

[54] **INPUT-OUTPUT TYPEWRITER APPARATUS**

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[52] U.S. Cl. **197/19, 197/16**

[51] Int. Cl. **B41j 5/30**

[58] Field of Search **197/16, 19**

[56] **References Cited**

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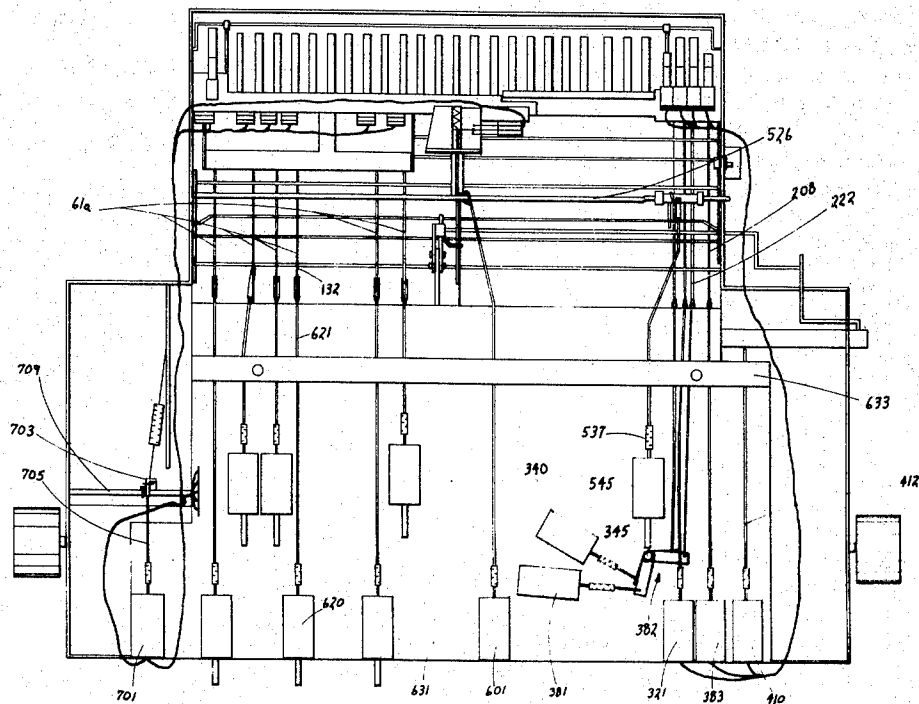
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[57]

ABSTRACT

A typewriter which is remotely operable or capable of providing signals for remotely operating another typewriter. The typewriter has movable mechanical mechanisms, such as interposers, for operating the character printing and carriage function mechanisms of the typewriter. A mounting board is horizontally mounted to the typewriter frame beneath the typewriter mechanism and a plurality of horizontally operable solenoids are mounted to the underside of the mounting board. The solenoids are connected to the interposers and other mechanical mechanisms by a plurality of connecting rods which extend downwardly from the typewriter mechanisms and then horizontally beneath the mounting board to the plungers of the solenoids. Blade switches are provided which seat in cam follower relationship against a cam lobe portion of the interposers and other typewriter mechanisms for providing output data. Selected ones of the connecting rods are provided with clevises which may be snapped on the standard clevis pins of the interposers.

1 Claim, 26 Drawing Figures



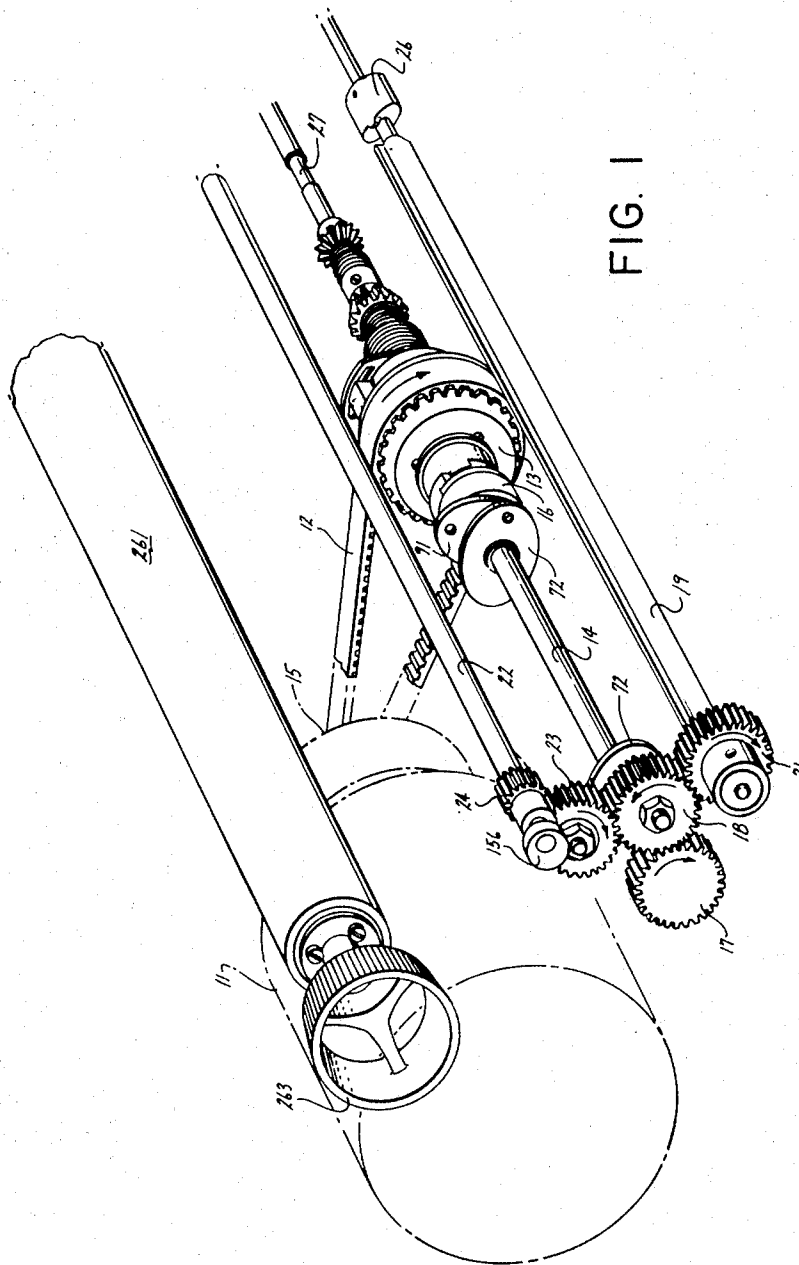


FIG. 1

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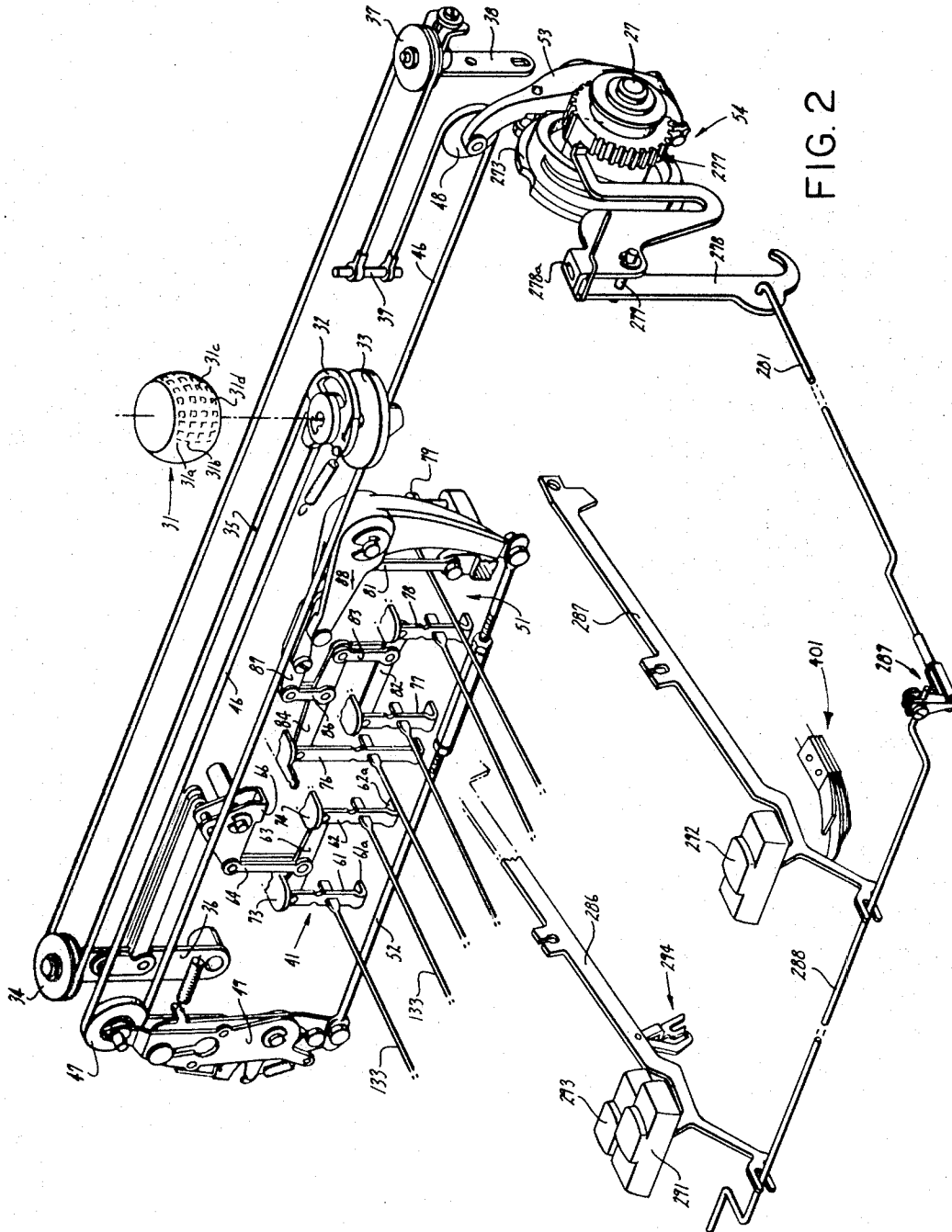


FIG. 2

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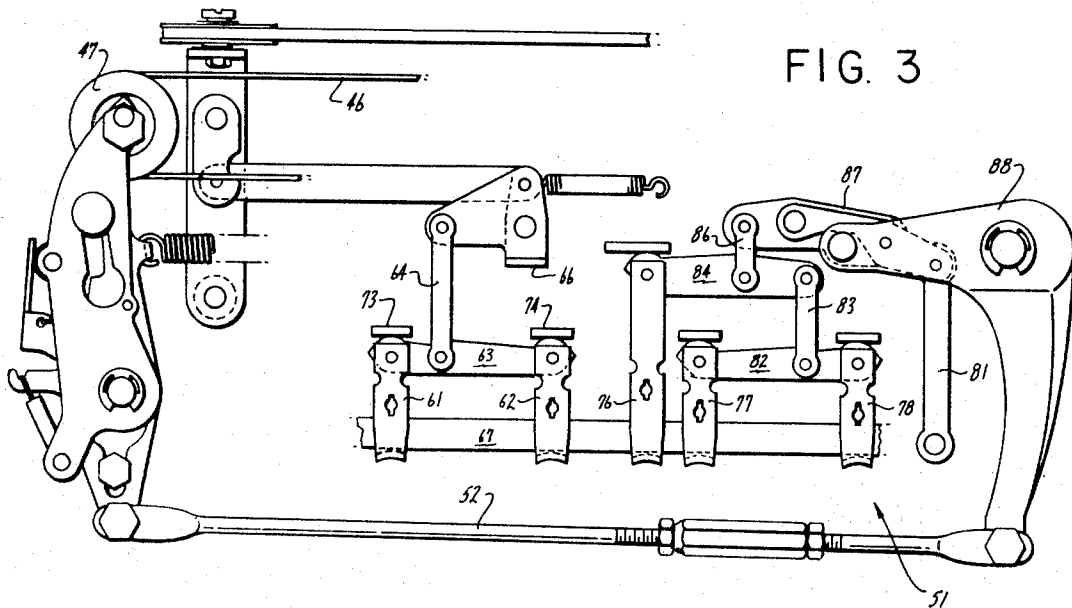


FIG. 3

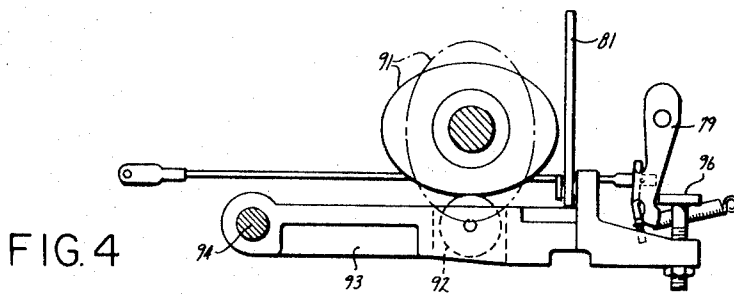


FIG. 4

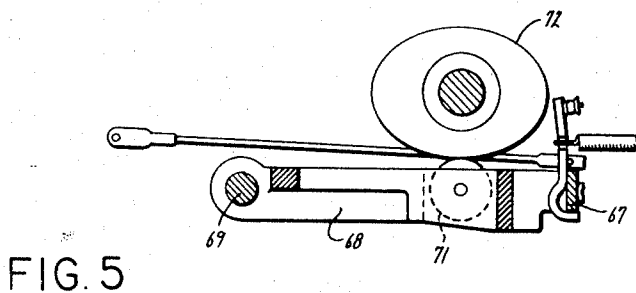
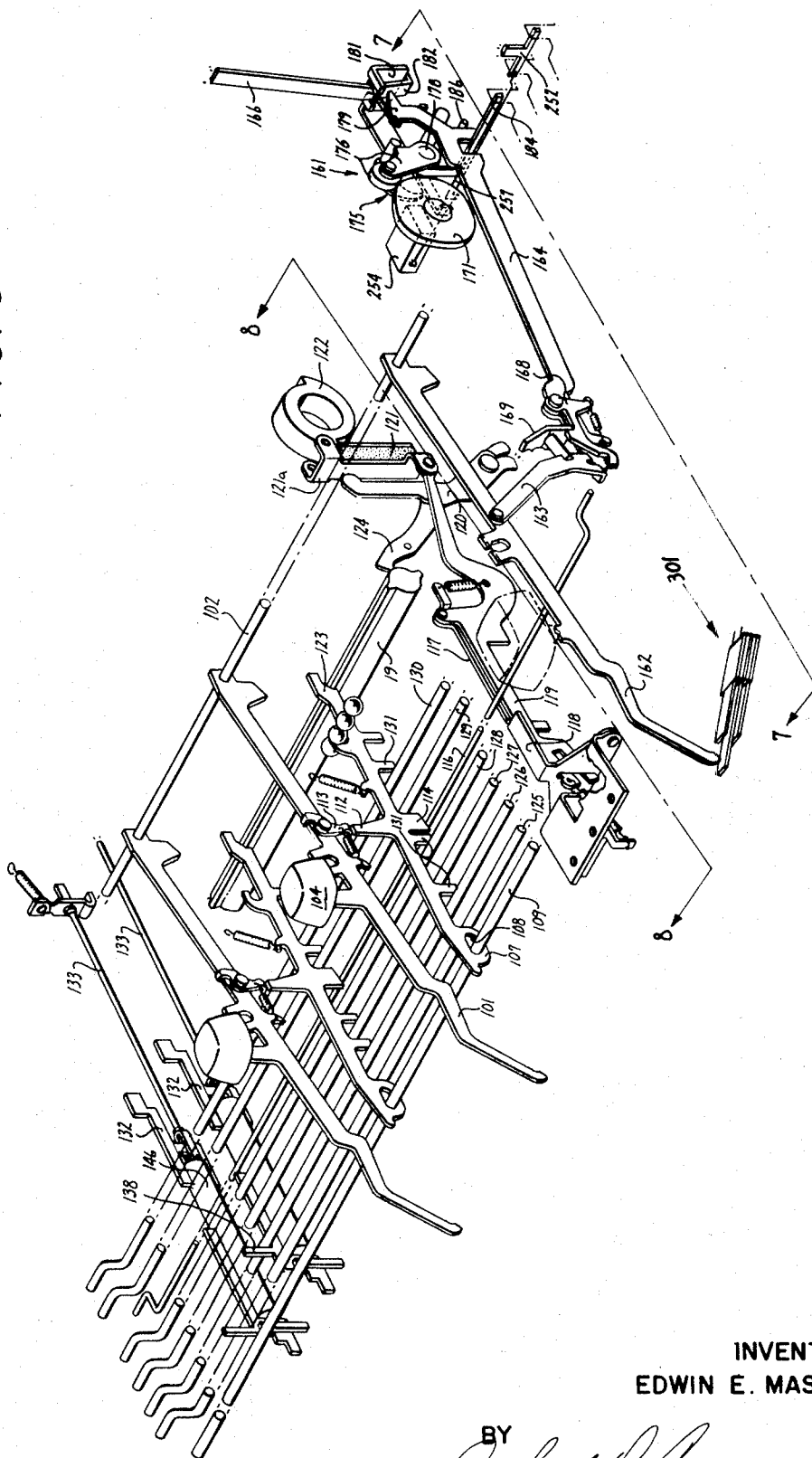


FIG. 5

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FIG. 6



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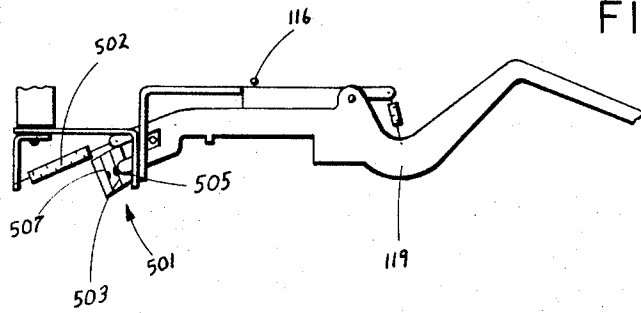


FIG. 6A

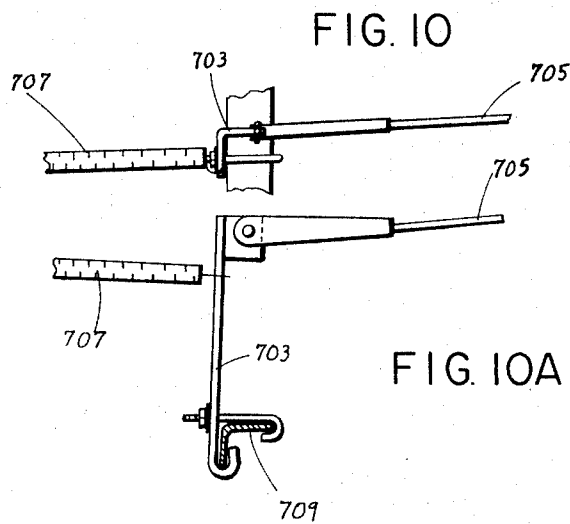


FIG. 10

FIG. 10A

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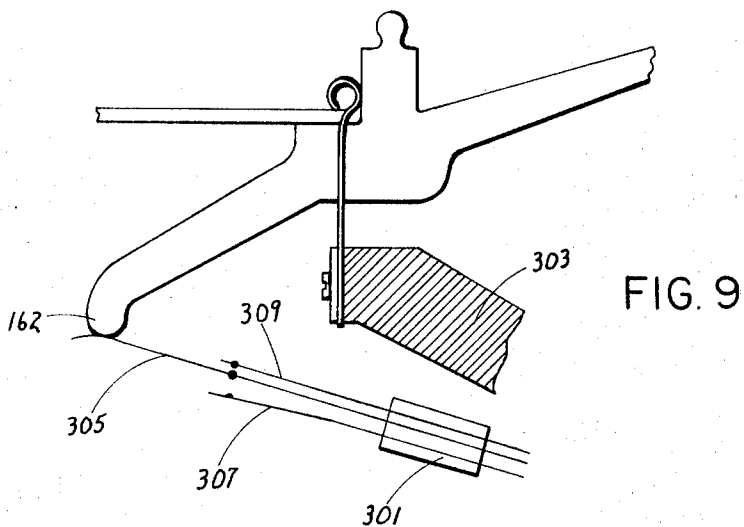


FIG. 9

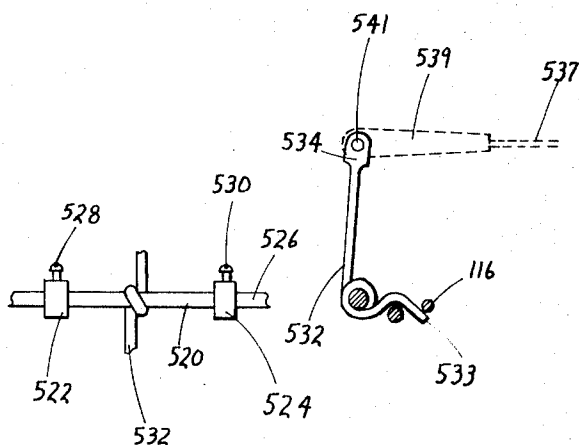


FIG. 6B

FIG. 6C

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FIG. 7

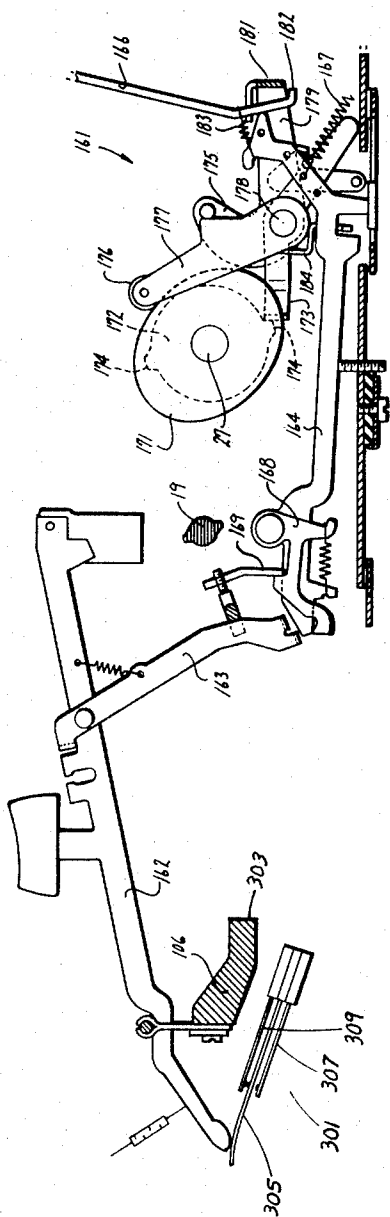
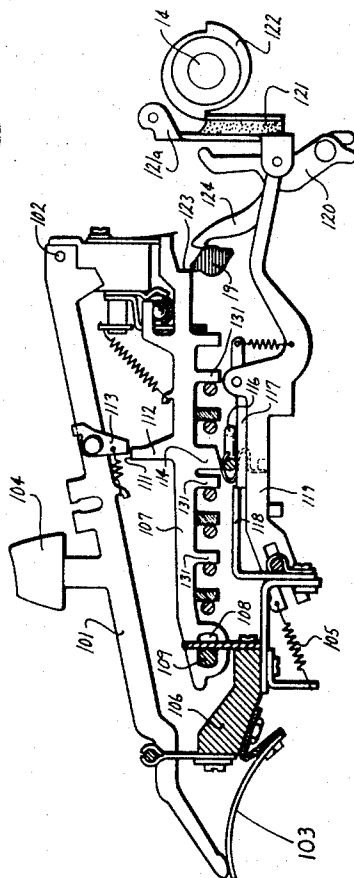


FIG. 8



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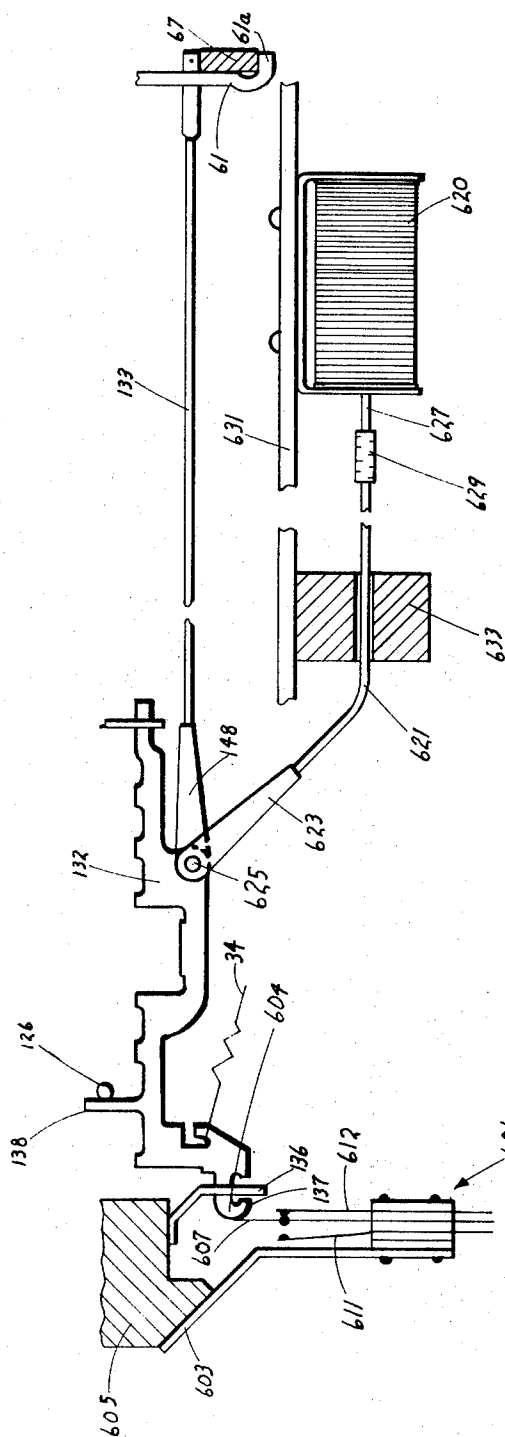


FIG. II

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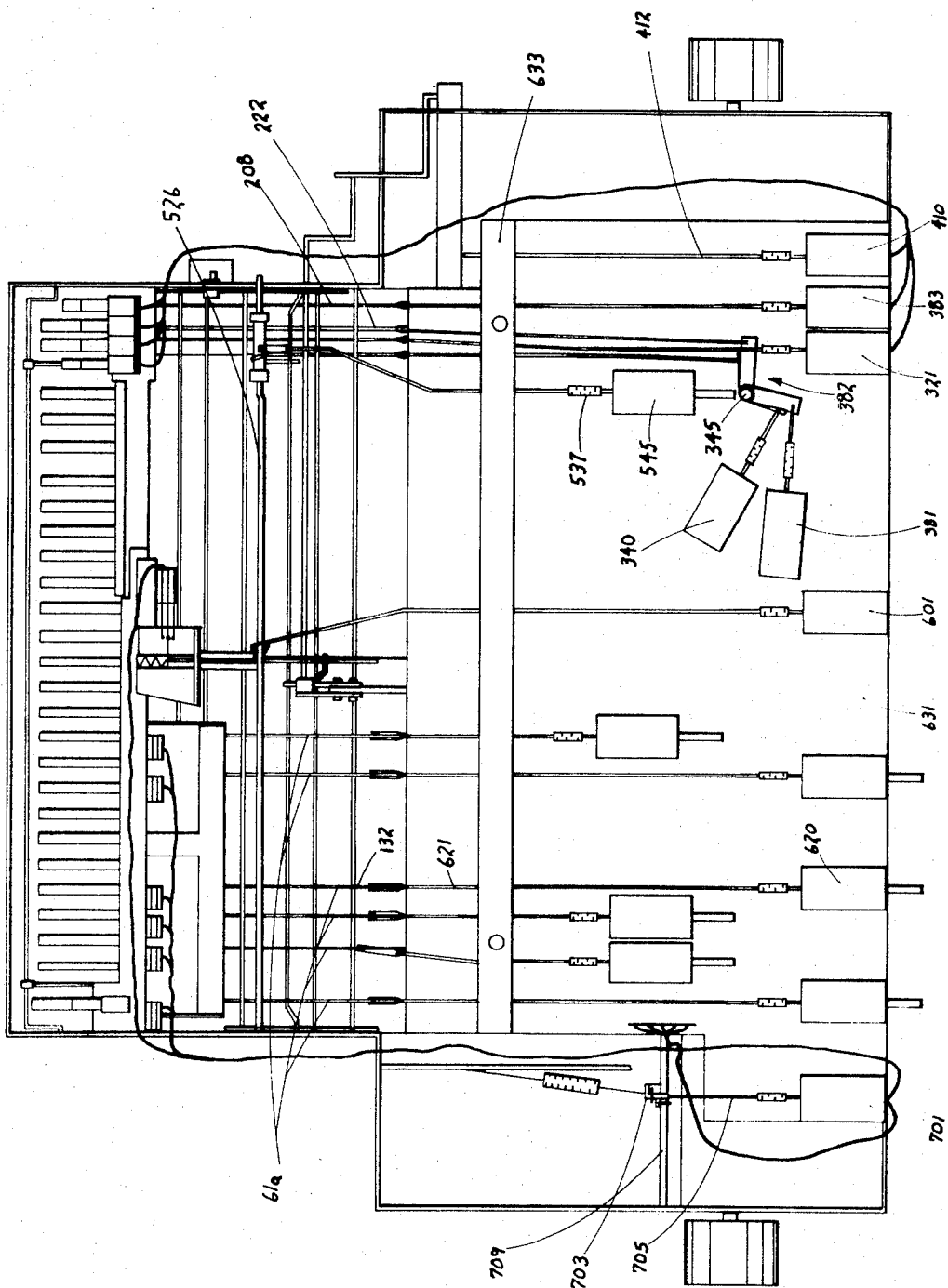


FIG. 12

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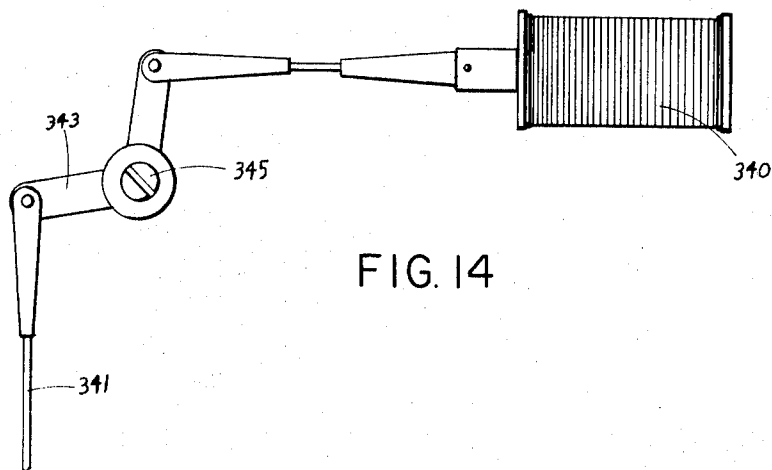


FIG. 14

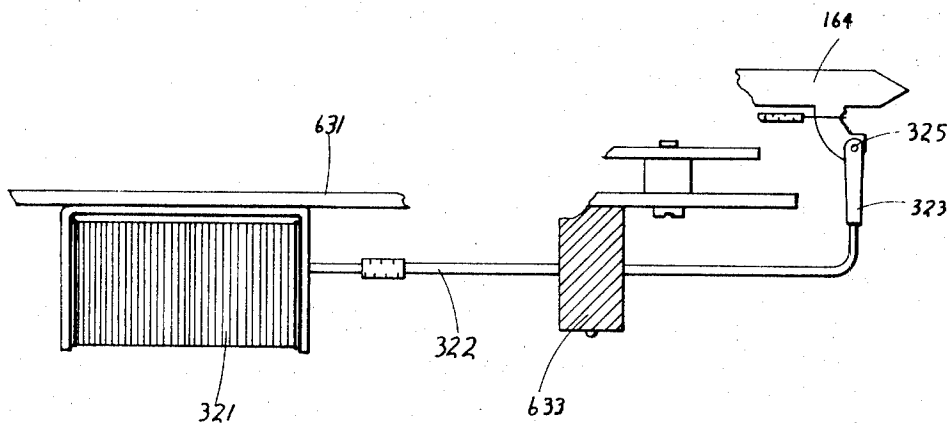
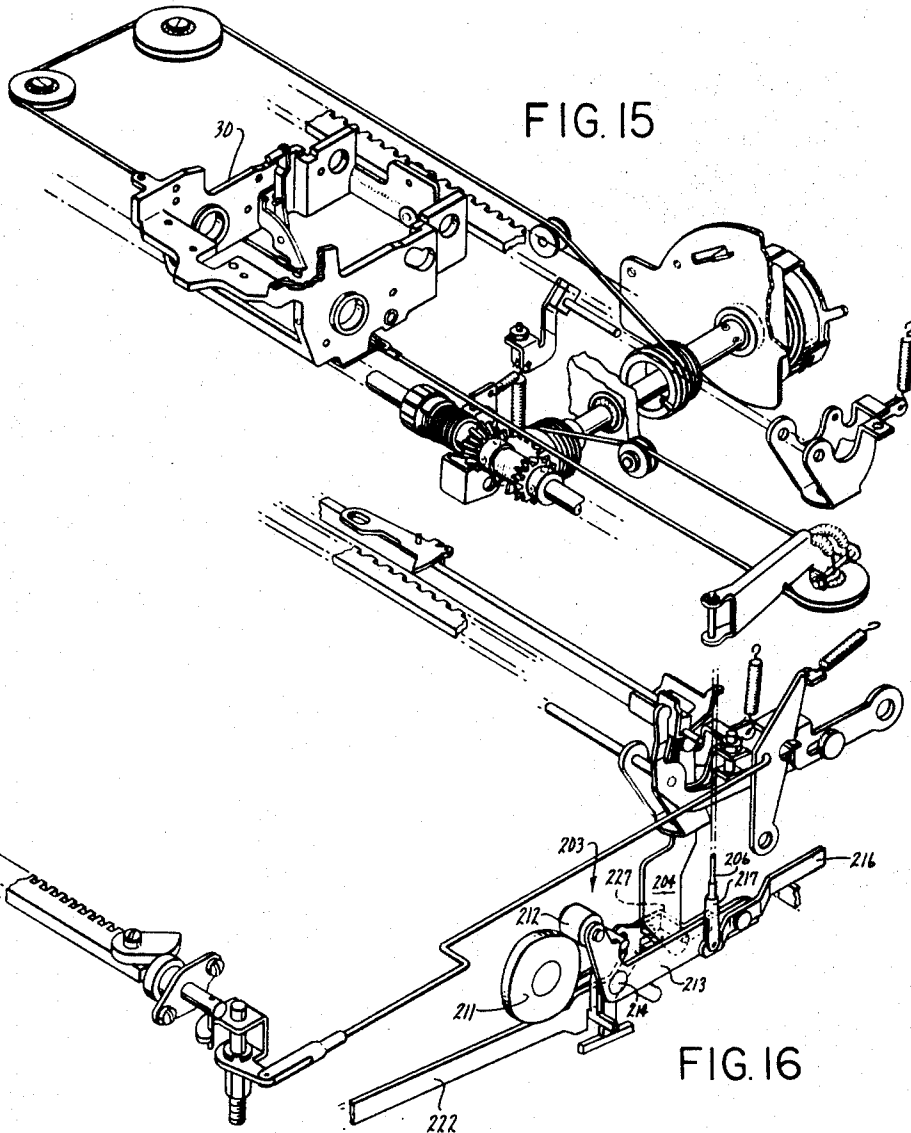


FIG. 13

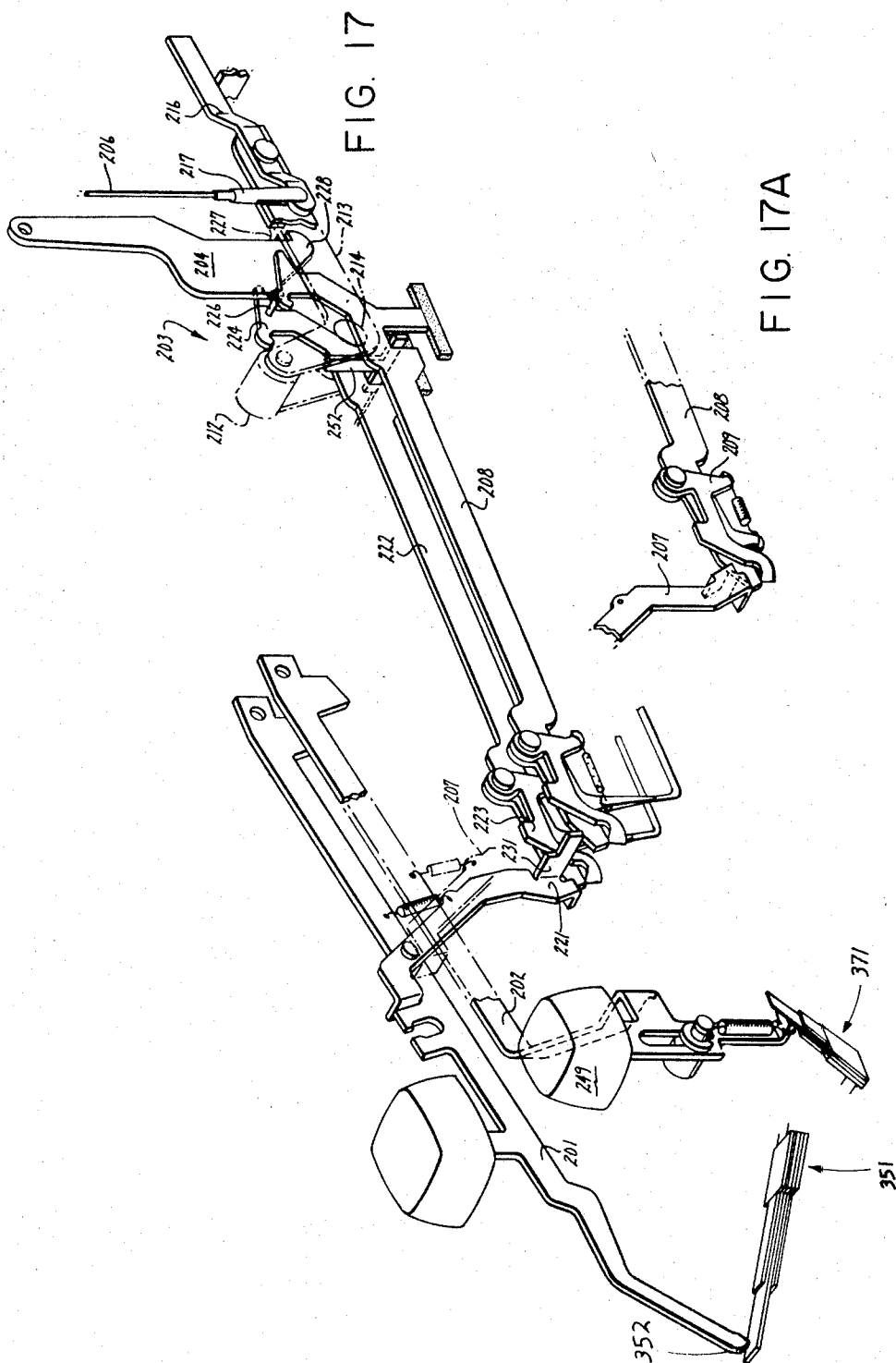
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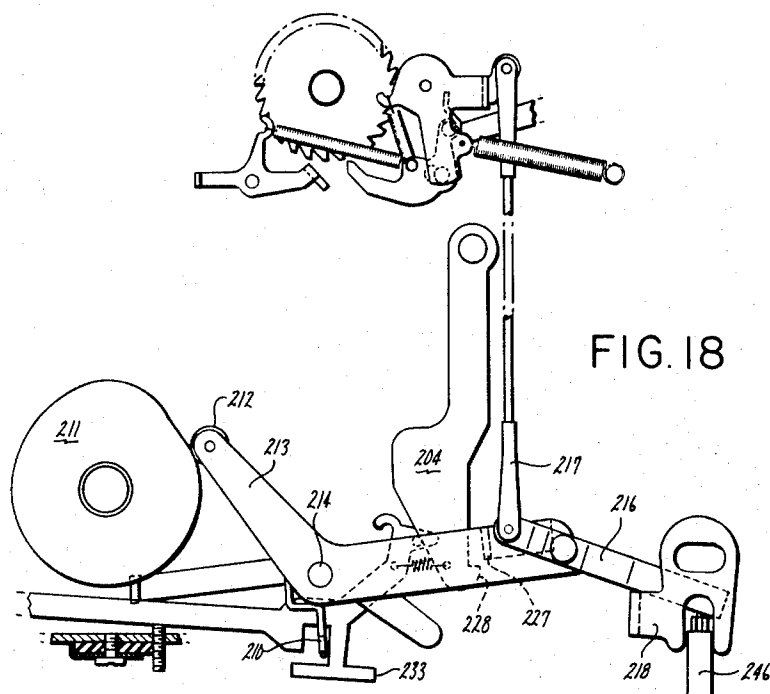


FIG. 18

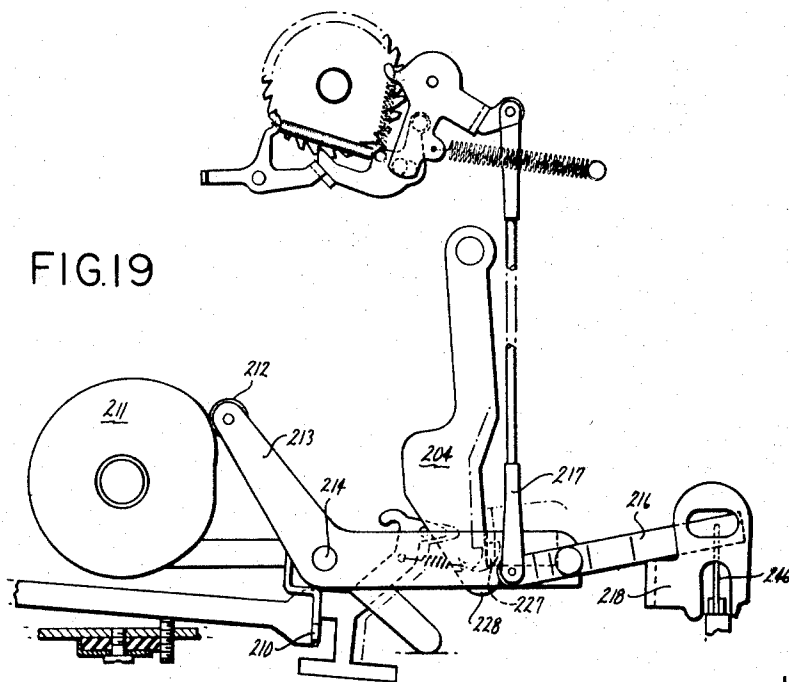


FIG. 19

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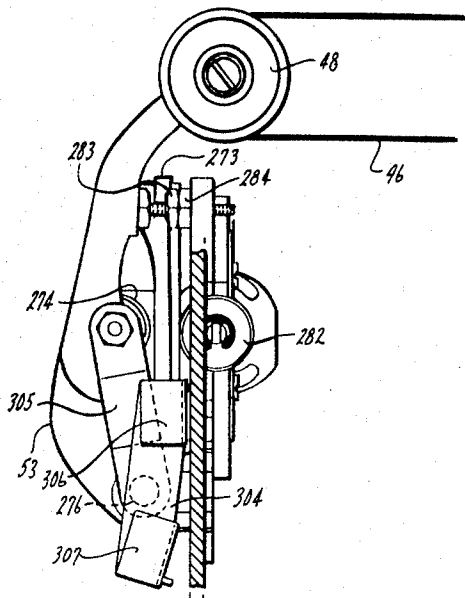


FIG. 20

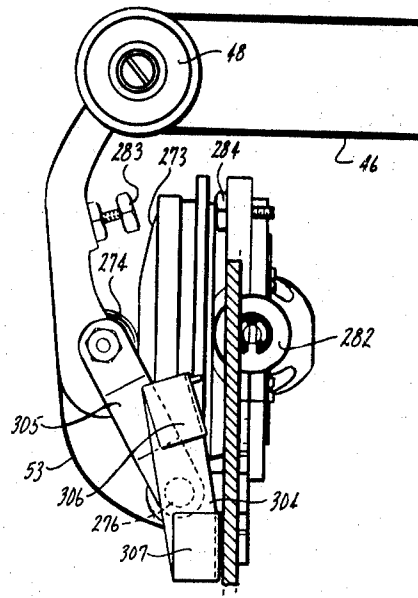


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INPUT-OUTPUT TYPEWRITER APPARATUS

BACKGROUND OF THE INVENTION

The invention relates to a typewriter which may be operated from remote equipment by incoming data or which alternatively may be used to provide such data for remote operations.

In recent years, the electric typewriter has become not only a means for communications from one location to another, but also has become a means for communicating with an electronic computer. Many attempts have been made to modify typewriters so that they may be used in any of three alternative functions. The first desired characteristic of a typewriter is that it may be used for its most common purpose of direct manual typing. The second desired function is the generation of data for transmission to a remote location. The third function which is desired is the receipt of data and the transforming of the data into a typewritten message.

Many types of mechanisms have been suggested for converting the standard IBM electric typewriter to add the additional input and output functions. For example, Holmes, in U.S. Pat. No. 3,453,379, has suggested a system which is typical and calls for the positioning of solenoids and micro switches in many diversified and widely scattered locations throughout the conventional typewriter mechanism. Attaching these types of converting mechanisms to the typewriter requires either factory installation or a rather complex and complete dismantling of the typewriter in order to install the equipment. In many cases the standard typewriter may not be utilized, but rather the typewriter manufacturer must manufacture unique parts for use on input-output typewriters. The consequent result of the complexity of the necessary prior art modifications is a typewriter which is far more expensive than the standard electric typewriter.

There is, therefore, a need for an input-output typewriter which is manufactured by installing simple and easily installed equipment on the standard typewriter without the necessity of dismantling the typewriter. There is similarly a need for apparatus which can be added to the standard typewriter and remain accessible for inspection and servicing. Furthermore, there is a need for such equipment which can be added to the standard electric typewriter without causing a substantial enlargement of the cabinet in which the typewriter mechanisms are housed.

SUMMARY OF THE INVENTION

The actuating mechanisms of the typewriter, for use in its remotely operable mode where the typewriter is of the type having mechanical mechanisms for operating the character printers and the carriage functions, include a mounting board horizontally mounted to the typewriter frame beneath the typewriter mechanisms. A plurality of horizontally operable solenoids are mounted to the underside of the mounting board. They are connected to the mechanical mechanisms by a plurality of connecting rods which extend downwardly from the mechanical mechanisms and horizontally beneath the mounting board to be linked to the plungers of the solenoids.

For operating in its output mode to provide data for a remote operation, the typewriter is provided with a plu-

rality of blade switches which are mounted in cam follower relationship against cam lobe portions of the mechanical mechanisms.

OBJECTS OF THE INVENTION

It is therefore the object of the invention to provide an improved input-output typewriter.

Another object of the invention is to provide mechanisms which may be very quickly and very inexpensively added to a standard IBM selectric typewriter.

Another object of the invention is to provide mechanisms which are easily accessible to service personnel for inspection, cleaning and repair.

Another object of the invention is to provide mechanisms which can be attached to the standard IBM selectric typewriter and yet permit the typewriter cabinet to remain substantially unchanged.

Another object of the invention is to provide such mechanisms which can be added to the IBM selectric typewriter without requiring dismantling of the standard typewriter mechanisms.

Further objects and features of the invention will be apparent from the following specification and claims when considered in connection with the accompanying drawings illustrating the preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective, illustrating a typewriter platen in relation to the typewriter drive system;

FIG. 2 is a view in perspective, illustrating portions of the typewriter character selection mechanism and case shift mechanism;

FIG. 3 is a front view of a portion of a typewriter character selection mechanism;

FIG. 4 and 5 are side views of portions of a typewriter character selection drive mechanism;

FIG. 6 is a view in perspective showing the character selection and back space selection portion of a typewriter;

FIG. 6a is a view in side elevation of the detail of the cycle clutch switch of the invention;

FIG. 6b is a view in side elevation of the bell crank mechanism of the invention for actuating the cycle clutch bail;

FIG. 6c is a front view of the mechanism illustrated in FIG. 6b;

FIG. 7 is a view in side elevation along the lines 7-7 of FIG. 6;

FIG. 8 is a view in side elevation taken generally along the lines 8-8 of FIG. 6;

FIG. 9 is a side view illustrating the detail of the key-lever switch illustrated in FIG. 7;

FIG. 10 is a top view and FIG. 10a is a side view of the pull rod and clevis attachment to the tab trip lever;

FIG. 11 is a view in side elevation showing the detail of the solenoid of the switch mechanisms which are added to the standard IBM selectric typewriter according to the invention to cooperate with the latch interposers;

FIG. 12 is a bottom view of the electric typewriter showing the mounting board solenoids and switches mounted in their respective positions on the underside of the typewriter;

FIG. 13 is a view in side elevation illustrating the detail of the solenoid structure utilized to operate the carriage function interposers;

FIG. 14 is a bottom view in detail, illustrating the bell crank mechanisms for operating some of the carriage functions illustrated in FIG. 12;

FIG. 15 is a view in perspective, illustrating a typewriter carrier mechanism;

FIG. 16 is a view in perspective, illustrating a portion of the carrier mechanism shown in FIG. 15 together with control mechanisms therefor;

FIG. 17 is a view in perspective, illustrating a typewriter carrier return and an index control mechanism as modified by the present invention;

FIG. 17a illustrates a portion of the mechanisms set out in FIG. 17;

FIGS. 18 and 19 are side views of the typewriter index mechanism; and

FIGS. 20 and 21 are side views of a typewriter case shift mechanism.

In describing the preferred embodiment of the invention illustrated in the drawings, specific terminology will be resorted to for the sake of clarity, however, it is not intended to be limited to the specific terms so selected and it is to be understood that these specific terms include all terms which operate in a similar manner to accomplish a similar purpose.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Character Selection and Printing

Referring now to FIG. 1, an electric typewriter motor 11 operates through a motor clutch 15 and a drive belt 12 to provide the typewriter with the power necessary to carry out a selected print operation or function operation. The drive belt operates over a drive pulley 13 which is connected to a cycle shaft 14 through a cycle clutch 16. When the motor 11 is energized and operating, it continuously drives the pulley 13, but only rotates the shaft 14 when clutch 16 is conditioned to transmit torque. Mounted between the ends of shaft 14 are a plurality of cams such as cams 72 and 91 the operation and function of which will be described below. Secured to the end of shaft 14 is a gear 17 which meshes with a gear 18 that drives a filter shaft 19 through gear 21. The gear 17 also drives a print shaft 22 through an idler gear 23 and print shaft gear 24. Thus, each time a print cycle is initiated by a keybutton being depressed the motor 11 drives the cycle shaft 14 which results in the filter shaft 19 and the print shaft 22 being driven for as long as the cycle clutch 16 connects the pulley 13 to the shaft 14. An escapement cam 26 on the filter shaft 19 initiates a function operation (space) to accompany each print operation and provides the only function operation which is initiated through the cycle clutch 16.

An operational cam shaft 27 also communicates with the drive pulley 13 and serves as the connection between the source of power 11 and those mechanisms which perform the various function operations. The IBM selectric typewriter has a print mechanism the operation of which is basically different than the more commonly known typewriters which employ a large number of individual key bars. In the more conven-

tional typewriter, paper is held to a platen which is secured on a carriage which is movable past a given fixed location at which a selected type bar strikes the paper. The IBM selectric typewriter employs a stationary platen for the paper and has a carrier which supports a type head that moves relative to the paper. The type is all located on the type head and by properly positioning the type head relative to the paper prior to having the type head strike the paper, a selected character or symbol is printed. The type head has four rows of characters with all lower case characters on one hemisphere and all upper case characters on the other hemisphere. In order for a selected character to be printed it may be necessary to both rotate and tilt the type head. The mechanisms which perform these functions are best shown on FIG. 2.

A type head 31 is connected (through mechanism not shown) to a tilt pulley 32 and a rotate pulley 33. Secured to the tilt pulley 32 is a steel band tilt tape 35. The tape 35 extends around a pulley 34, which is mounted on a movable tilt arm 36, over a second pulley 37 which is mounted on a stationary arm 38. The end of the tape is anchored to a shaft 39 which is secured to a movable type head carrier 30 (see FIG. 15) on which the head 31 and pulleys 32 and 33 are mounted. Since both ends of tilt tape 35 are secured to the movable type head carrier 30, movement of the carrier does not be itself change the angular position of the tilt pulley 32. The angular position of the tilt pulley 32 is a function of the position of the tilt arm 36, which in turn is a function of the tilt mechanism 41. When the tilt mechanism 41 operates to change the tilt position of the type head 31 the tilt arm 36 is positioned to change the distance between pulleys 34 and 37. The change in distance between these two pulleys is compensated for by rotation of the tilt pulley 32 which produces a tilt movement of the head 31.

Secured to the rotate pulley 33 is a rotate tape 46 which extends over a rotate arm pulley 47 and a shift arm pulley 48 before being secured to the shaft 39. The shift arm pulley 48 is stationary except when a shift operation occurs and thus for the purpose of this discussion can be considered as stationary. The pulley 47 mounted on the rotate arm 49 is movable (along with the rotate arm) and provides the means for rotating the head 31 in much the same manner as movement of arm 36 resulted in tilt rotation of the head 31. Rotate mechanism 51 operates through a rotate link 52 to position the rotate arm 49 and thus the rotate arm pulley 47. Moving the pulley 47 relative to the pulley 48 is compensated for by rotation of the spring-loaded rotate pulley 33.

The pulley 48 is secured to the shift arm 53 which is controlled by the shift mechanism 54 to be in one of two positions. In its normal position the type head 31 is operating on the hemisphere which produces lower case characters and symbols, and in its shifted condition the position of the pulley 48 causes 180° rotation of the type head 31 whereby typing produces upper case characters and symbols.

Each time a character keylever button is depressed both the rotate mechanism 51 and the tilt mechanism 41 operate to position the head 31 to that location which results in the printing of the selected character or symbol. The mechanism which translates the depres-

sion of a single keylever button into the exact positioning of the head 31 necessary to produce the desired results will now be described.

Referring now to FIGS. 2-5, the tilt mechanism 41 comprises a pair of selector latches 61 and 62 each 5 rotatably connected to one end of a cross lever 63. A link 64 is rotatably connected at one end to cross lever 63 and at its other end to the tilt bell crank 66. Link 64 is pinned to cross lever 63 at a location which is twice as far from selector latch 62 as from selector latch 61. 10 Each of the latches 61 and 62 includes a forwardly extending end bottom portion 61a and 62a, respectively, and the latches are spring-loaded to a position which positions portions 61a and 62a below a latch bail plate 67.

The latch bail plate 67 forms a portion of the latch bail 68 which is disposed for rotation about a shaft 69. The latch bail 68 carries a roller 71 which contacts a positive selector cam 72 which is mounted on the cycle shaft 14 (see FIG. 1). The positive selector cam 72 has a generally elliptical shape and thus provides a complete cycle of operation for each 180° of revolution. When the cam rotates 90° from the position shown in FIG. 5, the latch bail 68 is urged downwardly 25 with the latch bail plate 67 urging the selector latches along with it. A further 90° rotation of the cam enables the latch bail to return to its initial position. After the initial 40° of rotation of cam 72, those selector latches not withdrawn are positively engaged and those selector latches withdrawn are cleared. At this time the selector latches can be released without disrupting the desired operation. This feature will be shown to be of considerable importance further in the description of the invention. 35

The type head 31 (FIG. 2) carries four circular rows of characters 31a, 31b, 31c and 31d. The head has a normal tilt position in which the characters of row 31a are in the print location. The operation of tilt mechanism 41 results in the characters of one of the other rows being moved to the print location. When both of the selector latches 61 and 62 are pulled downward by the latch bail plate 67, the link 64 moves 45 down a distance equal to the distance moved by the latch bail plate and produces the maximum movement of tilt link 36 through the tilt bell crank 66. This produces a change of three rows on the type head such that the characters in row 31d are located for printing. If prior to the latch bail plate 67 moving downwardly the selector latch 61 is urged in a direction which withdraws the lower extending portion 61a from below the latch bail 67, then only the selector latch 62 will move downwardly with the latch bail plate. When only the selector latch 62 moved downwardly, the cross link 63 rotates about the upper portion of selector latch 61 (the upward movement of selector latch 61 being halted by a stop 73) and the downward movement of link 64 is only one-third as great as when both selector latches were pulled down. This one-third greater movement of link 64 produces only a third as much movement in bell crank 66 and consequently only a third as much movement in tilt link 36. Under these conditions the head tilts one row of characters to row 31b. If the selector latch 62 is withdrawn from below the latch bail plate 67 and selector latch 61 is the only latch urged 65 downwardly, then rotation of cross link 63 takes place

about the top of latch 62 (stop 74 preventing upward movement of latch 62) and the movement of link 64 is twice as great as when latch 62 is urged downwardly, and two-thirds as great as when both latches are urged downwardly. This gives rise to a two-row tilt of the type head whereby the characters of row 31c are located for printing.

To summarize, when both latches 61 and 62 are withdrawn from below latch bail plate 67 prior to the latch bail being cammed downwardly no tilting occurs in the type head and the characters of row 31a are located for printing. When latch 62 is withdrawn from under the bail plate the head tilts to locate row 31b for printing; when latch 61 is withdrawn from below the bail plate the head tilts two rows to row 31c; and when neither of the latches is withdrawn from below the bail plate (thus both latches being urged downwardly with the latching bail) the head tilts to locate the characters of row 31d for printing. 20

The rotate mechanism 51 is somewhat more complex than the tilt mechanism due to the need to move to more than four different locations. The principle of operation however is basically the same. The rotate mechanism includes three selector latches 76, 77 and 78 plus a five-unit latch 79 which works through five-unit latch link 81. Each of the selector latches 76, 77 and 78 includes a forwardly extending bottom portion which is disposed below the latch bail 67 unless urged in a direction which withdraws it. The selector latches 77 and 78 are connected by a cross link 82 which in turn is secured by a first lever 83 to a second cross link 84. Also connected to the cross link 84 is the selector latch 76. The second cross link 84 is connected by a second lever 86 to a balance lever 87. The balance lever 87 is connected to the rotate bell crank 88 which is connected through rotate link 52 to the rotate arm 49. It is the position of the rotate arm which determines the position of pulley 47 which in turn acts through tape to angularly position the rotate pulley 33. And angular position of pulley 33 determines the rotate position of head 31. 40

When both latches 76 and 78 are withdrawn from below the bail plate 67, such that latch 77 is the only latch urged downwardly, there results a rotation of bell crank 88 which is one fifth as great as the maximum rotation possible through the rotate mechanism 51. When latch 78 is the only latch urged downwardly the resulting rotation of bell crank 88 is twice that achieved through latch 77 and thus two-fifths the maximum possible rotation. The same rotation of bell crank 88 which is achieved when only latch 78 is urged downwardly is achieved when latch 76 is the only latch engaging the bail plate during its downward movement. Latch 76, however, is not used for the purpose of achieving a two-unit rotation. To achieve a three-unit rotation, latches 77 and 78 are both allowed to engage the bail plate on its downward movement and latch 76 alone is withdrawn. A four-unit rotation is accomplished by urging latches 76 and 78 down while withdrawing latch 77, and a five unit, or maximum rotation occurs, when all three latches are allowed to engage the bail plate during its downward movement. 65 Unlike the tilt mechanism, it is necessary in the rotate mechanism to produce rotation in both directions. The mechanism as described so far has only produced rota-

tion of the bell crank 88 in a single direction. For rotation in the opposite direction it is necessary to employ a five-unit latch system which will now be described with reference to FIG. 4.

The five-unit latch system has its own cam 91 which engages a roller 92 carried by a bail 93 which is mounted on a shaft 94 for rotation. The latch 79 is spring urged to a position which normally prevents the bail 93 from rising. A lug 96 is secured to the bail 93 and engages the bottom of the latch 79 unless the latch is urged out of its normal position. Thus for positive rotation of the bell crank 88 the end of balance lever 87 connected to link 81 is held downwardly. When the link 81 is allowed to rise by virtue of latch 79 being withdrawn, there is an associated rotation of bell crank 88 in a direction opposite to that produced by the selector latches being urged downwardly. If all of the latches 76, 77 and 78 are withdrawn from below the latch bail plate 67 and the five-unit latch is released to allow the link 81 to rise, a negative rotation of five units (the maximum negative rotation) occurs. If the selector latch 77, which as previously explained produces one unit of positive rotation is allowed to remain below the bail plate 67 and thus move downwardly therewith at the same time the link 81 is allowed to move upwardly, the total negative rotation is reduced by one unit and thus a four-unit negative rotation is achieved. Thus, through the combination of the five-unit latch 79 and the positive selector latches, a negative rotation of one, two, three, four, or five units can be achieved. The mechanisms employed for withdrawing selector latches and for driving the bail plate downwardly will now be described with reference to FIGS. 6 and 8.

The selection of a character or symbol to be printed is made through a key lever 101, one end of which is rotatably mounted on a fulcrum rod 102 and the other end of which is supported by a leaf spring 103. Depression of the key button 104 associated with the key lever 101 causes the key lever to move downwardly until it engages a lower stop 106. Mounted directly below each key lever 101 is an interposer 107, one end of which includes an elongated hole 108 through an interposer securing rod 109 passes. The elongated hole 108 allows the interposer to be moved a limited distance in the direction of its axis. The upper surface of the interposer includes a key-lever pawl contact surface 111 at the top of an upwardly projecting finger 112. The surface 111 engages the key-lever pawl 113 whenever the key lever is depressed and acts to transfer the downward motion of the key lever to the interposer 107. As the interposer moves downwardly, a downwardly extending clutch release lug 114 contacts a cycle bail 116 causing it to move downwardly.

As the cycle bail moves downwardly it engages the cycle clutch latch pawl 117 urging it downwardly so that it is able to slide under the cycle clutch keeper 118 which normally prevents the cycle clutch latch link 119 from moving toward the front of the typewriter (spring 103 being near the front while rod 102 is toward the rear) in which direction it is spring-urged by spring 105. With the pawl 117 disengaged from the keeper 118 the link can move under the force of spring 105, and in so doing disengages the cycle clutch latch 121 from the cycle clutch sleeve 122 allowing the cycle clutch to engage and thereby effectively connect the

motor to the cycle shaft 14 for rotation thereof. Rotation of the cycle shaft 14 produces accompanying rotation of the filter shaft 19 which engages the end 123 of the interposer 107 when the interposer is in downward position. As the filter shaft rotates it drives the interposer toward the front of the typewriter within the limits set out by the elongated hole 108 and the rod 109. It is this movement which operates to select a character or symbol for printing.

The filter shaft 19 also engages the cycle clutch latch restorer follower 124 which is connected to the cycle clutch latch restoring arm 120. The filter shaft causes clockwise rotation of arm 120 which engages the cycle clutch latch bracket 121a and urges it in a direction which results in the cycle clutch 121 being put back to the condition in which it prevents the motor from being effectively connected to the cycle shaft.

Disposed directly below the interposer 107 are six selector bails 125-130. The selector bails are separated from one another by a distance which is slightly greater than the distance which the interposer is able to move within the limits set by the elongated hole 108. Extending downwardly from the underside of interposers 107 are zero to six selector lugs 131 which are affixed at any one of six possible locations along the underside of the interposer. Since there may be anywhere from zero to six selector lugs associated with an interposer, the number of selector bails associated with a given interposer may range from zero to six. There are 64 different unique combinations possible with the six bails and each interposer is associated with a different combination. In this way each key lever is associated with a different combination of selector bails through the selector lugs on an interposer 107.

When an interposer is driven toward the front of the typewriter by the filter shaft 19, it carries with it the selector bail or bails, if any, with which it is associated through its selector lug or lugs if any.

Each selector bail has exclusively associated therewith a latch interposer 132 (only two of which are shown in FIG. 6). Each latch interposer, in turn, is connected through a latch link 133 to one of the selector latches previously described with reference to FIG. 3. When a selector bail is moved towards the front of the typewriter it carries with it one of the latch interposers 132 which in turn operates through a link 133 to withdraw one of the selector latches from under the latch bail plate 67 of the latch bail 68 (see FIGS. 3 and 5). In this way each key lever is capable of selecting a different set of selector latches to be withdrawn from the latch bail and thus select a character or symbol for printing.

It is necessary for the operation of the present invention that the typewriter not only be remotely operable to print a character or symbol but also that it operate to generate an electrical signal which uniquely identifies the particular character or symbol selected for printing. Thus, if it is necessary for the typewriter to be capable of both generating and operating in response to electrical signals. This last-mentioned feature can be provided (and has in fact been provided in prior art devices) by simply associating a solenoid with each of the key levers and through the use of a matrix or other logic device induce the desired operation by operation of the solenoid urging the key lever downwardly. Such a

system is not satisfactory, however, because it is costly and cumbersome, due to the presence of a great number of solenoids. The present invention provides for both signal generating, and operation in response to electrical signals, in a unique manner which has the advantages of simplicity, accuracy, economy and of permitting unusually easy modification of the standard IBM selectric typewriter.

By detecting those of the six latches 61, 62, 76, 77, 78, 75, and 79, which are withdrawn in order to print a selected character or symbol, it is possible to state which of the 44 characters and symbols has been selected to be printed. This is true since each character occupies a unique position on the type head and each position on the type head is identifiable with a single combination of selector latches.

By associating each of the six selector latches with an electrical signaling means which identifies those latches which have been withdrawn (or conversely those latches which have not been withdrawn) there will be generated, each time a character is printed, a six-channel electrical code signal representing a six-bit binary word which is uniquely identifiable with a single character or symbol which the typewriter is capable of printing.

Referring to FIGS. 6 and 11, each of the six latch interposers 132 (one of which is shown) is urged toward its associated selector latch by spring 134. A stop 136 limits the movement of the interposer in the direction of its selector latch such that when the end 137 of the latch interposer contacts the stop 136 the selector latch 61 (for example) is disposed such that its forwardly extending lower portion 61a is situated below the latch bail 67. When these conditions prevail, the selector latch is urged downwardly when the latch bail is driven downwardly. The particular latch interposer illustrated in FIG. 11 is associated with selector bail 126 through its upstanding latch interposer lug 138. When selector interposer 107 (FIG. 6) is driven toward the front of the typewriter by filter shaft 19, selector bail 126 is carried with the interposer by selector lug 131. The connection between bail 126 and upstanding latch interposer lug 138 will result in the latch interposer 132 also moving toward the front of the typewriter. This operates to withdraw latch 61 from beneath the latch bail plate 67 and thus prevents the latch from being operated by the bail.

In order to provide one bit of the six bit word indicating the character selected, an interposer switch 601 is mounted to a switch mount plate 603 which, in turn, is mounted to the typewriter frame 605. The interposer switch 601 has a movable blade 607 which is seated in cam follower relationship against a portion of the interposer 132. The standard latch interposer currently used in the IBM selectric typewriter has a portion 604 which can be utilized as a cam lobe. A second blade 611 of interposer switch 601 is positioned to be contacted by the movable blade 607. When the latch interposer 132 is driven toward the front of the typewriter by the selector bail 126, the contact of removable blade 607 with the blade 611 provides an electrical signal indicating actuation of the latch interposer 132. A third blade 612 provides a signal indication that the interposer 132 has returned to its original position.

Each of the six latch interposers are provided with similar interposer switches illustrated in FIG. 12. Each switch indicates the actuation of its associated latch interposer. For each character selected, a unique combination of latch interposers are driven forward by the filter shaft and actuate a unique combination of interposer switches. The data from these interposer switches will provide a six bit word for each character selectable at the typing keyboard.

One of the most attractive features of the interposer switch is that it can be very easily added to the conventional typewriter by merely attaching the previously constructed switch to a switch mounting plate and mounting the plate to the typewriter frame 205. It is unnecessary to dismantle portions of the working mechanism of the typewriter. Furthermore, if servicing is needed, all interposers switches are readily accessible for inspection, testing and servicing.

Each of the six latch interposers (shown collectively in FIG. 12 as 619) are also provided with a solenoid such as the solenoid 620 which is connected to the latch interposer, such as the latch interposer 132 by means of a connecting rod 621. This mechanism is illustrated in detail in FIG. 11 and is utilized when the typewriter is to function as a receiver of information from other remote sources. Each solenoid of the six, such as the solenoid 620, receives one bit from the six bit word indicating the character selected. This bit either causes the solenoid to be actuated or leaves the solenoid unactuated, depending on its magnitude.

The connecting rod 621 is provided with a clevis 623 which is connected to the latch interposer by means of the clevis pin 625. The clevis pin 625 is already in position in a conventional selectric typewriter for holding the clevis 148 of the latch interposer 132. The opposite end of the connecting rod 621 is connected to the plunger 627 of the solenoid 620 by means of spring connector 629.

A mounting board 631 is mounted beneath the typewriter mechanism in a substantially horizontal orientation. The solenoid is attached to the underside of the mounting board. Similarly attached to the mounting board 631 is a bearing block 633 which is oriented transversely to the connecting rods such as the connecting rod 621. The bearing block 633 has a plurality of horizontal bores forming connecting rod bearings. The horizontal portion of each connecting rod, such as the connecting rod 621 is slidably mounted through one of the bearings.

Actuation of the solenoid 620 by an incoming bit causes the connecting rod 621 to act as a push rod and thereby push the latch interposer 132 toward the front of the typewriter in the same manner that it would be pushed by the selector bail 126 if the typewriter keyboard were being utilized. Thus the six latch interposer solenoids cause the withdrawal of certain of the latches from the latch bail so that a character will be printed as described above.

The primary advantage of the present invention is the ease with which it can be attached to the conventional typewriter and its accessibility for purposes of servicing. It can be seen that the mounting board is merely mounted to the typewriter frame and that the clevis 623 on the end of the connecting rod 621 and the other five clevises need merely be snapped on the al-

ready existing clevis pin 625 and the other five similar clevis pins. Again there is no need to substantially dismantle the working mechanism of the typewriter. Because of the relatively horizontal position of the solenoids and their position beneath the interposers, they are readily available for inspection, testing and servicing.

It is also necessary that the cycle clutch be able to provide one data bit indicating its operation when the typewriter is operating as a transmitter and it is similarly necessary that the cycle clutch be operable by an incoming electronic data bit when the typewriter is being used as a remotely operated receiver. FIGS. 6a, 6b, 6c show the cycle clutch mechanism in more detail than illustrated in FIG. 6 and show the mechanisms added to the standard typewriter to accomplish these additional operations. FIG. 6a shows the cycle clutch latch link 119 with the cycle clutch switch 501 positioned at its front end. The cycle clutch switch 501 has a movable blade 503 which seats in cam follower relationship against the end 505 of the cycle clutch latch link 119. A second blade 507 of the cycle clutch switch 501 is positioned forwardly of the first movable blade 505 and is contacted by the first movable blade 505 when the cycle clutch latch link is moved toward the cycle clutch switch 501 by biasing spring 502 after being moved downwardly by the cycle clutch bail 116.

In this manner, the cycle clutch switch 501 together with suitable electronic circuitry will provide a data bit indicating the operation of the cycle clutch which may be transmitted to a remote location.

For the typewriter to operate as a receiver, controlled at a remote location, a suitable structure must be provided so that an incoming data bit can trip the cycle bail. FIG. 6b and FIG. 6c illustrate the structure of the invention for this purpose. A tubular sleeve 520 is mounted on the keyboard lock bail 526 which is immediately adjacent to the cycle bail 116. The sleeve 520 is provided with collars 522 and 524 which are secured to the keyboard lock bail 526 by set screws 528 and 530, in order to prevent axial sliding of the sleeve 520. The sleeve 520 operates as a bearing for a bell crank formed from a piece of wire. The bell crank lever 533 extends past a selector bail and above the cycle bail 116. The other bell crank 534 of the bell crank 532 extends downwardly beneath the typewriter mechanism and is connected to a connecting rod 537 by means of a clevis 539 and clevis pin 541.

Referring now to FIG. 12, the cycle clutch connecting rod 537 extends to a solenoid 545 which is mounted to the mounting board 231. The connecting rod 537 extends through the bearing block 233 and is substantially the same structure as illustrated and described below in connection with FIG. 13.

Thus an incoming electronic signal actuates the solenoid 545 which in turn pushes the connecting rod and thereby rotates the bell crank lever 532 in a counterclockwise direction as illustrated in 6b. In this manner, the arm portion 533 of the bell crank 532 moves downwardly in a counterclockwise direction forcing the cycle bail 116 downwardly in the same manner as would occur by manual depression of any of the character selection keys on the keyboard.

Function Operation Mechanism

Space and Backspace

In addition to the above-described character print cycle, a typewriter necessarily performs several function operations. Like the print operation, function operations must be electrically identified and capable of being induced by electrical data signals when the typewriter is a receiver and of producing electrical data signals when it is a transmitter. The following description will explain how the IBM selectric typewriter operates in performing a backspace, carrier return, index (line space), case shift, space, and paper feed in order that it may be fully understood how the present invention advantageously equips the typewriter with means for electrically signifying that one or more of such operations is occurring, and with means by which the typewriter responds to electrical signals by performing one or more of these function operations.

Referring now to FIGS. 6 and 7, the space/backspace operational control mechanism 161 is mechanically associated with a manually operable key lever 162 through key-lever pawl 163 and interposer 164. The space operation has associated therewith a separate key lever, key-lever pawl, interposer, and operational latch. Both functions, however, share the operational control mechanism 161 which provides the power for carrying out one of the functions. A description of the operation of the control mechanism 161 to actuate the operational latch 166 is accurate for either space or backspace and thus the description which follows pertains with equal accuracy to both the functions.

A spring 167 is attached to the interposer 164 and urges the interposer toward the rear of the typewriter. An interposer latch 168 rotatably secured to the interposer 164 is spring loaded to rotate in a clockwise direction and engages the key-lever pawl guide bracket 169 preventing the spring 167 from moving the interposer 164 urging it downwardly and disengaging the latch 168 from the key-lever pawl guide bracket 169 enabling the spring 167 to move the interposer toward the rear of the typewriter. This movement of the interposer 164 initiates the function of the operational control mechanism. The function of the operational control mechanism includes returning the interposer to its initial condition by urging it toward the front of the typewriter. As the interposer so moves, the front surface of the latch 168 acts as a cam which causes the latch to rotate until the key-lever pawl guide bracket is re-engaged.

The operational control mechanism includes an operational cam 171 which is mounted on a clutch wheel 17 that in turn is secured to the operational shaft 27 (see FIG. 1). The clutch 172 operates to prevent rotation of the cam 171 as long as clutch release arm 173 engages one of the diametrically opposed clutch wheel latch members 174. A roller 176, carried by a cam follower 177, engages peripheral surface of the cam 171 and causes the cam follower to rotate about its pivot joint 178 when the cam rotates. The cam follower lever 175 which includes the horizontally extending arm 179. At one end of the arm 179 and extending at right angles therefrom is an operational latch engaging plate 181. Plate 181 is disposed slightly above and slightly in front of the lower forwardly extending portion 182 of the operational latch 166. Thus, when the cam 171 causes the cam follower 177 to rotate in a clockwise direction, the cam follower lever arm 179 is urged downwardly.

If the end 182 of operational latch 166 is urged under the plate 181 prior to the arm 179 rotating downwardly, the operational latch will be urged downwardly with the cam follower arm and induce the mechanism to which it is attached to perform the function which it is designed to perform (space or backspace).

The rearward end of the interposer 164 engages the lower portion of the operational latch 166 and is maintained in contact therewith by a spring 183. When the interposer 164 moves rearwardly in response to actuation of keylever 162, the operational latch 166 is urged rearwardly under the plate 181 and in position to be actuated. At the same time that the rightward motion of the interposer 164 urges the operational latch 166 rearwardly it also engages the clutch release arm lever 184 which disengages the clutch release arm 173 from the clutch wheel latch member 174 permitting the cam 171 to rotate. As the cam rotates, the cam follower 177 rotates clockwise engaging the cam follower lever 175 causing it to rotate clockwise whereby plate 181 is driven downwardly engaging the end 182 of the rearwardly-urged operational latch 166.

As the cam follower arm 179 rotates clockwise, an interposer restoring lever 186 affixed to the arm 179 and extending in a generally downward vertical direction, engages the interposer 164 and drives it back toward its initial position. This movement of interposer 164 back to its initial position occurs prior to the clutch wheel latch member 174 rotating a full 180° whereby the other clutch wheel latch member engages the clutch release arm 173 causing the cam to stop after 180° of rotation. As previously explained, the interposer latch 168 re-engages the key-lever pawl guide bracket 169 whereby the mechanism is reset for operation the next time the key lever 162 is depressed. Both the space and backspace mechanisms operate through the operational control mechanism 161. Only that mechanism associated with the operational latch which has been urged rearwardly, however, will operate in response to the cam 171 rotating 180°. The other mechanisms will not be actuated as plate 181 will pass in front of the lower portion of their operational latch without driving it downwardly. While only a single operational latch 166 and single interposer 164 have been illustrated, it has been pointed out above that there is a separate interposer and operational latch for the space function and a separate interposer and latch for the backspace function. In fact, the characteristics that distinguish between a space and backspace function taking place is that when the space function takes place the interposer associated exclusively with the space function moves rearwardly, then returns during the functional cycle. When a backspace function cycle takes place only the interposer exclusively associated with the backspace mechanism moves rearwardly, then returns during the functional cycle.

For the typewriter acting as a transmitter to be able to transmit one data bit for the backspace function or similarly a data bit for the space function, a key lever switch is provided in cam follower relationship to each of the key levers associated with these functions. For example, in FIG. 7 (shown also in FIG. 6 and in larger scale in FIG. 9) a key lever switch 301 is illustrated mounted to the typewriter frame 303. The key lever

switch 301 has a central movable blade 305 in cam follower relationship to a cam portion of the key lever 162. A second key lever switch blade 307 is positioned beneath the movable blade 305 and is movable into contact therewith to provide an electrical signal when the key lever 162 is depressed. A third contact blade 309 is positioned above the movable blade 305 and is in contact with it when the key lever 162 is not depressed. In this manner actuation of the key lever 162 to indicate a back space function provides a data bit from the key lever switch 301 which can be transmitted through various circuitry to another typewriter or other machine.

For providing the space function, another and similar key lever switch is provided in cam follower relationship to the cam lobe portion of the space key lever. It will operate in the same manner to provide a data bit indicating the space function.

For the typewriter to act as a receiver, a solenoid, clevis and connecting rod is provided for the back space interposer and another similar system is provided for the space interposer. In FIG. 13 the structure for actuating the space interposer is illustrated in detail. A solenoid 321 is mounted to the mounting board 631 beneath the typewriter mechanism. The solenoid 321 is connected to the space interposer 164 by means of a connecting rod 322 and a clevis 323. The clevis is attached to the space interposer 164 by means of a clevis pin 325 inserted through a hole already existing in the standard typewriter space interposer. The connecting rod 322 slidably extends through a suitable bearing in the bearing block 633. Thus, when the solenoid 321 is actuated by a suitable electrical signal, the connecting rod 322 pulls the space interposer 164 in the same manner that it would be moved if the key lever 162 were manually depressed.

In order that the solenoid may be conveniently arranged on the mounting board 631, a bell crank mechanism illustrated in FIG. 14 is utilized to operate the back space interposer. Thus, although the conventional typewriter mechanisms are the same for space and backspace, the solenoid and connecting rod structure of the present invention are somewhat different.

In FIG. 14, the solenoid 340 is mechanically linked to the connecting rod 341 by means of a bell crank 343. The bell crank 343 is pivotally mounted to the mounting board 631 by means of a pivot screw 345. A clevis is provided at each end of the bell crank and a third clevis connects the pull rod 341 to the back space interposer in the same manner that the clevis 323 illustrated in FIG. 13 connects to the space interposer.

Thus electrical energization of the solenoid pulls the connecting rod 341 and actuates the back space interposer in the same manner it would be manually actuated by depression of the back space key lever. Carrier Return and Index

Referring now to FIGS. 16, 17, 18, and 19, the carrier return keylever 201 and index key lever 202 operate through the same operational control mechanism 203 to actuate the carrier return operation latch 204 and the index pawl carrier link 206, respectively. The carrier return and index functions are not totally independent of one another inasmuch as a carrier return function includes an index function (line feed) and thus operation of the key lever 201 results in both carrier

return operation latch 204 and index pawl carrier link 206 being actuated simultaneously. The index key lever 202 operates to actuate index pawl carrier link 206 alone to make it possible to line feed without accompanying carrier return.

The operational control mechanism 203 is similar to the operational control mechanism 161 previously described in detail with reference to FIG. 7. Thus the index key lever 202 has connected thereto a key-lever pawl 207 (see FIG. 17a) which engages the end of the index interposer 208 when the key lever is depressed. The interposer 208 carries an interposer latch 209 that is released when the interposer is urged downwardly by the pawl 207 and which when released enables the interposer to move rearwardly (in the direction of the index pawl carrier link 206). The rearward movement of the interposer 208 results in rotation of the cam 211 which is mounted on a clutch wheel that rides on the operational cam shaft 27 (neither of which are shown) in much the same manner as the cam 171 and clutch wheel 172. A roller 212 carried by a cam follower 213 rides on the peripheral surface of the cam 211 causing rotation of the cam follower 213 about its pivot point 214. Pivotaly connected to the end of cam follower 213 is a multiplying lever 216 one end of which is secured through a clevis pin 217 to the index pawl carrier link 206 and the other end of which is associated with a multiplying lever stop 218 which limits the movement of that end of the multiplying lever.

Rotation of the cam 211 produces reciprocating movement of the cam follower 213 which in turn imparts a reciprocating motion to the index pawl carrier link 206 through the multiplying lever 216 whereby the mechanism attached at the other end of the index pawl carrier link 206 is operated to produce a line space. The operational control mechanism 203 includes an interposer restoring lever 210 which operates during the rotation of the cam to relatch the interposer 208.

When the carrier return key lever 201 is depressed, a carrier return key-lever pawl 221 secured to the key lever 201 engages the carrier return interposer 222 and urges it downwardly releasing the carrier return interposer latch 223 thus enabling the interposer to move rearwardly (toward the carrier return operational latch 204). The end 224 of interposer 222 carries a carrier return operational latch actuator 226 which engages the carrier return operational latch 204 and carries it along with the interposer 222 when the interposer latch 223 releases the interposer.

The cam follower 213 has secured thereto a carrier latch engaging plate 227 which has a normal position slightly above and slightly in front of the projecting end portion 228 of the carrier return operational latch 204. The plate 227 is urged downwardly when the cam operates the cam follower, and if the interposer 222 has not been released from its latch 223 the plate 227 will not engage the end portion 228 of latch 204. If the interposer 222 has moved in response to its latch being disengaged, however, the carrier latch 204 will be positioned by operational latch actuator 226 to a position below the plate 227 just prior to the plate moving downwardly and will thus be urged downwardly along with the plate 227 as the cam follower responds to the rotation of the cam 211. The downward motion of the latch 204 results in the carrier return mechanism

secured to the other end thereof (see FIG. 16) being operated resulting in the carrier returning to its home position. The operation of the cam 211 in response to release of interposer latch 223 results in a reciprocating motion of link 206 which is identical to that produced when the interposer 208 is unlatched in response to depression of the index key lever 202. Thus each carrier return operation necessarily includes a line space operation since the link 206 is operated each time the cam follower 213 is driven by the cam 211 which occurs in response to depression of carrier return key lever 201.

The carrier return key-lever pawl 221 includes an index interposer latch release lever 231 which unlatches the index interposer latch 209 when the key lever 201 is urged downwardly below the position necessary to merely initiate a carrier return operation. While the release of interposer 208 is not necessary to induce both a carrier return and index function, it is necessary if repeated indexing is desired in response to depression of key lever 201.

Thus, an index operation in response to depression of the index key lever 202 is uniquely characterized by the movement of the single interposer 208 while the carrier return and index operation (not repeat) is characterized by the movement of single interposer 222.

For the typewriter acting as a transmitter, the operation of the carrier-return key lever 201 is signaled by the closing of a key lever switch 351. The key lever switch 351 is substantially the same in structure as the key lever switch 301 illustrated in FIG. 7. It seats against the cam lobe portion 352 of the key lever 201. Thus, as with the key lever switch 301 actuation of the carrier return key lever 201 provides an electronic signal indicating that the key lever 201 has been actuated.

In a similar manner, actuation of the key lever 202 for indicating an index function is detected by means of the index key lever switch 371 illustrated in FIG. 17.

When acting as a receiver, the index function is provided by a solenoid 383 illustrated in FIG. 12 and linking structure substantially identical to the structure shown in FIG. 13. The clevis for this function is attached to the interposer 208.

The carrier return function is provided by the carrier return solenoid 381 which is connected to the carrier return interposer 222. This connection is through a bell crank mechanism 382 which is, in detail, like that illustrated in FIG. 14. The bell crank mechanism 382 is also pivotally mounted on the screw 345 beneath the bell crank 343. Thus, when an electrical signal is applied to the solenoid 381, it operates the bell crank 382 to actuate the carrier return interposer 222 in a manner similar to its operation manually by the depression of the key lever 201. An electrical signal on the index solenoid 383 actuates the index interposer 208 in the manner it would be actuated by manual depression of the key lever 202. Upper Case Shift

Shift arm 53 (see FIGS. 2, 20 and 21) has two possible positions, one of which corresponds to the type head 31 being positioned for lower case printing while the other corresponds to the head being positioned for printing in upper case. The position of shift arm 53 is dependent upon the position of a cam 273, the camming surface of which engages a roller 274 carried

by the shift arm 53. The shift arm is pivotally mounted on a shaft 276 for movement away from or toward the rotate arm pulley 47 for the purpose of operating the rotate pulley 33.

The cam 273 is mounted on the operational shaft 27 but does not rotate therewith unless a clutch mechanism generally indicated as 277 secures the cam to the shaft. A shift release arm 278 is mounted for rotation about a shaft 279 and operates in its normal position to maintain the clutch mechanism 277 in that position which prevents the cam 273 from rotating with the shaft 27. When the shift release arm 278 is disengaged from the clutch mechanism as by a shift release link 281 being pushed toward the rear of the typewriter, the cam is connected to the shaft 27 resulting in 180° rotation of the cam.

The cam 273 is disc shaped and has a peripheral thickness which varies from that shown in FIG. 20 to that shown in FIG. 21. When the narrowest peripheral thickness of the cam is disposed between the shift arm cam roller 274 and roller 282, the band 46 is able to urge the pulley 48 toward the rotate arm pulley 47 until the shift arm adjustment screw 283 contacts a stop 284.

When the clutch release arm allows the cam to rotate with the shaft 27 the thickest peripheral portion of the cam 273 is disposed between the roller 274 and the roller 282 causing the arm 53 to rotate in a counterclockwise direction (as illustrated in FIG. 21) thus shifting the pulley 48 away from the pulley 47 and thereby inducing the head 31 to assume the upper case position.

When the shift release arm 278 is urged back to its lower case position (the position shown in FIG. 2) from an upper case position, the cam once again is allowed to rotate with the shaft 27 until the lower case position is once again achieved at which time the clutch between the shaft and the cam operates to prevent further rotation of the cam.

The shift mechanism is operated by depressing either shift key 286 or shift key 287 both of which engage a shift bail 288 which connects to shift release link 281 through a bell crank arrangement 289. When the shift release arm 278 is in its lower case position and bail 288 is rotated in response to either key lever 286 or 287 being depressed, the rotation of the bail is transferred through bell crank 289 to link 281 causing the shift arm 278 to rotate counterclockwise (as illustrated) about its shaft 279. This places the shift arm 178 in its upper case position which as previously described results in the cam 273 urging shift arm 53 to its upper case position. As long as the key lever is maintained in its depressed condition, the release arm 278 will stay in its upper case condition and the head 31 will also remain in that position which produces upper case characters and symbols. Release of the key lever causes the bail 288 to resume its lower case position which as previously described causes the cam 273 to rotate back to that position which places the shift arm 53 in its lower case position.

When either key lever 286 or key lever 287 is depressed in response to pushing key lever button 291 or 292, respectively, the shift which results therefrom will only be maintained as long as pressure is applied to the key lever button. A third key lever button 293, however, associated with shift key lever 286 has as-

sociated therewith a lock mechanism 294 which operates to hold the key levers 286 and 287 in a partially depressed condition after pressure is released from the key lever button 293. To release the lock mechanism 294, it is necessary to depress the key button 291 or key button 292 as if to initiate an upshift.

For the upper case function, when the typewriter is acting as a transmitter, a key lever switch 401, mounted beneath the key lever 287, provides an electrical signal by the same means as illustrated for the other key lever switches such as that of FIG. 7. The key lever switch 401, however, will provide an electronic data bit indicating depression of the shift key in the transmitting typewriter.

For operation as a receiver, a typewriter is provided with a solenoid 410 shown in FIG. 12. The solenoid 410 is linked by a connecting rod 412 and clevis mechanism similar to that illustrated in FIG. 13 to the shift release arm 278 shown in FIG. 2. The solenoid 410 like the other solenoids, is mounted to the mounting plate 231 and its connecting rod 412 similarly extends through the bearing block 233 to mechanical connections with the shift release arm 278. When actuated, an incoming signal directed to the solenoid 410 causes the connecting rod 412 to pull the shift release arm 278 toward the rear of the typewriter in the same movement that would occur if the shift key button 292 or the shift key button 291 were manually depressed.

Keyboard Lockout

A selector compensator is provided on the conventional typewriter to prevent simultaneous depression of two key levers insuring that only one interposer at a time can be operated down and then forward. If more than one interposer at a time were depressed, they would be operated forward together and a selection error would result causing the wrong character to print. A hook-shaped lug at the rear of each interposer operates in a device called the selector compensator attached to the rear interposer guide comb. The compensator (not illustrated) contains closely spaced steel balls that prevent downward movement of two or more interposers simultaneously. When an interposer is down, the steel balls shift in the tube of the compensator to block the downward movement of any other interposer.

The hook portion of the interposer lugs extend to the rear just to the center line of the steel balls. When an interposer is driven forward after being depressed at the rear, the lug will not be between the steel balls and another interposer can be depressed. With this arrangement, the operator does not have to wait until an interposer is restored upward before actuating another.

An adjustable stop at each end of the compensator tube keeps the balls somewhat centered between the interposers. The balls are thus prevented from shifting too far left or right. If the balls were allowed to move too far under the interposer lugs, they would partially block the depression of an interposer and the keyboard touch would suffer. The stops are removable so that the steel balls may be removed and cleaned if necessary.

On some machines when the ON/OFF switch is turned OFF, the keyboard must be locked to prevent mechanisms from being tripped while the motor is not running. This is to prevent an unwanted operation the next time the switch is turned ON. On the machine

which is modified according to the invention, it will also be necessary to lock the keyboard under certain other conditions. For example, the keyboard should be locked when the typewriter is functioning as a receiver of data from a computer so that manual interference will be prevented. Operation of the switch lever controls the keyboard lock mechanisms by rotating the lock out bail 526 which is a crank mechanism that extends across the bottom of the keyboard section (FIG. 12). When the switch lever is in the OFF position, the lockout bail is moved forward contacting the pawl stop which is positioned below an extension of the cycle clutch latch pawl, and prevents the cycle clutch from being released.

As additional insurance against an interposer being latched down, a special bell crank at the left side of the keyboard is rotated into the selector compensator by a link from the lockout bail. This forces the steel balls to shift in the tube and block the downward movement of all interposers. When the switch is ON, the keyboard lock bell crank is spring loaded out of the selector compensator.

A solenoid 601 is mounted on the mounting board 231 for rotating the lockout bail to the lock position when it receives a lockout signal from a computer. The solenoid plunger is connected to the lockout bail by a connecting rod 603, the end of which is looped around the lockout bail.

Because the single loop is somewhat resilient, it is very easily opened so that the connecting rod 603 may be quickly attached to the lockout bail without disturbing the conventional typewriter mechanisms. The automatic lockout mechanism is readily accessible for inspection and servicing. Tab

The tab is operated by a solenoid 701 (FIG. 12) which is linked to the tab trip lever 703 by a pull rod 705 illustrated in FIGS. 10 and 10a. The tab trip lever 703 is biased by a spring 707. The trip lever 703 is rigidly attached to the tab lever arm 709 which is a part of the standard IBM selectric typewriter. Actuation of the solenoid 701 by an incoming bit rotates the tab

lever arm in a clockwise direction from the position of FIG. 10a.

While certain and specific embodiments have been shown, it is to be understood that modifications may be made without departing from the true spirit and scope of the invention.

What is claimed is:

1. In a remotely operable typewriter of the type having movable mechanical mechanisms for operating the character printers and the carriage functions, an actuating mechanism comprising:

- a. a mounting board horizontally mounted to the typewriter frame beneath the typewriter mechanisms;
- b. a plurality of horizontally operable solenoids mounted to the underside of the mounting board;
- c. a plurality of connecting rods connected to said mechanical mechanism and extending downwardly therefrom and thence horizontally beneath the mounting board and linked to the plungers of the solenoid; and
- d. a bearing block mounted to the underside of the mounting board having a plurality of horizontal bores forming connecting rod bearings and having a horizontal portion of each connecting rod slidably mounted through a different one of said bearings wherein the typewriter has a cycle clutch bail parallel to a keyboard lockout bail crank and wherein
- e. a tubular bearing sleeve is rotatably mounted to a portion of the lockout bail crank which is limited to rotational movement;
- f. a collar is secured to the lockout bail at each end of the sleeve in order to prevent axial sliding of the sleeve;
- g. bell crank arms are fixed to the sleeve to form a bell crank, one arm extending above the cycle clutch bail and the other arm extending downwardly to connection with one of said connecting rods.

* * * * *

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