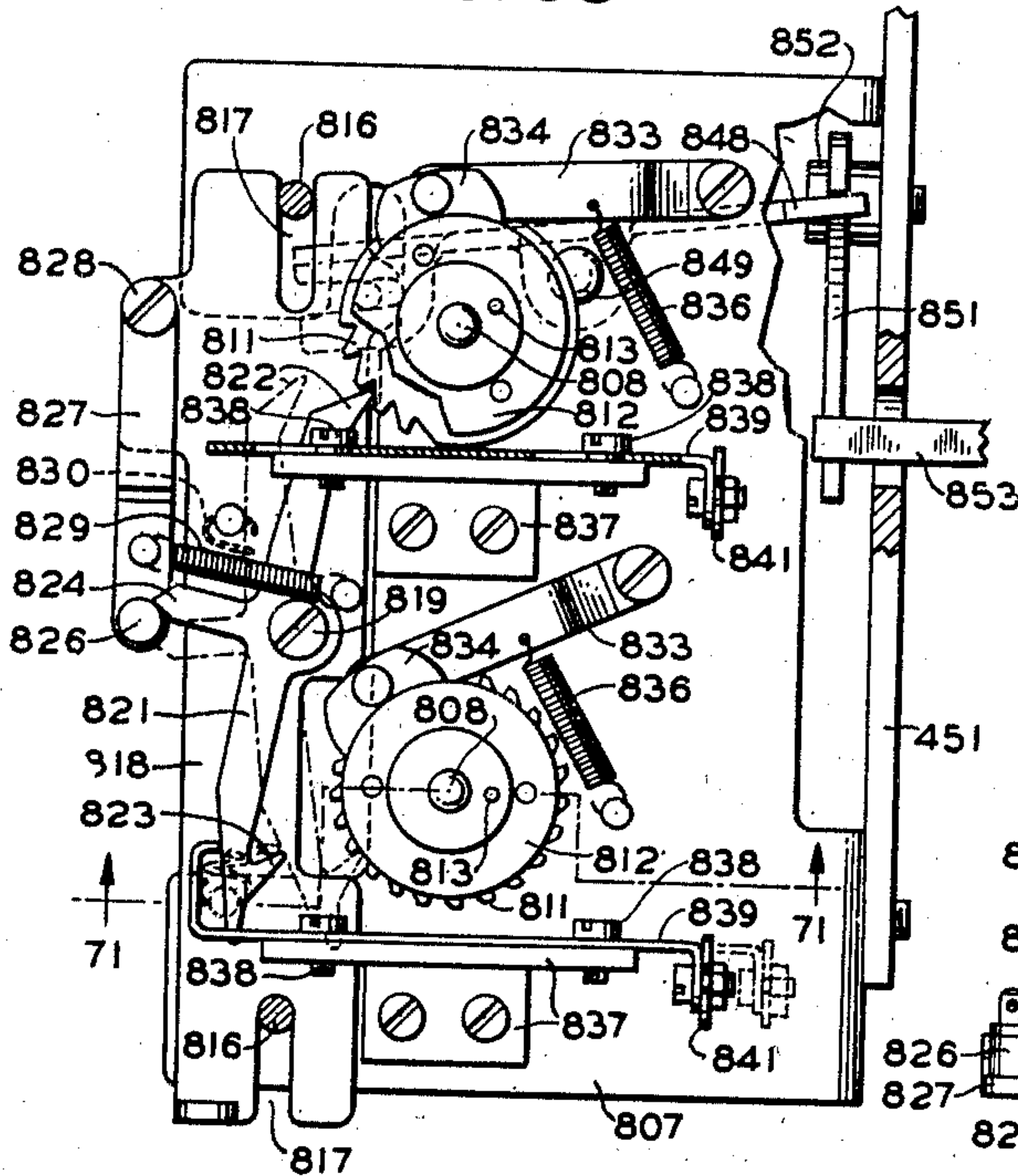


FIG. 70

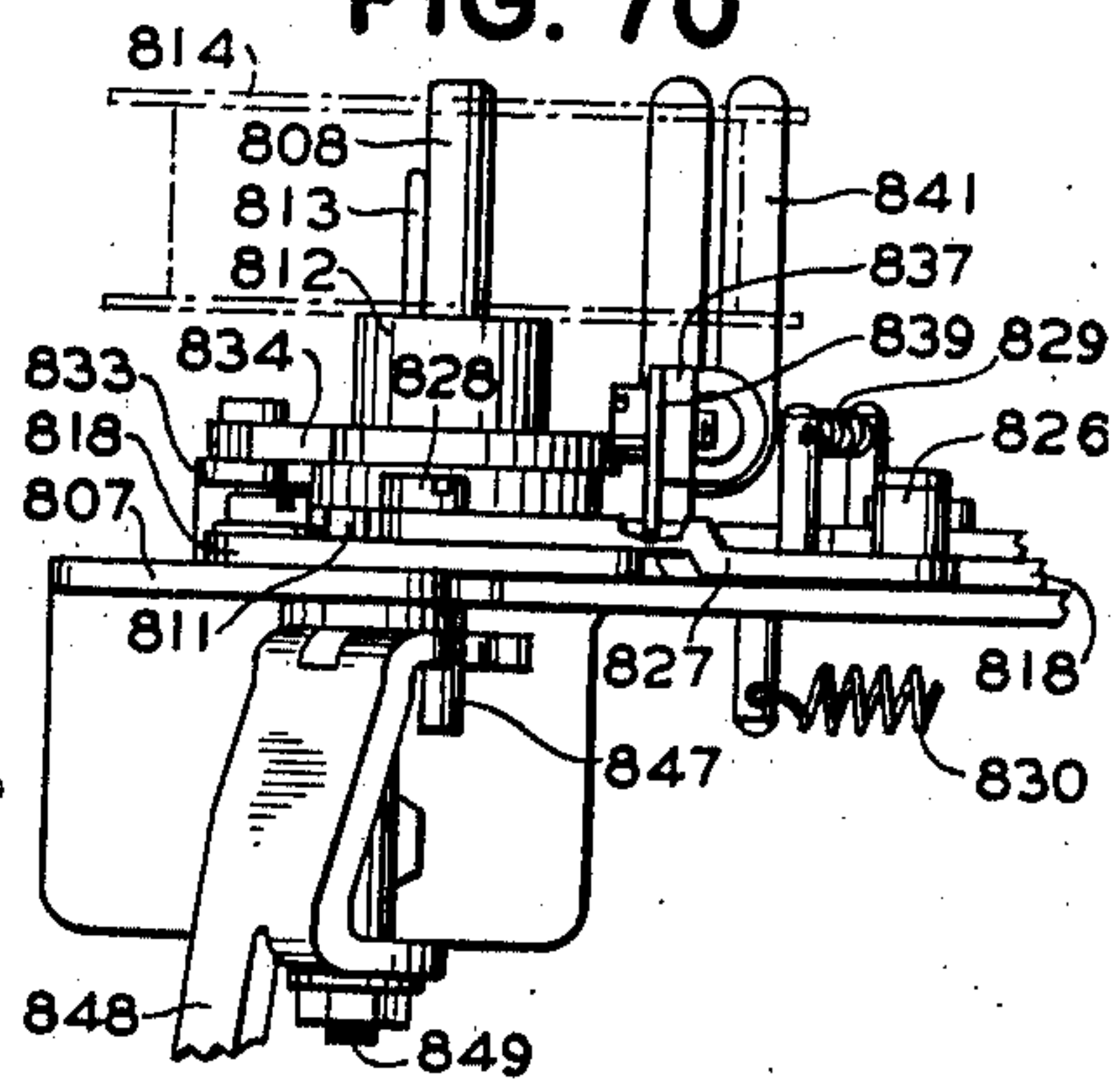


FIG. 71

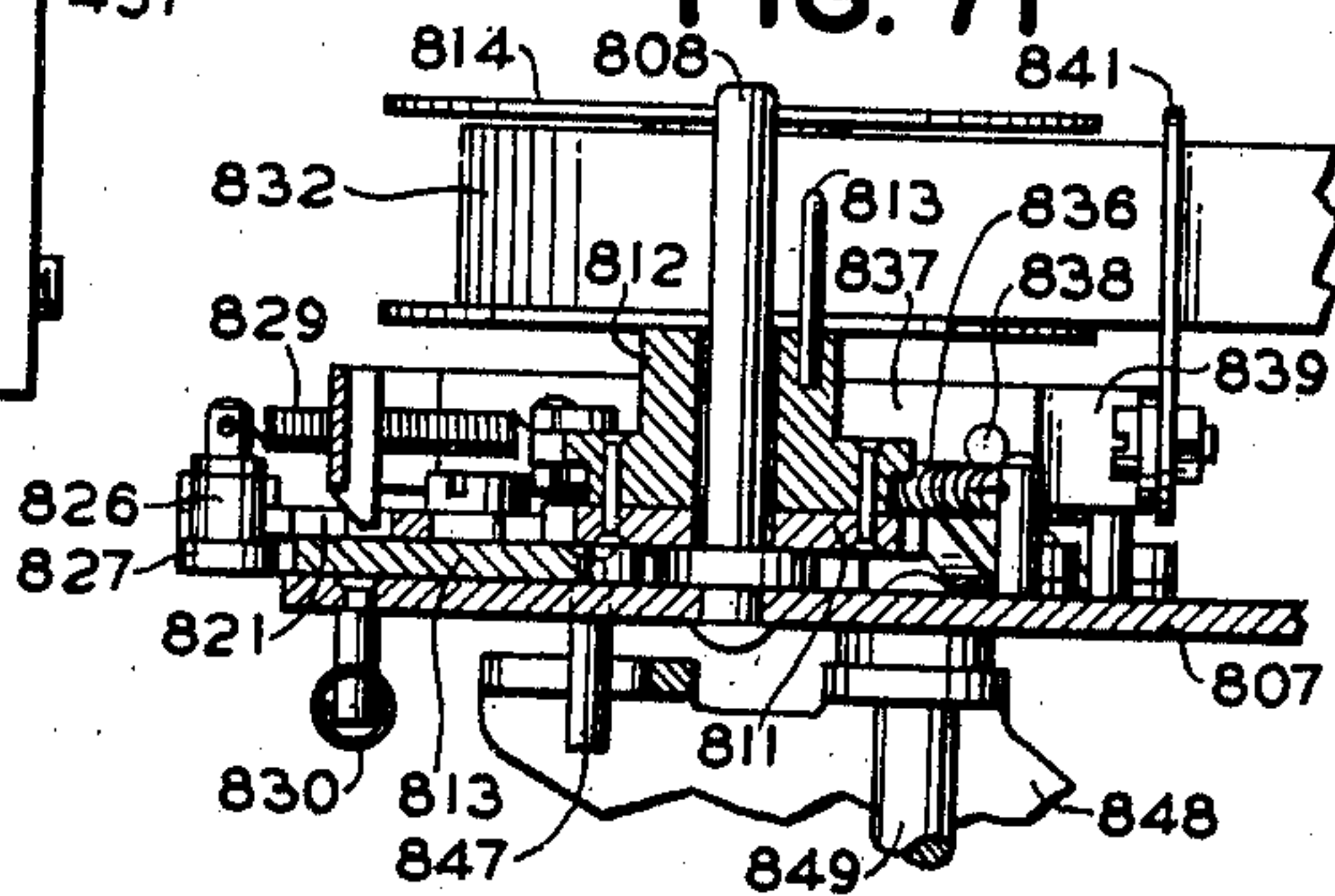


FIG. 69

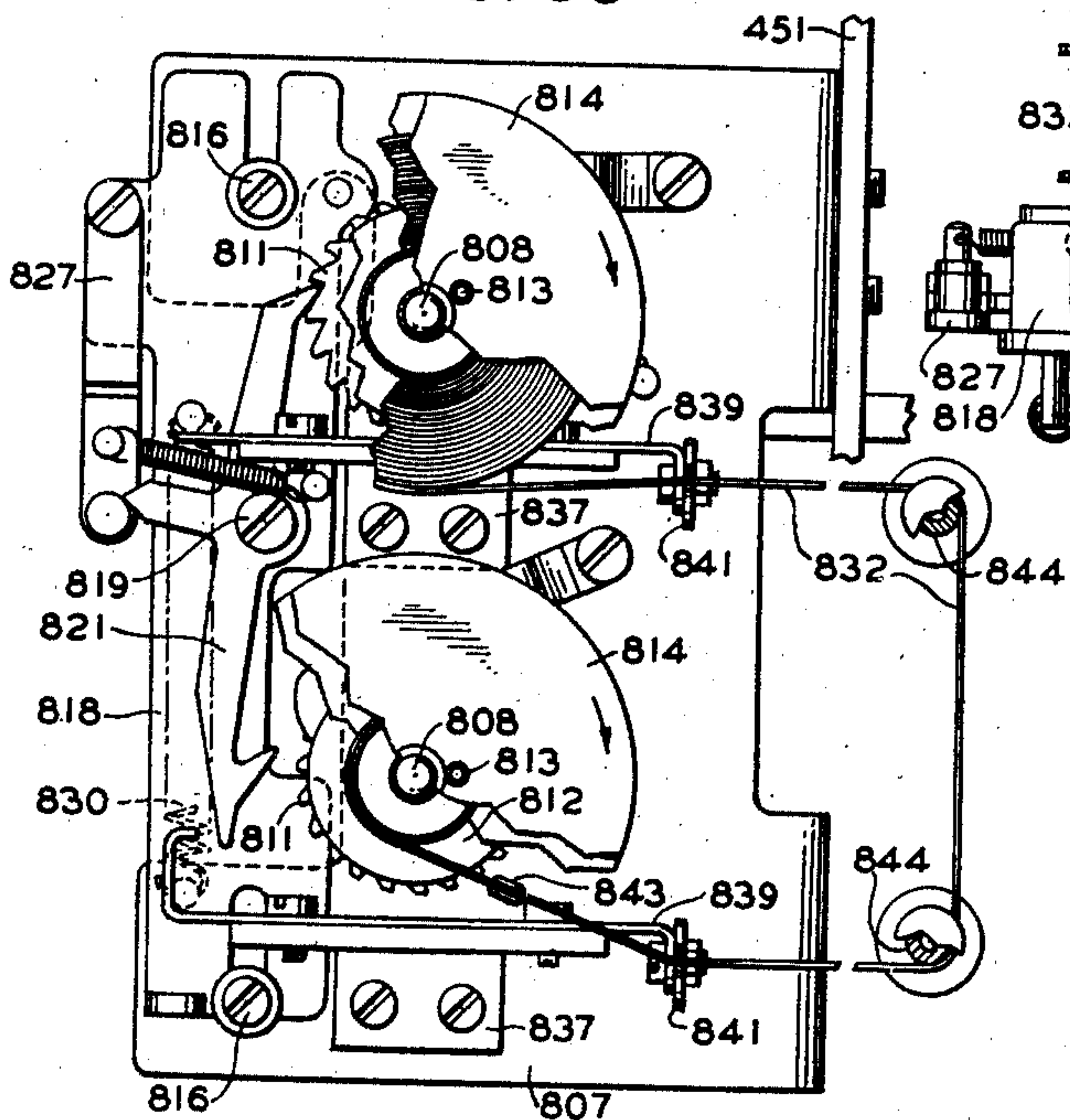
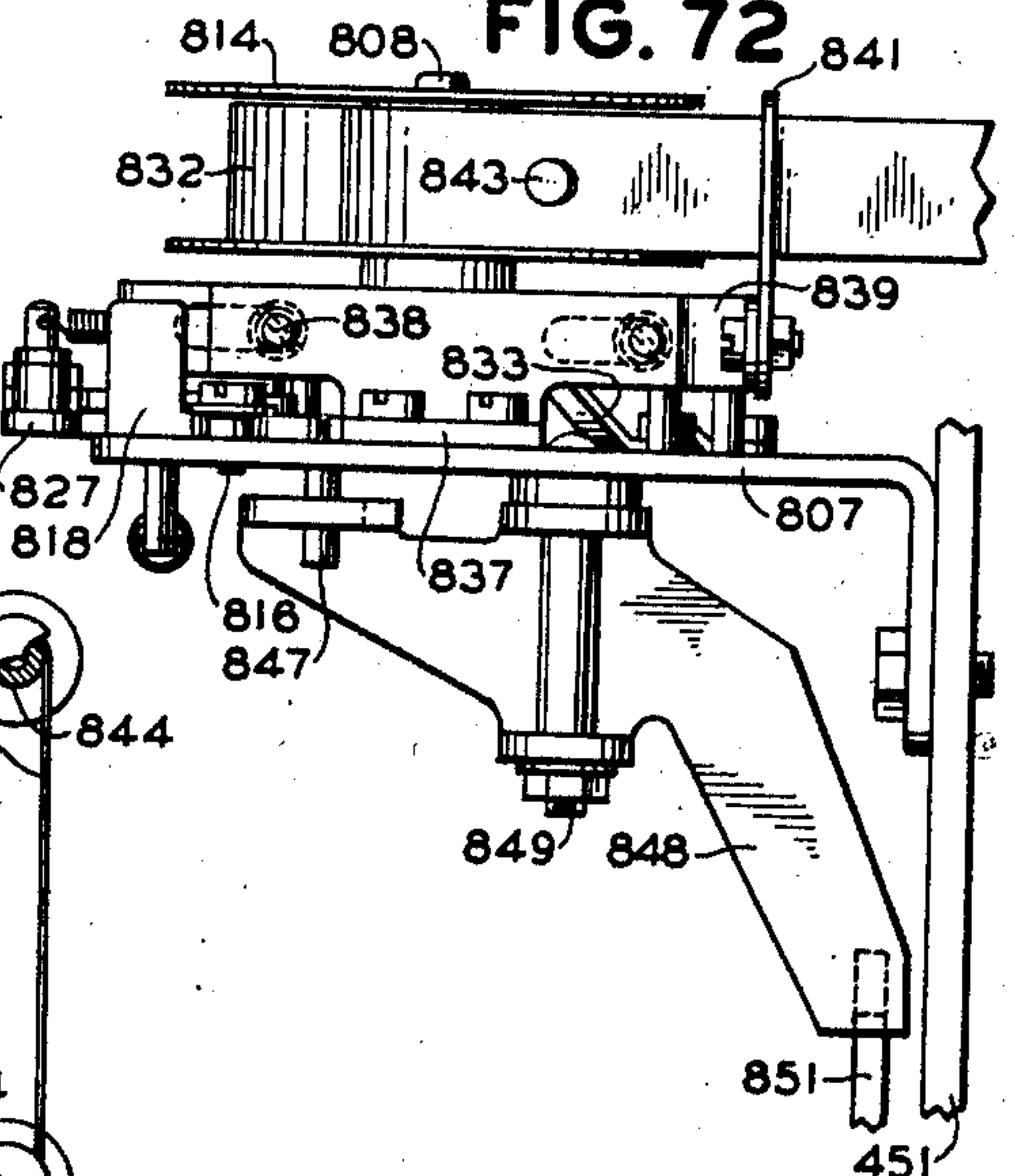


FIG. 72



INVENTORS
J. W. LONG
G. I. ROBERTS
BY *J. R. Marsh*
ATTORNEY

UNITED STATES PATENT OFFICE

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TELEGRAPH PRINTER

James W. Long, Plainfield, and George I. Roberts, Cresskill, N. J., assignors to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application September 13, 1938, Serial No. 229,672

53 Claims. (Cl. 178—29)

The present invention relates primarily to telegraph printers and more particularly to that type of telegraph printer commonly known and referred to as stationary platen page printers, such printers obviously, as the name implies, having a stationary platen and a to and fro moving printing unit, usually moved step by step from left to right to effect letter spacing and in one continuous movement from right to left for the beginning of new lines of print.

It has been general practice in the past to employ a different type of printer or receiver for each of the various types of telegraph services, each type of recorder not being suitable or adaptable for use on the other types of services. Accordingly, it is an object of this invention to provide a telegraph printer of improved design and construction and increased efficiency, which, without any or a few minor changes may be equally well employed in a plurality of different types of telegraph services, such as projection service, bulletin, or news printer service, ordinary message service, etc. Obviously, the advantages of such a printer are many and some of the more important ones are: the printers can be more efficiently manufactured and in larger quantities with a resulting lower cost per unit, fewer spare parts and printers required to be kept on hand; flexibility, in that a printer may be changed from one type of service to another, resulting in a general over-all increased efficiency of all the telegraph services.

In accordance with the above, another object of the invention is to provide a telegraph printer, the functions or operations of which, such as line feeding, printing, returning the typewheel car to a start position to start a new line of print, commonly referred to as "typewheel car return," letter space feeding, or typewheel car feed to effect letter or word spacing may be easily varied so that they may occur separately in response to associated signals or more than one of such functions be performed in response to a single signal. An example of such an arrangement is where a typewheel car return function and a line feed operation may occur in response to a single signal, or in response to respective signals.

Another object of the invention is to provide a printer of improved design, having automatic typewheel car return wherein this and all other functions may be performed within the time interval required to receive one complete signal, thus enabling the printer to be operated on the same signals used to control a tape printer; or

those wherein such signals as typewheel car return and/or line feed signals are not present.

Another object of the invention is to provide a stationary platen page printer with a typewheel positioning mechanism of novel design, improved efficiency and simplified construction capable of operating at a high rate of speed.

Another object of the invention is to provide a printer capable of printing intricate tabulations and manifold or duplicate copies.

Another object of the invention is to provide a telegraph printer, the size of the type of which and the letter spacing thereof, can be easily and readily changed.

These and other more specific objects of the invention will appear hereinafter in conjunction with the detailed description thereof, and are defined by the scope of the appended claims.

The selector mechanism of the printer in general comprises the means by which the received electrical permutation signals are translated into representative mechanical combinations of setting of selective elements for controlling the operation and functions of the printer. As fully described hereinafter in the detailed description thereof, the signals employed with the preferred embodiment of the printer are of the simplex or start-stop variety. Such signals, as is well known in the art, comprise successive groups of impulses each group of which is made up of a start impulse or signal of one line condition which is followed by a definite number, usually five impulses as in this case, of permutations of two different line conditions, which in turn are followed by a stop or rest signal or impulse of a definite line condition and opposite to that of the start impulse. The start impulse and the five variable impulses are usually of the same length, while the length of the stop impulse varies, depending on the time between successive signal groups, its length decreasing and approaching the length of the start or one of the variable impulses as the printer approaches its maximum speed of operation. As is the general practice, the start impulse is an open line condition and the rest impulse a closed line condition, and such conditions are usually respectively referred to as spacing and marking signals, impulses, or conditions. It should be understood, however, that the invention is not limited to operate in conjunction with this specific arrangement of signals, but may be readily adapted to operate under the control of other type signals such as polar signals of opposite

polarity and also of signals of the same polarity but of different values.

The start impulse of a code group which controls the start of the selector mechanism, being received on the selector magnet, initiates the rotation of a frictionally driven so-called pilot sleeve normally tending to rotate from power supplied thereto from an electric motor which also furnishes all the other power for operating the printer. The frictionally driven pilot sleeve in turn through an adjustable means releases the selector sleeve for rotation. The adjustable means disposed between the pilot sleeve and the selector sleeve comprises the means whereby the release of the selector sleeve relative to the release of the pilot sleeve may be varied. This arrangement, usually referred to as an orienting device, compensates for variable line or other conditions which may vary the length and/or effectiveness of the start impulse to permit the selector cams to be operative on their associated elements during the midportions or most effective portions of their associated signal periods. The selector cams in rotating sequentially cooperate with a set of five latches equal in number to the variable impulses of each code group which are arranged on the floating principle, whereby in cooperation with the selector magnet armature they are allowed to pivot about one or the other of two pivot points, depending upon the condition of their associated signal impulse. As the latches pivot about one of the two points, they unlatch associated selectors, and when pivoted about the other one of the two pivot points they retain their associated selectors in a latched position. A transfer cam released in timed relation with the positioning of the selectors operatively engages the unlatched ones of the selectors and transfers the selection set up therein to a set of transfer levers, and then relatches the unlatched selectors in their normal position. Four of the five transfer levers control the discs of a drum-type typewheel stop unit of the type well known in the art, and as the four discs are movable into one or the other of two positions, sixteen combinations of settings of the discs in the drum may be obtained. Thus any one of sixteen so-called stop members arranged around the periphery of the stop unit are selectable one at a time. A frictionally driven shaft rotatable in the stop unit may therefore be stopped by a selected stop member in any one of sixteen angular positions.

The horizontal shaft of the stop unit is connected through two sets of universal joints, a sliding or telescoping connection and two bevel gears to a substantially vertical typewheel shaft. A typewheel on the typewheel shaft has the type and symbols arranged in four rows around the periphery thereof, each peripheral row having sixteen type elements or positions therein. The bevel gears connecting the typewheel and the drum shaft have a one-to-one ratio and therefore the typewheel is capable of being stopped in any one of sixteen angular positions. The fifth one of the transfer levers controlled by the fifth impulse of the code together with so-called shift and unshift signals, each one of which comprises a complete code combination, control the movement of the typewheel in a vertical direction to determine which one of the four peripheral rows thereon will be moved to a printing position. The unshift and shift signals control the vertical position of the typewheel in such a manner that after the receipt of one or the other of the sig-

nals, all subsequent printings are from the first and second or the third and fourth peripheral rows on the typewheel respectively, while the fifth impulse of each code group through the instrumentality of the fifth transfer lever causes the typewheel to be positioned so that a position in either one or the other of the first and second or the third and fourth peripheral rows will be in printing position. The typewheel if in any other than its lower position is returned to its normal lower position after each printing operation and elevated to the desired level or left in its lower position for each succeeding printing operation.

A horizontal cylindrical printing platen roller holds the recording paper in operative relation to the typewheel and the typewheel slides back and forth in front of it to effect letter spacing and typewheel car return. The printing operation is effected by rocking the typewheel against the platen and line feed by rotating the platen.

The five transfer levers in addition to controlling the discs of the drum stop unit are differently notched and selectively control a series of pivot levers. The pivot levers in turn control the operation of a set of so-called pivot point slide bars. Cooperating with the pivot point slide bar are a set of so-called floating or function control bars, one of the ends of each of which receives a definite motion on each cycle of operation of the printer. The other ends of the floating bar are secured to various function operating links and levers and the slide bars determine whether the floating bars pivot idly about the ends attached to associated operating levers or at substantially their midpoints and in so doing perform associated printer functions.

A more complete and thorough understanding of the invention will be had from the following detailed description thereof when taken in conjunction with the accompanying drawings, in the latter of which:

Fig. 1 is a perspective view of a preferred embodiment of the invention taken from such a position as to show the top, front and right hand sides of the machine;

Fig. 2 is a plan view of the invention with some of the parts broken away;

Fig. 3 is an elevational view of the right hand end of the machine with some of the parts broken away;

Fig. 4 is a front elevational view of the function control floating levers and the operating means therefor;

Fig. 5 is a rear elevational view of the invention with a few parts broken away;

Fig. 6 is a view partly in section and partly in elevation taken substantially on line 6—6 of Fig. 2 approximately through the transverse center of the machine;

Fig. 7 is a fragmentary sectional view taken substantially on line 7—7 of Fig. 6;

Fig. 8 is a view partly in section and partly in elevation of the selector cam shaft and some of the associated elements taken substantially on line 8—8 of Fig. 2;

Fig. 9 is a sectional view of the pilot sleeve friction clutch taken on line 9—9 of Fig. 8;

Figs. 10 and 11 are fragmentary front and end views respectively, partly in section and partly in elevation of the selector magnet and the mounting arrangement therefor;

Fig. 12 is an elevational view showing some of the elements of the orienting mechanism;

Fig. 13 is a view partly in section and partly in elevation of the typewheel stop unit;

Fig. 14 is a fragmentary front elevational view partly in section showing particularly one of the elements of the selecting mechanism and its associated and cooperating members;

Figs. 15, 16 and 17 are fragmentary front elevational views partly in section showing various operated positions of one of the selector elements and its cooperative members;

Fig. 18 is a perspective view of the transfer cam assembly;

Fig. 19 is a semi-diagrammatic view in elevation showing the arrangement of the notches in the transfer levers and their relation to the pivot levers;

Fig. 20 is an exploded diagrammatic view showing the outline and relative setting of the selector cams and the elements mounted on the selector cam sleeve;

Fig. 21 is a view partly in section and partly in elevation of the transfer cam assembly together with the driving clutch and tripping means therefor;

Fig. 22 is a fragmentary sectional view taken substantially on line 22—22 of Fig. 21;

Fig. 23 is a fragmentary elevational view partly in section showing the latch employed for preventing rotation in a reverse direction of the transfer cam assembly;

Fig. 24 is a fragmentary plan view of some of the elements employed for suppressing the print and letter spacing operations;

Fig. 25 is a sectional view taken on line 25—25 of Fig. 24;

Figs. 26 and 27 are front and perspective views respectively of the elements of Fig. 24;

Fig. 28 is a fragmentary side elevational view partly in section showing the pivot levers, the pivot point slide bars, the floating levers in section and some of their cooperating elements;

Figs. 29 and 30 are fragmentary plan and front elevational views respectively of the elements of Fig. 28;

Fig. 31 is a fragmentary side elevational view partly in section of the elevator slide bar lever with some of its associated elements;

Fig. 32 is a fragmentary front elevational view partly in section of the shift control mechanism;

Fig. 33 is a fragmentary side elevational view partly in section of the elements shown in Fig. 32;

Figs. 34, 35 and 36 are fragmentary side elevational views showing various operated positions of some of the shift control elements;

Fig. 37 is a fragmentary plan view of the elevator slide bar lever and associated elements;

Fig. 38 is a fragmentary elevational view of the elevator slide bar lever operating elements;

Fig. 39 is a perspective view of some of the elements of the shift control mechanism;

Fig. 40 is a side elevational view partly in section of the typewheel, typewheel shaft and associated elements;

Fig. 41 is a sectional view taken substantially on line 41—41 of Fig. 40 substantially through the center of the typewheel shaft;

Fig. 42 is a side elevational view of the typewheel shaft elevator latch;

Fig. 43 is a plan view of an arm movable with the typewheel car;

Fig. 44 is a fragmentary sectional view taken substantially on line 44—44 of Fig. 40;

Fig. 45 is a developed view of the typewheel showing the arrangement of the type elements thereon;

Fig. 46 is a fragmentary elevational view partly in section showing the universal joints and associated elements employed in rotating the typewheel shaft;

Fig. 47 is a semi-diagrammatic view of the pivot point slide bars illustrating the manner in which they cooperate with the floating levers;

Fig. 48 is a developed view of the notched discs and guide plates of the typewheel stop unit showing the manner in which the notches cooperate with the stop elements;

Fig. 49 is a timing chart of the various operating cams on the operating cam shaft sleeve;

Fig. 50 is a semi-diagrammatic view of the floating levers showing the manner in which they cooperate with the pivot point slide bars;

Fig. 51 is a fragmentary plan view partly in section of the print and letter spacing mechanisms;

Fig. 52 is a front elevational view of the elements of Fig. 51;

Fig. 53 is a sectional view taken substantially on line 53—53 of Fig. 52;

Fig. 54 is a front elevational view of the typewheel car letter spacing feed rack and associated elements;

Fig. 55 is a front elevational view of the disengaging bar for the typewheel car letter spacing feed pawls with associated operating and control mechanisms;

Fig. 56 is a plan view partly in section of the typewheel car letter spacing feed pawls taken substantially on line 56—56 of Fig. 54;

Fig. 57 is a left hand end view of the floating levers showing their attached links and controlled elements;

Fig. 58 is a perspective view of the control for the bell signal;

Fig. 59 is a front elevational view of the typewheel shaft elevating bar and associated operating elements;

Fig. 60 is a sectional view taken substantially on line 60—60 of Fig. 59;

Fig. 61 is a front elevational view showing the typewheel shaft elevator latch operating bar;

Fig. 62 is a right hand end elevational view of the elements of Fig. 61;

Fig. 63 is a fragmentary side elevational view partly in section on the line feeding mechanisms;

Fig. 64 is a rear elevational view partly in section of a part of the elements employed in the automatic typewheel car return function;

Fig. 65 is a plan view partly in section of some of the automatic typewheel car return function control elements;

Fig. 66 is a sectional view taken substantially on line 66—66 of Fig. 65;

Fig. 67 is a fragmentary sectional view taken substantially on line 67—67 of Fig. 65;

Figs. 68 and 69 are plan views partly in section of the ribbon feeding mechanism;

Fig. 70 is a fragmentary left hand side elevational view of a part of the ribbon feeding mechanism;

Fig. 71 is a sectional view taken substantially on lines 71—71 of Fig. 68; and

Fig. 72 is a front elevational view of the ribbon feeding mechanism.

Power supply

As is the general practice in practically all telegraph receivers of this general type, all of

the operations or functions of the receiver, such as printing, line feeding, etc., are performed by power supplied through appropriate gearing and clutch mechanisms, hereinafter described, from a normally constantly rotating electric motor of the proper size and type. Such an arrangement obviously has advantages of removing practically all load from the selector magnet with the exception of positioning a light armature. This enables the selector mechanism and the complete receiver to be operated at a high rate of speed in response to comparatively weak signals which may be the result of transmitting the signals over considerable distances and/or having several of the receivers connected in series or in parallel. Referring to Figs. 2, 3 and 5, fractional parts of the motor M are shown which is located at the rear left hand side of the receiver. The motor rests on a set of collars such as 51, only one of which is shown in Fig. 3, and is attached to a motor sub-base 52 by screws such as 53 extending through the collars 51. The sub-base 52 is in turn supported on a series of collars such as 54 and is attached to the main base plate 56 of the entire receiver by screws such as 57. The motor M is of a substantially constant speed and may be a synchronous motor driven from a well regulated alternating current supply or it may be a direct current motor and kept at substantially constant speed by any one of several regulating devices of the type well known in the art.

Attached by a set screw 59 to the left hand end of the motor shaft 58, as shown in Fig. 5, for rotation therewith is a helical pinion gear 61. The gear 61 meshes with another helical stop unit gear 62 located thereabove, which is pivotally supported on a typewheel stop unit shaft 63. The shaft 63 is suitably supported, as hereinafter described, from a vertical mounting plate 64 which is attached to the base 56 and extends lengthwise along the rear of the machine. The stop unit gear 62 in turn meshes with an idler gear 66 which is attached by screws 67 to a collar 68 pivotally supported on a stud 69 extending horizontally from the plate 64. The idler gear 66 in turn meshes with a second idler gear 71 attached by screws 72 to a collar 73 pivotally supported on a stud 74 extending from the plate 64. Meshing with the idler gear 71 is an operating cam shaft gear 76 which is attached by screws 77 to a collar 78 which is in turn secured to the operating cam shaft 81 for rotation therewith by a set screw 79, Figs. 5 and 6. Also meshing with the idler gear 71, Fig. 5, is a third idler 82 pivotally supported in the same manner as idlers 66 and 71 from a stud 83 in the plate 64. The idler gear 82 meshes with and drives a selector cam shaft gear 84 which is attached by screws, such as 86, Fig. 8, to a collar 87, which in turn is secured by a set screw 88 to the selector cam shaft 89 for rotation therewith. Thus, as the motor M is constantly rotating the stop unit gear 62, the operating cam shaft 81, and the selector cam shaft 89 are also constantly rotating and they serve to operate their associated groups of mechanisms, as will hereinafter be described.

Selector

The selector mechanism and the manner in which its component elements cooperate with one another to transfer the electrical impulses comprising each group of signals into mechanical settings of the selectors will now be described.

The selector magnet 91, Figs. 1, 2, 3, 10 and 11, is composed of two individual coils mounted in a substantially vertical position on a magnet base 92. The magnet base 92 together with the magnet coils 91, Figs. 10 and 11, are attached by screws 93 to a horizontal section of a substantially U-shaped magnet yoke or cradle 94 which is pivotally supported at its upper ends on the inner ends of two trunnion screws 96 and 97. The screws 96 and 97 are supported in opposed vertical sections of a selector magnet mounting bracket 98 which is attached by screws such as 99, Fig. 3, to a set of posts 101 extending horizontally from the front of a vertical mounting plate 102, Figs. 2, 3 and 5, at the rear right hand corner of the machine. The screws 99, extending through elongated slots 103, Fig. 10, in the bracket 98 permit adjustment of the entire selector magnet assembly relative to their cooperating members. Such an arrangement also has the advantage in that it enables the entire selector magnet assembly to be readily removed when requiring adjustment, repairs or replacement.

The trunnion screws 96 and 97 are hollow-ended and have pivoted therein and extending therebetween an armature lever pivot rod 104, Fig. 11. Affixed to the pivot rod 104 for movement therewith is an armature lever 106, Figs. 10 and 11, which carries an armature 107 in operative relation with the pole pieces of the selector magnets 91. A threaded stud 108, is supported in a vertical position from the mounting bracket 98 and has thereon a self-locking nut 109. The self-locking nut 109, together with a flange 111 integral with the stud 108 cooperate with a rightwardly extending arm 112 of the armature lever 106 to limit the movement thereof. A leftwardly extending arm 113 of the armature lever cooperates in a manner hereinafter described with a group of five selector lever latches 115, only the lower part of one of which is shown in Fig. 10. A substantially vertical upwardly extending arm 116 of the armature lever has adjustably attached thereto by screws 117 an anvil 118.

As hereinbefore described, a closed line condition exists during marking or rest impulses and obviously during such impulse the selector magnet 91 is energized. This places the armature lever 106 in the position shown by the full outline thereof in Fig. 10 with the anvil 118 attached to the arm 116 thereof in the path of, or in engagement with the end of a pilot sleeve stop arm 119. The pilot sleeve stop arm 119 tends to rotate with the constantly rotating selector cam shaft 89 through a friction clutch hereinafter described, and is held from rotation during rest intervals by the engagement thereof with the anvil 118. During spacing or open line condition the ends 113, 112 and the anvil 118 of the armature 106 take the position represented by dot dash outline thereof in Fig. 10. The movement of the armature anvil 118 from its marking to a spacing position is accomplished by a retractile spring 121 one end of which is attached to the arm 112. The other end of the spring 121 is anchored to an adjustable thumb screw 122 supported in the horizontal section 123 of the selector magnet cradle 94. By adjusting the thumb screw 122 the retractile force on the armature lever 106 may be varied to compensate for variable line or other conditions which may affect the magnetic strength of the selector magnet 91. A threaded horizontal stud 124 supported in the selector unit mounting bracket 98 and extending

through an elongated hole 126 in a depending portion 127 of the cradle 94, has thereon an adjustable thumb nut 128. By adjusting the thumb nut 128 the selector magnet cradle 94 and its attached members may be rocked to change the air gap between the pole pieces of the selector magnet 91 and the armature 107. A spring 129 one end of which is attached to the bracket 98 and the other end to the cradle 94 holds the depending section 127 of the cradle against the thumb nut 128. Another adjustable screw 131 is supported in the bracket 98 in operative relation with the arm 113 of the armature lever 106 and serves as an auxiliary stop therefor in its marking position. This adjusting screw 131 has a tendency to prevent abnormal flexing or whip in the comparatively light arm 113 of the armature lever 106 when it is moved to its marking position.

Referring now to Fig. 8 a description of the arrangement of the selector cam shaft 89 and its associated elements will now be given. The right hand end of the shaft 89 is journaled in a bushing 132 supported by the plate 102 and held in place by a bushing clamping member 133. The left hand end of the selector cam shaft 89 is similarly journaled in a bushing 134 supported in the upper right hand end of a longitudinally extending vertical plate 136 adjacent the center of the machine. The bushing 134 is held in place by the bushing clamping member 137 and screws 138. The hereinbefore described gear hub 87 has extending axially from the left hand face thereof, as shown in Fig. 8, a series of pins 139 each of which engage a radial slot 141, Fig. 9, in an associated segment such as 142 of a segmented ring. A circular coiled radially contractible spring 143 located in a groove in the outer circumference of the segments 142 compresses them a felt ring 144 at the inner surfaces of the segments against the outer circumference of a section of a pilot sleeve 146. The pilot sleeve 146 is freely mounted on shaft 89 and tends to rotate therewith through the action of the rotating felt ring 144 in frictional engagement therewith. Clamped against the flange of the pilot sleeve 146 for rotation therewith by a nut 147 in threaded engagement with the threaded end thereof is the pilot sleeve stop arm 119 and a disc cam 148 intermediate with a spacer 149. When the stop arm 119 is in engagement with the armature lever anvil 118, Fig. 10, the pilot sleeve is held from rotation at which time the felt ring 144 slides around the sleeve 146.

Adjacent the lefthand end of the selector cam shaft 89 as shown in Fig. 8 is a friction clutch, indicated in general by reference numeral 151, similar to the friction clutch hereinbefore described, employed to rotate the pilot sleeve 146. The friction clutch 151 comprises a collar 152 fixed to the shaft 89 for rotation therewith by a set screw 153. A series of pins 154 extending axially from the righthand face of the collar 152 engage segments 156 which are held by a circular coiled spring 159 together with a felt ring 157 in frictional engagement with a collar integral with the lefthand end of a selector cam sleeve 158 loosely mounted on the shaft 89. The spring 159 is a substantial amount stronger than the pilot sleeve spring 143 and therefore the clutch 151 is a substantial amount heavier. Clamped against the flange 161 of the sleeve 158 intermediate with spacers such as 162, are a series of five selector cams referred to in general by reference numeral 163 and indicated individually by reference

numerals 163a to 163e, a transfer cam assembly trip cam 164, and a selector cam sleeve stop arm 166. A nut 167 threaded on the righthand end of the sleeve 158 clamps the cams 163 and 164, spacers 162 and stop arm 166 together and to the sleeve 158 for rotation therewith. The sleeve 158 is normally at rest and the manner in which it is released for rotation with the selector cam shaft 89 through the action of its associated friction clutch 151 will be hereinafter described.

Supported from the front upper corner of the plate 102 by studs, such as 169, Figs. 1, 2 and 12, is a vertical orienting plate 167. The orienting plate 167 has therein a curved slot 171, Fig. 12, the center of curvature of which is located at approximately the center of the selector cam shaft 89. Adapted to be moved in the slot 171 is a screw 172 which has fixed thereto a thumb nut 173, an index member 174 and one end of a lever 176. When the thumb nut 173 is loosened, the screw 172 and its attached members are movable within the limits of the slot 171. During such movement, the index member 174 cooperates with a scale 177 etched on the plate 102 to indicate the amount of movement of the screw 172. Fixed to the lower left hand end of the lever 176 is a roller cam follower 178, Figs. 2 and 12, which is in operative alignment with the selector sleeve release cam 148 on the pilot sleeve 146. Also in operative relation with the cam follower 178 is the lower left hand end of a selector cam sleeve releasing lever 179 which is pivoted at its upper end on a shoulder screw 181 in the plate 167. The lower end of the lever 179, which is in engagement with the cam follower 178 has a concave surface 182, the radius of the curvature of which is substantially equal to the normal radius of the selector sleeve releasing cam 148 plus the diameter of the roller 178. A spring 183, one end of which is fixed to the lever 179, holds it in engagement with the cam follower 178 and the cam follower in engagement with the cam 148. A projection 184 of the lever 179 normally has the end thereof in engagement with the end of the selector sleeve stop arm 166 and the selector sleeve 158 is thus normally held from rotating.

After a fractional part of the revolution of the pilot sleeve 146, it being released for rotation, as described, in response to the start impulse of a code group, the high part of the selector sleeve releasing cam 148 engages the cam follower 178 and causes the lever 176 to pivot in a counterclockwise direction as shown in Fig. 12. As the cam follower 178 is in engagement with the lever 179 the movement of the cam follower causes the lever 179 to also pivot in a counterclockwise direction. This movement of the lever 179 causes the disengagement of the projection 184 thereon and the selector cam sleeve stop arm 166 whereupon the selector cam sleeve 158 is free to rotate with the selector cam shaft 89 through the action of its associated friction clutch 151 until brought to a rest at the completion of one revolution as hereinafter described.

It will be evident that by moving the screw 172 within the limits of the slot 171 the cam follower 178 will move along the curved surface 182 of the lever 179 and in this way the time interval between the release of the pilot sleeve by the selector magnet and the release of the selector cam sleeve 158 may be varied. This compensates for the variable line and other conditions which may vary the length and effectiveness of the start impulse, enabling the selector cams 163 to be operative on their associated elements during

the midportion or most effective portion of their associated signal impulses.

In the preferred embodiment of the invention the selector cam shaft 89 is adapted to be rotated, as hereinbefore described, at such a speed relative to the speed of reception of the code signals that it will make one complete revolution in a time interval slightly less than that required to receive one complete group of code signals. The speed of rotation of the selector cam shaft 89 is such, however, that the pilot sleeve 146, Fig. 8, thereon when released, as hereinbefore described in response to the start impulse of the group of code signals will complete its revolution during the receipt of the rest impulse of the same code group. As the rest impulse is a marking or closed line condition, the anvil 113, Fig. 10, on the arm 116 of the armature lever 106 will be in its marking position and in the path of the selector pilot sleeve stop arm 119 to bring the same to a stop on engagement therewith at the completion of a revolution of the pilot sleeve 146.

The pilot sleeve 146 will thereupon remain stopped in its normal rest position during the remainder of the rest impulse until released by the start impulse of the following code group. As the selector cam sleeve 153, Fig. 8, and the pilot sleeve 146 are both rotated from the selector cam shaft 89 they rotate at the same speed. However, as the pilot sleeve 146 has to make part of a revolution before it can cause the release of the selector sleeve 153, which is determined by the position of the lever 176 and cam follower 178, as described above, the selector cam sleeve will always lag behind the pilot sleeve with respect to its start and stop. During the revolution of the selector cam sleeve 153 the selector cams 163a to 163e thereon cooperate with associated selector lever latches 115 to cause the selective operation thereof in accordance with respective impulses of the received code group, as hereinafter described.

Referring now to Figs. 2 and 14, a selector lever and a selector lever latch mounting bracket 187 is secured in a vertical position by screws such as 135 to horizontal posts, such as 136 extending from the upper right hand front section of the vertical mounting plate 64. Extending horizontally from the front side of the mounting bracket 187 are a series of threaded studs 138 which have thereon intermediated with spacing collars such as 139 a series of similar selector lever and latch guide plates 191. Nuts 192, Figs. 2 and 8, threaded on the left hand ends of the studs 138, clamp the collars 139 and the guides 191 together and in place to form a series of vertical spaces. In the first five spaces formed between guide plates 191 by the collars 139 are a set of five similar selector lever latches, hereinafter referred to and indicated in general by reference numeral 115 and individually by reference numerals 115a to 115e. The selector lever latches 115 are normally in a substantial vertical position and have the upper ends thereof horizontally bifurcated toward the left as shown in Fig. 14. The latches 115 are supported by the bifurcated ends thereof engaging a pin 193 extending horizontally from the mounting bracket 187. The disposition of the latches 115a to 115e, relative to the selector cams 163a to 163e on the selector cam sleeve 153, as shown in Fig. 8, is such that each latch is in the same vertical plane as its associated selector cam. A set of retractile springs 196 Fig. 14, one individual to each latch 115 has one end thereof attached to a rightwardly

extending projection 195 adjacent the lower half of each latch 115 and normally holds a rightwardly extending cam following projection 194 adjacent the center of each latch in engagement with the periphery of its associated cam 163 and the upper bifurcated end on the pin 193. The other ends of the spring 196 are attached to an adjustable member 197 suitably supported from the frame structure. At the lower end of each latch 115 is a rightwardly extending toe 198 which cooperates with the end of the leftwardly extending arm 113 of the selector magnet armature lever 106. A beveled leftwardly extending projection 199 just below the bifurcated upper end of each latch 115 normally engages the top surface of the right hand end of an associated selector lever, indicated and referred to collectively by reference numeral 201 and individually by reference numerals 201a to 201e. The selector levers 201 comprising elongated bars are five in number, one individual to each of the latches 115, and are guided for movement in a vertical plane, as are the latches by the guide plates 191. A pivot pin 202 extending horizontally from the bracket 187 passes through an elongated slot 203 adjacent the center of the selector levers 201 to pivotally support them thereat. Each of the selector levers 201 has a retractile spring 204 attached to the upper side thereof at the right of the center which holds the selector levers to the right, as limited by the pin 202 in the slots 203 and with the upper surfaces of the right hand ends in engagement or latched with the projections 199 on the associated latches 115. Such a position of a selector lever 201, as shown in Fig. 14 is hereinafter referred to as its normal, spacing or latched position, and in such a position the selector levers are tilted at a slight angle from the horizontal with the right hand end the lowest.

It is thought that the operation of selector levers 201, latches 115 and associated elements can best be described by tracing the manner of operations thereof on the receipt of a specific code group of signals. Accordingly let it be assumed that a code group of signals is to be received representing the letter R and that according to a predetermined code arrangement such a group is composed of the following five consecutive signaling impulses; spacing, marking, spacing, marking and spacing.

Each of the selector cams 163a to 163e have a notch 206 in the periphery thereof and the cams are arranged on the selector cam sleeve 153, as diagrammatically shown in Fig. 20, so that during a revolution of the sleeve the notches 206 are sequentially brought into operative relation with the cam following projections 194 on associated latches 115a to 115e respectively. As described the speed of rotation of the selector cam sleeve 153 and the adjustment of the orienting lever 176, Fig. 12, is such that during the mid-position or most effective position of the first signal impulse, the notch 206, Fig. 14, in the first selector cam 163a is rotated into operative relation with the projection 194 on the first selector lever latch 115a. The first impulse of the assumed code group is spacing, and accordingly the left hand arm 113 of the armature lever 106 will be in its upper position as shown by the dashed outline thereof in Fig. 14. Therefore as the notch 206 of the cam 163a rotates past the cam following projection 194 of the latch 115a the attached spring 196 is allowed to pivot this latch in a counter-clockwise direction an amount

determined by the depth of the notch 206 to a so-called spacingly operated position as shown by the dot-dashed outline in Fig. 14. During this movement the pin 193 in the upper bifurcated end of the latch serves as a pivot point and the toe 198 at the lower end of the latch passes beneath the armature lever arm 113. Because the selector lever latching projection 199 on the latch 115a is adjacent the upper pivoting end, there is not sufficient movement of the projection 199 to allow the disengagement thereof with the right hand end of the associated selector lever 201a. Accordingly the associated selector lever 201a remains latched in its normal position. As the cam sleeve 158 rotates further, the notch 206 in the first selector cam 163a passes out of operative relation with the cam follower 194 on the associated latch 115a which causes the latch to pivot in a clockwise direction about the pin 193 back into its normal position and at the same time tensioning the spring 196.

The second signalling impulse of the assumed group of signals is marking and consequently the end of the armature lever 113 will be moved into its lower position and sometime after the positioning thereof further rotation of the selector cam sleeve 158 brings the notch 206 in the second selector cam 163b into operative relation with the cam follower 194 on the second selector lever latch 115b during the midportion or most effective portion of this signal. As in the above described operation, the attached spring 196 at this time causes the cam follower 194 to start to enter the notch 206 in the cam 163b and the latch 115b to pivot in a counter-clockwise direction about the pin 193 at the upper end thereof. This movement of the latch 115b brings the toe 198 at the lower end thereof into engagement with the armature lever arm 113 whereupon further counter-clockwise pivoting of the latch is stopped. This movement is very slight due to the small clearance between the end of the toe 198 and the arm 113 and as the projection 194 has not at this time entered to the full depth of the notch 206, the spring 196 causes the latch to pivot in a clockwise direction with the toe 198 in engagement with the arm 113 acting as a pivot point. During such movement the upper bifurcated end of the latch 115b slides to the right on the pin 193 and assumes a position such as that shown in Fig. 16. This movement of the upper end of the latch 115b is sufficient to allow the disengagement of the latching projection 199 and the right hand end of the associated selector lever 201b. Thereupon the spring 204 attached to the selector lever 201b is allowed to pivot the same in a counter-clockwise direction to a substantially horizontal position such as shown in Fig. 16 and such a position is hereinafter referred to as a marking, unlatched, selected or partly operated position of a selector lever. The collars 199 on the studs 198 beneath the left hand end and above the right hand end of the latch 115b limits the amount of pivoting thereof.

The left hand end of each of the selector levers 201 is vertically bifurcated from the underside, and as the latch 115b pivots from its unselected latched position to its selected unlatched position the bifurcated end straddles a transfer cam disc 208. Shortly after this movement of the selector lever 201b the notch 206 on the selector cam 163b rotates out of operative relation with the cam follower projection 194 and the associated latch 115b is pivoted first, in

a counter-clockwise direction about the toe 198 to bring the bottom of the bifurcation at the upper end thereof against the pin 193 and then a slight amount in a clockwise direction about the pin 193 back into its normal position to disengage the toe 198 and the end of the arm 113 of the armature lever 106.

As the third and fifth impulses of the assumed code group are spacing, the same as the first impulse, the associated latches 115c and 115e will be operated in the same manner as the latch 115a and the selector levers 201c and 201e will remain latched in their normal position. The fourth impulse of the assumed group being marking, the latch 115d will be actuated in the same manner as latch 115b to unlatch its associated selector lever 201d to allow it to assume its unlatched or selected position with the bifurcated end thereof straddling the disc cam 208. Thus the selector levers 201a to 201e are selectively positioned in combinations of settings comprising latched, normal or spacing and unlatched, operated or marking positions in accordance with the impulse of a received code group, and for the assumed code group, the selector levers 201a, 201c and 201e will remain latched while selector levers 201b and 201d are unlatched.

It will be noted in Fig. 20 that the length of the notches 206 in the cams 163a to 163e are such, that after one latch, such as 115a, has been returned to its normal position there is an interval of time before the notch in the following cam engages the projection 194 of the next selector latch, such as 115b. This enables the armature lever 113 to move from one position to the other and not be hindered by toes 198 on the selector latches 115 and in addition enables the selective operation of the latches to occur only at the midpoint of the associated signaling impulses.

The left hand top front section of the mounting plate 64 has secured thereto by screws 210, Fig. 14, a transfer lever mounting bracket 211 in substantially the same manner as the selector lever and latch mounting bracket 197. The bracket 211 also has extending from the front side thereof a series of horizontal threaded studs 213 and on the studs, intermediate with spacing collars 214 are a series of transfer lever guide plates 212. Nuts, such as 215, Fig. 2, in threaded engagement with the front ends of the studs 213 clamp the collars 213 and the guide plates 212 together and in place. In the vertical spaces formed between the guide plates 212 which are in alignment with the vertical spaces formed by the selector lever guide plates 191 are a series of five transfer levers referred to and indicated in general by reference numeral 216 in Fig. 14 and by individual reference numerals 216a to 216e in Fig. 19. The left hand end of the transfer levers 216 are bifurcated to engage and be guided by a spacing collar 214 on a stud 213 at the left hand end of the bracket 211. The right hand end of the transfer levers are guided by spacing collars located on associated studs 213 above and below the right hand end thereof. The manner in which the transfer levers 216 cooperate with the selector levers 201 to be selectively positioned thereby will be described in the following paragraphs.

Extending between the longitudinal mounting plates 64 and 136 are two bearing supporting blocks 217 and 218, Fig. 21, which support therein two flanged bushings 219 and 221, respectively,

which are held in place by bushing clamping members 222 and 223. Supported in the bushings 219 and 221 adjacent its ends is a transfer cam shaft 224. Secured to the shaft 224 for rotation therewith by a set screw 226 is a flanged gear hub 227 which abuts the left hand face of the bushing 221. Attached to the gear hub 227 by screws, such as 228, is a helical gear 229 which meshes with another helical gear 231 located directly therebelow. The gear 231 is fixed to a collar 230, Fig. 6, which in turn is secured for rotation therewith to the hereinbefore described continuously rotating operating cam shaft 81 and by means of the gears 229 and 231 the transfer cam shaft 224, Fig. 21, is adapted to be continuously rotated. Loosely mounted on the shaft 224 is a sleeve 234 which has the left hand end in abutting relation with the right hand face of the bushing 219 and the right hand end thereof in abutting relation with the inner left hand face of the gear hub 227. Secured by pins, such as 236 to the outside left hand end of the sleeve 234 is a transfer cam assembly mounting hub 237 which has attached to the flange thereof by screws such as 238 the disc-shaped hereinbefore mentioned transfer cam 208. Loosely mounted adjacent the right hand end of the sleeve 234 is a flanged collar 239 which is operatively engaged with the right hand end of the transfer cam mounting hub 237 by means of interengaging tongues and grooves 241 on the collar and hub. Thus the collar 239 may slide longitudinally on the sleeve 234 by means hereinafter described but is at all times operatively engaged with the hub 237. A compression spring 242 coiled about the tongues and grooves 241 of the hub 237 and collar 239 tends to slide the collar 239 to the right to bring teeth 243 on the right hand face thereof into engagement with similar teeth 244 integral with and formed on the left hand face of the gear hub 227. However, the collar 239 is normally held in its left hand position by a cam following pin 246 engaged with a side cam surface 247 formed on the periphery of the collar 239. The cam following pin 246, Figs. 21 and 22, is carried in the depending arm of a clutch throw-out lever 248 which is pivotally mounted on a pivot stud 249 adjustably supported from a plate 251 attached to the block 218. An inverted U-shaped lever 252 supported by a pin 253 adjacent the center thereof extending from the bracket 187, has the left hand end thereof in engagement with the horizontal arm of the clutch throw-out lever 248. The other end of the lever 252 is in operative engagement with the transfer assembly release cam 164 on the selector sleeve 158. After the selector sleeve 158 has rotated approximately four-sevenths of a revolution from its rest position the hump on the cam 164 engages the right hand end of the lever 252 and causes the same to pivot in a counter-clockwise direction. This in turn causes the clutch throw-out lever 248 to pivot in a clockwise direction as shown in Fig. 22 and withdraw the cam following pin 246 on the lower end thereof from out of engagement with the side cam surface 247 on the collar 239. Thereupon the spring 242 slides the collar 239 to the right, bringing its teeth 243 into engagement with the teeth 244 of the constantly rotating gear hub 227. Thus the transfer cam and its associated elements is clutched to the shaft 224 for rotation therewith. After the clutch throw-out lever 248 is actuated, a spring 254 attached thereto returns it to its normal position with the cam following pin 246

riding on the periphery of the collar 239 and in the patch of the side cam surface 247. Therefore, as the collar 239 nears the end of a revolution, the side cam surface 247 and the cam following pin 246 engage, and further rotation of the collar forces it to the left bringing its teeth out of engagement with those on the gear hub 227. A further projection of the side cam surface 247 substantially parallel to the axis of the shaft 224 then engages the pin 246 and further rotation of the collar 239 is stopped. Thus the transfer cam 208 with its associated members hereinafter described, is released for one revolution at a time and is brought to rest at the completion of every revolution. As the transfer cam assembly shaft 224 is geared to rotate at a substantially higher rate of speed than the selector cam shaft 89, the collar 239 will complete its revolution and be in its normal stop position before it can be again released by the release cam 164 on the selector sleeve 158.

Attached to the left hand face of the transfer cam disc 208, Figs. 14, 16 and 18, for rotation therewith is a bevelled shaped element 256 hereinafter referred to as the gathering cam. The transfer cam disc 208 also has a portion 208a thereof displaced a slight amount towards the left and secured to the right hand side of the displaced portion is a selector lever reset cam 257. The transfer cam disc 208 with its attached cams, i. e., the gathering cam 256 and the reset cam 257 all rotate together and are hereinafter referred to as the transfer cam assembly in the description of their operation. As the transfer cam assembly begins to rotate, being released from rotation as described above, the disc 208 slides in the bifurcated left hand ends of the unlatched selectors 201. For the assumed conditions the selectors 201b and 201d will be straddling disc 208 while the other selector levers 201a, 201c and 201e will be above the disc and out of operative relation therewith. After the transfer cam assembly has rotated a fraction of a revolution from its rest position an angularly disposed portion 256a of the gathering cam 256 sequentially engages a depending projection 258 at the right hand end of all the transfer levers 216 that happen to be in their left hand position and slides them a slight amount to the right. All or none or some of the transfer levers 216 may be in their left hand position depending upon the character previously selected as will be apparent hereinafter. While the beveled surface 256a of the gathering cam 256 is still in operative relation with the depending portions 258 of the rearmost ones of the transfer levers 216, the displaced portion 208a of the transfer disc 208 rotates into operative relation with the bifurcated ends of the first ones of the selector levers 201. Upon further rotation of the transfer cam disc 208 the displaced portion 208a sequentially slides the selected selector levers, which in the assumed case are levers 201b and 201d, to the left an amount equal to the amount of offset of the displaced portion 208a of transfer cam disc 208. During such movement of these selected selector levers 201 the left hand ends thereof engage the right hand ends of associated transfer levers 216 to cause these associated transfer levers to slide to the left an amount substantially equal to the horizontal movement of the selector levers 201. Such leftwardly moved transfer levers 216 are hereinafter referred to as being in their operated or marking position and its other position is hereinafter referred to as its unoperated, right

hand or spacing position, these positions being shown by the dot-dashed and full outlines thereof respectively in Fig. 19. The reset cam 257 has a beveled leading surface 259, best seen in Fig. 18, which, as the transfer cam assembly rotates engages the bottom of a depending section 261, Figs. 14, 16 and 17, on the bifurcated ends of the selected selector levers 201 and causes the selected selector lever 201 to pivot in a clockwise direction to a position, such as that shown in Fig. 17. During such pivoting movement of the selector levers 201, the bifurcated left hand ends are elevated out of operative relation with the displaced portion 208a of the disc 208, but their attached springs 204 are prevented from moving them an appreciable amount toward the right because of a flange 262 forming a part of the reset cam 257 engages the right side of the sections 261 of the selector levers. While the depending sections 261 of the selector levers 201 are in engagement with a radial surface 259a of the reset cam 257 the flange 262 passes out of operative relation therewith, thereupon the springs 204 attached to the selector levers slides them to the right and the projections 261 slide out of operative relation with the radial surface 259a of the reset cam 257. However, before the depending projections 261 pass off the radial surface 259a of the reset cam 257 the right hand ends thereof are positioned beneath the latching projection 199 on the associated latches 115. Therefore, as the depending sections 261 slide off the radial surface 259a of the reset cam 257 the springs 204 pivot the associated selector levers a slight amount in a counter-clockwise direction back into their normal latched or spacing positions. From the above it will be noted that during the returning of the selector levers 201 to their normal latched position there is no engagement therebetween with their associated latches 115 until they reach their latching position. Such an arrangement has the advantage that the latches 115 are not disturbed in the relatching operation and does not require any time for them to settle down, thus permitting the selector to operate accurately at a comparatively high rate of speed. Some time after the reset cam 257 passes out of operative relation with the selector levers 201 the transfer cam assembly is brought to rest as hereinbefore described in its normal rest position. As the transfer assembly comes to a stop in its normal rest position, the end of a spring biased pivoted latch 260, Fig. 23, pivots into operative relation with an edge of the gathering cam 256 and prevents rotation of the assembly in a reverse direction due to its sudden stop. The gathering operation of the transfer levers 216 into their spacing position, the transfer operation and the reset of the selector levers 201 preferably occur in overlapped relation enabling the selector to operate smoothly and does not require the movement of all the selectors into one position to be completed before some start to move into another position.

Typewheel stop unit

A typewheel stop unit indicated in general by reference numeral 267, Figs. 2, 5 and 13, is employed to stop the typewheel in a selected angular position. The stop unit is of the drum type which is familiar to those versed in the art and the manner in which it is constructed and controlled by the transfer levers 216 will now be described.

The various elements of the stop unit are

centered about a horizontal sleeve 268 which has a flange 269 adjacent the center thereof. On the sleeve 268 and at the left of the flange 269 as shown in Fig. 13, from right to left, is a disc member 271, a spacer 272, a rear stop member guide plate 273, a stop member pivot plate 274 and a clamping plate 276. A set of screws such as 277 threaded into the flange 269 clamp all of the members on the left of the flange together and in place on the sleeve 268. Mounted on the sleeve 261 at the right of the flange 269, from left to right, is a spring anchor plate 278, a spacer 279, a series of circular guide plates 281 intermediate with filler washers 282, a spacer 283 and a nut 284. The nut 284 in threaded engagement with the threaded right hand end of the sleeve 268 clamps the above named elements to the right of the flange 269 together and in place on the sleeve. Rotatively mounted on each of the filler washers 287 are a series of five code discs indicated and referred to in general by reference numeral 286 and individually by reference numerals 286a to 286e. The code discs 286 are slightly thinner than the filler washers 282 and are therefore rotatively movable within the spaces formed between the guide plates 281. One of the discs, such as 286d, is shown in Fig. 14 and a schematic developed view of this and the other discs 286a to 286e are shown in Fig. 48. It will be noted that the disc 286e, which is of a smaller diameter than the others for reasons hereinafter apparent, has no notches such as 287, Figs. 14 and 48, in the periphery thereof. The other four code discs 286a to 286d have the notches 287 arranged in the periphery thereof in a predetermined manner, each disc having the notches arranged differently from those in another.

Extending horizontally from the right hand face of the disc member 271, as shown in Fig. 13, are a series of studs 288. Clearance holes are formed in the spring plate 278, the guide plates 281 and the code discs 286 for the passage of the studs 288 therethrough and secured to the right hand ends of the studs 288 by screws such as 289 is a front stop element guide plate 291. The rear and front guide plates 273 and 291, respectively, have formed in the periphery thereof as shown more clearly in the developed views thereof in Fig. 48, a plurality of radial slots such as 292 which are in alignment with one another. Extending between the guide plates and guided in the slots 292 are a series of stop members 293. These stop members 293 have notches adjacent the left hand ends thereof which engages the pivot disc 274 and are pivotally mounted thereat. Adjacent the center of each of these stop members 293 are attached individual resilient springs such as 294, the other ends of the springs being anchored in a spring anchor plate 278. Thus the stop elements 293 are urged toward the center of the stop unit. However, the notches 287 in the code discs 286 are arranged so that for any combination of settings of the discs only one axial row of notches will be in alignment and therefore all the stop members with the exception of the one in operative relation with the aligned row of notches will be prevented from entering the notches 287. Obviously the stop member 293 in operative relation with the aligned row of notches will be allowed to pivot about the pivot disc 274 and move its right hand end toward the center axis of the stop unit an amount determined by the depth of the notches in the code disc. There are four

notch code discs 286a to 286d and as is familiar to those versed in the art, with four elements movable from one of two positions to another sixteen combinations of settings may be obtained. Therefore there are sixteen stop members 293 arranged around the stop unit, each one of which is selectable depending upon the position of the code disc 286.

Each of the code discs 286 have a slot, such as 296 Fig. 14 therein which engages the rounded end of a depending portion 298 of an associated transfer lever 216. Each of the transfer levers 216 has an associated code disc 286 and as the gathering cam 256 engages the depending portions 258 at the right hand ends of the transfer levers that happen to be in their marking position to move them to their spacing position and prepare them for the transfer operation, as hereinbefore described, the depending portions 298 of the transfer levers causes the associated code discs to pivot a slight amount in a clockwise direction. This places all of the code discs 286 in a normal or spacing position and during the following transfer operation hereinafter described, the transfer levers 216 associated or in alignment with the unlatched selector levers 201 are slid to the left into their marking positions which causes the associated code discs 286 to rotate in a counter-clockwise direction a slight amount into their marking positions. On the selection of the assumed character where the second and fourth impulses are marking the code discs 286b and 286d will be rotated into their marking position and the other code discs 286a, 286c and 286e left in their spacing positions. Such a combination of settings of the code discs 286 causes an alignment of notches in operative relation with a stop member 293a, Fig. 48, and consequently the forward end of the stop member will be allowed to pivot toward the center of the typewheel stop unit. The manner in which it causes the typewheel to be stopped in a corresponding angular position will appear in the following paragraphs.

The complete stop unit 267 is mounted to the plate 64, Fig. 13, by a set of screws such as 299 threaded in the rear stop member guide plate 273. Pivotally supported within the sleeve 268 is the typewheel stop unit shaft 63. The typewheel stop unit shaft 63 derives its rotative force through a slip friction clutch indicated in general by reference numeral 301 which is located adjacent the left hand end thereof as shown in Fig. 13 from the constantly rotating stop unit gear 62. The friction clutch 301 is substantially similar to those on the selector cam shaft 89 hereinbefore described. The gear 62 is secured by screws, such as 302, to a gear hub 303 loosely mounted on a shaft 63. A series of pins 304 extending axially from the left hand face of the gear hub 303 engage segments 306 of a segmented ring and rotate the same therewith. The segments 306 surround a felt ring 307 on the outer circumference of a collar 308 at the left hand end of the shaft 63 and a radially contractable circular coiled spring 309 surrounding the segments 306 holds them, together with the felt ring 307 in frictional engagement with the periphery of the collar 308, tending to rotate the collar therewith. The collar 308 has a square hole at the center which fits over the square left hand end of the shaft 63 and is rotatable therewith. Thus the shaft 63 tends at all times to rotate with the gear 62 and does so when not held from rotation as hereinafter described. Fixed adjacent the

right hand end of the shaft 63 for rotation therewith is a stop arm 311, the end of which is in operative relation with the right hand ends of the stop members 293. Normally the end of the stop arm is engaged with the right hand end of a selected stop member 293 and the stop unit shaft 63 is thereby prevented from rotating. As the code discs 286 that happen to be markedly positioned are being reset to their normal or spacing position by the gathering cam 256, after little rotations of the transfer cam assembly, as described, the sloping sides of the notches 287 engages the previously selected one of the stop members 293 and cams it back into its normal position. This causes the disengagement of the end of the previously selected stop member 293 with the stop arm 311 whereupon the stop arm and the stop unit shaft 63 are free to rotate through the action of the friction clutch 301. This rotation of the shaft 63 continues until the end of the stop arm 311 engages the end of the stop member 293 selected as a result of the following transfer operation whereupon further rotation of the stop unit shaft 63 ceases. Thus from the above it is evident that the stop unit shaft 63 can be selectively brought to rest in any one of sixteen angular positions and the manner in which it controls the angular position of the typewheel will appear in the following paragraphs.

Typewheel elevating control

As hereinbefore stated the composite typewheel employed in the preferred embodiment of the invention is mounted in such a position that the axis thereof is in a substantially vertical plane and it has the type symbols or type elements arranged in four peripheral rows around the circumference thereof. Each peripheral row of type elements has sixteen type symbols or printing positions therein and forms sixteen vertical columns with four type elements in each column. The vertical column, in the typewheel, which is rotated into a printing position is determined by the typewheel stop unit 267 hereinbefore described under the control of the first four impulses of each code group and the mechanisms called the typewheel elevating control for determining which, one of the four type elements in a vertical column, on the typewheel will be placed in a printing position will now be described.

It is well known in the art that with a five unit code thirty-two permutations or combinations of impulses are available and in order to increase the number of selections, case shift signals called shift and unshift signals are employed, each of these signals comprising a complete code group in themselves. Following the receipt of an unshift signal the typewheel will be positioned so that a type element in either its first or second peripheral rows, from the top, will be in a printing position, and following the receipt of a shift signal a type element in either its third or fourth peripheral rows of type elements will be in a printing position. The fifth impulse of each selecting code group of impulses determines which one or the other of two type elements in the first and second or the third and fourth peripheral rows of type will be in a printing position.

The fifth transfer lever 216e, Fig. 19, positioned in accordance with the fifth impulse of each code group and under the control of the fifth selector lever 201e has a straight sided vertical notch

314 therein adjacent its right hand end. Engaged in the notch 314 as shown in Figs. 33 and 39, is the rear end of a horizontal lever 316. The lever 316 is pivotally mounted adjacent its center on a vertical shoulder screw 317 supported in a bracket 318 attached by screws such as 319 to the top of the vertical mounting plate 136. As the transfer lever 216e slides back and forth under the action of the displaced portion 208a of the transfer and gathering cams 208 and 256 respectively, the lever 316 is caused to pivot back and forth. With the transfer lever 216e in a marking position the lever 316 is pivoted to such a position that a hook shaped depending portion 321 on the forward end thereof is out of operative alignment with the upper end of a substantially vertical lever 322 and with the transfer lever 216e in a spacing position the hook portion 321 is in front of and in operative alignment with the upper end of the lever 322. A pivot pin 323 horizontally supported in a bracket 324 attached to the front side of the mounting plate 136 pivotally supports the vertical lever 322 and a spring 326 attached to the upper end of the lever 322 normally tends to pivot it in a clockwise direction as shown in Fig. 33. The manner in which the lower end of the lever 322 cooperates with an elevator slide bar 327 to assist in determining which peripheral row in the typewheel is selected or placed in printing position will hereinafter appear.

Referring to Fig. 19 which diagrammatically shows the transfer levers 216 in their spacing positions by the full outlines thereof and one in its marking position by the dot-dash outline thereof, it will be noted that, adjacent the center of each of the transfer levers are a series of beveled notches such as 329. The notches 329 are located both on the upper and lower sides of the transfer levers 216 and are beveled on one or both of the sides thereof. Extending horizontally at right angles to the transfer levers 216 and in operative relation with the notches 329 therein are a series of seven pivot levers referred to and indicated in general by reference numeral 331 and individually by reference numerals 331a to 331g. The pivot levers 331a to 331e are in operative relation with the notches 329 on the top of the transfer levers 216 while the pivot levers 331f and 331g are in operative relation with the notches on the under side of the transfer levers. The pivot levers 331 are pivotally mounted at their right hand ends on two pivot rods 339, Figs. 6 and 33, supported in a vertically slotted block 341 attached to the front side of the mounting plate 64. The slots in the block 341 guide the right hand ends of the pivot levers while other vertical slots in a vertical section of the bracket 318 guide the pivot levers adjacent their left hand end. A series of springs, such as 342, one individual to each of the pivot levers 331a to 331e tend to pivot these levers in a counterwise direction and urge the center portion thereof into the notches on the top of the transfer levers 216. Two other springs such as 343 attached to the pivot levers 331f and 331g tend to pivot these levers in a clockwise direction and urge the center portion thereof into the notches on the under side of the transfer levers 216. The portions of the pivot levers 331 in operative relation with the transfer levers 216 are wedged-shaped in order that they will more readily enter and be removed from the notches 329 in the transfer levers 216 in the manner hereinafter described. The notches 329 are ar-

ranged in the transfer levers so that when the transfer levers 216 are, all but 216c, markedly positioned a row of notches in operative relation with the pivot lever 331a will be in alignment and allow this pivot lever to enter the aligned row of notches under the action of its attached spring 342. Similarly, when the transfer lever 216d only is markedly positioned, the pivot lever 331b is allowed to enter a row of aligned notches. Likewise the pivot levers 331c, d, e, f and g are allowed to enter rows of aligned notches 329 in the transfer levers 216 when the transfer levers are positioned as follows: only 216c marking, all spacing, all marking, 216b marking, and 216a, b, and d, marking respectively. Thus for any one of these combinations of settings of the transfer levers 216 one of the pivot levers will be allowed to pivot and enter a row of aligned notches in the transfer levers 216, and obviously the notches 329 are arranged so that only one of aligned row exists at a time. The shift and unshift signals, according to a predetermined arrangement are such that the pivot levers 331a and 331e are allowed to enter rows of aligned notches on the receipt of shift and unshift signals respectively.

Attached to the front side of the vertical mounting plate 136 by screws such as 346, Figs. 32 and 33, is a shift control mounting bracket 347. Extending from the lower part of the bracket 347 is a pivot stud 348 which has pivotally mounted thereon a four-armed shift control member 349 adjacent the center thereof. Pivotally attached to the ends of the substantially horizontal arms of the member 349 are two upwardly extending push rods 351 and 352. The push rods 351 and 352 are guided adjacent the center thereof by clearance holes in a plate 353 adjustably attached by screws 354 to the upper horizontal section of the bracket 347. The upper ends of the push rods 351 and 352 are located beneath the left hand ends as shown in Fig. 33 of the pivot levers 331a and 331e respectively. With the shift control member 349 in the position shown in Fig. 32, the entering of the pivot lever 331a into a row of aligned notches 329 in the transfer levers 216 allows the underside of the movable end of this pivot lever to engage the top of its associated push rod 351, exerting a downward force on the rod which causes the shift control member 349 to pivot a slight amount in a counter-clockwise direction. The amount of pivoting of the member 349 is limited by horizontal projections 356 of an angle bracket 357 secured to the bracket 347 engaging the substantially vertical upwardly extending arm 358 of the member 349. The upper end of the arm 358 is beveled and cooperates with a roller 359 adjacent the right hand end of a substantially horizontal pivotally mounted spring biased jockey arm 361 to bias the member 349 in its actuated position. In a similar manner the selection on the pivot lever 331e causes the four-armed shift control member 349 to pivot from its left hand position back into its right hand position.

As best shown in Fig. 33 portions of the downwardly extending arm of the member 349 are bent at right angles and carries therein a pivot pin 362. Pivotally mounted on the pivot 362 is an elevator bar stop lever 363. A spring 364 attached to the lever 363 and the lower end of the member 349 tends to pivot the lever 363 in a clockwise direction and normally holds it against the end of an adjusting screw 366 carried in the

lower end of the member 349. The lower end of the stop lever 363 is bent horizontally toward the left as shown in Fig. 33 to form a leftwardly extending finger 369 and a stepped section 367. A toe 368 extending vertically from the rear end of the elevator slide bar 327 cooperates with the finger 369, the stepped section 367 and the lower end of the lever 322 to control which one of the four peripheral rows of type elements on the typewheel will be positioned in a printing position.

Following each cycle of operation of the selector mechanism and operating in timed relation therewith the hereinbefore mentioned elevator slide bar 327 starts to slide to the right, as shown in Figs. 31, 33 and 37, and the amount it is permitted to slide in this direction is controlled jointly by the positions of the shift control member 349 and the lever 316. The amount that the elevator slide bar slides to the right determines which one of the four peripheral rows of type elements on a typewheel will be placed in a printing position. Assume that a code group of signals is received corresponding to the unshift signal and that the fifth impulse of the following groups is spacing. As hereinbefore described for such conditions the shift control member 349 will be moved to the position shown in Fig. 32 and the hooked end of the lever 316 will be in front of or in the path of movement of the upper end of the lever 322. Now, as the elevator slide bar 327 starts to move under the control of mechanism hereinafter described, the toe 368 thereon engages the end of the finger 369 of the lever 363. The lower end of the lever 322 is in contact with the back side of the lever 363 and further movement of the toe 368 causes both the levers 363 and 322 to pivot in a counterclockwise direction as shown in Fig. 33. This pivoting movement is not very great and continues only until the upper end of the lever 322 engages the hooked end 321 of the lever 316 whereupon further movement of the levers 322 and 363 and the elevator slide bar 327 is prevented, the position of the toe 368 on the elevator slide bar lever 327 at this time being substantially that shown by the dot-dash outline thereof in Fig. 33. The instrumentalities causing the movement of the elevator slide bar 327 are sufficiently strong to overcome the tensions of the springs 326 and 364 and therefore they have no appreciable effect on its movement. Now, let it be assumed that the fifth impulse of a code group following an unshift signal is marking and accordingly the hooked end 321 of the lever 316 will be out of path of the upper end of the lever 322. For this condition, the toe 368 of the elevator slide bar 327 is allowed to pivot the levers 363 and 322, until the back side of the lower end of the lever 322 engages a stop such as the screw 372 in the mounting plate 136. This allows the toe 368 and the slide bar 327 to slide a distance somewhat greater than it was permitted to slide for the previous assumed set of conditions and such a position relative to its dot-dashed normal position is shown by the full outline thereof in Fig. 34. On receipt of a shift signal the shift control member 349 moves the lower end of the lever 363 to such a position as shown by the dot-dash outline thereof in Fig. 32. This places the finger 369 on the end of the lever 363 out of alignment with the toe 368 and the stepped section 367 in alignment therewith while the receipt of a following code combination wherein the fifth impulse is spacing, as hereinbefore described, positions the lever 316 so as to prevent any appreci-

able movement of the lever 322. Accordingly, for this set of conditions, the elevator slide bar 327 and toe 368 are permitted to slide to the position shown by the full outline thereof in Fig. 35, relative to its dot-dashed normal position. Where the fifth impulse of a code group following a shift signal is marking, the hook 326 of the lever 316 is pivoted out of the path of the upper end of the lever 322 and consequently the elevator slide bar 327 and toe 368 are allowed to move until they cause the levers 322 and 363 to engage the stop 372, such a position of the toe 368 being shown by the full outline thereof in Fig. 36 relative to its dot-dashed normal position. Thus, depending upon the positions of the shift control member 349 and the transfer lever 216e which are controlled by the shift signals and the fifth impulse of succeeding code combinations, respectively, the elevator slide bar 327 may be stopped in any one of four positions and the manner in which it controls which one of the peripheral rows of type are placed in a printing position will be hereinafter described.

Function control

The pivot levers 331a and 331e in addition to controlling the position of the shift control member 349 in the manner hereinbefore described, together with the other pivot levers 331b, c, d, f and g control the operation of a set of seven so-called pivot point slide bars referred to and indicated in general by reference numeral 373 in Figs. 2 and 28 and individually by reference numerals 373a to g, Figs. 29, 30 and 47. The pivot point slide bars 373 are supported and guided in a horizontal position by a series of vertical slots formed in the upper part of a horizontal block 374 in such a manner that a rear or right hand end of each of the pivot point slide bars 373, as shown in Fig. 29, is in operative alignment with the front or left hand end of an associated one of the pivot levers 331. The block 374, Figs. 28 to 30, is attached to the horizontal section of the bracket 347 which is supported at its front end by a set of rods such as 376 extending from the base plate 56. The left hand end of each of the pivot point slide bars 373 have upwardly extending projections 377 to which are attached one end of individually associated springs 378. The other ends of the springs 378 are anchored in a bracket 379 attached by screws 381 to the top of the block 374. The springs 378 tend to slide the pivot point slide bars to the right as shown in Figs. 28 and 29, but are normally prevented from doing so by an arm 382 engaging a vertical surface adjacent the right hand end of each of the slide bars 373. The arm 382 is carried on the upper end of a lever 383 which is pivotally supported at its lower end on a pin 384 carried in the bracket 324. The lever 383 has a horizontal arm 386 formed integral therewith which pivotally carries at the end thereof a roller cam follower 387. The roller cam follower 387 is in operative relation with a cam 388 formed by a flange of the transfer cam assembly mounting hub 237 adapted to rotate with the hereinbefore described transfer cam assembly. When the transfer cam assembly is released for rotation, as described, and has rotated a predetermined amount from its normal rest position, the cam follower 387 comes into operative relation with the section of the cam 388, which is of decreased radius. This allows the pivot point slide bars 373 engaged with the arm 382 to pivot the lever 383 in a clockwise di-

rection as shown in Fig. 28. Normally the left hand ends of the pivot levers 331 are in operative alignment with the right hand ends of their associated pivot point slide bars 373, and after the pivot point slide bars 373 have moved a small amount toward the right, the right hand ends thereof, engage the left hand ends of their associated pivot levers 331 and further movement of the slide bars 373 in this direction is stopped. However, when any one of the pivot levers 331 is allowed to enter a row of aligned notches in the transfer levers 216, the left hand end pivots sufficiently to move out of operative alignment with the right hand end of its associated pivot point slide bar 373. Therefore, as the pivot point slide bars 373 slide to the right in timed relation with the operation of the transfer levers 216, the slide bar 373 associated with an operated pivot lever 331 is allowed to slide to the right further than the rest and assumes an operated position such as that shown by the dot-dash outline thereof in Fig. 28. The manner in which a pivot point slide bar 373 in such an operated position controls or prevents the operations of the printer functions will appear in following paragraphs.

In telegraph printers it is desirable at times that certain predetermined printer functions be allowed or prevented only when preceded by one or the other of the shift signals or when the printer is in a shift or unshift condition. Accordingly, the pivot point slide bar 373g is allowed to assume an operated position only when the printer is in a shift condition or an unshift signal has not been received, since the receipt of the last shift signal, and the manner in which the operation of the pivot point slide bar 373g is also controlled by the pivot point slide bars 373a and 373e in addition to its pivot lever 331g will now be described. Attached by screws 389 to the under side of the horizontal section of the bracket 347 is a member 391, Figs. 28 to 30, which has pivotally supported on shoulder screws 392 and 393 adjacent the two ends thereof two bell cranks 394 and 396, respectively. Attached to the left hand ends of the pivot point slide bars 373a and 373e, as shown in Fig. 47, are downwardly extending lugs 397 and 398, respectively, which are associated with one of the arms of the bell cranks 394 and 396, respectively. The other ends of the bell cranks 394 and 396 are in operative relation with downwardly extending projections 399, Figs. 29 and 30, at the two ends of a slidable bar 401. The slidable bar 401 is supported on horizontally shoulder screws 402 in the block 374 and is movable thereon an amount substantially equal to the length of slots 403 in the bar 401. Attached adjacent the center of the slidable bar 401 is a notched block 404 which has formed in the center thereof a vertical notch 406. With the slidable bar 401 in its left hand position as shown in Fig. 30, the movement of the pivot point slide bar 373e to an operated position allows the lug 398 to engage one arm of the bell crank 396 to pivot the same which causes the other arm to engage the projection 399 associated therewith and slide the slidable bar 401 to the right. Fixed to the front end of the pivot point slide bar 373g is a downwardly extending plate 407, and when the slidable bar 401 is in its right hand position a section of the block 404 is in the path of the plate 407. Consequently for such a position of the slidable bar 401 the movement of the pivot point slide bar 373g to an operated position is prevented on the operation of its associated piv-

ot lever 331g. Similarly, the operation of the pivot point slide bar 373a pivots its associated bell crank 394 to slide the slidable bar 401 to the left and with the slidable bar 401 in its left hand position, the notch 406 in the block 404 is in alignment with the plate 407 on the pivot point slide bar 373g and therefore does not block its movement. Thus the pivot point slide bar 373g is allowed to move to an operated position only following a shift signal and the associated printer function which it controls and prevents in its operated and normal positions will be described hereinafter.

Operating shaft

The printing operation, the line feed operation, the letter spacing operation, etc., of the printer are performed by a set of cams on an operating cam sleeve, a description of the arrangement and operation of which now follows: Referring to Fig. 6 the above mentioned operating cam shaft 81 which is constantly rotated by means of the gear 76 fixed thereto, is journaled adjacent its left hand end in a flanged bushing 411, adjacent the center in a bushing 412 and adjacent the right hand end a bushing 413. The bushing 413 is supported from the mounting plate 64 and the bushing 412 from the mounting plate 136. The left hand bushing 411 is supported from a bearing post 414 attached to the base plate 56. Loosely mounted on the operating cam shaft 81 adjacent the left hand half thereof is an operating cam shaft sleeve 416 which has mounted thereon from left to right intermediate with a set of spacers such as 417 a so-called elevator bar operating cam 418, a typewheel reset operating cam 419, a print operating cam 421, a typewheel car letter spacing cam 422, an elevator slide bar operating cam 423 and a function or floating lever assembly operating cam 424. These cams are all clamped in position against a flange on the right hand end of the sleeve 416 for rotation with the sleeve by a nut 426 in threaded engagement with the threaded left hand end of the sleeve. The sleeve 416 is prevented from longitudinal movement toward the left on the shaft 81 as the left hand end thereof is in abutting relation with the bushing 411, and a sleeve 427 in abutting relation with the right hand end of the operating cam sleeve 416 prevents the sleeve 416 from moving toward the right. The right hand end of the sleeve 427 abuts against a flanged collar 428 affixed to the operating cam shaft 81 for rotation therewith by a set screw 429. The cam sleeve 416 is adapted to rotate with the operating cam shaft through the instrumentality of a ratchet clutch indicated in general by reference numeral 431, substantially similar in operation and construction to the clutch employed to rotate the transfer cam assembly. The driving member of the clutch 431 comprises the collar 428 fixed to the shaft 81 and the driven member, a collar 432 loosely mounted on the sleeve 427. The collar 432 is slidable along shaft 81 but is at all times operatively engaged with the operating cam sleeve 416 by means of interengaging tongues and grooves such as 433. A spring 434 coiled about the tongues and grooves 433 tends to slide the collar 432 toward the right to bring teeth on the right hand face thereof into engagement with similar teeth on the left hand face of the constantly rotating collar 428. However, the collar 432 is normally held to the left with its teeth out of engagement with those on the col-

lar 428 by means of a cam follower 436 engaging a slide cam surface 437, Fig. 7, formed on the circumference of the collar 432. The cam follower 436 is carried in the lower end of an operating cam sleeve clutch throwout lever 438 which controls the operation of the clutch 431. The upper end of the throwout lever 438 is clamped for movement therewith to a horizontal rod 439 pivotally supported in a bushing 441 which is fixed in the mounting plate 136. Attached to the other end of the rod 439 is a lever 442, the upper end of which is in operative relation with a pin 443 extending axially from the cam 333 of the transfer cam assembly. After the transfer cam assembly has rotated a predetermined amount from its normal rest position the pin 443 engages the lever 442, causing it and the rod 439 to pivot in a counterclockwise direction as shown in Fig. 7. The rod 439 in turn pivots the clutch throwout lever 438 and withdraws the cam follower 436 from engagement with the slide cam surface 437. Thereupon the spring 434 slides the collar 432 to the right, as shown in Fig. 6, to bring its teeth into engagement with the teeth of the constantly rotating collar 428, whereupon the operating cam sleeve 416 rotates with the shaft 81. After the pin 443 actuates the levers 442 and 438 a spring 444 returns the levers to their normal position with the cam follower 436 riding on the circumference of the collar 432 and in the path of the slide cam surface 437. When the cam sleeve 416 has made nearly a complete revolution the slide cam surface 437 engages the cam follower 436 and cams the collar 432 to the left, disengaging its teeth with those of the collar 428. A further projection of the slide cam surface 437 substantially parallel to the axis on the shaft 81 then engages the cam follower 436 bringing the collar 432 and sleeve 416 to a stop in their normal stop positions. In order to prevent bounce or rotation of the sleeve 416 in a reverse direction due to its sudden stop, a spring biased latch 446 pivotally supported from the mounting plate 136 is engageable with a notch on a disc 447 rotatable with the sleeve 416 in its stop position. Thus the operating cam sleeve 416 is rotated one revolution for each received group of signals and the operations performed during its rotation will be hereinafter pointed out in conjunction with the various mechanisms operated thereby.

Printing unit

A printing unit comprising in general a typewheel 448 and a printing platen 449, together with their associated elements, are located as shown in Fig. 1, at the front part of the printer. Two vertical plates 451 and 452 extending toward the rear are secured to the base plate 56 and provides supports for the various elements of the printing unit which are disposed for the most part therebetween. The ends 453 and 454 of a horizontally disposed U-shaped member 450 are secured to the mounting plates 451 and 452. Supported in the ends 453 and 454 of the member 450 and extending therebetween are two typewheel car guiding rods 456 and 457. The rod 456 is fixed by a set screw 458 to the block 453, while the rod 457 is pivotally supported thereat, being held in place by collars 459. A typewheel car bracket 461, Figs. 40 and 41, shaped substantially in the form of a horizontal U, carries therein a set of bushings such as 462 which are slidably mounted on the rods 456 and

457. Carried in the lower part of the typewheel car bracket 461 are horizontal pivot rods 463 upon which is pivotally mounted at its lower end a typewheel shaft mounting bracket 464. The typewheel shaft mounting bracket 464 has two substantially horizontal sections adjacent its upper and lower ends which carry therein bushings 468 and 469 respectively. Pivotally supported in the lower bushing 469 is a collar 471 which has in the center thereof a square hole in which is carried the lower square end of a typewheel shaft 472. The upper section of the typewheel shaft 472 is round and is pivotally supported in the bushing 468. A flanged sleeve 473 clamped to the upper end of the typewheel shaft 472 by means of a threaded clamping unit such as 474 has thereon intermediate with the spacers, such as 476, four type discs which have type elements on the periphery thereof as shown in the developed view, Fig. 45, and comprise the composite typewheel 448. The discs and the spacers 476 are clamped together and in fixed position on the collar 473 for rotation therewith and the typewheel shaft 472 by a nut 478 in threaded engagement with the upper end of the sleeve 473. Pinned to the shaft 472 adjacent the center thereof by a pin 479 is a threaded flanged collar 481. Two nuts 482 are threaded on the collar 481 and the lower one engages the upper face of the collar 469 to limit the lower position of the typewheel shaft 472. Pinned to the collar 471 for rotation therewith by pins such as 483, is a beveled gear 484 which engages with a similar horizontally mounted beveled gear 489 hereinafter described. A compression spring 487 coiled about the lower square section of the typewheel shaft 472 exerts a downward force on a cap 488 attached to the lower end of the typewheel shaft and tends to keep the typewheel shaft in the lower position.

With the typewheel shaft 472 in its lower normal position, as limited by the lower nut 482 engaging the upper face of the collar 469, the upper type disc of the typewheel 448 is in substantially the same horizontal plane as the axis of the printing platen 449, best shown in Fig. 6, and accordingly the upper type disc is in a so-called printing position or printing plane. The typewheel shaft 472 is elevated in a manner hereinafter described to bring the other type discs of the typewheel 448 into printing position on the printing plane. Each of the type discs of the typewheel 448 has sixteen type elements or positions thereon and it is rotated to bring the selected type element opposite the printing platen 449 prior to the printing operation. The beveled gear 484 is employed to rotate the typewheel shaft 472 and it meshes with the beveled gear 489 fixed for rotation therewith by rivets such as 491 to the flanged end of a short shaft 492, Fig. 46. The shaft 492 is journaled in a threaded bushing 493 which is supported by a depending section 494 of the typewheel shaft car bracket 461. A nut 496 on the sleeve 493 clamps the sleeve in position. Secured to the right hand end of the shaft 492 by a set screw 497 is a member 498 which comprises one element of a universal joint indicated in general by reference numeral 499. The member 498 pivotally supports a block 502 which has extending from opposite sides thereof pins 503 which pivotally engage two elongated members 504. The members 504 are riveted to opposite sides of a square shaft 506 adjacent the left hand end thereof and the right hand end of the square shaft 506 fits

or telescopes into a square sleeve 507. Riveted into the right hand end of the square sleeve 507 is a block 505 which has riveted to opposite sides thereof two members, such as 509. These two members 509 pivotally engage pins 511 on opposite sides of a block 512 comprising a second universal joint indicated in general by reference numeral 513 and similar in construction to the universal joint 499. Pivotaly engaging other pins 514 extending from opposite sides of the block 512 is a forked collar 516 which is attached by a set screw 517 to the end of the typewheel stop unit shaft 63, Fig. 13, for rotation therewith. Thus the typewheel stop unit shaft 63 and the typewheel shaft 472 are connected for rotation together while the universal joints 499 and 513 and the square shaft 506 and the sleeve 507 permit the typewheel shaft 472 to move to and fro to effect letter spacing. The universal joints 499 and 513 are arranged so that angularities occurring therein substantially compensate one another and the typewheel stop unit shaft 63 and the typewheel shaft 472 rotate in substantial synchronism.

Typewheel elevator

The typewheel stop unit shaft 63, as described, is capable of being stopped in any one of sixteen angular positions, and as the typewheel shaft 472 is connected thereto through the universal joints 499 and 513 and beveled gears 484 and 489 having a one to one ratio, it may also be stopped in any one of sixteen angular positions. Normally, the upper type disc on the typewheel 448 is in the printing plane and the manner in which it is elevated to bring any one of the other three lower type discs into the printing plane will now be described. This operation is controlled by the position of the hereinbefore mentioned shift control member 349 cooperating with the lower end of the lever 322, the operation being performed and timed by the elevator slide bar operating cam 423.

Attached to the base 56 by screws such as 521 is a substantially vertical H-shaped bracket 522, Figs. 31 and 37. The bracket 522 has attached to it by screws such as 523 two horizontally grooved blocks 524, the grooves of which provide a guideway for the hereinbefore mentioned elevator slide bar lever 327. The screws 523 also clamp two plates 526 to the blocks 524 to hold the slide bar 327 in the grooves. Extending horizontally from adjacent the center of the slide bar 327 is a pin 527 which has attached thereto a comparatively strong retractile spring 528, the other end of which is anchored to a post 529 in the bracket 522. The spring 528 tends to slide the elevator slide bar 327 to the right, as shown in Figs. 31 and 37, but is normally prevented from doing so by a roller 531 pivotally supported on a pin 530 adjacent the center of the slide bar 327, engaging a vertical arm of a bell crank 532. The bell crank 532 is pivotally supported from a stud 533 extending horizontally from the bracket 522 and has pivotally supported on the leftwardly extending arm a roller 534. Engaging the top of the roller 534 is the bottom of an adjustable screw 536 which is carried in the leftwardly extending arm of another bell crank 537 which is pivotally supported on a bracket 538, Fig. 38. The upwardly extending arm of the bell crank 537 has pivotally supported therein a roller cam follower 539 which is in operative relation with the periphery of the elevator slide bar operating cam 423 on the operating cam sleeve 416. The spring 528 tending to

slide the elevator slide bar 327 to the right, tends to pivot the bell cranks 532 and 537 in a clockwise direction as shown in Figs. 31 and 38, and normally keeps the cam follower 539 in engagement with its associated cam 423.

Referring to the timing chart of the cams on the operating cam sleeve 416, Fig. 49, it will be noted that after the operating cam sleeve 416 has rotated approximately thirty-five degrees from its rest position, the drop in the cam 423 will be in operative alignment with its cam follower 539, whereupon the spring 528 will be allowed to start to slide the elevator slide bar lever 327 to the right. However, the amount the slide bar 327 moves is determined as hereinbefore described by the position of the shift control member 349 and the lever 322 which block the toe 368 attached to the slide bar 327 at any one of four different positions.

Extending horizontally and at right angles from adjacent opposite sides of the left hand end of the slide bar 327 are two right angle brackets 541 and 542, Fig. 37. The bracket 541 carries two adjusting screws 543 and 544 which extend in the direction of movement of the slide bar 327 and the bracket 542 carries one adjusting screw 545. The adjusting screws 543, 544 and 545 are in operative alignment with vertically mounted latches 547, 548 and 549, respectively. The latches 547 to 549 are pivotally supported intermediate with spacers, on a horizontal pin 551 in a bracket 552, Fig. 1, attached to the front center section of the printer base 56. Individual springs such as 553 attached to the latches 547 to 549 tend to pivot the latches in a counter-clockwise direction and normally holds them against a stop 554. With the shift control member 349 and the lever 322 in the positions shown in Fig. 33 movement of the elevator slide bar 327 to the right will be stopped after the toe 368 has moved to the position substantially indicated by the full outline thereof in this figure. The adjustment of the screws 543 to 545, Figs. 31 and 37 are such that when the toe 368 is stopped in this position, none of the screws engage their associated latches 547 to 549. However, when the toe 368 of the slide bar 327 is stopped in the position indicated by the full line thereof in Fig. 34, the screw 545 is allowed to engage its associated latch 549 and pivot it in a clockwise direction out of its normal position into an off-normal position. Likewise when the toe 368 is permitted to slide to the right to the position indicated by the full outline thereof in Fig. 35, the screws 545 and 544 are both permitted to engage their associated latches 548 and 549 respectively to pivot them in a clockwise direction to an off-normal position. Similarly, when the toe 368 moves to the position as shown by the full outline thereof in Fig. 36 all three of the screws 543 to 545 engage and pivot their associated latches 547 to 549 in a clockwise direction from their normal position to an off-normal position. Obviously, for the last cited condition the amount of pivoting of the latch 549 is greater than that of latch 548 which in turn is greater than that of latch 547, and the spring 528 moving the slide bar 327 has such a retractile force that the springs 553 biasing the latches 547 to 549 in normal position have no appreciable effect on the movement of the slide bar 327. Thus only the latch 549, both the latches 548 and 549 or all three of the latches 547 to 549 may be pivoted out of their normal into off-normal position; and the manner in which they, in their off-normal position control the elevation of the typewheel shaft 472 will herein-

after be described. Associated with the latches 547 and 548 are two locking levers 556 and 557 respectively, which are pivotally supported in the bracket 552, Figs. 31 and 37. These levers 556 and 557 have surfaces such as 558, shown dotted in Fig. 31 which are adapted to engage pins, such as 559, extending horizontally from the latches 547 and 548 to lock them in an off-normal operated position as hereinafter described.

Extending beneath the end of the typewheel shaft 472 is an angle shaped elevator bar 561, Figs. 1, 40, 41, 59 and 60, which is of sufficient length to be in operative relation with the lower end of the typewheel shaft for any longitudinal position thereof. Pivoted adjacent the ends of the elevator bar 561 are two similarly shaped links 562 and 563 which are pivotally supported at their other ends in a bracket 564 attached to the base 56. The links 562 and 563 are similar and their pivot points so arranged that as the elevator bar 561 moves, as hereinafter described, it is always maintained in a level position. Attached to the back side of the elevator bar 561 is a right angle bracket 566 which rests on the top of a roller 567 carried on a stud 568 extending from the front side of a depending arm 573 fixed to the left hand end of a substantially horizontal lever 569. The lever 569 is pivoted at its right hand end on a shoulder screw 571 supported in a bracket 572 secured to the base 56. Also secured to the depending arm 573 is the end of a flexible band 574. The flexible band 574 is adapted to wind around a spring drum indicated in general by reference numeral 576, of the type familiar to those skilled in the art, tending to elevate the lever 569 and hold a cam follower 577, at the right of the center thereof, in engagement with its associated elevator operating cam 418, Fig. 6. A notch in the elevator operating cam 418, operating in timed relation with the elevator slide bar lever 327 and before it has started to return to its normal left hand position rotates into operative relation with the cam follower 577 and allows the spring drum 576 to pivot the lever 569 in a clockwise direction, as shown in Fig. 59. As the lever 569 pivots, the roller 567 moving therewith and in engagement with the bracket 566 on the elevator bar 561, causes the elevator bar to rise, and the amount that the elevator bar 561 is allowed to rise is determined by the position of the latches 547 to 549. If the amount of movement of the elevator slide bar 327 to the right is restricted as hereinbefore described so that none of the latches 547 to 549 are moved out of their normal position, a right angle bracket 578, Fig. 31, attached to the back side of the elevator bar 561, will engage the hook 549 and prevent any appreciable upward movement of the elevator bar 561. If the movement of the elevator slide bar 327 is sufficient to operate only the latch 549 to an operated off-normal position, the elevator bar 561 will be permitted to rise until the bracket 578 engages the latch 548, whereupon further upward movement is stopped. Similarly, when latches 548 and 549 are both in an off-normal position, the elevator bar 561 is allowed to rise until the bracket 578 engages the latch 547 to prevent further movement thereof. When all the latches 547 to 549 are in an operated position, the elevator bar 561 is allowed to rise to a height which is limited by the depth of the notch in the elevator operating cam 418. It will be noted that the latching surfaces of the latches 547 to 549 are

slightly undercut and that the edge of the bracket 578 has a small upwardly extending projection and these two cooperate to prevent the latches from sliding out of engagement with the bracket. As the lever 569 rises a depending member 563 attached thereto allows the levers 556 and 557 to pivot and place the surfaces 558 in the paths of the pins 559 on the latches 547 and 548 if one or both of these latches happen to be operated. Therefore as the slide bar lever 327 returns to its normal left hand position, the latches 547 and 548, if operated do not at this time return to their normal positions but are held operated as the elevator bar may not have reached its desired height before the return of the elevator slide bar 327 to its normal position.

As hereinbefore stated, the elevator bar 561 is normally beneath the lower end of the typewheel shaft 472 and as the elevator bar 561 rises, it engages the cap 488 on the lower end of the typewheel shaft 472 causing the typewheel shaft 472 to rise with the elevator bar 561. Thus the typewheel shaft 472 is elevated to any one of three positions depending on how many of the latches 547 to 549 are in an off-normal position. While the typewheel shaft 472 is in an elevated position a typewheel shaft latch 581, Figs. 41 to 44, is allowed to pivot in a counterclockwise direction, as hereinafter described to place one of the surfaces 580 thereon beneath the flange of the collar 481 attached to the shaft 472 to latch the same in an elevated position. The lever 581 is pivoted at its lower end on the pivot rods 483 and a spring 585 attached thereto and anchored in an arm 582 of the typewheel mounting bracket 464 normally tends to place the surfaces 580 in the path of the collar 481. Thus as the elevator bar 561 returns to its normal position, the typewheel shaft 472 is latched in substantially the highest position to which it is elevated and with the desired type disc or peripheral row of type in printing position. Just before the lever 569 reaches its normal position, it being moved thereto by the cam 418, the downwardly extending member 583, Fig. 31, attached thereto engages the right hand ends of the levers 556 and 557 causing them to pivot and remove the surfaces 558 thereon from operative relation with the pins 559 in the latches 547 and 548. This allows the latches 547 and 548 if operated to return to their normal position. A spring 590, Figs. 59 and 60, attached to the bracket 566 on the elevator bar 561 and a pin 595 in the arm 573 on the lever 569 tends to keep the bracket 566 in engagement with the roller 567 and move the bar 561 with the lever 569. In this manner the typewheel may be elevated and latched in any one of three positions other than its normal position to bring any one of the other three peripheral rows of type into printing position, and as hereinbefore described, the mechanisms for accomplishing this are controlled by the shift and unshift signals together with the fifth impulse of each code group.

Letter spacing of typewheel

In this printer, for reasons hereinafter set forth, for each cycle of operation the movement of the typewheel car from left to right to effect letter spacing occurs prior to the printing operation. In previous paragraphs it has been described how the type wheel is rotated to the desired angular position to bring the correct vertical row of type elements into position, then elevated or left at its normal level so that any

one of the four characters or type elements in the selected vertical row is in printing position and the manner in which the typewheel car is advanced from left to right to effect letter spacing concomitantly with the selection of a type element on the typewheel will now be described.

Attached to the front center section of the hereinbefore mentioned horizontal U shaped mounting bar 450 by screws such as 586, Fig. 40, is a stationary retaining rack 587. Two blocks 588 and 589, Fig. 54, attached to the left and right ends respectively of the member 450 have horizontal grooves therein which guide a horizontally disposed movable rack 591 adjacent the ends thereof in front of the stationary rack 587. Plates such as 592 attached to the blocks 588 and 589 hold the rack 591 in the grooves. The right hand end of the movable rack 591 extending through slots in the right hand end 454 of the member 450 and the side plate 452 has pivotally mounted thereon a roller 593, Figs. 1, 3 and 52. The roller 593 engages the right hand side of depending arm 594 which is fixed for pivotal movement therewith to the front end of a pivot rod 596. The rod 596 is pivotally supported in a horizontal U shaped member 597 attached to the outside of the right hand printer unit mounting plate 452. A spring 598 attached to the right hand end of the rack 591 biases it to the left to normally hold the left hand side of the depending arm 594 against an adjustable eccentric 599 supported in the member 597. Clamped to the rear end of the pivot rod 596 is a substantially horizontal arm 601 which has pivotally attached thereto on a pin 600 adjacent the center thereof, the upper end of a link 602. A flat spring 603 secured to the lever 601 holds the upper end of the link on the pin 600 permitting it to be readily removed therefrom for reasons hereinafter apparent. The lower end of the link 602 is pivotally attached to the right hand end of a letter space operating cam lever 604, which is exactly similar in shape to a print operating cam lever 606 located directly in front of the lever 604. The left hand end of the cam lever 604 extends in the rear of a bracket 607 and has at its left hand end a vertical slot 608 which engages a bushing 609 on the rear end of a shoulder screw 611. A spring 613 attached to the end of the lever 604 and anchored in the bracket 607 normally holds the bottom of the slot 608 in engagement with the bushing 609. The lever 604 has a depending portion 614 directly below the vertical slot 608 which is directly above the upper end of the upwardly extending arm of a three-armed lever 617. The three-armed lever 617 at the rear of the bracket 607 is pivotally supported on a shoulder screw 618 and is exactly the same as a hereinafter mentioned three-armed lever 616 also pivoted on the shoulder screw 618, at the front of the bracket 607. A spring 619 normally holds the vertical arm of the three-armed lever 617 against a pin 621 in the bracket 607 and the purpose of the lever 617 will hereinafter be described. At the center of the lever 604, Fig. 51, is a roller cam follower 622 which is in operative relation with the letter-space operating cam 422 located directly thereabove. After the operating cam sleeve 416 has rotated approximately 120° from its rest position, the hump on the feed or letter spacing operating cam 422 starts to engage its associated cam follower 622 and at first causes the lever 604 to pivot in a counter-clockwise direction with the end at-

tached to the link 602 acting as a pivot point. However, after the lever 604 has pivoted a slight amount in this direction, the depending portion 614 engages the top of the vertical arm of the lever 617 and further pivoting movement of the lever 604 in this direction is stopped. Thereupon further rotation of the cam 422 causes the lever 604 to pivot in a clockwise direction with the depending portion 614 in engagement with the upper end of the vertical arm of lever 617 acting as a pivot point. This pivoting movement of the lever 604 produces a downward movement of the link 602, which in turn causes the pivot rod 596 to pivot in a counter-clockwise direction, Fig. 52. As the pivot rod 596 pivots, the arm 594 attached to the front end thereof engages the roller 593 on the movable rack 591 and slides the rack to the right. Thereafter as the hump of the cam 422 passes out of operative relation with the cam follower 622, the rack 591 slides back to its normal position by the action of its attached spring 598. In this manner the rack 591 is normally oscillated to the right and back again once for each revolution of the operating cam sleeve 416.

The upper portion of the typewheel car bracket 461, Fig. 40, is bent horizontally toward the rear and then downward to form a support for a pivot pin 623. Pivotally supported on the pin 623 are two pawls 624 and 626 which extend toward the left and have the ends thereof engaged with the teeth of the racks 591 and 587, respectively. Flat springs, such as 627, normally hold the pawls 624 and 626 in engagement with the teeth on their associated racks. As the rack 591 moves to the right, as shown in Fig. 54, a tooth thereon engages the pawl 624 and causes the entire typewheel car to move to the right. As the rack 591 moves to the left back into its normal position, the retaining pawl 626 engages the stationary rack 587 and holds the car in its moved position. Attached to the left side of the typewheel car bracket 461 is one end of a flexible band or cord 628, Figs. 1 and 41, the other end of which is attached to a spring drum of the type familiar to those versed in the art and indicated in general by reference numeral 629. The spring drum 629 is supported from a bracket 631 attached to the outside of the printer unit mounting plate 451 and tends to wind the flexible cord 628 about the circumference thereof which biases the typewheel car bracket and attached elements toward the left. It will be evident that by changing the position of the eccentric 599 and by replacing the racks 587 and 591 with other racks having teeth thereon spaced further or closer together, the amount of movement of the typewheel car for each cycle of operation may be varied to accommodate for different amount of car movement required for different size type on the typewheel 448.

Printing operation

After the typewheel has been positioned to the correct angular position, elevated to the correct level and advanced to effect letter spacing, it is ready for the printing operation. This printing operation is accomplished by rocking the typewheel shaft mounting bracket 464 which carries the typewheel shaft 472 through instrumentalities which will now be described. The lower right hand mounting bushing 462, Figs. 41 and 44, of the typewheel car mounting bracket 461 has a shoulder thereon upon which is pivotally supported a lever 632. A nut 633 threaded

on the bushing 462 holds the lever 632 in place. The upper end of the lever 632 shown in dot-dashed outline in Fig. 40 is bifurcated and engages a roller 634 carried in a frontwardly extending arm of the typewheel shaft mounting bracket 464. The lower end of the lever 632 is also bifurcated and engages a square rod 636 which extends the full width of the travel of the typewheel car. The rod 636 is supported at its ends from studs such as 637 extending radially from the rod 457, best shown in Figs. 1 and 52. Fixed to the right hand end of the rod 457, Figs. 3, 51 and 52, which is pivotally supported as hereinbefore described, is a substantially horizontal arm 638, extending toward the rear of the machine. A spring 639 attached adjacent the right hand end of the arm 638 and anchored in the bracket 597 tends to pivot the arm 638 in a counter-clockwise direction and hold it in engagement with an adjustable eccentric 641 attached to the outside of the printer unit frame plate 452. A pin 642 in the end of the arm 638 pivotally supports at its upper end a link 643 which is held on the pin 642 by a flat spring 644. The lower end of the link 643 has pivotally attached thereto by a shoulder screw 646 the hereinbefore mentioned print operating cam lever 606. The left hand end of the lever 606 as shown in Fig. 52 has a vertical slot 647 therein which engages the shoulder screw 611. A spring 648 normally holds the bottom of the slot 647 in engagement with the shoulder screw 611. The lever 606, similar to the lever 604 has a depending section 649 adjacent the left hand end thereof which is directly above the upwardly extending arm of an associated three-armed lever 616. The lever 616 is pivotally supported as is the lever 617 on the shoulder screw 618 and has an associated spring 652 which normally holds the vertical arm thereof in engagement with the pin 621. The manner in which the three-armed lever 651 prevents the printing operation for predetermined conditions will be hereinafter described. Adjacent the center of the print cam operating lever 606 is pivotally supported a roller cam follower 653 which is in operative relation with its associated print operating cam 421 located directly thereabove. After the operating cam sleeve 416 has rotated approximately 250° from its rest position, the hump on the cam 421 starts to engage the roller 653 which causes the lever 606 to pivot first in a counterclockwise direction until the projection 649 engages the top of the vertical arm of the three-arm lever 651 and then in a counterclockwise direction with the projection 649 serving as a pivot point. As the right hand end of the lever 606 moves in a downward direction, the link 643 transmits this motion to the arm 638 which in turn causes the rod 457 to pivot. As the rod 457 pivots, it causes the squared bar 636 to swing outward which in turn pivots the lever 632. The lever 632, Figs. 40 and 41 in pivoting rocks the typewheel shaft mounting bracket 464 and typewheel shaft 472 therewith to bring the typewheel 448 against the platen 449, best shown in Fig. 6, and print on the recording paper a character corresponding to the received code group. The pivot point of the typewheel shaft mounting bracket 464 is tangent to the pitch circles of the two beveled gears 484 and 489, Fig. 40, permitting the bracket 464 to rock while the gears remain in mesh. An arm of the typewheel shaft mounting bracket 464 carries

an adjusting screw 656, the end of which is adapted to engage an inverted U-shaped member 657 extending substantially the full width between the plates 451 and 452 to limit the amount of pivoting of the typewheel shaft and the blow with which the typewheel strikes the platen. As the typewheel shaft rocks inwardly a radial slot in an indexing wheel 659 attached to a collar 661 which in turn is secured to the typewheel shaft 472 engages a vertical plate 662 attached to the bracket 461 to correctly align the typewheel. This takes up any lost motion which might occur between the typewheel stop unit and the typewheel shaft. During further rotation of the cam sleeve 416 the hump of the cam 421 passes out of operative relation with the cam follower 653 and allows the associated elements to return to their normal position.

Typewheel reset

After each printing operation the typewheel shaft 472 when in any other but its lower position is returned to its lower position ready to be elevated to the same or another position or left in its lower position in accordance with the next code group. The return of the typewheel shaft 427 to its lower position is accomplished by actuating the typewheel shaft latch 581, Figs. 40 to 42, to cause the disengagement of the surface 580 thereon with the flange of the collar 481 on the typewheel shaft 472, whereupon the spring 487 and the weight of the typewheel shaft 472 with its attached elements causes the shaft to drop to its lower position. At this time the elevator bar 561, which caused the elevation of the typewheel, will be in its normal lower position and consequently will not interfere with the return of the typewheel shaft to its lower position. The typewheel shaft latch 581 has a rightwardly extending arm 663, the end of which is bent upward and has adjustably attached thereto a comparatively small plate 664. Above the plate 664 and extending in a horizontal direction is a reset bar 666 which is of sufficient length to be in operative relation with the plate 664 for any position of the typewheel car. Pivotally attached to the reset bar 666, Figs. 61 and 62 by screws such as 667 is a lever 668 and a bell crank 669. The lever 668 and the bell crank 669 are pivotally supported on shoulder screws such as 671 extending from the rear of the center section of the hereinbefore mentioned U-shaped bracket 450. The length of the lever 668 and the substantially horizontal arm of the bell crank 669 are such and the pivot points so arranged so that during movement of the reset bar 666 it always remains horizontal. The depending arm of the bell crank 669 has pivotally mounted in the lower end thereof a roller cam follower 672 which is in operative relation with its associated typewheel reset operating cam 419 on the operating cam sleeve 416. A spring 673 attached to the reset bar 666 normally holds the cam follower 672 against the associated cam 419.

When the operating cam shaft 415 is in its normal rest position, the cam follower 672 is in engagement with the hump on the cam 419 and, immediately following the elevating operation of the typewheel shaft 472, the hump on the cam 419 rotates out of engagement with the cam follower 672, allowing the spring 673 to raise the reset lever 666. Thereupon the spring 585 is allowed to rock the typewheel shaft latch 581, Fig.

42, in a counter-clockwise direction to latch the typewheel shaft 472 in its elevated position as hereinbefore described. The typewheel shaft latch 581 remains in this operated position until after the printing operation, whereupon as evident by the arrangement of the cams in the timing chart, Fig. 49, near the end of the revolution of the operating cam shaft 416 the hump of the cam 419 reengages the cam follower 672 to actuate the reset bar 666 in a downward direction which in turn rocks the elevator latch 581 in a clockwise direction. This causes the disengagement of one of the surfaces 580 thereon with the flange of the collar 481 on the typewheel shaft and allows the typewheel shaft to drop to its normal position.

As clearly shown in the developed timing chart, Fig. 49, the operation of the elevator slide bar operating cam 423, the elevator operating cam 421 and the typewheel reset operating cam 419 all function in timed relation with one another, and where possible some of these operations occur in overlapped relation.

Printer functions

Obviously during certain cycles of operation of the printer such as those initiated in conjunction with shift and unshift signals, carriage return signals, etc., hereinbefore and hereinafter described, it is desirable to prevent the operation of certain of the normally occurring printer functions such as the printing operation and/or letter spacing of the typewheel. The elements that are instrumental in preventing certain of these functions and allowing others in response to predetermined code groups are a set of five so-called function or floating levers referred to and indicated in general in Figs. 2 and 4 by reference numeral 674 and individually by reference numerals 674a to 674e, Figs. 50 and 57, the selective operation of which is normally controlled by the positions of the hereinbefore mentioned pivot point slide bars 373. All of the floating levers 674 are pivoted at their right hand ends as shown in Figs. 2 to 4 on a horizontal pin 676 carried in a block 677. Vertical slots 675 in the block 677 space the floating levers 674 the proper distances apart. Screwed into the bottom of the block 677 is a vertical pull rod 678 which has at its lower end a bifurcated member 679. A pivot pin 681 in the member 679 pivotally carries thereon adjacent its right hand end a function operating cam lever 682 which is pivoted at its left hand end on another pin 683 supported in a bracket 684 extending from the mounting plate 136. Adjacent the center of the function operating cam lever 682 is pivotally supported a roller cam follower 686 which is in operative relation with the function operating cam 424 located directly thereabove. The pin 676 in the block 677 extends a slight amount from the right hand side thereof as shown in Fig. 3 and is guided for vertical movement by a vertical slot in an upwardly extending arm of a bracket 687 attached to the front side of the mounting plate 136. A spring 688 anchored in the bracket 687 and attached to the right hand end of the function operating cam lever 682 normally holds the cam follower 686 in engagement with the cam 424 and in the normal position of the cam 424 the floating levers 674 are in a substantially horizontal position. A vertically mounted comb plate 689, Fig. 4, attached to the left hand end of the bracket 347 has a series of vertical slots therein which guide the floating levers 674 for

movement in a vertical plane adjacent the left hand ends thereof. A bracket 691 also attached to the left hand end of the plate 347 has a series of upwardly extending projections such as 690 upon which rest the downwardly extending left hand ends of the floating levers 674. Pivotally attached to the left hand ends of the floating levers 674 and extending in a downward direction are the various associated operating levers 10 and links which will hereinafter be described.

During each revolution of the operating cam sleeve 416 the function operating cam 424 engages the roller 686 and causes the lever 682 to pivot in a clockwise direction which, through the rod 678 and attached elements causes the floating levers 674 to also pivot in a clockwise direction with the left hand ends resting on the top of the bracket 691 normally serving as a pivot point. This operation occurs relatively early in the cycle so as to permit the floating levers 674 to block out or perform various printer functions in a manner which will be hereinafter described. Each of the floating levers 674a to 674e have predeterminedly arranged adjacent the center thereof, as diagrammatically shown in Fig. 50, downwardly extending fingers 692a to 692e, respectively, which cooperate in a manner hereinafter described with a series of upwardly extending fingers 693a to 693j, diagrammatically shown in Fig. 47, adjacent the center of the pivot point slide bars 373. During a normal cycle of operation of the receiver wherein the typewheel car is moved in a letter spacing direction and a print operation performed, the pivot point slide bars 373 are all in their left hand or normal position with none of the fingers 693 thereon in operative alignment with a finger 692 on the floating levers 674. Therefore, as the floating levers 674 are pivoted by the function operating cam 424, the floating levers only pivot idly about their left hand ends. However, when the received code group is such that one of the pivot point slide bars 373 is allowed to move to an operated or off-normal position, the operation of one or more of the floating levers 674 is quite different and the operation for such conditions will now be described.

Print suppression

Let it be assumed that the end of a word is reached whereupon it is desired to move the typewheel car for a word space and for this cycle, suppress the printing operation. In accordance with the receipt of the associated code combination allows the pivot point slide bar 373c to move to an operated position as shown by the dot-dash outline thereof in Fig. 47, relative to its normal left hand position shown by the full outline thereof. Such movement of the lever 373c places the finger 693c beneath the finger 692d on the so-called word spacing floating lever 674d. This operation occurs prior to the normal pivoting movement of the floating levers 674 and when the pivoting movement of the floating lever assembly subsequently occurs, a slight amount of movement of the lever 674d causes the bottom of the finger 692d to engage the top of the finger 693c of the pivot point slide bar 373c. Further downward movement of the right hand end of the floating lever 674d then causes it to pivot adjacent its center with the end of the finger 692d in contact with the finger 693c serving as a pivot point while all of the other floating levers 674 pivot about their normal left hand end pivot points. This pivoting movement of the lever

674d about its center causes the left hand end to rise, to which is pivotally attached by a pin 694 a downwardly extending link 696, Figs. 24, 26, 55 and 57. Engaged in the bottom of a vertical slot 697 of the link 696 is a pin 698 which is carried adjacent the left hand end of a rocker arm 699. The rocker arm 699 is clamped to the rear end of a horizontal rod 701 for movement therewith which in turn is pivotally supported in a bracket 702 attached to the base plate 56. Clamped to the front end of the rod 701 for movement therewith is a second rocker arm 703 which extends toward the right and has its right hand end slightly above the end of the leftwardly extending arm of the hereinbefore mentioned three-armed lever 616. The upward movement of the left hand end of the floating lever 674d raises the link 696 which in turn pivots the rod 701 in a clockwise direction causing the rocker arm 703 to engage the leftwardly extending arm of the three-armed lever 616 and pivot it in a counterclockwise direction. As the lever 616 pivots, a bell crank shaped latch 704, Fig. 52, pivotally supported on a shoulder screw 706 in the bracket 607 is actuated by its attached spring 707 to latch the lever 616 in its operated position. The floating levers 674 subsequently return to their normal position and the print operating cam 421 operating in timed relation therewith, begins to actuate the print operating cam lever 606. With the lever 616 latched in its operated position the upper end of the upwardly extending arm thereof is out of operative alignment with the projection 649 adjacent the left hand end of the print cam operating lever 606. Therefore, as the hump of the print cam 421 engages the associated cam roller 653 the lever 606 pivots idly about its right hand end and consequently has no effect upon the printing mechanism hereinbefore described. The relative strength of the springs 648 and 639 are such, relative to one another that when the lever 606 is not blocked at its left hand it will pivot as described about its right hand end. During the pivoting of the lever 606 about its right hand end it engages the leftwardly extending arm of the bell crank latch 704 to actuate the same and unlatch the three-armed lever 616 which thereupon returns to its normal position concomitantly with the return of the lever 606 to its normal position. Thus when the pivot point slide bar 373c is allowed to assume an operated position the printing function is suppressed during the associated cycle of operation of the operating cam sleeve 416 while the typewheel car moves in a letter spacing direction to form a word space. However, all the other functions performed by the operating cam sleeve occur in their regular order.

Suppression of printing and letter spacing

Ordinarily on the receipt of a signal such as those representing the shift or unshift signal, it is desirable to suppress both the printing operation and the letter spacing operation of the typewheel car. Let it be assumed that a shift signal is received which in addition to controlling the position of the shift control member 349, as hereinbefore described, allows the pivot point slide bar 373a, Fig. 47, to move in an operated position. This movement of the bar 373a places the finger 693j, Figs. 47 and 50 thereon, beneath the downwardly extending finger 692a on the print and typewheel car feed suppressing floating lever 674a. Now as the floating levers 674 are subsequently actuated by their operating cam 424 the

floating lever 674a pivots about a point adjacent its center while the other floating levers pivot idly about their left hand ends. As the floating lever 674a pivots about its center a depending link 708, Figs. 24 to 27 and 57, pivotally attached to its left hand end is moved in an upward direction. The link 708 has in the lower end thereof a vertical slot the bottom of which is normally engaged with a pin 709 extending horizontally from the left hand end of a rocker arm 711. The rocker arm 711 is clamped for movement therewith to a sleeve 712 loosely mounted on the rod 701 supported in the bracket 702. Also clamped to the sleeve 712 for movement therewith is a second rocker arm 713 which extends toward the right with the right hand end above and in operative alignment with the leftwardly extending arm of the hereinbefore mentioned three arm lever 617. A spring 714 attached to the lever 711 and anchored to an extension of the bracket 702 normally maintains the pin 709 in the bottom of the slot of the link 708 and the right hand end of the lever 713 out of engagement with the lever 617. The lever 713 has attached to its right hand end a lug 716 which extends above the right end of the lever 703. The upward movement of the link 708 causes the sleeve 712 to rotate a slight amount in a clockwise direction and the right hand end of the rocker arm 713 to engage the leftwardly extending arm of the three-armed lever 617, Figs. 51 to 53. This pivots the lever 617 and withdraws the upper end of the upwardly extending arm out from beneath the downwardly extending projection 614 of the letter spacing operating cam lever 604 and it is latched in its operative position by an associated latch 717 in the same manner as the three arm lever 616 was latched in an operated position. As the rocker arm 713 pivots, the lug 716 thereon engages the rocker arm 703 to pivot the same, which as hereinbefore described, operates the three-armed lever 616. With both the three-armed levers 616 and 617 latched in an operated position the subsequent operation of the print and the letter spacing operating cam 421 and 422 pivot their associated operating levers 606 and 604, respectively, idly about the right hand ends and release the latches 704 and 717. Accordingly no appreciable movement is imparted to the links 602 and 643 associated with the levers 604 and 606 respectively. Thus the printing operating and the letter or word spacing operation of the typewheel car is suppressed during cycles of operation initiated in response to a shift and like signals.

In the same manner the receipt of an unshift signal which allows the pivot point slide bar 373e, Fig. 47, to move to an operated position suppresses the print and letter spacing of the typewheel car during the associated cycle. The receipt of a signal which allows the pivot point slide bar 373d, Figs. 47 and 50, to be moved to an operated position, places the finger 693b thereon beneath the finger 692a and also prevents the print and letter spacing of the typewheel car. The pivot point slide bar 373d may also be employed to control some other printer function.

Signal control typewheel car return

After the completion of one line of print the typewheel car, being in or adjacent its right hand position, has to be returned to its left hand position for the beginning of another line of print. This function may be performed by the receipt of a typewheel car return signal which is composed of the following impulses: spacing, spacing,

spacing, marking and spacing in the order named and on receipt of such a signal, as is evident from inspection of Fig. 19, the pivot lever 331b is actuated and allows its associated pivot point slide bar lever 373b, Fig. 47, to assume an operated position. The movement of the slide bar lever 373b to an operated position places the fingers 693f and g thereon beneath the fingers 692a and 692e. For this condition the subsequent operation of the floating bars 674 by the function operating cam 424 causes the floating levers 674a and e to pivot about points adjacent the centers thereof, while the others pivot idly about their left hand ends. The pivoting of the floating lever 674a about the center suppresses the printing and letter-spacing operations of the typewheel car, as described above, while the pivoting of the typewheel car return floating lever 674e about its center causes the typewheel car to be returned to its left hand position as will now be described.

Pivotally attached to the left hand end of the floating lever 674e, Figs. 54 and 57, is a depending link 718 which pivotally engages at its lower end a pin 719 extending from the right hand end of a rocker arm 721. The link 718 is held on the rocker arm 721 by a spring 722, Fig. 5, permitting it to be readily disengaged therefrom. The rocker arm 721, Figs. 54, 55 and 57, is clamped for movement therewith to a horizontal rod 723 pivotally supported in a bracket 724 attached to the inside of the printer frame plate 451. Attached to the other end of the rod 723 for movement therewith is a bell crank 726 which has on the end of the upwardly extending arm thereof a roller 727. The pivoting of the floating lever 674e about its center raises the link 718 which causes the rod 723 to pivot in a counter-clockwise direction. The bell crank 726 pivoting with the rod 723 causes the roller 727 on the upper end of the vertical arm thereof to engage an upwardly beveled surface 728 adjacent the left hand end of a horizontal lever 729. The lever 729 is pivotally mounted adjacent its center on a shoulder screw 731 extending from the rear of the member 450 and as the roller 727 rides up the beveled surface 728 the lever pivots in a counter-clockwise direction. Pivotally supported at the right hand end of the lever 729 is a roller 732 which engages the lower edge of a horizontal angle shaped bar 733 located between the racks 587 and 591 hereinbefore mentioned and extending the full width of the travel of the typewheel car. The bar 733 has pivotally attached thereto two similar levers such as 734, which are arranged so as to allow the bar to rise with the upper surface thereof always horizontal. A spring 735 attached to the bar 733 normally holds the lower edge thereof in engagement with the roller 732 and as the lever 729 pivots in a counter-clockwise direction, the roller 732 engages the bar 733 to raise the same. The bar 733 after being raised is latched in its elevated position by a latch 737 adjacent its left hand end and when the bell crank 726 returns to its normal position the bar remains in its elevated position.

As the bar 733 rises, the upper surface thereof engages depending projections 739 and 741, Fig. 56, on the typewheel car pawls 624 and 626 respectively and pivots the pawls upward. This pivoting movement of the pawls 624 and 626 disengages them from the racks 587 and 591, whereupon the spring drum 629, Fig. 1, through the attached flexible member 628 is effective to slide the typewheel car to the left. The left hand position of the typewheel car is limited and de-

termined by the engagement of one of the collars 462 on the typewheel car bracket 461 with a collar 742 on the left hand end of the typewheel car guiding rod 456. Just before the typewheel car reaches its extreme left hand position an arm 743, Fig. 43, attached to the typewheel car bracket 461 engages the upper end of the latch 437, Figs. 54 and 55, and causes it to pivot against the action of its attached spring 744. This unlatches the left hand end of the bar 733 whereupon it drops a slight amount to engage its right hand end with another latch 745. The arm 743 holds the latch 737 out of engagement with the bar 733 and with the typewheel car in its left hand position the bar 733 is still sufficiently elevated to hold the pawls 624 and 626 out of engagement with their racks 587 and 591. If the feeding operation is not suppressed during the next cycle of operation of the operating cam sleeve 416, the rack 591 will be moved as described to the right and back again. During this movement of the rack 591 a member 746 attached thereto adjacent the right hand end of the bar 733 engages the latch 745 and pivots it in a clockwise direction against the tension of its attached spring 747. This operation of the latch 745 allows the bar 733 to return to its normal lower position and the pawls 624 and 626 to reengage their associated racks. Now the pawls are in condition to advance the car prior to the printing operation of the second group of impulses following the car return signal. Thus the typewheel car is returned for the beginning of a new line of print on receipt of a car return signal.

By employing two latches 737 and 745 to hold the bar 733 in an elevated position and releasing them as described, it insures that the typewheel car pawls 624 and 626 do not engage their respective racks 591 and 587 until after the car has had sufficient time to settle down in its extreme left hand position. If only the one latch 737 were employed, it would allow the pawls 624 and 626 to engage their racks when the typewheel car reached its left hand position to actuate the latch 737. Under this condition if there were rebound of the car it would be retained in its rebounded position and the first character of the new line of print would be indented, resulting in an uneven left hand margin. However, as the latch 745 is employed and is not actuated until the following cycle of operation, the typewheel car has sufficient time to settle down in its left hand position after each typewheel car return operation.

The bell crank 726 has a leftwardly extending arm 750, Fig. 5, which may be manually operated to actuate the typewheel car return mechanism to return the typewheel car for the beginning of a new line of print.

Line feed

The line feeding operation which advances the recording paper to present the fresh section of the paper in the printing plane is usually performed concomitantly with the typewheel car return operation. The line feed signal is represented by a group of impulses composed of spacing, marking, spacing, spacing and spacing line conditions and as is evident from Fig. 19 that on receipt of such a group the respective positioning of the transfer levers 216 allows the pivot lever 331f to operate which in turn allows the pivot point slide bar 373f to move into an operated position. This movement of the pivot point slide bar 373f, Figs. 47 and 50, places the fingers

693h and 693i beneath the downwardly extending fingers 692a and 692c respectively on the floating levers 674a and 674c. With the fingers 693h and i in this position on the subsequent operation of the floating levers assembly, the floating levers 674a and c will pivot adjacent the centers while the others pivot idly about their left hand ends. This pivoting movement of the floating lever 674a suppresses the letter spacing and printing operation of the typewheel as hereinbefore described while the floating lever 674c performs the line feed operation in a manner which will now be described. Attached to the right hand end of the floating lever 674c as shown in Fig. 64 is a link 751 which engages at its lower end a pin 752 in the left hand end of a lever 753. The lower end of the link 751 is held on the pin 752 by a flat spring 754 and the lever 753 is pivoted adjacent its center on a shoulder screw 756 mounted in the bracket 724. At the right hand end of the lever 753 is pivotally attached an upwardly extending link 757, the upper end of which is pivotally attached to the rightwardly extending arm, Fig. 63, of a bell crank 758. The bell crank 758 is pivoted on a shoulder screw 759 mounted on the printer unit frame plate 451 and has pivotally attached to the end of its upwardly extending arm a member 761. The member 761 has a hooked portion 762 in operative relation with a ratchet wheel 763 fixed for rotation therewith to the platen roller shaft 764. The platen roller shaft 764 is pivotally supported adjacent its ends in brackets 766 and 767, Fig. 1, and each time a line feed signal is received, the floating lever 674c pivots about its center, causing the attached linkage to move the member 761 toward the right as shown in Figs. 6 and 63, and rotates the ratchet 763 and shaft 764 a predetermined amount. The platen roller 449 is attached to the platen shaft 764 for rotation therewith and the recording paper 768, Figs. 1 and 3, is held in frictional engagement with the platen roller by means of a series of pressure rollers, such as 769, Fig. 6, in a manner well known in the art and on rotation of the platen roller the paper is advanced. The paper is supplied to the printer from a roll supported in brackets such as 771 and as it unwinds from the roll it is looped over a spring biased roller 772 which absorbs the greater part of the jerk due to the line feed operation.

Line feed and carriage return

Ordinarily in order to save line time it is desirable to return the typewheel car to its initial position during the performance of the line feeding operation and this may be accomplished by a small hooked member 773 attached to the floating lever 674e adjacent its left hand end as shown in Fig. 50. The hook member 773 is so shaped that the end thereof is in operative relation with the top surface of the floating lever 674c. Therefore as the floating lever 674c pivots about its center the left hand end engages the hook 773 to also raise the floating lever 674e. Accordingly every time a line feed signal is received to perform its associated line feed function, the floating lever 674e will also be operated to perform its associated typewheel car return operation. As the hook 773 does not engage the floating lever 674c when the floating lever 674e pivots about its center in conjunction with a typewheel car return signal the associated typewheel car return function may be performed independently of the line feed operation. This arrangement has the ad-

vantage in that the typewheel car may be returned to its initial position and all or part of the last line of print may be blanked out during the advancing of the typewheel over this last line a second time. Obviously this would not be possible if the line feed operation occurred with the typewheel car return operation in response to a typewheel car return signal. However if this arrangement is desired all that is necessary is to place a hook such as 773 on the floating lever 674c so that it is engaged and carried up by the floating lever 674e. With the hook 773 arranged in that manner line feed could occur in response to its associated signal independent of the typewheel car return operation. With the hook 773 removed all together the line feed and typewheel car functions will occur independent of one another in response to their associated signals.

Automatic typewheel car return

When the printer is operating in response to signals wherein there are no typewheel car return or line feed characters, such as those used to control a tape printer, it is necessary that the typewheel car return and line feed operations be performed automatically. These operations in the preferred embodiment are performed in conjunction with the receipt of any word space signal received after the type wheel car has approached within a predetermined distance of the limit of its travel. Attached to the typewheel car bracket 461, Figs. 40 and 44, and extending toward the rear of the machine, is an arm 774 which has a turned end. After the typewheel has advanced a predetermined distance from its normal left hand position, the end of the arm 774 engages a bevelled surface 776, Figs. 65 and 67, on the end of a bent rocker arm 777 which is attached for movement therewith to a pivotable rod 778 extending between the two print unit mounting plates 451 and 452. The engagement of the end of the arm 774 and the bevelled surface 776 causes the rod 778 to pivot in a counterclockwise direction as shown in Fig. 66, against the action of a retractile spring 779 attached to a lever 781 fixed for movement therewith adjacent the left hand end of the rod 778. The left hand end of the lever 781 engaging the horizontal U-shaped member 450 normally holds the rod 778 with its attached elements in their normal position. Clamped to the rod 778 adjacent the left hand end is a second rocker arm 782, Figs. 65 and 66, which has pivotally supported thereon by a pin 783 a bent lever 784. A spring 786 connected to a bent strap 785 of the lever 784 and to a pin 787 in the rocker arm 782 normally keeps the bent lever 784 extending in the same direction as the rocker arm 782. Pivotally attached by a shoulder screw 788, Figs. 57 and 64, to the link 751 depending from the line feed floating lever 674c is an L-shaped member 789. To the end of a horizontally extending arm 755 of the link 751, is anchored a spring 791 which normally keeps the member 789 against a projection 792 of the arm 755. The member 789 has at its upper end an angularly extending projection 793 which is in line with but normally out of operative alignment with a slightly bevelled surface 794 on the left hand end of the word space floating lever 674d. When the typewheel car is moved sufficiently towards its right hand position, the arm 774 engages the rocker arm 777 and pivots the rod 778 which raises the free end of the bent lever 784. As the lever 784 rises, it engages a bevelled surface 796 on

the member 789, causing it to pivot in a counter-clockwise direction to place the section 793 thereon over the surface 794 on the floating lever 674d. Now as the floating lever 674d rises in response to the next word space signal the surface 794 thereon engages the section 793 of the member 789 to raise the same together with the attached link 751 and floating lever 674c. Because of the hook 773, as hereinbefore described, the car return floating lever 674e will also rise with the line floating lever 674c. Thus the three floating levers 674c, d and e, are all raised when a word space signal is received after the typewheel car is advanced to a position to allow the arm 774 thereon to engage the rocker arm 777 on the rod 773. The pivoting of the line feed floating lever 674c performs the line feed operation while the car return floating lever 674e simultaneously performs the typewheel car return function and the word spacing floating lever 674d suppresses the printing operation. It will be noted that for the automatic car return function, the letter spacing operation of the feed rack 591, Figs. 52 to 54, is not suppressed. The suppression of this operation is not necessary as this function occurs shortly after the operation of the floating levers 674, and will occur while the typewheel car is moving toward the left. Therefore the latch 745 is returned to a position to latch the right hand end of the bar 733 when the arm 743 on the typewheel car actuates the latch 737 to unlatch the left hand end of the bar 733. Accordingly, the typewheel car will not be advanced in conjunction with the signal following the word space signal which initiated the automatic typewheel car return function but will remain in its left hand position until the car spacing operation accompanying the second signal following a car return function in the same manner as described above.

At times it may be desirable to operate the receiver without the automatic typewheel car return feature. If this is desired all that is necessary is to manually place the bent lever 784, Figs. 64 to 66, on a stationary hook 797 extending from the plate 451. With the lever 784 in this position, it is held out of operative relation with the member 789 and the rocker arm 777 is pivoted out of operative relation with the end of the arm 774. Thus the movement of the typewheel car has no effect on the member 789 to automatically return the typewheel car to its initial position.

Bell signal

When a code group of signals representing the character J consisting of a marking, marking, spacing, marking and spacing line condition is received the pivot lever 331g, Fig. 19, is allowed to operate and, as hereinbefore described, if preceded by a shift signal the associated pivot point slide bar 373g, Figs. 47 and 50, is allowed to assume an operated position. The movement of the pivot point slide bar 373g to an operated position places the fingers 693d and 693e thereon beneath the associated fingers 692a and 692b on the floating levers 674a and 674b respectively. Now as the function operating cam 424 subsequently pivots the floating lever assembly, the levers 674a and 674b will pivot about points adjacent their centers while the others pivot about their left hand ends. This pivoting of the floating levers 674a as described, suppresses the print and the letter spacing operations of the typewheel car and the floating lever 674b in pivot-

ing adjacent its center allows an associated normally open contact 798, Fig. 58, to close. The contact 798 is attached to the bracket 347 and has on one spring thereof an insulating member 799, the upper end of which engages the under surface of the floating lever 674b and is normally held open thereby. The contact 798 is in series with a source of potential 801 and a single stroke bell 802 and each time the floating lever 674b allows the contact 798 to close, the bell 802 is operated. Thus an audible signaling device at the printer is operated whenever a J signal preceded by a shift signal is received. The floating lever 674b has attached to its left hand end a link 803 which has at its lower end a spring 804, Fig. 57, to bias the floating lever in its normal position. It is obvious that the link 803 could readily be arranged to mechanically operate a bell or the like.

In some types of services it is often desirable to have the bell signal operate in response to some signal other than the shift of J. In the preferred embodiment of this receiver means are provided for making the bell signal operate in response to the shift of S signal instead of the shift of J. To accomplish this all that is necessary is to remove the pivot point slide bar 373g from the slot it occupies in the block 374, Fig. 29, and place it in another similar slot 806 already milled in the block. By moving the associated pivot lever 331g to a position in alignment with the slot 806 where it will occupy a position such as that represented by the dot-dashed outline thereof 331h, Fig. 19, it is evident that the notches in the transfer levers 216 will allow it to operate on a signal representing a letter S which is composed of marking, spacing, marking, spacing and spacing line conditions. Thus the pivot point slide bar 373g will operate to control the floating levers 674a and b on receipt of the S signal preceded by a shift signal. The finger 692b on the floating lever 674b is of sufficient width to be in operative relation with the finger 693e on the pivot point slide bar 373g in either of its two positions and the block 404 on the slidable bar 401 is also adapted to prevent and allow the operation of the pivot point slide bar 373g in its new position following the receipt of shift and unshift signals respectively.

Type inking ribbon feeding mechanism

The printing is effected through a type inking ribbon in much the same manner as in an ordinary typewriter and the ribbon feed mechanism is mounted on a horizontal plate 807 attached to the outside of the printer unit frame plate 451 adjacent the upper end thereof, Figs. 1 and 63 to 72. Extending vertically from the plate 807 are two studs 808 each of which has pivotally mounted thereon a ratchet 811 and a collar 812. The ratchets and collars 811 and 812 are riveted together and extending from the collar is a pin 813 which is adapted to engage a hole in a ribbon bobbin 814 associated therewith. Extending from the plate 807 are two shoulder screws 816 which engage slots, such as 817, at the ends of a slide bar 818 to guide it in longitudinal movement. A shoulder screw 819 in the slide bar 818 has pivotally mounted thereon at its center a two-ended pawl 821, the ends 822 and 823 of which are in operative relation with associated ratchets 811. An arm 824 of the pawl 821 has the end thereof in engagement with a pin 826 extending from the end of a jockey lever 827. The jockey lever 827 is pivoted on a screw 828 in the

slide bar 818 and a spring 829 attached thereto holds the pin 826 in engagement with the end of the arm 824 to jockey the pawl 821 in one or the other of its two operating positions as shown by the full and dot-dashed outlines thereof in Fig. 68. As the slide bar 818 slides from its normal position, as shown in Fig. 68, to its operated position as shown in Fig. 69, and with the pawl 821 in the position shown in full, the end 822 of the pawl 821 engages a tooth on the associated ratchet 811 to step the same an amount proportional to the amount of movement of the pawl. On the return of the slide bar 818 to its normal position by its attached spring 830 the end 822 of the pawl 821 is engageable with another tooth on the ratchet 811. The ribbon spool or bobbin associated with the ratchet 811 rotates therewith and in rotating winds up the inking ribbon 832 thereon. As the inking ribbon winds up about one of the spools 814 it is unwound from the other spool. Associated with each of the collars 812 are pivotally mounted levers 833 which have on the free ends thereof brake shoes 834 which are held in engagement with the peripheries of the collars 812 by springs 836. Thus a slight drag is maintained on the bobbins 814 and eliminates the necessity of employing a retaining pawl on the ratchets 811 as the lever 821 returns to its normal position to pick up another tooth and also prevents the spool from which the ribbon is unwinding from rotating more than the desired amount.

Extending from the top of the plate 807 are two angle brackets such as 837 each of which has slideably mounted thereon by screws 838 two substantially similar sliding arms 839. Attached to the right hand ends of the arms 839 are bifurcated members 841 through which passes the ribbon 832 as it unwinds or winds up on the bobbins 814. However, when the inking ribbon 832 is nearly exhausted from the supply spool, a button 843, on the ribbon 832, engages the bifurcated member 841 associated with the supply spool and causes the associated slide arm 839 to slide to the right. With the pawl 821 in the position shown in Fig. 69 the upper spool 814 will be the take-up spool while the lower spool will be the supply spool and for this condition the button 843 will slide the lower slide arm to the right when the ribbon is nearly exhausted from the lower spool. As the lower slide arm 839 moves to the right the left hand end thereof engages the lever 821 to pivot the end 822 out of engagement with the ratchet 811 associated with the upper spool and the end 823 into engagement with the ratchet 811 associated with the lower spool 814. Such a position of the lever 821 is shown by the dot-dashed outline thereof in Fig. 68 and thereafter on movement of the slide bar 818 the lower spool 814 will wind the ribbon up while it is unwound from upper spool. When the ribbon is nearly exhausted from the upper spool 814, a button thereon will move the slide arm 839 associated therewith to the right which operates the lever 821 to reverse the direction of movement of the ribbon and it will be wound up again on the upper spool. The ribbon 832, as shown in Fig. 1, passes from one of the bobbins 814 between the typewheel 448 and the front of the platen roller 449 and recording paper 768 and then around the right hand end of the platen roller and along the rear thereof back to the other bobbin 814. An H-shaped member 846 attached to the type-wheel car bracket guides the inking ribbon 832 adjacent the type-wheel

and rollers 844 guide it at the right hand end of the platen roller 449. Extending from beneath the slide bar 818 is a pin 847, Figs. 68 to 72, which engages a bifurcated end of a lever 848 which is pivotally mounted adjacent its center on a stud 849 extending from the underside of the plate 807. The other end of the lever 848 is in engagement with the vertical arm of a bell crank 851 pivotally mounted on a shoulder screw 852, Figs. 2 and 5, extending from the printer unit mounting plate 451. The horizontal arm of the bell crank 851 extends over the end of a rocker arm 853 which is clamped for movement therewith to a sleeve 854 on the rod 723. A second rocker arm 856, Figs. 55 and 57, clamped to the sleeve 854, is engaged with a pin 857 extending horizontally from adjacent the center of the link 696. The link 696, as hereinbefore described, rises each time the word-space floating lever 674d pivots and in rising, through the described linkage operates the slide bar 818, and as the link 696 is returned to its normal position, the spring 830 returns the described linkage to its normal position. Normally, the floating lever 674d is actuated in response to a word-space signal and accordingly the ribbon feed mechanism is actuated only on word-space signals. However, it could easily be adapted to operate on other printer functions.

It is obvious 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 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 selector mechanism, a plurality of selectors, a plurality of latches, one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, individual resilient means for pivoting said unlatched selectors to an unlatched position, a first power operated means for linearly moving said selectors from said unlatched position to a transferring position, and a second power operated means for moving said transferringly operated selectors to a preliminary resetting position, said resilient means then being operative to linearly move said selectors back into latching relation with said latches.

2. In a selector mechanism, a plurality of selectors, a plurality of latches, one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, a recording mechanism, means employing only unlatched ones of said selectors for controlling said recording mechanism and means for returning said selectors to said latching position without engaging said latches until they are in latching position.

3. In a selector mechanism, a plurality of selectors, a plurality of latches, one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, individual resilient means for moving the unlatched ones of said selectors to an unlatched position, a first power operated

means for linearly moving said selectors from an unlatched position to a transferring position and a second power operated means for thereafter moving said selectors to a preliminary resetting position whereupon said resilient means is effective to move said selectors back into latching engagement with said latches.

4. In a selector mechanism, a plurality of selectors, a plurality of latches, one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, individual resilient means for pivoting unlatched ones of said selectors to unlatched position, power means operative thereafter for linearly moving said unlatched selectors to an operated position and means comprising a second power operated means and said individual resilient means for returning said operatively positioned selectors to a latched position, said last movement of said selectors being controlled by said second power operated means and said individual resilient means so that the same have a combined pivoted and lateral movement whereby said selectors re-engage said latches only in a latching position.

5. In a selector mechanism, a plurality of selectors each having a selected and an unselected position, a plurality of latches, one individual to each of said selectors and normally latching said selectors in an unselected position, means responsive to received permutations of impulses for selectively operating said latches to unlatch said selectors, means for moving unlatched of said selectors to unlatched positions, means for moving said selectors from unlatched to selected positions through a first path of movement and means operative thereafter for returning said selectors from their selected positions to said unselected positions through a second path of movement, said second path of movement being different from said first path of movement.

6. In a selector mechanism, a plurality of selectors each having a normal latched position, a selected unlatched position, a selected operated position and an intermediate reset position, a plurality of latches one individual to each of said selectors and normally latching the same in latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch said selectors, a first means for moving said unlatched selectors to said selected unlatched position, a second means for moving said selectors from said selected unlatched position to said selected operated position, a third means for moving said selectors from said selected operated position to said intermediate reset position, said first means then being operative to move said selectors from said intermediate reset position to said normal latched position, said selector moving means being operative on said selectors in the order named and in such a manner that none of the complete paths of movement of said selectors are retraced during movement thereof.

7. In a selector mechanism, a plurality of selectors, said selectors being mounted so as to permit pivotal movement thereof and movement in the direction of their length, a plurality of latches, one individual to each of said selectors and normally latching the same in a latched position, means for selectively operating said latches to unlatch associated selectors, individual resilient means for moving said unlatched selec-

tors in a first path of movement, power operated means for linearly moving said selectors in a second path of movement substantially at right angles to said first path of movement, a second power operated means for moving said selectors in a third path of movement substantially opposite to said first path, said resilient means then being operative to linearly move said selectors in a direction substantially opposite to said second path of movement and then a comparatively small amount in the direction of said first path of movement back into latching relation with said latches.

8. In a selector mechanism, a plurality of selectors having normal and operated positions, an associated group of latches normally latching said selectors in normal position, said latches being pivotable about two points adjacent either end thereof and normally pivoting about one of these points, means adjacent the normal pivot point of each latch for latching associating selectors, means for allowing said latches to pivot about one or the other of said pivot points in accordance with the received signal impulses, means for unlatching associated selectors when said latches pivot about one of said pivot points, means for moving unlatched of said selectors to operative positions and means operative thereafter to return said selectors to said latched position without engaging said latches until in latched position.

9. In a telegraph receiver, a typewheel having the type elements arranged thereon in a plurality of more than two circumferential rows, said typewheel normally having a predetermined single one of said circumferential rows in a printing plane, a permutation selector mechanism having selectively movable elements one for each impulse of a code group, means including said elements for controlling rotative and axial movement of said typewheel to place a selected type element from any one of said plurality of circumferential rows in printing position in a single operation, means operative thereafter for causing the printing of said selected type element and means operative following each printing operation for axially moving said typewheel to place said predetermined circumferential row of type elements in the printing plane.

10. In a telegraph receiver, a typewheel having the type elements arranged thereon in a plurality of more than two circumferential and axial rows, said typewheel having a normal position with a predetermined single one of said circumferential rows in the printing plane, a selector mechanism having selector elements one for each impulse of a permutation group selectively positioned in response to received permutations of impulses, a first means controlled by said selector elements for rotatively positioning said typewheel to bring one of said axial rows of type elements into printing position, a second means controlled by said selector elements for axially moving said typewheel from said normal position in a single cycle of operation to place any one of said circumferential rows of type elements, other than said predetermined row in a printing plane to select a type element in the selected axial row, means for causing the printing of the type element selected from the circumferential and axial rows, and means operative thereafter when said typewheel is axially moved to place any one other than said predetermined circumferential row in the printing plane to return said typewheel to said normal position.

11. In a telegraph receiver, a typewheel with the type elements arranged thereon in circumferential rows, said circumferential rows being divided into a plurality of groups of rows, a permutation selector selectively positioned in accordance with received permutation signals, means including said selectors controlled by predetermined pre-selecting groups of impulses for determining from which group of circumferential rows type elements will be selected by following type selecting groups of impulses, means controlled by said selector and responsive to a portion of the impulses of each of said type selecting group of impulses for determining the circumferential row in said group of rows from which a type element will be selected, means responsive to other impulses of said type selecting groups for selecting the type element in said determined circumferential row and means operative thereafter for moving said typewheel in accordance with said predetermined pre-selecting group of impulses and said type selecting groups.

12. In a cyclically operable telegraph receiver, a rotatable and axially movable typewheel having a plurality of groups of circumferential rows of type elements thereon, a selector mechanism, means controlled by said selector mechanism and operative during predetermined cycles of operation of said receiver for determining from which one of said groups of rows a type element will be selected during subsequent cycles of operation, means operative during said subsequent cycles of operation for determining from which one of said rows of said group the type elements will be selected and other means operative during said subsequent cycle of operation for rotating and axially moving said typewheel as controlled by said last two mentioned means to place said selected type element in a printing position.

13. In a telegraph receiver, a typewheel having a plurality of peripheral rows of characters of more than one case group thereon, said typewheel normally having a predetermined one of said peripheral rows in a printing plane and capable of being axially moved to place any one of the other of said rows in the printing plane, a selector mechanism, means including said selector mechanism controlled jointly by predetermined pre-selecting case determining groups of impulses and a portion of the impulses of each succeeding selecting group for determining which of said peripheral rows of characters will be moved into the printing plane and means operative concomitantly with each of said succeeding selecting groups of impulses for moving said typewheel from said normal position to the position determined by said predetermined preselecting case determining groups and the said portion of the impulses of succeeding selecting groups to thereby place any one of the other of said peripheral rows in the printing plane.

14. In a telegraph receiver, a selector mechanism comprising a plurality of the selectors, each having a selected and unselected position, means responsive to received code groups for selectively positioning said selectors, a plurality of transfer levers, one individual to each of said selectors, a plurality of notched code discs, means for transferring the selection set up in said selectors to said transfer levers, means controlled by some of said transfer levers for selectively positioning said code discs, a typewheel having a plurality of peripheral rows of type elements thereon, means controlled by said code disc for positioning said typewheel in a selected angular position,

and other means controlled by said transfer levers for axially moving said typewheel to place a selected one of said periphery rows in a printing position.

15. In a telegraph receiver, a typewheel shaft stop unit disposed in a horizontal position, a typewheel disposed in a substantially vertical position and movable in a direction at right angles to the axis thereof and at right angles to the axis of the shaft of said typewheel shaft stop unit to effect letter spacing, means disposed between said typewheel and said typewheel shaft stop unit for allowing said typewheel to move to and fro and at all times be connected with said typewheel shaft stop unit.

16. In a telegraph receiver, a typewheel having a plurality of periphery rows of characters thereon with the top row normally in a printing plane, a typewheel shaft movable on the axis thereof, a typewheel shaft elevator normally tending to raise said typewheel shaft, a series of stop latches for limiting the movement of said typewheel shaft elevator, means for selectively operating said latches and means operative thereafter for allowing said typewheel shaft elevator to raise said typewheel an amount determined by said latches.

17. In a telegraph receiver, a typewheel having a plurality of periphery rows of characters thereon with the top row normally in a printing plane, means for elevating said typewheel to bring the other of said periphery rows into the printing plane, a latch for latching said typewheel in an elevated position and means operative a predetermined length of time after the latching of said typewheel in an elevated position for operating said latch to allow said typewheel to return to its normal position.

18. In a telegraph receiver, a selector mechanism comprising a series of selector elements each having selected and unselected positions, means for selectively positioning said selector elements, a plurality of longitudinally movable notched transfer levers, a plurality of rotatably movable notched code discs, means for setting said transfer levers and said code discs in accordance with the positions of said selector elements to bring predetermined of the notches therein into selective alignment, selectable elements selected by movement into said aligned notches, a printing mechanism, means controlled jointly by said selectable elements on movement into aligned rows of notches in said code discs and said transfer levers and a single one of said transfer levers for controlling said printing mechanism.

19. In a telegraph machine, a plurality of selector elements having normal and operated positions, means responsive to received permutations of impulses for selectively positioning said selector elements, a plurality of associated longitudinally movable members having notches predeterminedly arranged on more than one surface thereof, a plurality of notched selecting discs, one less in number than said longitudinally movable members, a first group of selectable elements associated with said selecting discs and a second group of selectable elements associated with said longitudinally movable members, means for transferring the setting of said selector elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements into said aligned notches, a recording mechanism and means employing selectable elements in said

aligned notches for controlling said recording mechanism.

20. In a telegraph machine, a plurality of selector elements having normal and operated positions, means responsive to received permutations of impulses for selectively positioning said elements, a plurality of associated longitudinally movable members having notches predeterminedly arranged on more than one surface thereof, a plurality of notched selecting discs one less in number than said longitudinally movable members, a first group of selectable elements associated with said selecting discs and a second group of selectable elements associated with said longitudinal movable members, means for transferring the setting of said selector elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements into such aligned notches, a recording mechanism partially controlled by said first group of selectable elements and employing a plurality of function control levers, said levers normally pivoting about a predetermined point thereon, means controlled by said selectable elements associated with said longitudinally movable members for changing the pivot point of said function control levers and means operative during the pivoting of said function control levers about said changed pivot point for performing associated functions.

21. In a telegraph machine, a plurality of selector elements having normal and operated positions, a plurality of associated longitudinally movable members having notches predeterminedly arranged thereon, a plurality of notched selecting discs one less in number than said longitudinally movable members, means responsive to received permutations of impulses for selectively positioning said selector elements, a first group of selectable elements associated with said selecting disc and a second group of selectable elements associated with said longitudinally movable members, means for transferring the setting of said selector elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements into said aligned notches, a rotatable and axially movable typewheel, means controlled by said first group of selectable elements for positioning said typewheel in a selected angular position and means controlled by said second group of selectable elements and the longitudinally movable member not associated with a selecting disc for controlling the axial movement of said typewheel.

22. In a telegraph machine, a plurality of selector elements having normal and operated positions, a plurality of associated longitudinally movable members having notches predeterminedly arranged on more than one surface thereof, a plurality of notched selecting discs one less in number than said longitudinally movable members, means responsive to received permutations of impulses for selectively positioning said selector elements, a first group of selectable elements associated with said selecting discs and a second group of selectable elements associated with said longitudinally movable members, means for transferring the setting of said selecting elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements

into said aligned notches, a typewheel rotatable and axially movable to select a character thereon and movable in a direction perpendicular to the axis thereof to effect letter-spacing, means controlled by said first group of selectable elements for positioning said typewheel in a selected angular position, means controlled by said second group of selectable elements and the longitudinally movable member not associated with a selecting disc for controlling the axial movement of said typewheel and means whereby all of said typewheel movements may occur simultaneously.

23. In a telegraph machine, a plurality of selector elements having normal and operated positions, a plurality of associated longitudinally movable members having notches predeterminedly arranged thereon, a plurality of notched selecting discs one less in number than said longitudinally movable members, means responsive to received permutations of impulses for selectively positioning said selector elements, a first group of selectable elements associated with said selecting discs and a second group of selectable elements associated with said longitudinally movable members, means for transferring the setting of said selector elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements into said aligned notches, a rotatable typewheel having a normal and a plurality of operated axial positions, means controlled by said first group of selectable elements for determining the angular position of said typewheel, means controlled by said second group of selectable elements and the longitudinally movable member not associated with a selecting disc for determining the axial movement of said typewheel and means for positioning said typewheel in accordance with the operation of said last two mentioned means, said last means being operable on said typewheel simultaneously to position the same and in a time interval less than that required to position said selector elements.

24. In combination, a plurality of selector elements positionable into one or the other of two positions in accordance with received permutations of impulses, an equal number of associated longitudinally movable transfer members having notches predeterminedly arranged on two sides thereof, a notched code disc associated with all but one of said transfer members, said transfer members and said code discs being movable from either one of two operating positions to the other, means for moving all of said transfer members and said code discs into one position, means operative thereafter for transferring the setting of said selector elements to said transfer members and said code discs to selectively align the notches therein, a first and a second group of selectable elements associated with said transfer members and said code discs respectively selectable by movement into rows of aligned notches, means for invariably selecting a selectable element in the second of said group on each transfer operation and means for selecting a selectable element in said first group only on the selection of predetermined of said selectable elements in said second group, a printing mechanism having printer functions comprising a rotatable and axially movable typewheel, means controlled by said second group of selectable elements for rotatively positioning said typewheel and means controlled by said first group of selectable elements and the transfer member not associated with a code disc

for controlling said printing functions and the axial movement of said typewheel.

25. In a cyclically operable telegraph receiver, a typewheel shaft, a typewheel having type elements arranged thereon in a plurality of peripheral rows and fixed to said shaft, said shaft being axially movable to place the peripheral rows of the typewheel one at a time in a printing position, a cyclically operable typewheel shaft operating member for axially moving said shaft in one direction, means independent of said last mentioned means for latching said shaft in the position moved thereby, a selector mechanism responsive to received impulses, means including said selector mechanism for controlling the amount of axial movement imparted to said typewheel shaft by said operating member for each cycle of operation thereof and means for actuating said typewheel shaft operating member in accordance with said last mentioned means.

26. In a telegraph receiver, a typewheel shaft, a typewheel having type elements arranged thereon in a plurality of peripheral rows and fixed to said shaft, said shaft being axially movable and having a normal and a plurality of operated axial positions, a cyclically operable member having a normal and a plurality of operated positions with a one-way connection between it and said typewheel shaft for axially moving said shaft from said normal position to any one of said operated positions, signal controlled means for determining the position to which said cyclically operable member will be moved on each cycle of operation thereof and means for actuating said cyclically operable member in accordance with said last mentioned means to axially position said typewheel shaft.

27. In a telegraph receiver, a typewheel shaft with a typewheel fixed thereto having a plurality of peripheral rows of type elements thereon, said shaft having a normal position with a predetermined one of said peripheral rows in a printing plane and axially movable to any one of a plurality of operated positions to place the other of said peripheral rows, one at a time, in the printing plane, a cam controlled operating bar for moving said typewheel shaft from said normal position to any one of said operated positions in one continuous movement, a plurality of movable stops for stopping said operating bar in any one of a plurality of positions, a signal responsive means and means controlled by said signal responsive means for selectively operating said stops.

28. In a telegraph receiver, a typewheel shaft with a typewheel fixed thereto having a plurality of peripheral rows of type elements thereon, said shaft having a normal position with a predetermined one of said peripheral rows in a printing plane and axially movable to any one of a plurality of operated positions to place the other of said peripheral rows one at a time in the printing plane, a cam controlled operating bar for moving said typewheel shaft from said normal position to any one of said operated positions in one continuous movement, a plurality of movable stops normally in the path of movement of said operating bar for stopping the same in any one of a plurality of positions, a member operating in timed relation with said operating bar for operating none or one or more of said stops on each cycle of operation thereof, a signal responsive means and means including said signal responsive means for controlling the operation of said stop operating member.

29. In a telegraph receiver, a typewheel shaft with a typewheel fixed thereto having a plurality of peripheral rows of type elements thereon, said shaft having a normal position with a predetermined one of said peripheral rows in a printing plane and axially movable to any one of a plurality of operated positions to place the other of said peripheral rows one at a time in the printing plane, a cam controlled operating bar for moving said typewheel shaft from said normal position to any one of said operated positions in one continuous movement, a plurality of movable stops normally in the path of movement of said operating bar for stopping the same in any one of a plurality of positions, a cyclically operable member operating in timed relation with said operating bar for progressively operating said stops to remove the same from the path of said operating bar, a signal control means and means including said signal control means for controlling the operating of said cyclically operable member.

30. In a telegraph receiver, a typewheel having a normal and a plurality of axial operated positions, means for biasing said typewheel in said normal position, means for selecting any one of said operated positions at a time, a typewheel moving means for moving said typewheel in one direction from said normal position to a position past said selected operated position, a typewheel retaining means for preventing the complete return of said typewheel to said normal position with said typewheel moving means, said retaining means being adapted to stop the return movement of said typewheel in said selected position and means operative a predetermined length of time thereafter for releasing said retaining means whereupon said typewheel biasing means is effective to return it to a normal position.

31. In a telegraph receiver, a substantially vertical and axially movable typewheel shaft, a typewheel fixed to said shaft and having a plurality of circumferential rows of type elements thereon with the uppermost one of said rows normally in a printing plane, a signal responsive means selectively controlled by permutation signals and having selectively operable selectors positioned in accordance with received signals, a first means controlled by said selector for angularly positioning said typewheel and shaft, a second means controlled by said selector for moving said typewheel and shaft in one continuous axial movement to place any one of the other of said circumferential rows in the printing plane, means operative concomitantly therewith for rocking said typewheel and shaft to effect a printing operation and means effective during said printing operation for rotating said typewheel and shaft a slight amount in either direction to correct for any slight angular displacement thereof.

32. In a cyclically operable telegraph receiver, a substantially vertical and axially movable typewheel shaft, a typewheel fixed to said shaft and having a plurality of circumferential rows of type elements thereon with the uppermost one of said rows normally in a printing plane, a signal responsive means, a first means controlled by said signal responsive means for angularly positioning said typewheel and shaft, a second means controlled by said signal responsive means for determining whether said typewheel and shaft will remain in said normal position or elevated in one continuous movement to place any one of either of said circumferential rows of type elements in the printing plane during each cycle of

operation, means for latching said typewheel and shaft in any one of said elevated positions and means operative thereafter for rocking said typewheel and shaft to effect a printing operation, a star-wheel fixed to said typewheel shaft, a co-operating member therefor and means including said star-wheel and said cooperating member effective only after a predetermined amount of rocking of said typewheel and shaft for angularly moving the same a slight amount in either direction to correct for any slight angular displacement thereof.

33. In a telegraph receiver responsive to permutation signals, a substantial vertical typewheel shaft, a typewheel fixed to said shaft and having a plurality of circumferential rows and type elements thereon, a typewheel car for moving said typewheel and shaft to and fro in a horizontal direction to effect letter spacing, a drum type typewheel stop unit comprising a horizontal shaft capable of being stopped in any one of a plurality of angular positions, means for axially moving said typewheel and shaft to place any one of said circumferential rows of type elements in a printing plane, means for rocking said typewheel and shaft in a vertical plane to effect a printing operation and means disposed between said typewheel shaft and said stop unit shaft for maintaining said shafts in synchronism during all of said movements of said typewheel shaft.

34. In a selector mechanism, a plurality of selectors, a plurality of latches, one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, a first means for pivoting unlatched of said selectors to an unlatched position, a second means for linearly moving said latches to a transferring position, a third means for pivoting said selectors to a preliminary resetting position whereupon said first means is operative to linearly move said selectors back into said latching position.

35. In a selector mechanism, a plurality of selectors each having a plurality of positions, a plurality of latches, one individual to each of said selectors and normally latching the same in a normal position, means responsive to received permutations of impulses for selectively and sequentially operating said latches to unlatch said selectors, means operative on said unlatched selectors for moving them through said plurality of positions, said last mentioned means moving said selectors so that they occupy said positions only once for each cycle of operation.

36. In a selector mechanism, a plurality of selectors each having a normal latched position, a selected unlatched position, a selected operated position and an intermediate reset position, a plurality of latches one individual to each of said selectors and normally latching the same in a latched position, means responsive to receive permutations of impulses for selectively operating said latches to unlatch said selectors, a first means for sequentially moving said unlatched selectors to said selected unlatched position, a second means for sequentially moving said selectors from said selected unlatched position to said selected operated position in reverse order of the movement into said selected unlatched position, a third means for sequentially moving said selectors from said selected operated position to said intermediate reset position, said first

means then being operative to sequentially move said selectors from said intermediate reset position to said normal latched position, means for timing the operation of said selector moving means whereby the last three movements of said selectors occur in overlapped relation and in a time interval less than that required to move said latches from said normal latched position to said selected unlatched position.

37. In a selector mechanism, a plurality of selectors, said selectors being mounted so as to permit a plurality of different paths of movement thereof, a plurality of latches one individual to each of said selectors and normally latching said selectors in a latched position, means responsive to received permutations of impulses for selectively operating said latches to unlatch associated selectors, means for moving unlatched of said selectors in a first path of movement, means operative thereafter for moving said latches in a second path of movement substantially at right angles to said first path of movement, means for moving said selectors in a third path of movement substantially opposite in direction to said first path of movement and means for moving said selectors in a fourth path of movement in a direction substantially opposite to said second path of movement.

38. In a telegraph receiver, a typewheel having a normal position and with the type elements arranged thereon in a plurality of circumferential rows, said circumferential rows being divided into a plurality of groups of rows, a selector mechanism, means controlled by said selector mechanism as responsive to predetermined preselecting groups of impulses for determining from which group of circumferential rows type elements will be selected during following type selecting groups of impulses, means controlled by said selector mechanism as responsive to a portion of the impulses of each of said type selecting group for determining the circumferential row in said predetermined group of rows from which a type element will be selected, means controlled by said selector mechanism as responsive to other impulses of said type selecting groups for selecting the type element in said determined circumferential row, means operative thereafter for moving said typewheel from said normal position in accordance with the predetermined preselecting group of impulses and said type selecting group of impulses for each received group of impulses, means for printing the selected type element and means automatically operative thereafter for returning said typewheel to a normal position.

39. In a telegraph receiver a typewheel having a plurality of peripheral rows of characters thereon with a predetermined one of said rows normally in a printing plane, means for axially moving said typewheel to place any one of the other of said peripheral rows in the printing plane, a selector mechanism, means controlled by said selector mechanism in response to one or the other of two predetermined groups of impulses for determining which one or the other of two groups of periphery rows of characters will be placed in the printing plane during subsequent character groups of impulses, means controlled by said selector mechanism in response to subsequent character selecting groups for determining which one of the peripheral rows in a group will be placed in printing position and means for moving said typewheel in a single operation from

said normal position to one selected in accordance with the operation of said two determining means.

40. In a telegraph receiver, a selector mechanism comprising a series of selector elements each having selected and unselected positions, means for selectively positioning said selector elements, a plurality of longitudinally movable notched transfer levers, a plurality of rotatably movable notched code discs, means for setting said transfer levers and said code discs in accordance with the positions of said selector elements to bring predetermined of the notches therein into selective alignment, selectable elements selected by movement into said aligned notches, a typewheel having a plurality of peripheral rows of type elements thereon, means controlled jointly by said selectable elements on movement into said aligned notches in said code discs and said transfer levers for selecting two of said type elements on said typewheel and means controlled by one of said transfer levers for selecting one or the other of said two type elements.

41. In a cyclically operated telegraph receiver, a selector mechanism comprising a series of selector elements each having selected and unselected positions, means for selectively positioning said elements, a plurality of slidably movable notched transfer levers, a plurality of rotatably movable notched code discs, means for sequentially transferring the setting of said selector elements to said transfer levers and said code discs to bring certain of the notches therein into selective alignment, selectable elements selected by movement into said aligned notches, a typewheel having a plurality of peripheral rows of type elements thereon, means controlled during cycles of operation of said telegraph receiver wherein one or the other of two predetermined selectable elements enters an aligned row of notches in said transfer levers for determining which one or the other of two groups of peripheral rows on said typewheel will be placed in printing position during subsequent cycles of operation and means controlled jointly on said subsequent cycles of operation by one of said transfer levers and selectable elements entering aligned rows of notches in said code discs for selecting a type element in said predetermined group of peripheral rows.

42. In a cyclically operable telegraph receiver, a selector mechanism comprising a series of selector elements each having selected and unselected positions, means for selectively positioning said elements, a plurality of longitudinally movable notched transfer levers equal in number to said selector elements, a plurality of rotatably movable notched discs one less than said transfer levers and associated with all but one, means for progressively transferring the selection of said selector elements to said transfer levers and said code discs to bring certain of the notches therein into selective alignment, selectable elements selected by movement into said aligned notches, a typewheel having a plurality of peripheral rows of type elements thereon, means controlled during cycles of operation of said telegraph receiver wherein one or the other of two predetermined selectable elements enters an aligned row of notches in said transfer levers for determining which one or the other of two groups of peripheral rows on said typewheel will be placed in printing position during subsequent

cycles of operation and means controlled jointly on said subsequent cycles of operation by the one of said transfer levers not associated with a notched disc and selectable elements entering aligned rows of notches in said code discs for selecting a type element in said predetermined group of peripheral rows.

43. In a telegraph machine, a plurality of selector elements having normal and operated positions, a plurality of associated longitudinally movable members having notches predeterminedly arranged thereon, a plurality of notched selecting discs one less in number than said longitudinally movable members, means responsive to received permutations of impulses for selectively positioning said selector elements, a first group of selectable elements associated with said selecting discs and a second group of selectable elements associated with said longitudinally movable members, means for transferring the setting of said selecting elements to said longitudinally movable members and said selecting discs to bring certain of the notches therein into selective alignment, individual resilient means for urging said selectable elements into said aligned notches, a rotatable typewheel having a normal and a plurality of operated axial positions, means controlled by said first group of selectable elements for positioning said typewheel in a selected angular position and means controlled by said second group of selectable elements and the longitudinally movable member not associated with a selecting disc for selecting said normal or any one of said operated axial positions of said typewheel.

44. In combination, a plurality of selector elements positionable into one of the other of two positions in accordance with received permutations of impulses, an equal number of associated longitudinally movable transfer members having notches predeterminedly arranged on two sides thereof, a notched code disc associated with all but one of said transfer members, said transfer members and said code discs being movable from either one of two operating positions to the other, means for moving all of said transfer members and said code discs into one position, means operative thereafter for transferring the setting of said selector elements to said transfer members and said code discs to selectively align the notches therein, first and second groups of selectable elements associated with said transfer members and said code discs respectively selectable by movement into rows of aligned notches, means for invariably selecting a selectable element in the second of said groups on each transfer operation and means for selecting a selectable element in the first of said groups only on the selection of predetermined of said selectable elements in said second group.

45. In combination, a plurality of selector elements positionable into one of the other of two positions in accordance with received permutations of impulses, an equal number of associated longitudinally movable transfer members having notches predeterminedly arranged on two sides thereof, a notched code disc associated with all but one of said transfer members, said transfer members and said code discs being movable from one to the other of two operating positions, means for moving all of said transfer members and said code discs into one position, means operative thereafter for transferring the setting of said selector elements to said transfer mem-

bers and said code discs to selectively align the notches therein, a first and second group of selectable elements associated with said transfer members and said code discs respectively, selectable by movement into rows of aligned notches, a rotatable typewheel having a plurality of peripheral rows of characters thereon, said rows being divided into two groups, means controlled by said second group of selectable elements for rotatively positioning said typewheel and means controlled on the selection of one or the other of two predetermined selectable elements of said first group for selecting one or the other of said groups of rows on said typewheel.

46. In combination, a plurality of selector elements positionable into one of the other of two positions in accordance with received permutations of impulses, an equal number of associated longitudinally movable transfer members having notches predeterminedly arranged thereon, a notched code disc associated with all but one of said transfer members, said transfer members and said code discs being movable from one to the other of two positions, means for moving all of said transfer members and said code discs into one position, means operative thereafter for transferring the setting of said selector elements to said transfer members and said code discs to selectively align the notches therein, a first and second group of selectable elements associated with said transfer members and said code discs respectively, selectable by movement into rows of aligned notches, a printing mechanism comprising a typewheel movable in one direction to effect letter spacing and in another to effect printing of selected characters thereon, means controlled by the selection of one of the first group of selectable elements for suppressing the second of said typewheel movements and means controlled by the selection of other ones of said first group of selectable elements for suppressing both of said typewheel movements.

47. In combination, a plurality of selector elements positionable into one of the other of two positions in accordance with received permutations of impulses, an equal number of associated longitudinally movable transfer members having notches predeterminedly arranged thereon, a notched code disc associated with all but one of said transfer members, said transfer members and said code discs being movable from one to the other of two operating positions, means for moving all of said transfer members and said code discs into one position, means operative thereafter for transferring the setting of said selector elements to said transfer members and said code discs to selectively align the notches therein, a first and second group of selectable elements associated with said transfer members and said code discs respectively, selectable by movement into rows of aligned notches, a typewheel rotatable and movable in a first direction to effect character selection, movable in a second direction to effect letter spacing and movable in a third direction to effect printing, means controlled by said second group of selectable elements for controlling the rotative movement of said typewheel and means controlled by a predetermined one of said first group of selectable elements and the transfer member not associated with a code disc for controlling said first, second and third typewheel movements.

48. In a cyclically operable telegraph receiver, a typewheel shaft, a typewheel having type ele-

ments arranged thereon in a plurality of peripheral rows and fixed to said shaft, said shaft being axially movable to place the peripheral rows of the typewheel one at a time in a printing position, a cyclically operable typewheel shaft operating member for axially moving said shaft in one direction, means responsive to received impulses for controlling the amount of axial movement imparted to said typewheel shaft by said operating member for each cycle of operation thereof, means for actuating said typewheel shaft operating member in accordance with said last mentioned means, a latch for latching said typewheel shaft in an actuated position, means operative in timed relation with the operation of said typewheel shaft operating member for operating said latch and means operative thereafter for returning said typewheel shaft to a normal position.

49. In a telegraph receiver, a typewheel shaft, a typewheel having type elements arranged thereon in a plurality of more than two peripheral rows and fixed to said shaft, said shaft being axially movable and having a normal and a plurality of operated axial positions, said positions being equal in number to the number of peripheral rows of type elements, a cyclically operable member having a normal and a plurality of operated positions with a one-way connection between it and said typewheel shaft for axially moving said shaft from said normal position to any one of said operated positions, signal controlled means for determining the position to which said cyclically operable member will be moved on each cycle of operation thereof and means for actuating said cyclically operable member in accordance with said last mentioned means to axially position said typewheel shaft.

50. In a telegraph receiver, a typewheel shaft, a typewheel having type elements arranged thereon in a plurality of more than two peripheral rows fixed to said shaft, said shaft being axially movable and having a normal and a plurality of operated positions, said positions being equal in number to the number of peripheral rows of type elements, a cyclically operable member having a normal and a plurality of operated positions with a one-way connection between it and said type wheel shaft for axially moving said shaft from said normal position to any one of said operated positions, signal controlled means for determining the position to which said cyclically operable member is moved on each operation thereof, means for momentarily actuating said cyclically operable member in accordance with said last mentioned means, means for retaining said typewheel shaft in an operated position for at least a predetermined length of time and means operative thereafter for releasing said last mentioned means and returning said typewheel shaft to said normal position.

51. In a telegraph receiver, a typewheel shaft with a typewheel fixed thereto having a plurality of peripheral rows of type elements thereon, said shaft having a normal position with a predetermined one of said peripheral rows in a printing plane and axially movable to any one of a plurality of operated positions to place the other of said peripheral rows one at a time in the printing plane, a cam controlled operating bar for moving said typewheel shaft from said normal position to any one of said operated positions in one continuous movement, a plurality of movable

stops normally in the path of movement of said operating bar for stopping the same in any one of a plurality of positions and a cyclically controlled member for operating said stops, said member being adapted to operate none or one or more of said stops on each cycle of operation thereof.

52. In a telegraph receiver, a typewheel shaft with a typewheel fixed thereto having a plurality of peripheral rows of type elements thereon, said shaft having a normal position with a predetermined one of said peripheral rows in a printing plane and axially movable to any one of a plurality of operated positions to place the other of said peripheral rows one at a time in the printing plane, a cam controlled operating bar for moving said typewheel shaft from said normal position to any one of said operated positions in one continuous movement, a plurality of movable stops normally in the path of movement of said operating bar for stopping the same in any one of a plurality of positions, a slidable member operating in timed relation with said operating bar for progressively operating said stops to remove the

same from the path of movement of said operating bar, and means for stopping the movement of said slidable member after none, one, or more than one of said stops are removed from the path of movement of said operating bar.

53. In a telegraph receiver, a typewheel having a normal and a plurality of axial positions, resilient means for biasing said typewheel in said normal position, means for selecting one operated position of said typewheel at a time, means for moving said typewheel in one direction to a position an amount less than the distance between two consecutive positions beyond said selected axial operated position, means operative thereupon for moving said typewheel moving means to a normal position, means including said resilient means for concomitantly moving said typewheel toward said normal position and means for stopping for at least a predetermined length of time the return movement of said typewheel to said normal position into said selected axial position.

JAMES W. LONG.
GEORGE I. ROBERTS.