United States Patent

[11] 3,626,120

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[21] Appl. No. **76,718**
[22] Filed **Sept. 30, 1970**
[45] Patented **Dec. 7, 1971**

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[54] **KEY-LOCKING ASSEMBLY**
12 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** ..... **200/50 C,** 200/5 E, 74/483 PB
[51] **Int. Cl.** **H01h 9/26**
[50] **Field of Search** ..... 200/50 C, 5 R, 5 A, 5 D, 5 E, 5 F; 74/483 PB

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ABSTRACT: A key-locking assembly for a keyboard using manually depressed keys with key stems and skirted key buttons includes a movably mounted latching member resiliently biased against the stem of the key to be locked. This stem includes a notch normally disposed above the latching member which is moved into alignment with and receives the latching member when the key is depressed. The latching member includes an actuator arm extending upwardly adjacent the stem of the release key so that its free end is disposed adjacent an internal cam surface on the skirted button on this key. Depression of the release key causes the cam surface to engage the actuator and shift the latching member to release the locked key. This latching member is pivotally mounted in one embodiment, and is slidably mounted in another embodiment.

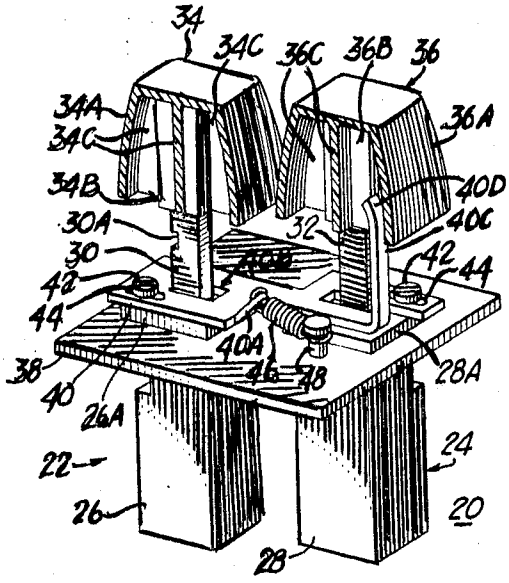

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Fig. 1

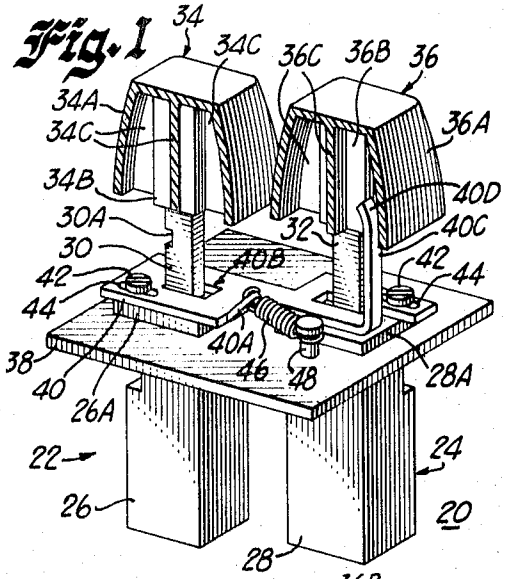

Fig. 5

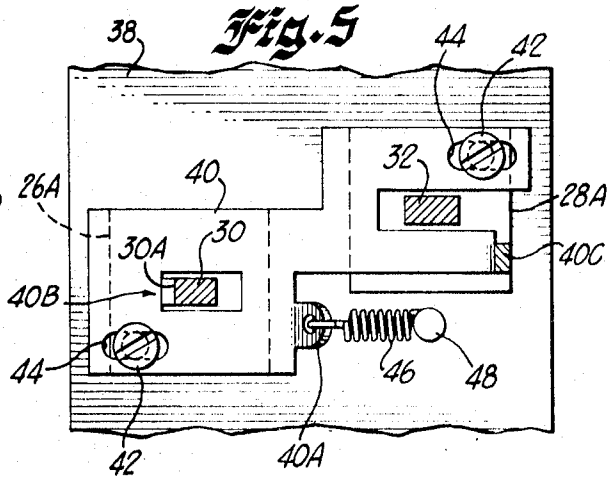

Fig. 2

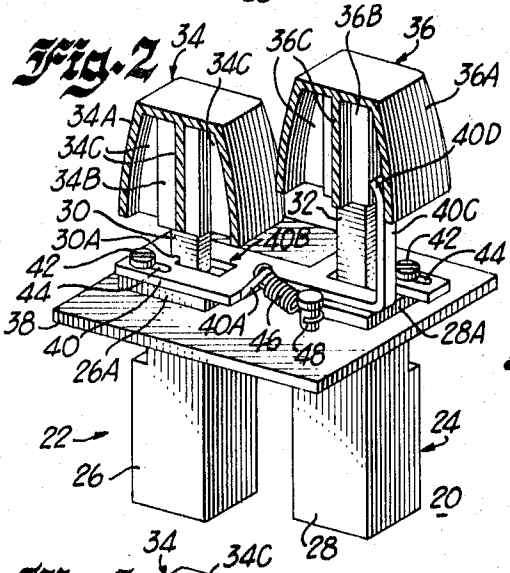

Fig. 4

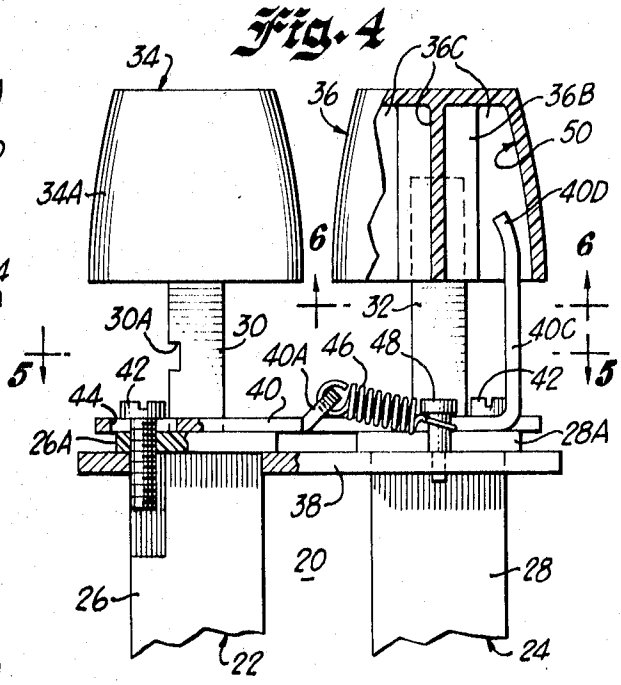

Fig. 3

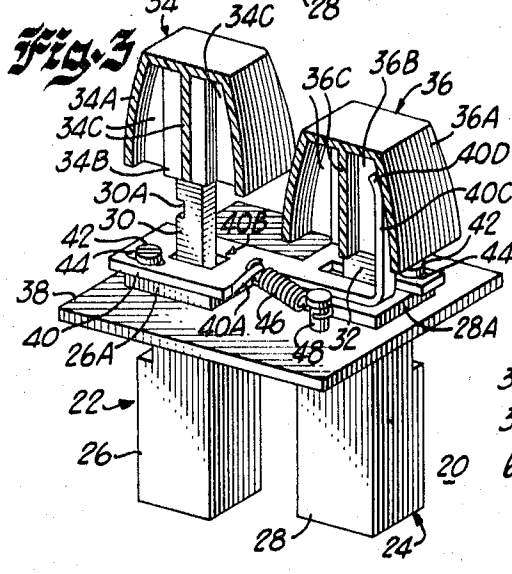

Fig. 6

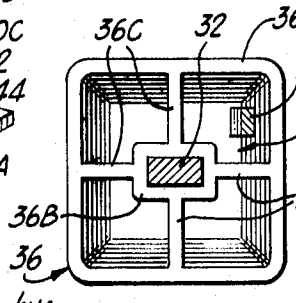

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Fig. 7

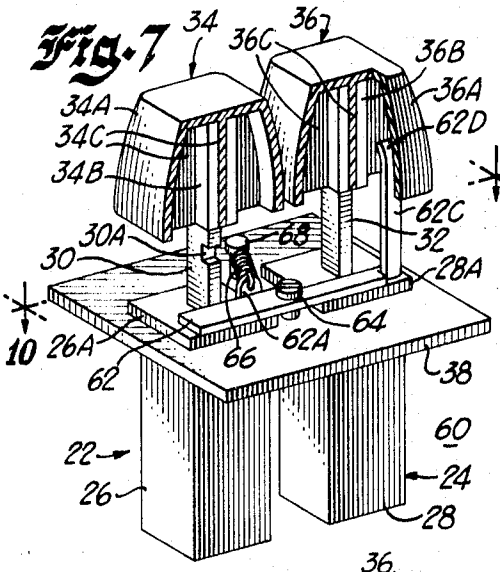


Fig. 10

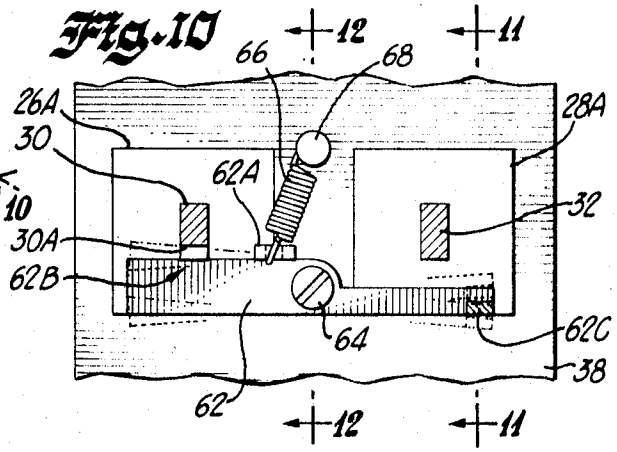
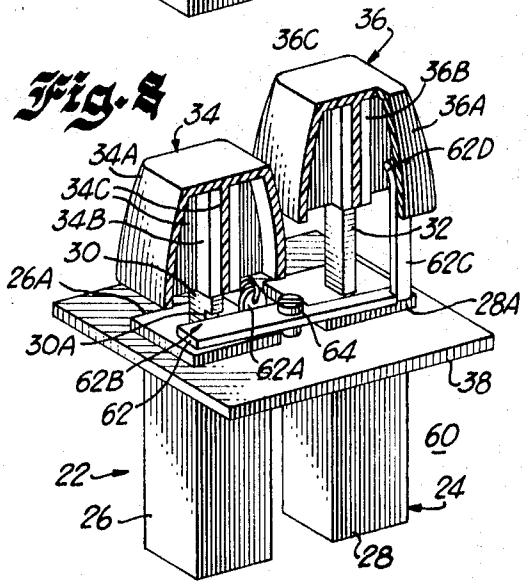


Fig. 8



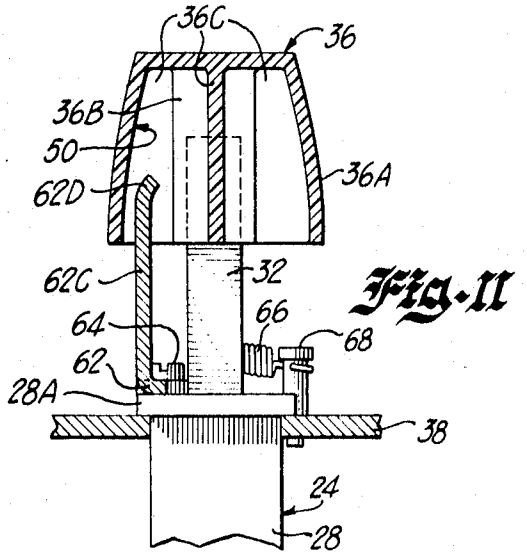
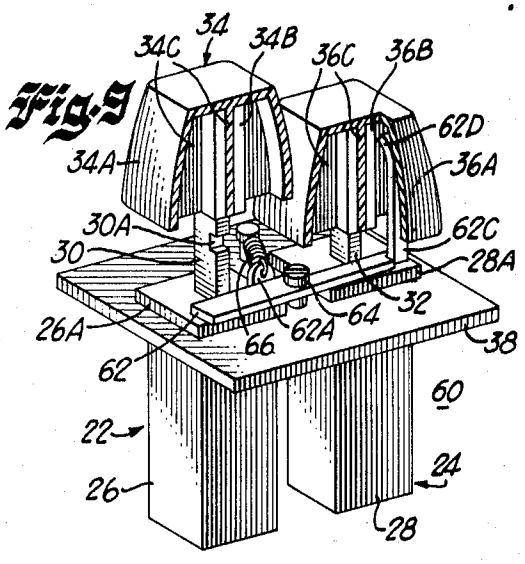


Fig. 11

Fig. 9



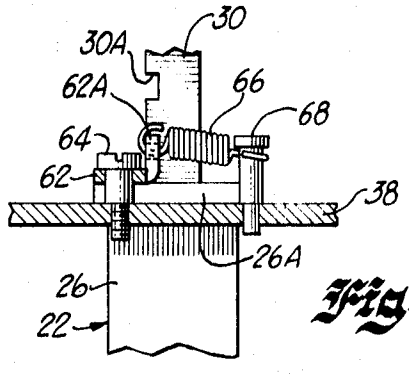


Fig. 12

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KEY-LOCKING ASSEMBLY

The present invention relates to a keyboard latching assembly and, more particularly, to a new and improved arrangement by which one key is automatically latched depressed on actuation and is released by actuation of another key.

Keyboard assemblies have long included arrangements for latching a given key in an operated or depressed position and for releasing the key for return to its normal position when another key is depressed. As an example, such arrangements have been used with shift keys to hold the shift key in an operated or depressed state until another key is operated to release the shift key. In such keyboards using sealed reed switches operated by the keys, magnets have been used for shift locking, but these arrangements require magnetic shielding of the switches if the latching magnet is in proximity to the switches so as to avoid magnetic interference and inadvertent operation. This increases the cost of the unit and requires nonstandard switches for certain of the keyboard switches. If the holding magnet is physically remote from the shift key, additional coupling mechanisms are required, with the attendant increase in installation space and expense.

Mechanical latching assemblies of the type used in typewriters are not suitable for keyboard applications using key-actuated switch assemblies for a number of reasons. In the first place, these shift locks require mechanical actuating forces that are substantially greater than those required for key actuation in this type keyboard. This results in a nonuniform operating "touch" over the full extent of the keyboard. In addition, these mechanical locks frequently require the shift lock and release keys to be of substantially different configurations with the result that the required part inventory is increased. The construction of these locks is also such that they cannot be added to or removed from a standard keyboard assembly with ease.

Accordingly, one object of the present invention is to provide a new and improved key-locking arrangement for keyboard assemblies.

Another object is to provide a key-latching assembly requiring a minimum modification of standard keyboard parts and capable of being easily added to keyboard units.

Another object is to provide a keyboard-locking assembly requiring small operating force and installation space but providing positive locking action.

A further object is to provide a keyboard locking assembly in which the force required to actuate the lock and release keys is not substantially greater than the force required to operate other keys in the keyboard.

In accordance with these and many other objects, the key-locking assembly of the present invention includes a pair of key-actuated mechanisms such as switching assemblies which are mounted on a supporting structure with their key stems carrying actuating key buttons on their free ends. The key buttons are provided with a peripheral portion defining a cavity opening downwardly toward the support. The stem for the key to be locked includes a notch. The locking assembly includes a latching member movably mounted on the support adjacent the key stem and resiliently biased into engagement with the stem on the locking key so that when the locking key is depressed, the notch moves into alignment with and receives the latching member which prevents return of the key to its normal position when the manual actuating force is removed.

To provide a means for releasing the locked key, the latching member includes an actuator arm extending upwardly into the cavity defined by the key button for the release key so that its free end is disposed in proximity to a cam surface formed in this cavity. When the release key is depressed, the cam surface engages the actuator arm and shifts the latching member against the resilient bias to move the latching member out of the notch on the key stem of the locked key. This permits the locked key to be restored to its normal position by a bias provided in the key assembly. The latching member is restored to a position biased against the key stem when the release key is released and returns to its normal position. In one embodiment, the latching member is slidably mounted on the support, and in a second embodiment the latching member is pivotally mounted on the support.

Accordingly, the key-latching assembly of the present invention requires only the provision of the latching member and its biasing spring as additional inventory parts to provide key locking means in a keyboard assembly. The latching means on the lock key comprising nothing more than a notch in the key stem which can, if desired, be formed as a standard item on the stems for all of the keys. Since the actuator for the latching member is actuated by the cam surface formed internally on a standard key button, no additional or nonstandard items are provided in the construction of the release key. Further, since relative movement of the actuator and the key button during depression of the release key affects the release of the latching means, the relative telescoping movement of the actuator and the key button minimized the additional space required for the installation of the key latching means.

Many other objects and advantages of the present invention will become apparent from considering the following detailed description in conjunction with the drawings in which:

FIG. 1 is a perspective view in partial section of a key-locking assembly forming a first embodiment of the present invention shown in a normal condition;

FIG. 2 is a view similar to FIG. 1 showing one key in a locked state;

FIG. 3 is a view similar to FIGS. 1 and 2 illustrating the release of the locked key by the actuation of a release key;

FIG. 4 is an enlarged elevational view in partial section illustrating the key-locking assembly in normal position;

FIG. 5 is a sectional view taken along line 5—5 in FIG. 4;

FIG. 6 is a sectional view illustrating the bottom of a key button and taken along 6—6 in FIG. 4;

FIG. 7 is a perspective view in partial section of a key-locking assembly forming a second embodiment of the invention and illustrating the key-locking assembly in a normal condition;

FIG. 8 is a view similar to FIG. 7 illustrating the assembly locking one key in a depressed position;

FIG. 9 is a view similar to FIGS. 7 and 8 and illustrating the release of a locked key;

FIG. 10 is an enlarged sectional view taken along line 10—10 in FIG. 7;

FIG. 11 is a sectional view taken along line 11—11 in FIG. 10; and

FIG. 12 is a sectional view taken along line 12—12 in FIG. 10.

Referring now more specifically to FIGS. 1–6 of the drawings, therein is illustrated a key-locking assembly indicated generally as 20 and which embodies the present invention. The assembly 20 selectively locks a key indicated generally as 22 in a depressed position following its actuation and until a release key unit indicated generally as 24 is actuated. In a keyboard assembly of which the key units 22 and 24 form a part, these key units can be assigned any given function and can be formed of any suitable well-known construction. As an example, the key unit 22 can be assigned a shift key function, and the key unit 24 can be assigned any suitable function in addition to its function of releasing the shift key 22. The key units 22 and 24 can comprise switching assemblies of various known mechanical constructions or, in their preferred form, comprise sealed reed switch units actuated by relative movement between these switch units and a permanent magnet operator.

As illustrated, the switch units 22 and 24 comprise housing or casing 26 and 28 in which are disposed, in the preferred embodiment, one or more sealed reed switch units and a permanent magnet operator which are coupled for movement relative to each other to cause switch actuation in response to depression of a key stem 30, 32 coupled thereto. Biasing means such as compression or tension springs coupled to the key stems 30 and 32 normally urge the stems to the normal position shown in FIG. 1. A key button 34, 36 is mounted on the outer free end of each of the key stems 30 and 32.

Each of the key buttons 34, 36 which can be formed of plastic or other suitable materials includes a depending peripheral wall or skirt 34A, 36A defining an internal cavity or chamber which opens downwardly toward the key unit or module housing 26, 28. Centrally disposed within this cavity is a structure 34B, 36B defining a recess for frictionally receiving the upper end of the key stems 30, 32. The structure 36B is joined to the inner surfaces of the walls 36A by four wall segments 34C, 36C (FIG. 6).

Although the key units or modules 22, 24 can be supported in any suitable fashion in the keyboard assembly, these units in FIGS. 1–6 are received within openings formed in a generally uniplanar supporting wall or plate 38 so that flanged or enlarged portions 26A and 26B on the housings therefor are disposed immediately adjacent the upper surface of the support 38. If desired, the housing 26 and 28 and the portion of the support 38 defining the openings in which these housings are received can be provided with interfitting structures providing a snap fitting.

The locking or latching assembly 20 comprises a latching plate 40 with openings or recesses through which the key shafts 30 and 32 extend. These openings are large enough to permit the latching member or plate 40 to be assembled on the key stems 30 and 32 prior to assembling the key buttons 34 and 36 on these key stems. The latching member 40 is slidably mounted on the supporting structure, or more particularly, on the flanged top portions 26A and 28A of the housing 26 and 28 by a plurality of threaded fasteners 42 which extend through elongated slots 44 formed in edge portions of the latching member 40. A tension spring 46 secured at one end to a tab 40A struck from the latching member 40 and a pin 48 secured to the supporting plate or wall 38 continuously bias an edge portion 40B (FIG. 5) providing a latching portion of the latching member 40 against the adjacent edge of the key stem 30 of the key unit 22 which is to be latched. In the normal position of the key unit 22, a recess, notch, or opening 30A formed in the key stem 30 of the key unit 22 is disposed above the latching member 40 (FIG. 1).

When the key unit 22 is actuated by manually depressing the key button 34 and moving the key stem 30 downwardly against the resilient bias provided by the biasing means provided within the housing 26, the notch 30A moves into alignment with the plate 40 when the key unit 32 is fully operated. In doing so, the key unit 22 moves from the position shown in FIGS. 1 and 4 to the position shown in FIG. 2. At this time, the tension spring 46 shifts the latching member 40 to the right so that the latching portion 40B thereon enters the notch 30A. Thus, when manual pressure is removed from the key button 34, the key unit 22 is retained in its depressed or operated state, as shown in FIG. 2.

To provide means for releasing the latched key 22, the latching member 40 is provided with an actuator or arm 40C which extends upwardly adjacent the key stem 32 substantially parallel thereto so that its upper free end which is provided with an inclined or cammed portion 40D (FIG. 4) is disposed within the internal chamber or cavity formed in the button 36 for the release key 24. In the normal condition of the latching assembly 20, the cam or inclined portion 40D of the actuator arm 40C is spaced somewhat from the internal inclined surface or actuator surface indicated generally as 50 so that the release key 28 can be operated to perform its normal function without appreciable engagement or interference between the actuator surface 50 and the free end 40D of the actuator arm 40C. However, when the key unit 22 is latched in its depressed position (FIG. 2), the latching member 40 is shifted to the right, and the arm 40C and its inclined upper end 40D are moved closely adjacent the actuating surface 50 on the key button 36 for the release key 24.

Accordingly, when the key 22 is to be released from its latched condition, the key unit 24 is actuated to its depressed condition by moving the key button 36 downwardly against the resilient bias applied to its key stem 32 from the position shown in FIG. 2 to the position shown in FIG. 3. During this movement, the curved or inclined upper end 40D of the actuator arm 40C engages the inwardly and upwardly inclined actuating surface 50 with the result that the latching member 40 is shifted to the left against the bias of the tension spring 46 from the position shown in FIG. 2 to the position shown in FIG. 3. As the latching portion 40B on the latching member 40 moves out of the notch 30A, the resilient bias applied to the key stem 30 moves this stem and the connected button 34 to the normal position shown in FIG. 3, thereby releasing the key unit 22. When manual pressure is removed from the key button 36, the bias applied to the stem 32 restores the release key 24 to its normal condition (FIG. 1). Since the locking portion 40B on the latching member 40 now bears against the edge of the key stem 30, the actuator arm 40C is spaced from the actuating surface 50 on the key button 36.

Referring now more specifically to FIGS. 7–12 of the drawings, therein is illustrated a second embodiment of the invention comprising a key lock assembly indicated generally as 60. In FIGS. 7–12, the components identical to those in the embodiment shown in FIGS. 1–6 are designated by identical reference numbers. Although the embodiments shown in FIGS. 1–6 and FIGS. 7–12 both are illustrated as using the key units 22 and 24, the position of the key units 22 and 24 relative to the support 28 in the embodiment of FIGS. 7–12 is such that the key stems 30 and 32 are displaced 90° in a counterclockwise direction in the illustration.

The latching assembly 60 includes a latching member 62 which is pivotally mounted on the support 38 approximately midway along its length by a shouldered fastener 64 so that the lower surfaces of the member 62 slidably engage the enlarged portions 26A and 28A on the housing for the switch units 22 and 24. A tension spring 66 connected between an upstanding lug 62A on the latching member 62 and a pin 68 secured to the support 38 continuously bias the latching member 62 in a clockwise direction (FIG. 10) so that an edge of the member 62 indicated generally as 62B is biased against the adjacent edge of the key stem 30 and provides, in effect, a latching portion on the latching member 62.

Accordingly, when the key unit 22 is actuated by depressing the button 34 against the resilient bias of the unit 22, the key stem 30 moves downwardly from the position shown in FIG. 7 to the position shown in FIG. 8 in which the locking or latching portion 62B on the lever 62 is aligned with and moves into the recess 30A on the key stem 30. This interlocking engagement retains the key stem 30 in a depressed state when manual force is removed from the button 34 and locks the key 22 in its depressed condition.

To provide means for selectively releasing the key unit 22, the latching member or lever 62 is provided with an upwardly extending arm 62C spaced from but extending generally parallel to the key stem 32 in a position underlying the key button 36. The upper end of the arm 62C terminates in an inclined or cam portion 62D which is normally spaced from but lies adjacent the actuating surface 50 formed on the interior of the sidewall 36A. When, however, the key 22 is latched in its depressed position, the clockwise movement of the lever 62 (FIG. 10) to the position shown in dot-and-dash outline moves the inclined portion 62D of the arm 62C on the latching lever 62 into immediate proximity to the actuating surface 50 (FIG. 8).

Accordingly, when the key unit 22 is to be released, the key 24 is actuated by manually depressing the button 36 so that relative movement is produced between the engaged actuating surface 50 and the inclined portion 62D on the arm 62C. This pivots the lever 62 about the pivot formed by the fastener 64 against the bias of the spring 66 in a counterclockwise direction (FIG. 10) so that the locking portion 62B on the lever 62 moves out of the notch 30A on the key stem 30. This permits the bias applied to the key stem 30 to move this stem and the connected button 34 upwardly to the normal position shown in FIG. 9 and thereby releasing the key unit 22. When manual force is removed from the key button 36, the resilient bias in the key unit 24 moves the key stem 32 and the button 36 upwardly to the normal position shown in FIG. 7. This per-

mits the latching lever **62** to move slightly in a clockwise direction about the pivot provided by the fastener **64** so that the edge or locking portion **62B** again bears against the adjacent edge of the key stem **30**. This movement moves the inclined end **62D** of the actuator **62C** away from the actuating surface **50** and thus permits operation of the key unit **24** when the key **22** is not locked without the necessity of providing the additional force necessary to pivot the lever **62** against the bias of the spring **66**.

Accordingly, the latching assemblies **20** and **60** embodying the present invention are capable of providing positive latching and release of a key unit in a keyboard assembly while requiring only a minimum number of additional parts and substantially no modification in the standard key units. The locking assemblies **20** and **60** can be assembled with the keyboard unit merely by removing the buttons **34** and **36** of the involved keys and the replacement of these buttons after mounting the locking assemblies. Even without the usual escutcheon, the key buttons **34** and **36** almost completely conceal the mechanism of the locking assemblies. The force required to actuate the assemblies **20** and **60** has been determined to be on the order of 3 or 4 ounces, which is approximately the force required to actuate the key units **22** and **24**. Only a minimum number of parts are required to provide the locking assemblies **20** and **60**, and this reduction in parts is enhanced by the use of the actuating surface **50** which exists on the interior of the key button **36**.

While the present invention has been described with reference to two illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art which will fall within the true spirit and scope of the principles of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States:

1. A key-locking mechanism for use with a keyboard assembly comprising

a pair of manually operable keys each including a key stem and key button and each being manually operated from a released position to a depressed position, the key stem for a first one of the keys having a locking portion and the key button for the second of the keys having an actuating surface formed on its interior,

a latching mechanism movably mounted adjacent the pair of keys between an inactive and latching position with a locking portion adjacent the key stem of the first key and an actuator adjacent the actuating surface on the key button for the second key,

and biasing means biasing the latching mechanism toward the latching position to move the locking portion on the latching mechanism into an interlocking relation with the locking portion on the key stem of the first key when the first key is operated to its depressed position, operation of the second key to its depressed position moving the actuating surface against the actuator to shift the latching mechanism against the force of the biasing means to its inactive position, thereby moving the locking portions on the latching mechanism and the key stem of the first key out of an interlocking relation.

2. The key-locking mechanism set forth in claim **1** in which

the actuator for the latching mechanism is spaced out of actuating engagement with the actuating surface on the key button for the second key when the latching mechanism is in its inactive position and is moved into a position to be operated by said actuating surface when the latching mechanism is in its latching position.

3. The key-locking mechanism set forth in claim **1** in which

the key button for the second key includes a depending peripheral wall defining a downwardly open chamber,

and the actuator for the latching mechanism extends into said chamber.

4. The key-locking mechanism set forth in claim **1** in which

the latching mechanism includes a pivotally mounted arm.

5. The key-locking mechanism set forth in claim **1** in which

the latching mechanism includes a slidably mounted plate.

6. The key-locking mechanism set forth in claim **5** in which

the slidably mounted plate includes open portions through which the key stems of the first and second keys extend.

7. A key-locking assembly for use with a keyboard comprising

a generally uniplanar support having openings therein,

first and second key assemblies mounted in said openings and each including a key stem extending above the support and a key button on the key stem, the key button being manually operable from a normal position spaced from the support to a depressed position closer to the support, the stem for the first key assembly having a latching portion disposed above the support, the key assembly button for the second key having an internal actuating surface,

a latching means movably mounted adjacent the support and adjacent the stems of the first and second key assemblies, said latching means including a member extending generally transverse to the stems and having a latching portion adjacent said first key stem, said means also including an actuator coupled to the member and extending upwardly from a position below the key button of the second key assembly to a position adjacent the actuating surface,

and biasing means coupled to the latching means and urging the latching portion toward the key stem of the first key assembly to be moved into an interlocking engagement with the latching portion of this key stem when the first key is moved to its depressed position, movement of the second key to its depressed position moving the actuating surface against the actuator to move the latching portions on the member and the stem for the first key assembly out of their interlocking engagement.

8. The key-locking assembly set fort in claim **7** in which

the member in the latching means includes a plate slidably mounted adjacent the support for reciprocating movement.

9. The key-locking assembly set forth in claim **7** in which

the member in the latching means includes a lever pivotally mounted adjacent the support.

10. The key-locking assembly set forth in claim **7** in which

the key button on the second key assembly includes a depending peripheral portion defining a downwardly open chamber containing the actuating surface,

and the actuator includes an arm extending generally parallel to the key stem of the second key assembly with the upper end of the arm disposed within the chamber.

11. The key-locking assembly set forth in claim **7** in which

the actuating surface moves through a path of reciprocating movement when the second key button is operated between its normal and depressed positions,

and the actuator is moved adjacent said surface when the latching portions on the stem of the first key assembly and the member are moved into an interlocking engagement.

12. The key-locking assembly set forth in claim **7** in which

the latching portion on the stem for the first key assembly includes a recess formed in this stem,

and the latching portion on the member includes a structure movable into and out of the recess.

* * * * *