



March 15, 1960

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CASE SHIFT MECHANISM

2,928,467

Filed Dec. 27, 1957

3 Sheets-Sheet 2

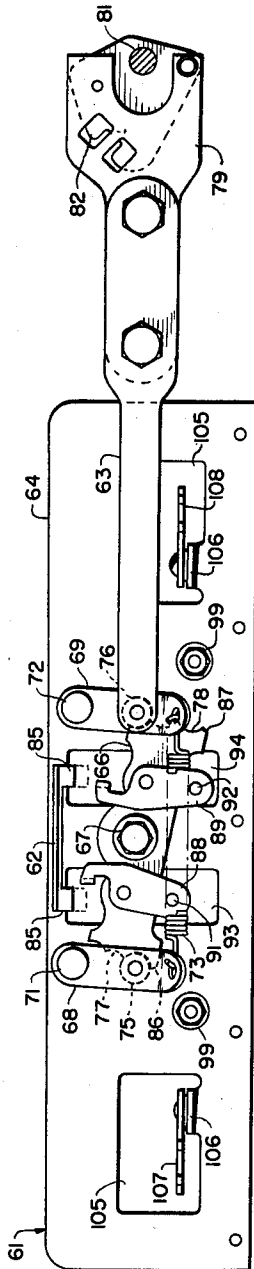


FIG. 3

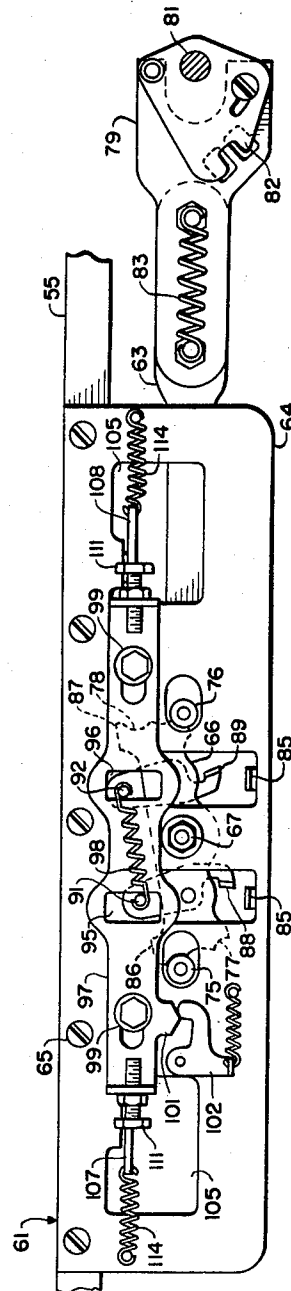


FIG. 4

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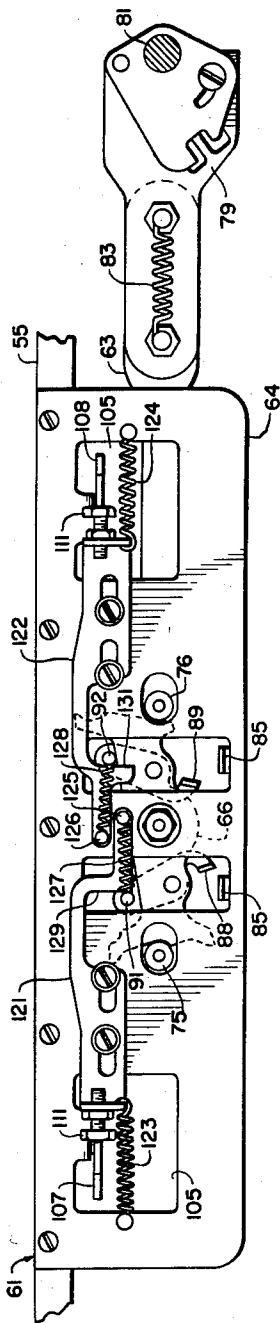


FIG. 5

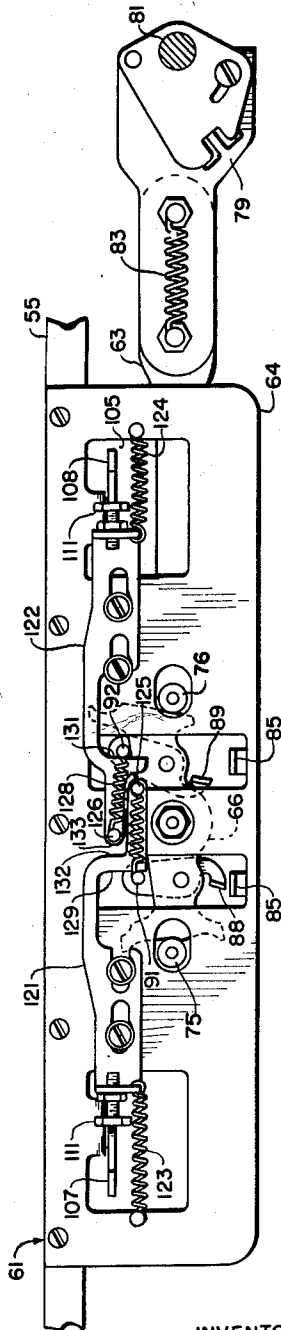


FIG. 6

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2,928,467

## CASE SHIFT MECHANISM

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Application December 27, 1957, Serial No. 705,579

12 Claims. (Cl. 164—112)

This invention pertains to keyboard apparatus and more particularly to shift mechanisms therefor.

The primary object of the present invention is to provide a power operated shift and unshift mechanism for keyboard devices.

Another object of the invention is to provide a positive means for shifting the counting code blade selector unit of a keyboard perforator and counter.

The invention is concerned particularly with an improvement in a keyboard perforator and counter of the type shown in U.S. Patent No. Re. 22,350, and resides in the substitution of a key controlled power operated shift mechanism for the manually operated shift device disclosed in said patent. Moreover, the arrangement according to the present invention is particularly related to the shifting of the counting code blade selector unit disclosed in co-pending application Serial No. 705,558, filed December 27, 1957 by A. F. Lindberg.

Briefly, the apparatus according to the present invention, like that shown in said patent, is provided with a keyboard including a series of keylevers each of which performs the function of controlling a permutation selector mechanism of a perforating mechanism, and which, through a push bar mechanism individual to each key, are arranged to control counting code elements contained in removable code bar units. Also, similar to the structure of said patent, the coded elements of each code bar unit are arranged to control a plurality of counting vanes. As in said patent, the counting vanes control, in turn, a differential accumulator to actuate an indicating device. Thus, according to the present invention, means is provided for shifting the counting code blade selector unit disclosed in said co-pending application from its lower case to upper case positions and vice versa by a power operated shift device under the control of the shift and unshift keylevers, respectively.

A more comprehensive understanding of the present invention may be had from the following description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is an elevational view of the shift mechanism according to the present invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a plan view of the shift mechanism;

Fig. 4 is a bottom view of the shift mechanism; and

Figs. 5 and 6 are bottom views of a modification of the shift mechanism under two conditions of operation.

Referring to Figs. 1 and 2, the shift mechanism, according to the invention, is shown as associated with the operatively related elements of the apparatus disclosed in said co-pending application. For example, keylevers 23 are analogous to the keylevers 23 of said co-pending application. Similarly, the counting code blade selector unit 41 is analogous to the unit 41 of said co-pending application, and comprises a plurality of push bar mechanisms, each comprising a push bar 42, a push bar depressing rod 43, a depressing rod pivot link 44 and a push bar spring 45. The fixed pivot elements which are common to all push bar mechanisms are the link pivot plate

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46 and the push bar pivot 47. The unit 41 is slidably supported on the universal blade shaft 53, and through rollers 54, on a track 55 to effectuate the shifting operation described herein. As disclosed in said co-pending application, each push bar 42 is operatively associated with two rows of code elements 38, so that as a result of the shifting operation, hereinafter described, the push bar 42 is presented in alignment with either one or the other of the two rows of elements 38. To facilitate the operation of the push bar mechanisms in both the shift and unshift positions of the unit 41, the top portion 40 of the depressing rods 43 are widened so that they will each be depressed by their respective keylever 23 in either of the two case positions. The shift in the position of the unit 41 carrying the push bar assemblies is done by the shift device, indicated generally as 61 in Figs. 1 to 4, which device is placed directly under the unit 41 and utilizes a power take-off vane 62 from the universal blade shaft 53 and is conditioned (by depressing one of the shift keylevers) to do the required shifting before the depressed keylever trips the control clutch, initiating the shift cycle.

The shift mechanism 61 is mounted in its entirety, except for a link 63 connecting it with the push bar mechanism unit 41, on a shift mechanism mounting plate 64 which is secured in a horizontal plane by means of screws 65 to member 55. The shifting device may be considered as consisting of two units; namely, a shift mechanism and a shift control mechanism. The shift mechanism, mounted to the top side of the shift mechanism plate 64 comprises a shift cam element 66, pivotally mounted by means of a screw and bushing arrangement 67 to the plate 64. Two follower roller arms 68 and 69 (Fig. 3), pivoted at 71 and 72, respectively, on plate 64, are biased toward each other by a spring 73 tending to hold the cam follower rollers 75 and 76 against the two diametrically opposed cam surfaces 77 and 78 of the shift cam 66. The link extension 63 in articulation to the follower arm 69 through the center of the follower roller 76 moves with the roller 76 as the roller 76 follows its associated cam contour 78. A link 79 is mounted in slidable assembly with link extension 63, and is pivotally articulated to a shift post 81 at its other end through an adjusting plate 82. The slidable connection between link 79 and its extension 63 is biased in one direction by means of the spring 83 so that the length of the link assembly 63—79 is yieldable in compression but rigid in tension.

The shift post 81 which is screwed rigidly into the right end plate 84 of the unit 41, will cause the unit 41 to move with it in accordance with the movement imparted to it by the cam follower roller 76 through the yieldable link assembly 63—79, as will presently appear. The cam contour 78 associated with the follower roller 76 is designed to impart to its follower roller 76 a total displacement just equal to the amount needed for shifting the alignment of the push bars 42 from one set of code blades 38 to the adjacent set of code blades 38. With such an arrangement, the end dwells of the cam 78 become the elements that control the registration of the shift positions and therefore preclude the need of end position stop adjustments. The cam contour 78 is so designed as to control the acceleration and deceleration of the unit 41 with the result that there is no important impacting of parts one against another. The cam contour 77 associated with the follower roller 75 is designed, except for the end positions of the cam 66, so that no change in extension of the spring 73 will take place during the shifting operation. By the use of this expedient, very little of the work energy available at the power fingers 85 of the power take-off vane 62 will be needed to overcome the force of the spring 73. This same contour (associated with follower roller 75) is cut with detenting drops dia-

metrically opposite the registration dwells of the opposed cam contour 78. When the follower roller 75 drops into one of the depressions in the cam contour 77, the cam 66 will be held in that position until forcibly turned to its alternate position. Stop ears 86 and 87 of cam 66 are designed to appear as parts of the cam contours 77 and 78, respectively; stop ear 86 will prevent over-rotation of the cam in the clockwise direction (Fig. 3) when it abuts against roller 75, and stop ear 87 will prevent over-rotation of the cam 66 in the counterclockwise direction when it abuts against roller 76.

Power to operate the shift cam 66 is provided by the two fingers 85 extending downward from the power take-off vane 62 which is securely affixed to the universal blade shaft 53. During every cycle of operation, the fingers 85 will be moved in a path shown by dotted lines in Fig. 3, and return. Two pawls or interponents 88 and 89 are mounted pivotally on the shift cam 66 in such a manner as to enable the power fingers 85 to rotate the shift cam 66 to the shift or unshift position depending on which pawl 88 or 89 is turned or rotated into the path of movement of the fingers 85. The pawls 88 and 89 having been set for a particular shift position with respect to the shift cam 66 and power fingers 85, as will hereinafter appear, will remain in that position until they are changed by depressing the complementary shift key.

The control of the shift mechanism centers entirely around the operation of the cam operating pawls 88 and 89. The ends of the pawls 88 and 89, opposite to the ends which cooperate engagingly with the power fingers 85, are provided with pins 91 and 92, respectively, which extend downward, parallel with the axes of the pawl pivots, through apertures 93 and 94, respectively, in the mounting plate 64 through slots 95 and 96, respectively, in a shift control bar 97 and terminate in ends that are grooved to retain the loops of the spring 98 by which pins 91 and 92 are biased toward each other tending to hold said pins against the edges of their respective slots 95 and 96 in the shift control bar 97.

The shift control bar 97 is slidably assembled to the mounting plate 64 by means of the shoulder screws 99 so that movement to the right will cause both operating pawls 88 and 89 to turn in a clockwise direction (Fig. 4) engaging pawl 88 and disengaging pawl 89 with the power fingers 85. On the other hand, movement of the shift control bar 97 to the left (Fig. 4) will cause both operating pawls 88 and 89 to turn in a counterclockwise direction, thereby disengaging pawl 88 and engaging pawl 89 with the power fingers 85. The shift control bar 97 is provided with a detent 101 arranged to cooperate with a spring actuated detent bell crank lever 102 so that the control bar 97 will be held in that one of its alternate positions resulting from the depression of one of the shift keys until the other of the two shift keys 103 and 104 is depressed.

Near each end of the shift mechanism mounting plate 64 is an aperture 105 from which an ear 106 is turned upward for pivotally mounting the bell crank levers 107 and 108. The lower ends 109 (Fig. 1) of the bell crank levers 107 and 108 are aligned to act on the tops of the heads of adjusting screws 111 carried in the ends of the control bar 97, so that upon the selective operation of the bell crank levers 107 and 108, as will presently appear, the control bar 97 may be pushed into either of its alternate shift control positions.

The shift keylever 103 and the unshift keylever 104 each have a rod 112 depending from a pivotal pin riveted into the rod and held in free engagement with a hole in the keylever by a retaining leaf spring 113 which is also riveted to the rod 112. The lower ends of the rods 112 are pivotally articulated to their respective bell crank levers 107 and 108. Each of the bell crank levers 107 and 108 is under the influence of a return spring 114 which tends to return the bell crank lever 107 (or 108), the keylever rod 112 and the keylever 103 (or 104) to the unoperated position.

In the operation of the device according to the present invention, if the perforator operator depresses the shift keylever 103, the keylever rod 112 associated therewith is also depressed causing the bell crank lever 107 to rotate in a counterclockwise direction (as viewed in Fig. 1) against the pull of its spring 114. The lower end 109 of the bell crank lever 107 will push the shift control bar 97 to the right which, in turn, will effect a clockwise rotation, Fig. 4 (counterclockwise in Fig. 3) of the cam operating pawls 88 and 89 by reason of its engagement with the pawl pins 91 and 92, to position the pawl 88 into the path of the left-hand power finger 85, and the pawl 89 out of the path of the right-hand power finger. At the end of the keylever stroke, a clutch (not herein shown, but which may be of the type disclosed in Fig. 5 of U.S. Patent No. 2,019,505) is tripped, which permits a main cam shaft (not shown) to rotate through one operating cycle to permit (as disclosed in said co-pending application) a spring 117 (Fig. 1) to act through a lever arm 59 (Fig. 2) to rock the universal blade shaft 53, to cause the power fingers 85 to execute one operation, whereupon the left-hand finger 85 impinges against pawl 88 to rotate the shift cam 66 counterclockwise (as viewed in Fig. 3).

As the shift cam 66 rotates in the counterclockwise direction (Fig. 3), the roller 76 is forced to move to the right carrying with it the push bar mechanism unit 41 by means of the connecting link assembly 63—79 unless mechanical obstruction prevents movement of the unit 41, in which event, the spring 83 will yield to protect the mechanism. This actuation of the shift keylever 103 moves the push bar mechanism 41 to the right. Now, if the perforator operator depresses the unshift key 104, the keylever rod 112 associated therewith is depressed causing the bell crank lever 108 to rotate in a clockwise direction. The lower end 109 of bell crank lever 108 will push the shift control bar 97 leftwardly to effect a counterclockwise rotation, Fig. 4 (clockwise in Fig. 3), of the cam operating pawls 88 and 89 to position the pawl 89 into the path of the right-hand power finger 85, and the pawl 88 out of the path of the left-hand power finger. Upon rocking the shaft 53 the power fingers 85 are caused to execute one operation so that the right-hand finger 85 impinges against pawl 89 to rotate the shift cam 66 clockwise (as viewed in Fig. 3). This rotation of the shift cam 66 causes the follower roller 75 to be forcibly moved to the left, while the follower roller 76 merely follows its associated cam contour 78 with the result that the tension in the spring 73 is held constant except, of course, for the change necessary for the detenting action. This actuation of the unshift key 104 moves the push bar mechanism unit 41 to the left, unless mechanical obstruction is present, in which event the spring 73 will yield to protect the mechanism.

Figs. 5 and 6 illustrate a modified form of the shift mechanism according to the present invention. If comparison is made between the form of the invention shown in Figs. 5 and 6 and the form shown in Fig. 4, it will be noted that the important change in the shift control mechanism is that the single control bar 97 (Fig. 4) has been replaced by two control bars 121 and 122. With this arrangement, both shift pawls 88 and 89 are positioned out of the path of action of their respective power fingers 85 in the normally unoperated positions of the shift keylevers 103 and 104, as shown in Fig. 5. The normally unoperated positions of the shift control bars 121 and 122 are maintained by their individual springs 123 and 124, respectively. Tension in spring 123 urges control bar 121 to the left, and spring 124 urges control bar 122 to the right. Spring posts 125 and 126 in the control bars 121 and 122, respectively, support springs 127 and 128 which serve to yieldably hold the control pins 91 and 92 of the shift pawls 88 and 89 against control edges 129 and 131 of the control bars 121 and 122, respectively.

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Fig. 6 illustrates the condition existing after the left hand shift keylever 103 has been depressed and release of the perforator clutch is imminent. The control bar 121 has been moved to the right, pulling with it the pin 91 through the tension of spring 127 and thereby rotating pawl 88 clockwise into the operating path of power finger 85. It will be observed that the interposition of either shift pawl 88 or 89 into the path of its respective power finger 85 by means of its controlling shift control bar 121 or 122 will preclude engagement of the other pawl by virtue of the abutment of the edges 132 and 133 of bars 121 and 122, respectively. Thus, the accidental simultaneous operative engagement of the shift pawls 88 and 89 with the power fingers 85 is precluded. Operation of the shift cam 66 by a power finger 85 through the medium of a shift pawl 88 or 89 is the same as described hereinbefore.

Although preferred forms of the invention have been disclosed and described, it is manifest that changes may be made in the details set forth without departing from the essentials of the invention.

What is claimed is:

1. In a keyboard apparatus, a series of keylevers, means to be operated, a unit carrying a plurality of devices for operating said means, means for slidably carrying said unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rocker member having dual camming facilities oppositely disposed thereon, cam follower means operably associated with said rocker member and said unit, a pair of interponents pivotally carried by said rocker member, a pair of operating fingers, and means controlled by certain of said keylevers for pivoting said interponents to determine the coaction between said interponents and said pair of fingers, whereby said rocker member is effective through said cam follower means to determine the positionment of said unit.

2. In a keyboard apparatus, a series of key levers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rocker member having dual camming facilities oppositely disposed thereon, cam follower means operably associated with said rocker member and said unit, a pair of interponents pivotally carried by said rocker member, a pair of operating fingers, and means controlled by certain of said keylevers for pivoting said interponents to determine the coaction between said interponents and said pair of fingers, whereby said rocker member is effective through said cam follower means to determine the positionment of said unit.

3. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable member having dual camming facilities oppositely disposed thereon, dual cam follower means operably associated with said rockable member and said unit, a pair of interponents pivotally carried by said rockable member, a pair of operating fingers, and means controlled by said pair of keylevers for pivoting said interponents to determine the coaction between said interponents and said pair of fingers, whereby said rockable member is effective through said cam follower means to determine the positionment of said unit.

4. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable member having dual camming facilities oppositely disposed thereon, dual cam follower means, a link interconnecting said follower means and said unit, a pair of interponents pivotally carried by said rockable member, a pair of operating fingers, and means controlled by said pair of

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keylevers for pivoting said interponents to determine the coaction between said interponents and said pair of fingers, whereby said rockable member is effective through said cam follower means and said link to determine the positionment of said unit.

5. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable member having dual camming facilities oppositely disposed thereon, dual cam follower means, a link interconnecting said follower means and said unit, a pair of interponents pivotally carried by said rockable member, a shift control bar articulated to said pair of interponents, a pair of operating fingers, and means controlled by said keylevers for actuating said control bar to selectively condition said interponents for operation by said pair of fingers, whereby said rockable member is effective through said cam follower means and said link, upon the operation of said fingers, to establish the positionment of said unit.

6. In a keyboard apparatus, a series of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a cam shift member, cam follower means operably associated with said cam shift member and said unit, a pair of interponents carried by said cam shift member, a pair of operating fingers, and means controlled by certain of said keylevers for determining the coaction between said interponents and said pair of fingers, said last recited means comprising a pair of interponent-actuating facilities, each of said facilities cooperably related to one of said certain keylevers, whereby said cam member is effective through said cam follower means to determine the positionment of said unit.

7. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable cam member, dual cam follower means, a link interconnecting said follower means and said unit, a pair of interponents carried by said cam member, a pair of operating fingers, and means controlled by said pair of keylevers for determining the coaction between said interponents and said pair of fingers, said last recited means comprising a pair of interponent-conditioning facilities, each of said facilities cooperably related to one of said certain keylevers, whereby said cam member is effective through said cam follower means to determine the positionment of said unit.

8. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable cam member, dual cam follower means, a link interconnecting said follower means and said unit, a pair of interponents carried by said cam member, a shift control bar articulated to each of said pair of interponents, a pair of operating fingers, and means controlled by said keylevers for actuating said control bars selectively to condition said interponents for operation by said pair of fingers, whereby said cam member is effective through said cam follower means and said link, upon the operation of said fingers, to establish the positionment of said unit.

9. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable cam member, dual cam follower means, a link interconnecting said follower means and said unit, a pair of operating fingers having a predetermined path of operation, a pair of interponents carried by said cam member, said interponents normally positioned out of the path of operation of said fingers, a shift control bar articulated to each of

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said pair of interponents, and means controlled by said keylevers for actuating said control bars selectively to position its respective interponent into the path of said fingers, whereby said cam member is effective through said cam follower means and said link, upon the operation of said fingers, to effectuate the positionment of said unit.

10. In combination, a pair of keylevers, a shiftable unit, operating means for reciprocating said unit to determine the positionment thereof in either of two positions, said operating means comprising a rockable cam member, dual cam follower means, a link interconnecting said follower means and said unit, a pair of interponents carried by said cam member, a shift control bar articulated to each of said pair of interponents, a pair of operating fingers, means controlled by said keylevers for actuating said control bars selectively to condition said interponents for operation by said pair of fingers, whereby said cam member is effective through said cam follower means and said link, upon the operation of said fingers, to establish the positionment of said unit, and means for preventing the simultaneous conditioning of said interponents for operation.

11. In a keyboard apparatus, a series of keylevers, a shiftable unit, operating means for determining the various positionments of said unit, said operating means comprising a rockable member having dual camming facilities oppositely disposed, cam follower means operably asso-

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ciated with said rockable member and said unit, interponents pivotally carried by said rockable member, operating fingers, and means controlled by certain of said keylevers for determining the coaction between said interponents and said fingers, whereby said rockable member is effective through said cam follower means to determine the positionment of said unit.

12. In a keyboard apparatus, a series of keylevers, a shiftable unit, operating means for determining the various positionments of said unit, said operating means comprising a cam shift member, cam follower means operably associated with said cam shift member and said unit, interponents carried by said cam shift member, operating fingers, means individually associated with certain of said keylevers and controlled thereby for determining the coaction between said interponents and said fingers, whereby said cam shift member is effective through said cam follower means to determine the positionment of said unit, and means for assuring the coaction between only one each of said interponents and operating fingers simultaneously.

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