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[54] **KEY SHIFT MECHANISM**
6 Claims, 13 Drawing Figs.

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73, 74, 75, 76, 77, 78, 79, 80, 81, 98, 99, 106, 107,
108, 110; 197/16

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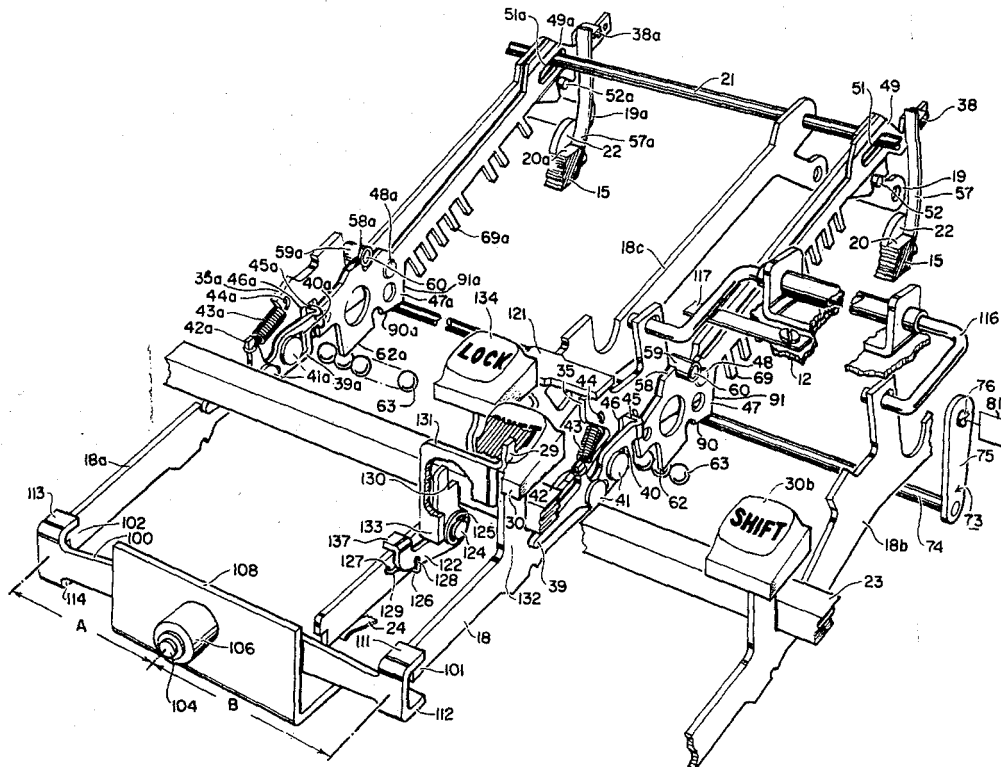
Attorneys—Patrick J. Schlesinger, George W. Killian, Charles R. Lepchinsky and Jay M. Cantor

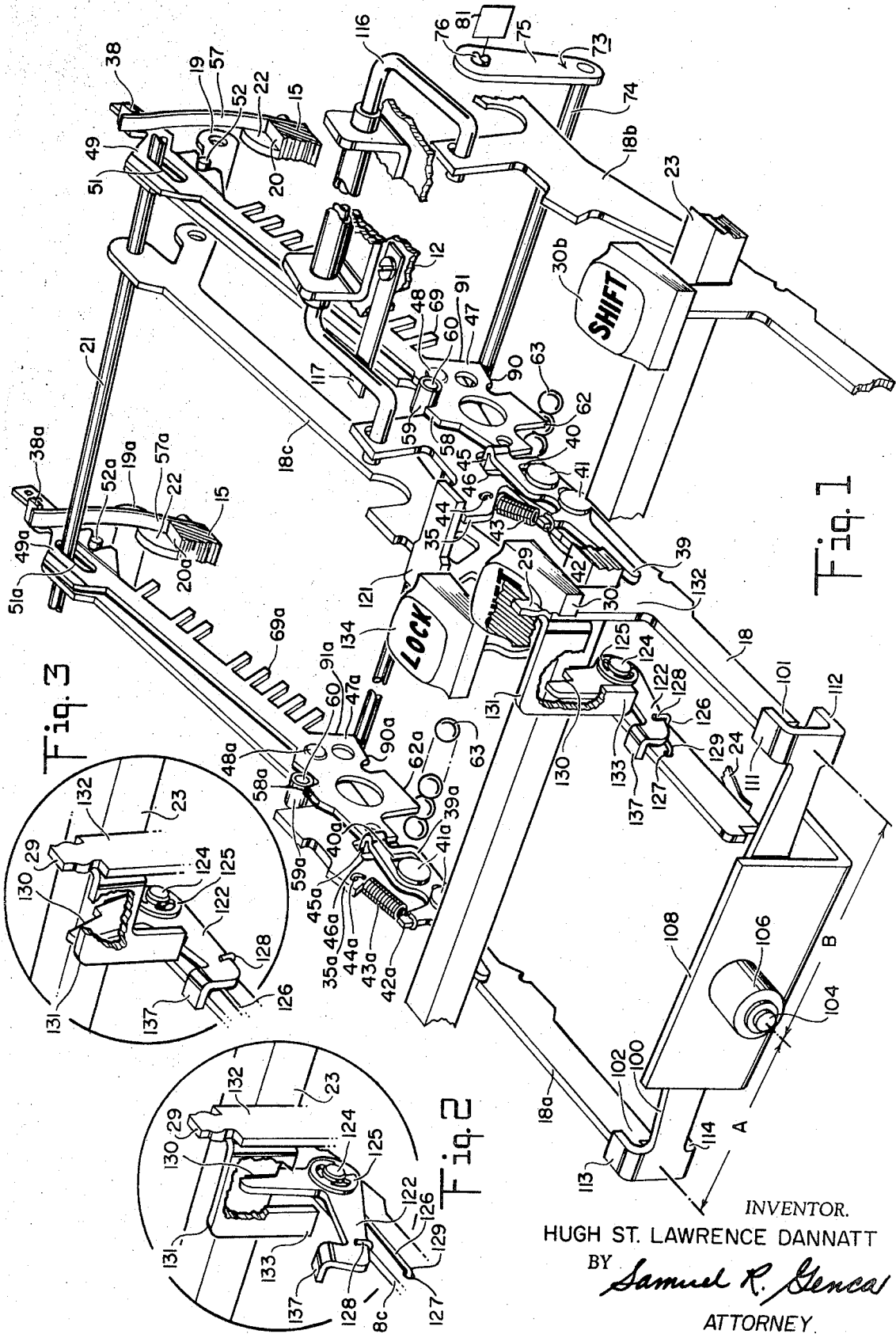
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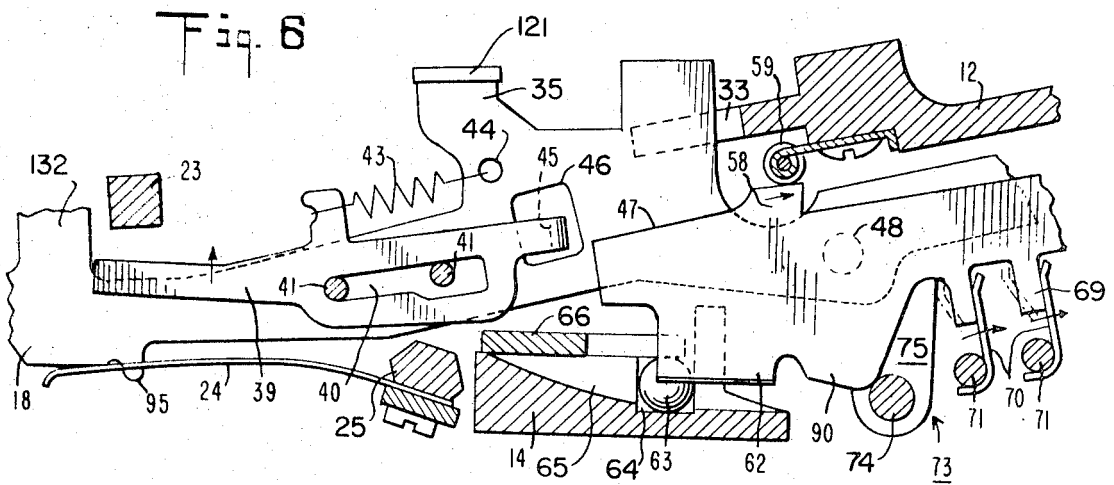
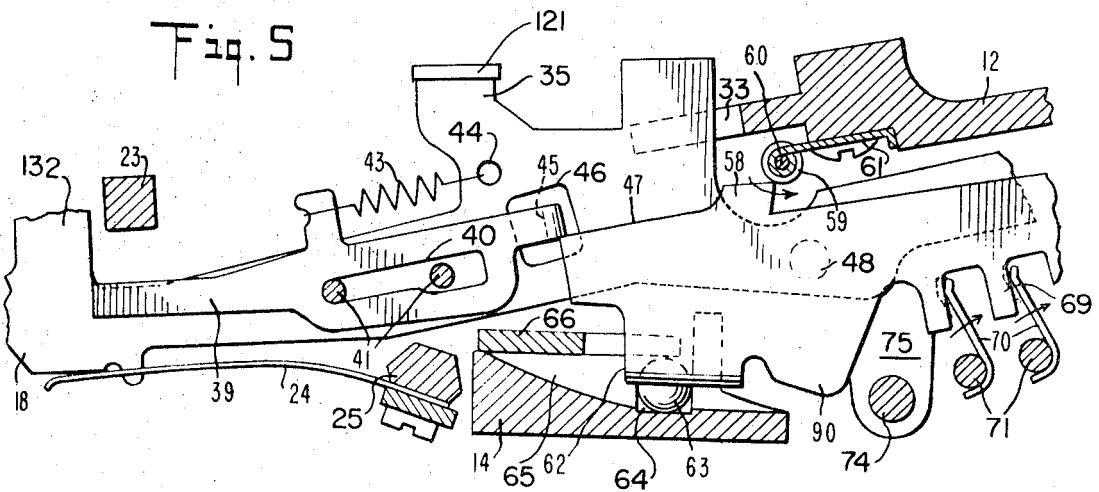
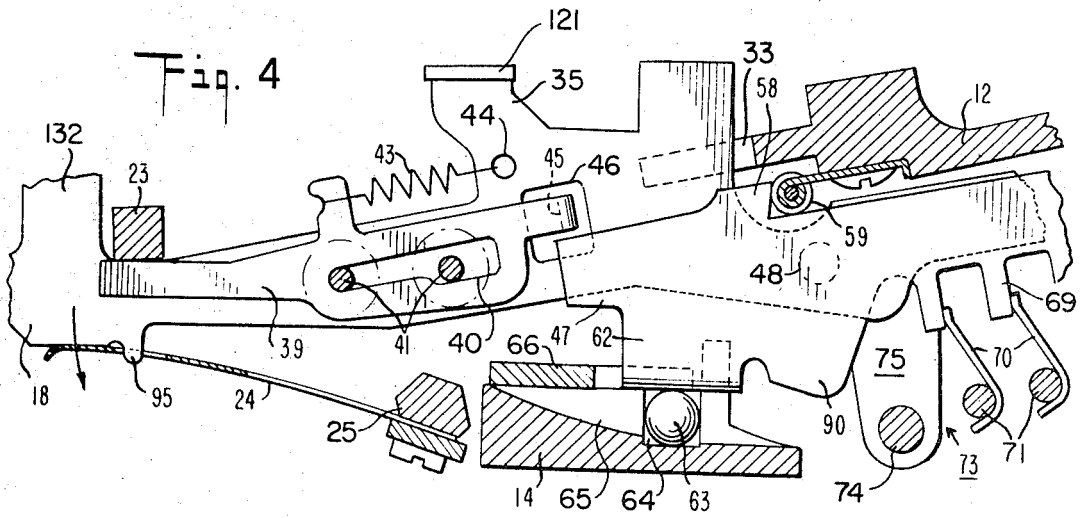
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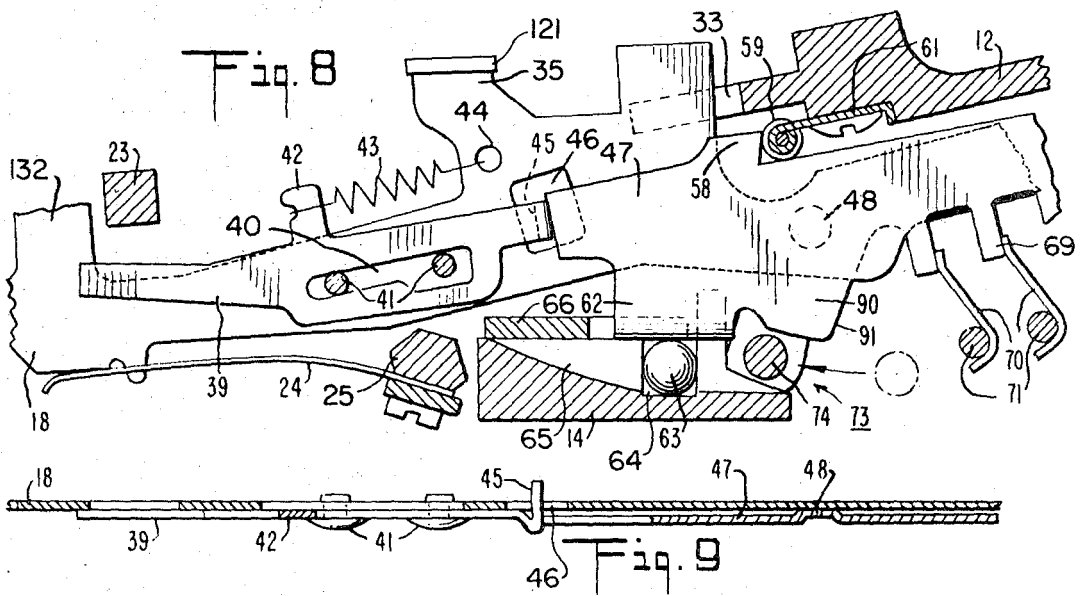
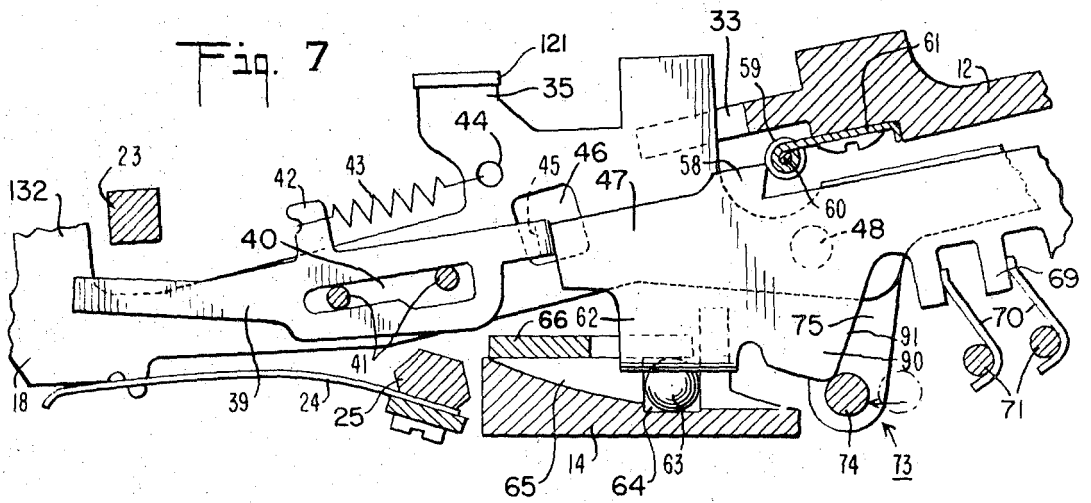
ABSTRACT: A key shift mechanism for a typewriter keyboard wherein a rocker arm causes two key levers to actuate shift and unshift functions in opposite phase upon actuation of only one of the key levers.





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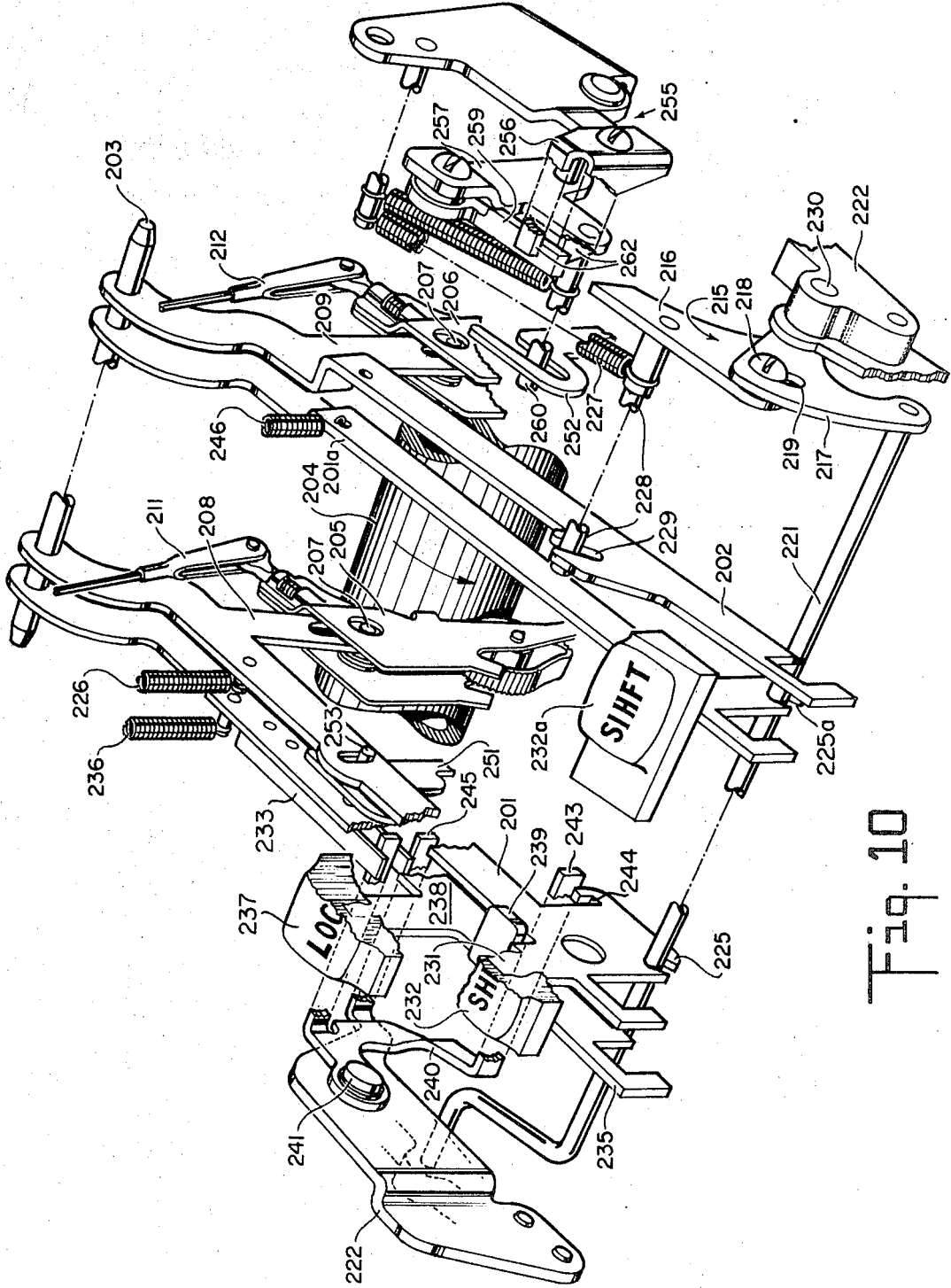


Fig. 10

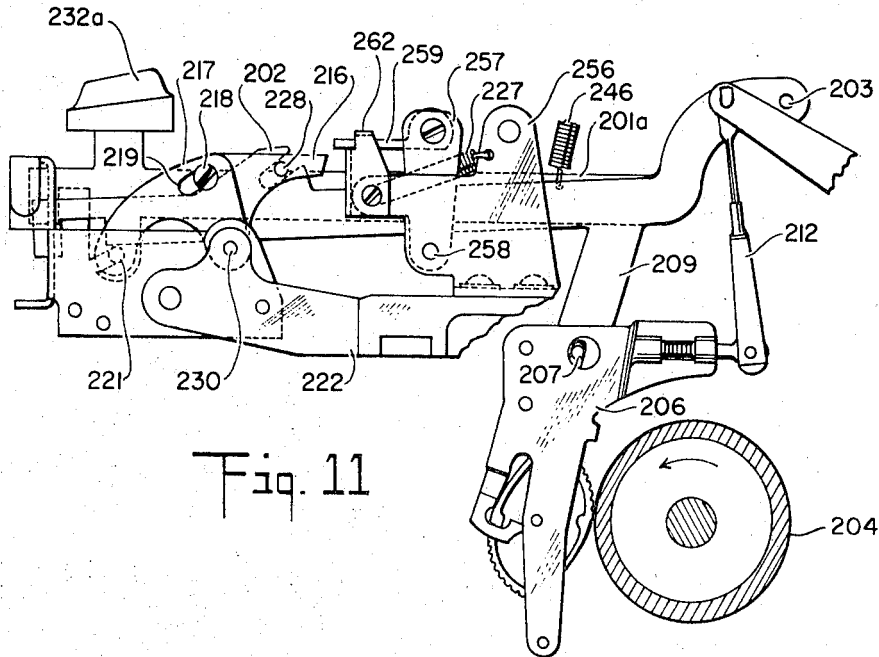


Fig. 11

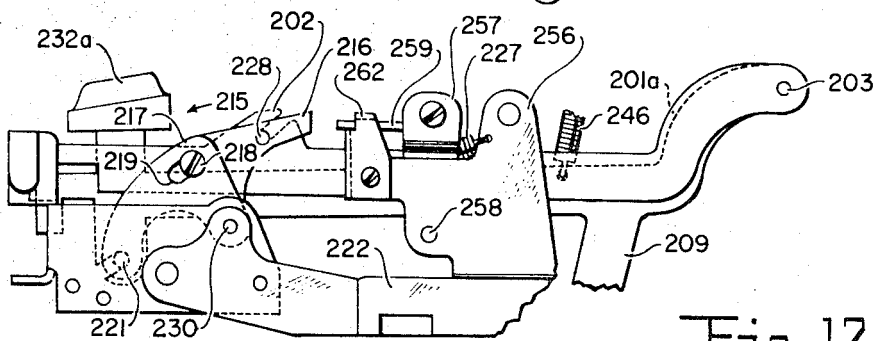


Fig 12

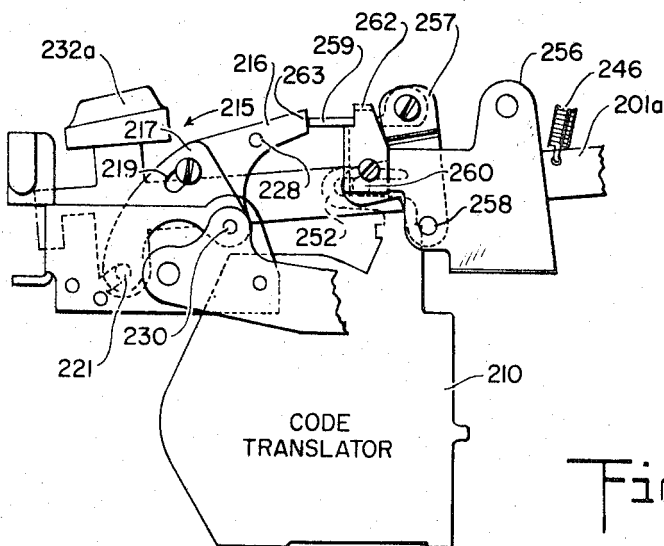


Fig 13

KEY SHIFT MECHANISM

The present invention relates to a keyboard mechanism and, more particularly, to a key shift mechanism for a typewriter.

Although the present invention is suited for more general applications, it is particularly adapted for use in a key shift mechanism for a tape perforating machine for controlling the operation of shift and unshift functions. Shift and unshift functions in an electric keyboard are well known to those skilled in the art. The shift and unshift functions are usually performed by two separate keys for changing the position of a shift bail for selectively operating character selection bars and setting up a sequence of operation for perforating an upper and lower type character code in a tape.

In the past, many attempts have been made to power drive the shift and unshift key levers. Such attempts have included the use of solenoids and other electromechanical devices.

Accordingly, it is an object of the present invention to provide a key shift mechanism which combines the operation of the shift and unshift functions through a single key lever.

It is another object of the present invention to provide a new and improved key shift mechanism which avoids one or more of the disadvantages and limitations of prior such mechanisms.

It is a further object of the invention to provide a novel key shift mechanism of compact and relatively simple construction and one exhibiting both smooth yet firm key manipulation and quiet operation.

It is yet a further object of the invention to provide an improved keyboard mechanism possessing high versatility for numerous and diverse applications, combined with consistent dependability over prolonged periods of operation, and one which enables a very easily and simply effected change in the coding of upper case and lower case characters.

It is yet a further object of the invention to provide a relatively simple and inexpensive key shift mechanism for signal responsive typewriters.

Briefly described, the present invention accomplishes the above and other objects in a key shift mechanism which includes a shift key lever for generating codes representing upper case letters and an unshift key lever for generating codes representing lower case letters. The shift key lever and the unshift key lever are coupled by a rocker arm lever which is pivotal at a midpoint or at some point along its length. The rocker arm lever coacts with the shift and unshift key levers to maintain a phase relationship such that the operation of one of the key levers produces one of the codes and the return of that lever effects the operation of the other key lever through the rocker arm to produce the other code.

Other and further objects and advantages of the invention will appear as the detailed description thereof proceeds in the light of the drawing forming a part of this application and in which:

FIG. 1 is a schematic view of one embodiment of the key shift mechanism embodying the present invention with some parts broken away for clarity;

FIGS. 2 and 3 are fragmentary perspective views of a shift key lock mechanism for the key shift mechanism of FIG. 1;

FIGS. 4-8 are enlarged side elevational cross-sectional views used to illustrate sequential operational movements of certain components concerned with the operational key shifting employed in the key shift mechanism of FIG. 1;

FIG. 9 is a fragmentary top view of the components shown in FIGS. 4-8;

FIG. 10 is a schematic view of another embodiment of the key shift and key lock mechanism embodying the present invention with selected parts broken away for clarity; and

FIGS. 11-13 are side elevational views to illustrate sequential operational movement of certain components concerned with the operational key shifting employed in the key shift mechanism of FIG. 10.

The present invention may be embodied in different typewriter keyboards and, is shown by way of example in FIGS. 1-9, in one embodiment of the structure shown in U.S.

Letters Pat. No. 3,327,828 entitled "Keyboard Mechanism Having Latch Means," issued Jun. 27, 1967, to Hugh St. Lawrence Dannatt and assigned to the same assignee as the present application. Only the structure necessary to show the invention is illustrated in FIGS. 1-9. For a more complete description of the keyboard mechanism, reference may be made to the above-mentioned patent which is hereby incorporated by reference.

Referring now more particularly to FIGS. 1-9 of the drawing, a key shift mechanism embodying the present invention includes a keyboard frame structure comprised by a base plate 12 and plural spacer bars 14 and 15. An upper case or shift key lever 18 and a lower case or unshift key lever 18a are positioned in parallel spaced relationship and are supported for pivotal motion by integrally formed and laterally extending rear arms 19, 19a which are received in individual comb slots 20 and 20a, respectively, of the spacer bar 15 and are pivotally mounted on a rod 21 extending between the frame end plates (not shown) and fixedly positioned in aligned apertures of the comb teeth 22 as more fully described in the aforesaid Dannatt U.S. Pat. No. 3,372,828. The shift key lever 18 and the unshift key lever 18a have similar features and structure and therefore for the convenience of the reader these elements, and other associated elements, will be given identical element numbers except that a lower case a, will be added to each element associated with the unshift key lever 18a. FIGS. 4-9 show the structure of the shift key lever 18 and the sequence of operation which will be described more fully hereinafter. The key levers 18 and 18c are both biased upwardly by comb spring 24 against a common traverse stop bar 23 and are pivotally supported by rod 21. There is an individual time of comb spring 24 associated with each of the key levers, 18, 18a, 18b and 18c and the comb spring 24 is secured to a spring tension bar 25. The comb spring 24 is more clearly shown in FIGS. 4 to 8. It should be understood that a tooth of comb spring 24 is associated with each of the key levers 18, 18a, 18b and 18c although some are not illustrated in FIG. 1 to avoid unnecessary crowding and complexity in the drawing. The unshift key lever 18a, however, is held in a depressed or down position when the shift key lever 18 is in an up position in a manner to be explained hereinafter.

The shift key lever 18 includes a laterally extending and forwardly positioned projection 29 which adapted to be received and retained in a socket of a shift key button 30. The key levers 18 and 18a are spaced apart to permit a plurality of key levers (not shown) to be retained in spaced parallel arrangement and pivotally guided at their forward ends by comb slots (not shown) provided in the upper edge of a spacer bar as described in the aforesaid patent. The key levers are similarly spaced and guided centrally by comb slots 33 formed in the forward edge of the base plate 12, and are spaced and guided at their rear ends by comb slots provided in a rear lateral projection (not shown) of the base plate 12. Elongated pawls 39 and 39a each have a central longitudinal slot 40 and 40a, respectively, and are supported for angular and longitudinal movement on the sides of their respective key levers 18 and 18a by the enlarged heads of studs 41 and 41a, respectively, extending through the slots 40 and 40a of the respective pawls 39 and 39a. Each pawl 39, 39a is provided with a projection 42, 42a which anchors one end of bias springs 43, 43a having its opposite end received in aperture 44, 44a, respectively, provided in the base portion of the rearwardly adjacent key lever projection 35, 35a respectively. The spring 43, 43a are effective to bias pawls 39, 39a, respectively, in a clockwise direction as seen in FIGS. 4-8. Accordingly, when the shift key lever 18 is in its at rest or up position both the shift key lever 18 and the elongated pawl 39 will be in contact with the underside of the stop bar 23. The rear end of each of the pawls 39, 39a is bent over laterally to provide an actuating projection 45, 45a which extends through an aperture 46, 46a of the key levers 18, 18a and into engageable relation with the forward end of the respective associated slide members 47, 47a associated with key levers 18, 18a and supported for pivotal and longitudinal movement in a manner now to be considered.

As just indicated, there is associated with each of the key levers 18, 18a slide members 47, 47a having a configuration shown more clearly in FIGS. 4-7. The slide members 47, 47a, as shown by the enlarged fragmentary views of FIGS. 4-9, are positioned in side-by-side relation with their associated key levers 18, 18a but are maintained in slight spaced relation to their associated key levers 18, 18a by small dimples 48, 48a pressed laterally from the slide members 47, 47a and also by short longitudinal extending plateaus 49, 49a likewise pressed laterally from the slide members 47, 47a. The dimples 48, 48a and plateaus 49, 49a, thereby serve to minimize the frictional engagement between the slide members 47, 47a and their associated key levers 18, 18a. The slide members 47, 47a are pivotally and longitudinally supported on the rod 21 which is received in elongated slots 51, 51a of each of the slide members 47, 47a to permit a limited amount of longitudinal movement of the slide members 47, 47a. While the rod 21 could support and guide the rear end of each slide member 47, 47a in its longitudinal movement, the sides of the slots 51, 51a of the slide members 47, 47a would in such case preferably need to be polished to minimize the frictional forces involved. In practice, it is preferred to form the slots 51, 51a slightly wider than the diameter of the rod 21 and to support the slide members 47, 47a during their longitudinal motion upon rod 21. Each of the slide members 47, 47a is provided at its rear end with overturned ears 38, 38a which are engaged by the slightly overturned end of an individual tooth 57 of a comb spring secured to a sloping rear edge of the spacer bar 15, to provide a bias force urging movement of the slide members 47, 47a in a rearward direction and urging movement of the rear end of the slide members 47, 47a in a downward direction. The slide members 47, 47a are normally latched against such rearward movement, however, by slide member latch portions 58, 58a which engage latch rollers 59, 59a individual to the slide members 47, 47a. These latch rollers 59, 59a are rotatably journaled on a wire 60 and retained by the overturned end of a plate 61 which is secured to the base plate 12 at its forward end as shown and is slotted to receive the latch rollers 59, 59a.

Upon finger depression of the shift key button 30 pivotally to depress the associated key lever 18 to a down position, the pawl actuating projection 45 of the pawl 39 associated with the depressed key lever 18 engages the forward end of the associated slide member 47 and pivots it about the rod 21 while moving it slightly forward to disengage the slide member latch portion 58 from its associated latch roller 59. Upon latching disengagement of the latch portion 58 and latch roller 59, an interlock portion 62 (FIGS. 4-8) of the slide member 47 begins to be inserted between balls 63 of an interlock structure formed in the spacer bar 14 by a longitudinal ball retaining slot 64 and transverse comb slots 65 permitting entry of the interlock portion 62 between adjacent ones of the interlock balls 63. A comb plate 66, secured to the upper surface of the spacer bar 14, retains the interlock balls 63 in the longitudinal slot 64 of the spacer bar 14 while also permitting the interlock portion 62 of the slide member 47 to be inserted between the interlock balls 63. The length of the longitudinal slot 64 of the spacer bar 14 and the number of interlock balls 63 retained in this slot 64 are such that only one interlock portion 62 of any slide member 47 may be inserted sufficiently far between adjacent interlock balls 63 as to release the latch portion 58 of the slide member 47 from its associated latch roller 59. The interlock portions 62 of all other slide members 47 are thereupon prevented from entering between the interlock balls 63 sufficiently far as to enable another slide member 47 to become likewise unlatched. Thus, only one of the slide members 47, 47a may become unlatched at a given time, and all other slide members 47, 47a are mechanically interlocked in their latched positions until the operated one of the slide members 47, 47a slide has been restored to latched position in a manner next to be considered.

As will be evident from the drawing, the latch portion 58, 58a of each of the slide members 47, 47a has a sharply pointed nose configuration providing an angled edge surface which

may be in engagement with its associated latch roller 59 or 59a, respectively. So long as the apex or nose of the latch portions 58, 58a is above the axis of the roller support wire 60, the spring bias force exerted by the comb spring teeth 57, 57a on the slide members 47, 47a tends to move the latch portion 58, 58a on its associated latch roller 59, 59a upward into fully latched position of the slide members 47, 47a. Thus, if finger pressure on the shift key button 30 in pivoting the slide member 47 in the manner just explained should be released at any time prior to the time when the slide member latch portion 58 is positioned with its nose an incremental distance above the axis of the roller wire 60, the slide member 47 will restore to fully latched position. As soon as the slide member 47, has been pivoted by finger button pressure on the associated key lever 18, sufficiently far that the nose of the latch portion 58 is an incremental distance below the axis of the roller wire 60, the bias force exerted by the comb spring tooth 57 on the slide member 47 will cause the nose of one of the latch portion 58 to ride down on the now rotating latch roller 59. The selected slide member 47 will now begin to move longitudinally to the rear, with the latch portion 58 continuing in engagement with the now rotating latch roller 59 even to the extent that the latch roller 59 is eventually engaged by the uppermost top edge surface of the latch portion 58. While this is occurring, the interlock portion 62 of the slide member 47 moves down between and rearwardly through the interlock balls 63 and the rearward longitudinal movement of the selected slide member 47 continues until halted by engagement of the rod 21 with the forward end of the slot 51.

The lower edge of the slide members 47, 47a are provided with coding teeth 69, 69a which engage and pivotally move individual ones of a plurality of coding vanes 70 (more clearly shown in FIGS. 4-8) which extend transversely of the keyboard mechanism and are operated in common by a corresponding coding tooth 69, 69a of the slide members 47, 47a. The vanes 70 are secured for pivotal motion on individual ones of a plurality of vane support rods 71. The vane support rods 71 are pivoted by pivotal motion of their respective associated coding vanes 70, in response to the rearward longitudinal motion of slide members 47, 47a as just described to effect in a conventional manner the closure of a pair of normally open electrical code selector contacts (not shown) individual to each rod 71. These contacts are shown in the Hugh St. Lawrence Dannatt U.S. Pat. No. 3,327,828. By providing one or more coding teeth 69, 69a selected tooth positions on each of the slide members 47, 47a and by omitting coding teeth 69, 69a from all other tooth positions thereon, each of the slide members 47, 47a in longitudinally moving to their rearmost unlatched positions effect closure of an individual unique combination of the electrical code selector contacts. The generated electrical code is transmitted to associated equipment by well-known means, not shown, and not forming a part of the present invention. The associated equipment, after progressing through a portion of its cycle of operation, supplies return electrical energization to the keyboard to effect latch restore movement of a latch restore bail 73. The latch restore bail 73 is comprised by a rod 74 which is supported at its ends on arm 75. In particular, the latch restore bail 73 is movably pivoted between a rearmost position shown in full lines and a forward position. This is accomplished by mechanical connection of a bail arm 75 coupled to a rotary solenoid-operated actuator 81 as disclosed in the Hugh St. Lawrence Dannatt U.S. Pat. No. 3,327,828.

The solenoid actuator 81 is normally maintained energized by the associated equipment to which coded data information is supplied by manual manipulation of the keyboard mechanism including the key shift mechanism. The latch restore bail 73 is thus normally maintained in its rearmost position as illustrated in FIGS. 4-8.

In accordance with the invention, the key shift mechanism includes a rocker arm lever 100 connected between the shift key lever 18 and the unshift key lever 18a at the forward ends 101 and 102 of key levers 18 and 18a, respectively. The

rocker arm 100 is pivotally mounted on a pivot pin 104 which is rotatable in a bushing 106 fixed to the bracket 108. The pivot pin 104 is fixed along the length of the rocker arm lever 100 such that the length A of one side of the rocker arm lever 100 is greater than the length B of the other side of the rocker arm lever 100. The length A is made greater than the length B so that the unshift key lever 18a will travel at least as far as the shift key lever 18 when shift key lever 18 is moved in response to the depression of button 30 or by any other action.

The rocker arm lever 100 includes a set of upper and lower tabs 111 and 112 which are coupled to the shift key lever 18 and another set of upper and lower tabs 113 and 114 which are coupled to the unshift key lever 18a. It has been found that by having the upper and lower tabs 111-114 coupled to their respective key levers 18, 18a.

FIGS. 4-8 of the drawing illustrate the various stages of operation of the shift key lever 18. However, it should also be understood that these same FIGS. also illustrate the successive stages of operation of the unshift key lever 18a inasmuch as the two key levers 18 and 18a function in a substantially identical manner although with a phase opposition relationship. Accordingly, although the elements are designated without any postscript it should be understood that these FIGS. relate with equal vigor to the shift key lever 18 and the unshift key lever 18a. The shift key lever 18 is shown as being disposed in a normally up position as shown in FIG. 4. Since the unshift key lever 18a is in phase opposition it would be disposed in the down position as shown in FIG. 7 for shift key lever 18. The shift key lever 18 and the unshift key lever 18a operate in a similar manner to provide a code representing upper case and lower case characters, respectively.

FIG. 4 illustrates the normal latched position of slide member 47 prior to manual actuation of the shift button 30 and the corresponding pivotal actuation of associated shift key lever 18; the latter thus engages the bottom surface of stop bar 23 and the latch portion 58 of the slide member 47 is in full latching engagement with its associated latch roller 59. The latch restore bail 73 is held in its rearmost position at this time by energization of the solenoid actuator 81 through a shaft 76 and arm 75 as described in the aforesaid Dannatt U.S. Pat. No. 3,327,828. At the same time the unshift key lever 18a is normally disposed in the down position as shown in FIG. 7 for shift key lever 18.

In FIG. 5 the shift key lever 18 has been manually depressed sufficiently far that the associated pawl 39 has engaged and pivoted the slide member 47 beneath its point of latched engagement with the associated latch roller 59. The nose of the latch portion 58 of the slide member 47 accordingly has moved below the axis of the roller wire 60, so that latching engagement can no longer be maintained by reason of the rearward force exerted by the associated finger of the comb spring 57 on the slide member 47 as earlier explained. As the slide member 47 now moves downward and longitudinally in a rearward direction, the nose of the latching portion 58 of the slide member 47 continues to engage and rotate the latch roller 59 thus to minimize any frictional forces which may be associated with the unlatching operation and thereby reduce the downward force necessarily exerted on the key lever 18 to effect unlatching of the slide member 47. It may be noted, as illustrated in FIG. 5, that the force exerted by the actuating projection 45 of the pawl 39 on the end of the slide member 47 maintains the pawl 39 substantially nonpivoted on the shift key lever 18 notwithstanding the bias force exerted by the spring 43 on the pawl 39. As also illustrated in FIG. 5, it may be noted that the interlock portion 62 of the slide member 47 has now moved between adjacent balls 63 of the interlock structure to prevent similar unlatching of any other slide member 47. The unshift key lever 18a is out of phase with shift key lever 18 and is disposed at this time substantially in the position as shown in FIG. 4 for shift key lever 18.

FIG. 6 illustrates the positioning of the shift key lever 18 near the end of its downward stroke, and shows the rearmost position of the unlatched slide member 47 at the moment

when the latch restore bail 73 is about to initiate a cycle of reciprocal pivotal motion to restore the unlatched slide member 47 to the latched position, while at the same time the unshift key lever 18a is in the up position. As the slide member 47 moves rearwardly to its rearmost position, the coding vanes 70 are pivoted by the coding teeth 69 from their positions indicated in broken lines to their positions shown in full lines and in thus pivoting operate against the bias spring force of the code selector contacts (not shown) coupled to support rod 71. This bias force coacting with that of the comb spring 57 tends to pivot the slide member 47 upwardly at its forward end; the upper edge surface of its latch portion 58 accordingly tends to continue to maintain rolling contact with the latch roller 59 and thus minimize frictional drag on the motion of slide member 47. It will be noted in FIG. 6 that the rearward motion of the slide member 47 has effected disengagement of its forward end with the pawl-actuating projection 45, and the pawl spring 43 thereupon pivots the pawl 39 on the key lever 18 about the forward stud 41 and until the rearmost stud 41 limits the pivotal movement by its engagement with the upper edge of the pawl slot 40.

The purpose of this pivotal movement of the pawl 39 is made evident in FIG. 7 which illustrates the shift key lever 18 remaining in its depressed position and the slide member 47 partially restored to near latched position by action of the latch restore bail 73. It will be recalled from the aforesaid Dannatt U.S. Pat. No. 3,327,828 and as above described that the solenoid actuator 81 is deenergized by the associated equipment as the latter initiated a cycle of operation upon closure of the code selector common contacts and the resultant spring-tension effected pivotal displacement of the restore bail 73 in forward direction causing it to engage the restore bail rod 74 with a downwardly projecting restore portion 90 provided on the lower edge of the slide member 47 so that continued forward motion of the restore bail 73 moves the slide member 47 in a forward direction toward its relatchable position with the associated latch roller 59. The slide restore portion 90 has a sloping cam surface 91 which when engaged by the restore bail rod 74 exerts a pivotal upward force on the forward end of the slide member 47 to lift it into latched engagement with the associated latch roller 59. Here again the continued engagement of the upper flat surface of the latch portion 58 with the latch roller 59 minimizes the frictional forces involved in the slide restore operation. As illustrated in FIG. 7, the forward end of the slide member 47 while moving in a forward direction engages the side of the pawl actuating projection 45 and forces the pawl 39 forwardly on the shift key lever 18 against the tension of the spring 43 so that the slide member 47 may move in a forward direction to fully latched position without restoring unlatching engagement of the pawl actuating projection 45 with the upper end surface of the slide member 47. As the latch restore bail 73 continues its forward movement, the restore bail rod 74 begins to ride under the nose of the slide restore portion 90 and thus forcibly moves the forward end of the slide member 47 upwardly toward latching engagement of its latch portion 58 with the latch roller 59. The restore bail rod 74 moves beneath the slide restore portion 90 just after the nose of the latch portion 58 of the slide member 47 is elevated an incremental amount above the axis of the latch roller support wire 60, at which time the sloping edge surface of the latch restore portion 58 lifts the slide member 47 upward to fully latched position on the latch roller 59 by reason of the rearwardly directed force exerted by the comb spring 57 (FIG. 1) on the slide member 47. This disengages the slide restore portion 90 and restore bail rod 74 so that the restore bail 73 thereafter completes its forward motion without being restrained by any of the latched slide members 47. As already been mentioned the pivotal motion of the shift key lever 18 and the unshift key lever 18a function in phase opposition. However, this should not be construed to mean that as the slide 47 associated with shift key lever 18 is restored to its normal position that the slide 47a associated with the unshift key lever 18a is moved rearwardly

towards its active position. Furthermore, it should be observed that at any given time only one of the slide members 47, 47a may be in its rearward position.

FIG. 8 illustrates the shift key lever 18 in fully depressed position, the slide member 47 in fully latched position with its interlock portion 62 out of engagement with the interlock balls 63, and the restore bail rod 74 now moved to its forwardmost position. In this position, the restore bail rod 74 underlies the restore portion 90 of all slide members 47 and thereby locks them against pivotal motion to unlatched position until the restore bail rod 74 has again moved rearwardly sufficiently far as to be no longer engaged by the restore portion 90 of any slide member 47 which may be key-lever pivoted to unlatched position. Thus continued deenergization of the solenoid actuator 81, as by removal of power from the associated data utilizing equipment, causes the restore bail 73 to be biased by its bias spring (not shown) to its forwardmost position where it locks up all key levers 18 against manual manipulation. However, as will be comprehended when the entire structure is understood and, more specifically, when the function of pawl 39 is appreciated, the restore bail 73 may be moved to the position just described even though one or more of the key levers 18 remains in a downward position. As illustrated in FIG. 8, the pawl 39 remains longitudinally displaced on the key lever 18 with the pawl actuating projection 45 yet in side abutting relation to the end of the latched slide member 47 so that the latter cannot again be unlatched by the pawl 39 until the key lever 18 is once more restored to its normal uppermost or nonoperated position to reestablish the overlapping relation between the pawl actuating projection 45 and the end of the slide member 47 as illustrated in FIG. 4. Even though the shift key lever 18 remains so depressed for a prolonged interval, another key lever of the keyboard may be manually depressed to pivot and unlatch its associated slide member 47 as soon as the restore bail 73 has been moved rearwardly by reenergization of the solenoid actuator 81. The unshift key lever 18a follows the same operation as that shown for the shift key lever 18 but out of phase as shown between FIGS. 4 and 8.

From the operation of the shift key lever 18 and the unshift key lever 18a, it may now be seen that the rocker arm lever 100 couples the shift key lever 18 and the unshift key lever 18a in phase opposition.

The key shift mechanism also includes another shift key lever 18b which is of similar construction to the shift key lever 18 except that the slide mechanism 47 and pawl 39 together with the associated structure is omitted since shift key lever 18b is coupled to shift key lever 18 by bail 116. The shift key lever 18b includes a button 30b similar to the button 30 of the shift key lever 18. The shift key lever 18b is pivotally mounted on the rod 21 and is urged to the up position by the spring 117.

The usual typewriter form of shift key mechanism for a keyboard mechanism is conventionally provided with a key lock mechanism. This key lock mechanism is provided in the present shift key mechanism as shown in FIGS. 1-3. The structure here illustrated and described below is disclosed and claimed in the copending application of John F. Herrmann entitled "Key Lock Shift Mechanism," Ser. No. 679,753 filed Nov. 1, 1967, and assigned to the same assignee as the present application.

The key lock mechanism includes a key lock lever 18c which is substantially of the same structure as the key levers 18a, 18b, except that the key lock lever 18c includes a bridging member or tab portion 121 which coacts with the projection 35 of the shift key lever 18 each time the key lock lever 18c is depressed. The key lock mechanism also includes a locking member 122 which is pivotally mounted on the key lock lever 18c by a pivot pin 124. The locking member 122 is retained laterally by a washer member 125 in a manner well known to those skilled in the art. The locking member 122 is yieldingly urged in a clockwise direction by a spring 126. The spring 126 is retained at one end 129 in an aperture 127 in the key lock lever 18c and is retained at another end by an upturned portion 128 coacting with the locking member 122.

The locking member 122 includes a notch portion 130 which coacts with the bar 23 for retaining the key lock lever 18c in a depressed position which, of course, in turn retains the shift key lever 18 in a depressed position by the tab 121 acting on the projection 35. The key lock mechanism also includes a bridging member 131 which is fastened to a vertical projection 132 of the shift key lever 18 and includes a portion 133 which coacts with the locking member 122 to retain or urge the locking member 122 in a counterclockwise direction when the shift key lever 18 is depressed. The portion 133 of the bridging member 131 is positioned in cooperative relationship with the lock member 122 such that the lock member 122 engages the bar 23 when the shift key lever 18 is released and moved to an upward position. The bridging member 131 and the portion 133, however, remain in contact with the lock member 122 when the lock key button 134 is depressed or released so that shift key lever 18 exerts a force on the lock member 122 to retain it in a substantially counterclockwise position to avoid engagement with the bar 23.

FIGS. 2 and 3 show the lock member 122 in a locked position and in an unlocked position, respectively. It should be noted that when the lock member 122 is in the lock position, the bridge member 131 and portion 133 have a small clearance, say in the order of .030 of an inch. Referring to FIG. 3, the lock member 122 includes a tab portion 137 which coacts with the key lever 18c to depress the key lever 18c when a force is exerted on the lock member 122 by the portion 133 of the bridging member 131.

In the operation of the key lock mechanism, the key lock lever 18c when urged in the downward direction depresses the shift key lever 18 simultaneously therewith through the action of the bridging member 121 and the spring 126 urges the lock member 122 in a clockwise direction. The key lock lever 18c and the shift key lever 18 are retained in the shift position by the coaction of notch 130 on lock member 122 with bar 23 when pressure is released on the lock button 134. When it is desired to generate an unshift signal from the keyboard, the shift button 30 is depressed downward to rotate the lock member 122 in a counterclockwise direction and release it from the bar 23 so that the key lock lever 18c and the shift key lever 18 may be returned to the home or upward position.

Referring now to FIGS. 10-13, another embodiment of the invention is shown in a FLEXOWRITER automatic writing machine manufactured by the Singer Company, Friden Division. It should be understood, however, that the invention is not limited in application to the specific machines selected for the purpose of illustration, but may be applied to other power operated writing machines. Only the structure necessary to illustrate the invention is shown in FIGS. 10-13. For a more complete description of the FLEXOWRITER automatic writing machine, reference may be made to the E. O. Blodgett U.S. Pat. No. 2,797,790, issued Jul. 2, 1957, and assigned to the same assignee as the present application. The shift key mechanism shown in FIG. 10 is similar to the key shift mechanism shown in FIG. 1, except that the rocker arm lever of FIG. 10 is shown in a position substantially parallel to the key levers of the automatic writing machine instead of being transverse to the key levers. Thus, different arrangements may be used in the shift key mechanism to conserve space or to be capable of being mounted in restricted areas.

As shown in FIG. 10 of the drawing, the shift key lever mechanism includes a shift key lever 201 and an unshift key lever 202, both of which are pivotally mounted on a rod 203 which is supported by a cross member of a power frame assembly (not shown). A power roll 204 is mounted under the power frame assembly for rotation in the direction of the arrow by means of a source of power such as an electric motor (not shown).

Cooperating with the power roll 204 are similar cam units 205 and 206 which are pivotally mounted on a rod 207 extending parallel to the roller 204. Cam unit 205 is coupled to the shift key lever 201 by a vertical projection 208 and the unshift key lever 202 is coupled to the unshift cam unit 206 by

a vertical projection 209. Each of the cam units 205, 206 and its associated key levers 201, 202 are in control of a type basket (not shown) which is movable between upper and lower case printing positions by linkages 211, 212.

The type basket is mounted for selectively shifting between upper and lower case printing positions by mounting the same on two sets of parallel leaf springs in the well-known manner as disclosed in the above noted patent to Blodgett U.S. Pat. No. 2,797,790. The shift key lever 201 and its associated cam assembly 205 are provided for shifting the type basket in one position and the unshift key lever 202 and its associated cam assembly 206 is provided for shifting it to the other position. This provides fast, positive, automatic operation of the type basket shift for selectively printing upper or lower case characters under the control of a single key lever and a code translator mechanism 210 to be described hereinafter in more detail. In accordance with the invention, the shift key lever 201 and the unshift key lever 202 are coupled through a rocker arm lever assembly 215. The rocker arm lever assembly 215 is similar to the rocker arm lever 100 of FIG. 1; except that it includes two halves, namely, a shift restore arm 216 and shift restore lever 217 which may be adjusted for different lengths through a screw 218 and elongated slot 219. The rocker arm lever assembly 215 is pivotally mounted on a pivot pin 230 fixed to the frame 222. The rocker arm lever assembly 215 is coupled to the shift key lever 201 and the unshift key lever 202 through a bail 221 pivotally mounted to a frame 222 at one end and fixed to the shift restore lever 217 of the rocker arm lever assembly 215 at the other end. The shift key lever 201 is connected to the bail 221 at an elongated slot 225 thereon. The bail 221 and shift key lever 201 are urged in clockwise direction by springs 227, 226. The shift key lever 201 when moved in an up or down position rotates the rocker arm lever assembly 215 in a clockwise or counterclockwise direction, respectively, through the bail 221. The unshift key lever 202 is coupled to the rocker arm lever assembly 215 by a pin 228 fixed to the shift restore arm 216 of the rocker arm lever assembly 215 and slidably disposed in a slot 229 in the unshift key lever 202. The unshift key lever 202 is movable to a down position through a clockwise rotation of the rocker arm lever assembly 215 to effect an unshift function of the type basket. The shift key lever 201 includes a vertical projection 231 for receiving a shift button 232. The unshift key lever 202 in accordance with the invention does not include a button since it is operated by the coaction of the rocker arm lever assembly 215 and the shift key lever 201. Thus, only the actuation of the shift key lever 201 or the operation of the code translator 210 is necessary to perform shift and unshift functions of the type basket.

The two oppositely opposed toggle mechanisms partially shown as links 211 and 212 adjustably hold the basket in its two shift positions and power from each basket shift cam unit is applied to move the basket by breaking its associate toggle (not shown) and more fully described in the aforesaid Blodgett U.S. Pat. No. 2,797,790. This imparts an easy accelerated motion to the basket. Specifically, the manner in which the type basket is shifted from one position to the other is more fully described in the E. O. Blodgett U.S. Pat. No. 2,797,790 previously explained hereinbefore. However, it should be pointed out that the shift key lever 201 and the unshift key lever 202 are out of phase with each other. That is, the shift key lever 201 is normally shown in an up position while the unshift key lever 202 is in a normally down position. The rocker arm lever assembly 215 translates the motion between the shift key lever 201 and the unshift key lever 202 to provide the opposite phase functions which in turn control their associated cam assemblies 205, 206 to effect the shift and unshift position of the type basket. This has not been done in the past since in the prior art the shift and unshift functions were performed by separate keys which were both in the up position and one or the other key had to be depressed to provide the various shift functions.

It is conventional in typewriters to provide two shift key buttons 232 and in the present embodiment of the invention a second shift key lever 201a and a button 232a are included. The second shift key lever 201a is also pivotally mounted on the rod 203 at one end and is coupled to the bail 221 by an elongated slate 225a for providing shift and unshift functions through the bail 221. A spring 246 urges the shift key lever 201a in a clockwise direction to keep the key button 232a in a normally up position. The shift key button 232a and the shift key lever 201a are spaced from the shift key button 232 and the shift key lever 201 for the convenience of an operator in a manner well known to those skilled in the art.

A shift key lock mechanism is provided for the shift key mechanism of FIG. 10 for locking the type basket in a shift position. The shift lock key mechanism includes a key lock lever 235 pivotally mounted at one end of the rod 203 and urged to an up or normal rest position by a spring 236 in a manner similar to the other key levers. The shift key lock lever 235 includes a lock button 237 which is marked "Lock" and is mounted on a key lock lever 235 at a projection 238 thereon. The shift key lock lever 235 also includes a horizontal tab 239 which coacts with one end of the shift key lever 201 to urge the key lever 201 in a downward motion simultaneously as the shift key lock lever 235 is depressed.

The shift key lock mechanism includes a pawl 240 which is pivotally mounted on the frame 222 by a pin 241. The pawl 240 includes a horizontal foot projection 243 which is positioned in cooperative relationship with a notch 244 on a shift key lever 201 for locking the key lever 201 in a downward or shift position. The pawl 240 is urged towards the shift key lever 201 by a U-shaped spring 233 horizontally disposed on the key lock lever 235 so that when the key lock lever 235 is in an up or rest position the pawl 240 is yieldingly urged in a counterclockwise direction and when the key lock lever 235 is in a down or shift position, the U-shaped spring 233 urges the pawl 240 in a clockwise direction. A stop member 245 limits the travel of the pawl 240 and the key lock lever 235.

In the operation of the key lock mechanism of FIG. 10, the key lock lever 235 when depressed urges the shift key lever 201 to a downward position simultaneously by the horizontal tab 239. At the same time the horizontal spring 233 urges the pawl 240 in a clockwise direction against the notch 244 on the shift key lever 201, so that when the shift key lock lever 235 is released, both the pawl 240 and the shift key lever 201 are retained in the downward position since the foot projection 243 of the pawl 240 engages the notch 244 of the key lever 201. When the foot projection 243 is engaged with the notch 244 the spring 226 urges the shift key lever 201 in a clockwise or upward direction. However, the pawl 240 cannot rotate any further because the stop member 245 limits the counter rotation of the pawl 240. The key lever 201 may be released when the shift key lever 201 is depressed so that the spring bias on the pawl 240 offered by the U-shaped spring 233 effects a departure of the foot projection 243 from the notch 244 such that the shift key lever 201 can be returned to the up or normal position when released.

In a mechanism such as the FLEXOWRITER automatic writing machine, it is necessary for a reader to read a coded tape and translate the information thereon automatically into printed matter or translate the information onto another coded tape through a punch mechanism. The shift mechanism of the present invention is adapted for automatically shifting from upper case or lower case in response to the action of the seekers from the code translator 210. The code translator 210 is well known to those skilled in the art and may be of the type manufactured by The Singer Company, Friden Division and described in more detail in the E. O. Blodgett patent heretofore mentioned. The code translator 210 includes a shift seeker 251 for shifting the type basket in response to a shift code and an unshift seeker 252 for shifting the type basket in an unshift position in response to an unshift code. The shift seeker 251 is coupled to the shift key lever 201 by a pin 253. As is more fully shown in one or more of the FIGS. 10-13 the

unshift seeker 252 is coupled to the unshift key lever 202 through a seeker unshift mechanism 255. The seeker unshift mechanism 255 includes a shift restore bracket 256 fixed to the frame 222, a pivot arm actuator 257 which is pivotally mounted on the bracket 256 on a pivot pin 258 and a key lock pawl 259 also pivotally mounted on the pivot arm actuator 257. The pivot arm actuator 257 is rotatable in a clockwise and counterclockwise direction under the control of the shift seeker 252 through a pin 260. The pawl 259 is positioned in cooperative relationship with the rocker arm 216 such that when the pivot arm actuator 257 is pivoted about the pin 258 the pawl 259 strikes the rocker arm lever assembly 215 when the shift key lever 201 is in a down position. The pawl 259 is guided in a substantially horizontal direction by guides 262 when the pivot arm actuator 257 is rotated.

Referring to FIGS. 11—13, the seeker unshift mechanism as shown in FIGS. 11 and 12 is in a normally rest position. FIG. 13 shows the seeker unshift mechanism in an actuated position wherein the seeker 252 of the code translator 210 pivots the pivot arm actuator 257 in a counterclockwise direction so that the pawl 259 strikes the nose portion 263 of the rocker arm lever assembly 215 to unshift the key shift mechanism. This action corresponds to pressing one of the shift buttons 232, 232a in a downward direction to produce the unshift code.

It will be evident from the foregoing description of the invention that a shift key mechanism embodying the invention is a compact, relatively simple construction for providing shift and unshift functions by a single shift key lever through a rocker arm lever which maintains an out of phase relationship between a shift key lever and an unshift key lever.

I claim:

1. A key shift mechanism for a typewriter keyboard, said mechanism comprising:
 - a. a shift key lever means including a first slide member and a shift key lever having a first end vertically movable between an up position and a down position for controlling said first slide member to generate a shift code representing upper case characters when said shift key lever is moved from said up position to said down position;
 - b. an unshift key lever means including a second slide member and an unshift key lever mounted substantially parallel to said shift key lever and having a second end vertically movable between an up position and a down position for controlling said second slide member to generate an unshift code representing lower case characters when said unshift key lever is moved from said up position to said down position;
 - c. a rocker arm lever pivotally mounted about a given point along its length and coupled at one end to said first end of said shift key lever and connected at the other end thereof to said second end of said unshift key lever for maintaining said first end of said shift key lever and said second end of said unshift key lever in phase opposition to each other;
 - d. spring means coupled to said first end of said shift key lever and said second end of said unshift key lever for yieldingly urging said first and second ends towards said

up position; and

- e. button means connected near said first end of said shift key lever for controlling the vertical motion of said first end of said shift key lever whereby said rocker arm lever coacts with said unshift key lever to cause said second slide member to generate said unshift code when said first end of said shift key lever is moved from said down position to said up position.
2. The invention defined in claim 1 wherein said given point on said rocker arm lever is disposed nearer to said one end of said rocker arm lever than to said other end so that the portion of said rocker arm lever between said other end and said given point has a length greater than the portion of said rocker arm lever between said one end and said given point for assuring that said other end of said rocker arm lever moves at least as far as said one end of said rocker arm lever in response to any pivotal motion of said rocker arm lever about said given point.
3. The invention defined in claim 1 and further including locking means positioned in cooperative relationship with said key shift mechanism for locking said shift key lever in said down position.
4. The invention defined in claim 1 wherein said rocker arm lever includes upper and lower tab portions on said one end and on said other end for engagement with said first and second ends of said shift key lever and said unshift key lever, respectively.
5. The invention defined in claim 4 wherein said rocker arm lever is disposed transversely to said shift key lever and said unshift key lever.
6. A key shift mechanism for a typewriter keyboard comprising:
 - a. a shift key lever;
 - b. an unshift key lever;
 - c. means for pivotally mounting said shift key lever and said unshift key lever in parallel spaced relationship about a common rod
 1. said shift key lever and said unshift key lever being pivotally mounted to said rod at one end thereof and movable between an up position and a down position at the opposite ends thereof;
 - d. a rocker arm lever means coupled to said opposite ends of said shift key lever and said unshift key lever for maintaining an out-of-phase relationship between said opposite ends of said shift key lever and said unshift key lever with respect to said up position and said down position at said opposite ends;
 - e. individual code generating means coupled to said shift key lever and said unshift key lever for generating a shift code when said opposite end of said shift key lever is moved from said up position to said down position and for generating an unshift code when said opposite end of said unshift key lever is moved from said up position to said down position;
 - f. spring means for yieldingly biasing said opposite end of said shift key lever to said up position normally; and
 - g. means fixed near said opposite end of said shift key lever for selectively depressing said opposite end of said shift key lever into said down position.

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