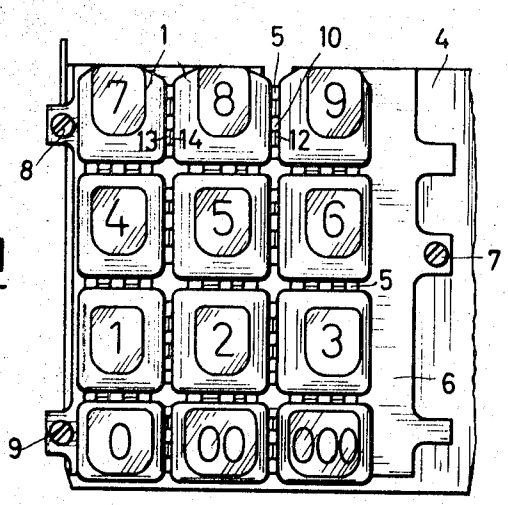
Feb. 13, 1973 J. HAUGER 3,716,695

KEYBOARD LOCKING ARRANGEMENT

Filed May 24, 1972

FIG. 1



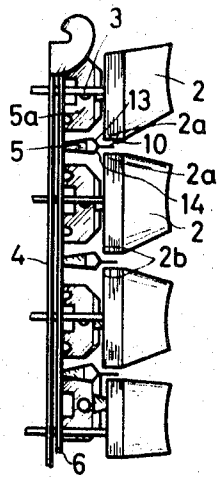
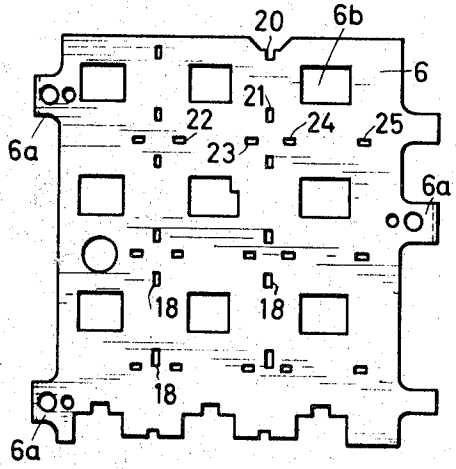


FIG. 2

FIG. 4



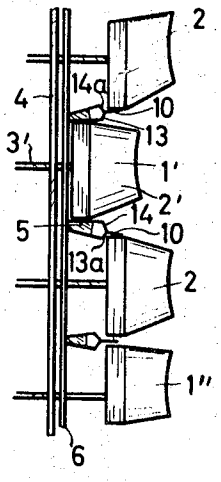


FIG. 3

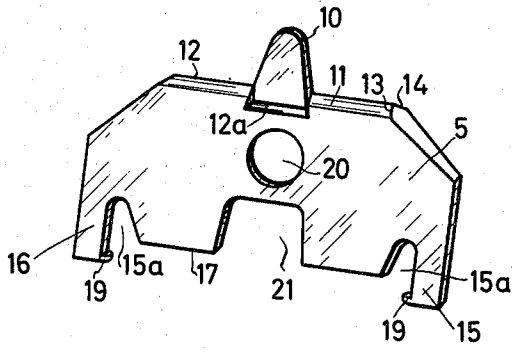


FIG. 5

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KEYBOARD LOCKING ARRANGEMENT

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ABSTRACT OF THE DISCLOSURE

Between pairs of adjacent keys or key buttons, of a keyboard on which the keys are mounted in crossing columns and rows, resiliently bendable locking plates are mounted on a support plate so that in the normal position of the locking plate, adjacent keys cannot be simultaneously depressed. When only one key is depressed, the respective locking plates are resiliently bent to locking positions located under the adjacent keys which then cannot be depressed.

BACKGROUND OF THE INVENTION

The present invention relates to a keyboard locking arrangement, particularly suited for numerical keyboards, and serving the purpose of preventing that several keys, representing digits, can be simultaneously depressed to an operative position which would cause a malfunction of the machine.

Locking arrangements for this purpose are known, and generally speaking, there are two types of locking arrangements for keyboards, namely, ball locking devices, and key locking devices. In the ball locking device, a number of spherical balls are mounted in a tubular channel in closely adjacent position, leaving in the closed channel only so much space that the stem of a single key may enter between two adjacent balls. The stem of any other key engages balls which are firmly pressed together, and prevent entering of a second key stem. If two keys are simultaneously operated, there is not sufficient space for two stems, and none of the two stems can enter between the locking balls so that the respective keys cannot be depressed.

Key locking devices include slides, located under the keys, and being shifted upon operation of any key to a position locking other keys so that no second key can be depressed simultaneously with the first key.

The known keyboard locking arrangements are comparatively expensive to manufacture, and it is not possible to build locking devices according to the prior art into an existent finished machine.

SUMMARY OF THE INVENTION

It is one object of the invention to overcome the disadvantages of known keyboard locking devices, and to provide a keyboard locking device which is based on an entirely new principle. Another object of the invention is to provide, instead of one locking device for a great number of keys, a locking means cooperating only with two adjacent keys.

The present invention is based on the recognition of the fact that erroneous double actuations of keys mainly occur with two adjacent keys, so that for the elimination of 95% of all errors of this type, it is sufficient to lock only adjacent keys to prevent simultaneous operation.

The present invention is concerned with a keyboard locking arrangement, particularly for numerical keyboards, which prevents the simultaneous depression of two adjacent keys. In accordance with the invention, between each pair of adjacent keys, locking means, preferably in the form of a resilient locking plate, are arranged which, when a key is depressed, are moved to a locking position locking the adjacent key in a position of rest, and preventing simultaneous depression of several keys.

The locking plates consist of an elastic material, and each locking plate preferably has two downward slanted shoulder faces respectively cooperating with control portions of the respective adjacent keys, and more particularly key buttons.

All locking plates are detachably mounted on a support plate which has cutouts for receiving projecting hook portions of the locking plates.

The locking arrangement of the invention can be applied to at least two adjacent key means, or to three or more key means arranged in a row or column, or to three or more key means arranged at right angles. An arrangement according to the invention comprises at least first and second adjacent key means, each key means being mounted for movement between a position of rest and a depressed position, the key means having adjacent control portions, preferably portions of key buttons, forming a gap in the position of rest; and at least one locking means including a top portion having a width greater than the width of the gap, and a bottom portion mounted on supporting means, preferably a supporting plate. The locking means have a normal position in which the top portion is located under the gap and under the adjacent control portions of the key means.

Consequently both key means are locked by the locking means in the normal position against simultaneous movement to the depressed position.

When only one of the first and second key means is depressed, the top portion of the locking means is engaged by the control portion only of the key means which was depressed, whereby the locking means is displaced to a locking position located under the respective other key means for locking the other key means in the position of rest, while permitting movement of the depressed key means to the depressed position.

In the preferred embodiment of the invention, the locking means includes an elastic locking plate having a top surface with opposite symmetrical downward slanted face portions located under the adjacent control portions of the first and second key means. Consequently, the locking plate is resiliently bent by the depressed first key means to a locking position located under the second key means, and is resiliently bent by the depressed second key means to a second locking position located under the first key means.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmenatry schematic plan view illustrating a ten key keyboard, a keyboard cover being omitted for the sake of clarity;

FIG. 2 is a fragmentary schematic side view illustrating a row of keys with locking means;

FIG. 3 is a fragmentary schematic side view corresponding to FIG. 2, but illustrating one of the keys in the depressed position displacing the adjacent locking plates;

FIG. 4 is a fragmentary plan view illustrating a support plate for the locking plates; and

FIG. 5 is a perspective view illustrating a locking plate according to the invention on an enlarged scale.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A ten digit keyboard has twelve key means **1**, each of which includes a key button **2** secured to a key stem **3**. A first support plate **4**, and a top cover, not shown, are provided with openings for guiding the stems **3** of the key means for movement between a normal position of rest as shown in FIG. 2, and a depressed operative position shown for a key **1'** with the key button **2'** and a key stem **3'** in FIG. 3. As shown in FIG. 1, keys means **1** are arranged in crossing columns and rows, and between each pair of adjacent key means **1**, locking means in the form of elastic locking plates **5** are disposed. All locking plates **5** are detachably secured to a second support plate **6** which is superimposed on the first support plate **4**, and secured thereto by screws **7**, **8**, **9** passing through projecting attaching portions **6***a*.

The shape of each locking plate **5** is best seen in the enlarged view of FIG. 5. Locking plate **5** has a top portion with a top surface which includes two downwardly slanted faces **13** and **14** which are symmetrically arranged in relation to a top edge **12**. The top surface **11**, **12**, **13** has a cutout **12***a* in which a thin guide nose **10** is secured. At the bottom portion of guide plate **5**, recesses **21** and **15***a* are provided between which a straight bottom edge **17** extends. Outwardly of the two recesses **15***a*, two downwardly projecting holding leg portions **15** with hooks **19** are provided which project downwardly beyond the bottom edge **17**.

As best seen in FIG. 4, pairs of cutouts **18** are provided in the support plate **6** which are spaced the same distance as the holding portions **15** and **16** with the hooks **19** so that each locking plate **5** can be secured to the support plate **6** by inserting the holding portions **15** and **16** into the corresponding cutouts **18** so that the hooks **19** engage the bottom surface of the support plate **6**, and the central bottom edge **17** abuts the top surface of support plate **6**.

The locking plates **5** consist preferably of an elastic synthetic material so that the holding portions **15** and **16** can be spread apart when being inserted into the corresponding cutouts **18**, whereupon they resiliently move toward each other so that the hooks **19** secure the locking plate **5** to the support plate. The recesses **21**, **15***a*, and even the bore **20** facilitate the resilient deformation of the locking plate **5** during attachment to the support plate **6**.

As shown in FIG. 4, support plate **6** has a number of cutouts **18** arranged so that a pair of cutouts **18** is provided between the portions of support plate **6** which are covered by the key buttons **2**. In this manner, a locking plate **5** can be provided between each pair of adjacent key means **1**. For example, between the key means **1** representing the digits 8 and 9, a locking plate **5** is provided. Another locking plate **5** is provided between the key means **1** associated with the digits 8 and 5, and another locking plate **5** is arranged between the key means **1** associated with the digits 9 and 6. For example, the plate **5** between the key means **1** associated with digits 8 and 9, is inserted with the holding portions **15** and **16** into the cutouts **20** and **21**, the locking plate **5** between the key means **1** associated with digits 8 and 15 have holding portions **15** and **16** inserted into the cutouts **22** and **23**, and locking plate **5** between the key means **1** associated with digits 9 and 6 have holding portions **15** and **16** located in cutouts **24** and **25**.

FIG. 2 illustrated the key means **1** with key buttons **2** and key stems **3** in a position of rest, and the corresponding locking plates **5** in a normal position in which the thin guide nose **10** projects into the gap between adjacent control portions of the key means **1**, and more specifically of adjacent key buttons **2**. The transverse width of the top portion of each locking plate **5**, is greater than the associated gap between key buttons **2** so that the downwardly slanted shoulders **13** and **14** are located under horizontal

shoulders **2***b* of the respective adjacent control portions **2***a* of two adjacent key buttons **2**.

In the position of rest shown in FIG. 2, the locking plates **5** are not engaged by key buttons **2**. When a key means, for example key means **1'** with key button **2'** and stem **3'** is manually depressed to the depressed operative position shown in FIG. 3, shoulders **2***b* of the control portions **2***a* slide along the slanted control faces **13** and **14** of the adjacent locking plates **5**, outwardly displacing the same to positions in which the projecting noses **10** abut the respective adjacent two key buttons **2**. Since the respective other downwardly slanted faces **14***a* and **13***a* are now located under the control portions **2***a* of the adjacent key buttons **2**, they are engaged by the same and prevent movement of the two key means **1** on opposite sides of key means **1'** to the depressed operative position. Other key means, for example key means **1''** in FIG. 3, are not locked upon depression of key means **1'**.

As is apparent from FIG. 2, if two key means **1** are simultaneously depressed, the respective control portions **2***a* of the respective key buttons **2** simultaneously engage the downwardly slanted abutment face portions **13** and **14** of the locking plate **5** located between the respective two keys means **1**, so that the lateral forces balance each other, and the respective locking plate **5** remains in its normal position preventing depression of both adjacent key means **1**. In addition to the cutouts **18**, support plate **6** has large cutouts **6***b* through which the stems **3** of the key means **1** pass.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of keyboard locking arrangements differing from the types described above.

While the invention has been illustrated and described as embodied in a keyboard locking arrangement provided with elastic locking plates between adjacent keys, and preventing simultaneous depression of adjacent keys, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Keyboard locking arrangement comprising supporting means; at least first and second adjacent key means, each key means being mounted on said supporting means for movement between a position of rest and a depressed position, said key means having adjacent control portions forming a gap in said position of rest; and at least one locking means including a top portion having a width greater than the width of said gap, and a bottom portion mounted on said supporting means, said locking means having a normal position in which said top portion is located under said gap and under said adjacent control portions of said key means so that both said first and second key means are locked by said locking means in said normal position against simultaneous movement to said depressed position, and so that, when only one of said first and second key means is depressed, said top portion of said locking means is engaged by said control portion of only said one depressed key means whereby said locking means is displaced to a locking position located under the respective other key means for locking said other key means in said position of rest, while per-

mitting movement of said one depressed key means to said depressed position.

2. Keyboard locking arrangement as claimed in claim 1 wherein said locking means includes an elastic locking plate having a top surface located under said control portions and under said gap so that said locking plate is resiliently bent by the depressed first key means to a first locking position located under said second key means, and is resiliently bent by the depressed second key means to a second locking position located under said first key means.

3. Keyboard locking arrangement as claimed in claim 2 wherein said top surface of said locking plate has opposite symmetrical downwardly slanted face portions located under said adjacent control portions of said first and second key means, respectively, and engaged by the control portion of any depressed key means.

4. Keyboard locking arrangement as claimed in claim 3 wherein said top surface of said locking plate is wider than the bottom plate portion of said locking plate; and wherein said bottom plate portion is secured to said supporting means and resiliently bendable.

5. Keyboard locking arrangement as claimed in claim 4 wherein the thickness of said bottom plate portion is substantially equal to the width of said gap so that any depressed key means in said depressed position abuts said secured bottom plate portion.

6. Keyboard locking arrangement as claimed in claim 5 wherein said locking means includes a thin guide nose projecting from said top surface into said gap between said control portions of said first and second key means in said position of rest, and abutting said control portion of one of said key means when the respective other key means is moved to said depressed position.

7. Keyboard locking arrangement as claimed in claim 1 wherein said locking means includes a guide nose projecting from said top portion into said gap and being thinner than said gap.

8. Keyboard locking arrangement as claimed in claim 1 wherein said locking means includes an elastic locking plate having a top portion located under said gap and under said control portions, and a bottom plate portion including a central bottom edge and downwardly projecting holding hook portions at the ends of said bottom edge; and wherein said supporting means include a support plate having at least two cutouts in which said projecting holding hook portions are located while said bottom edge abuts said support plate between said cutouts whereby said locking plate can be detached from, or attached to, said support plate by elastic deformation of said projecting holding hook portions.

9. Keyboard locking arrangement as claimed in claim 1 wherein said support means include a first support plate mounting said key means for movement between said position of rest and said depressed position, and a second support plate superimposed on said first support plate

and secured thereto; and wherein said bottom portion of said locking means is detachably secured to said second supporting plate.

10. Keyboard locking arrangement as claimed in claim 9 comprising means for detachably attaching said second support plate to said first support plate.

11. Keyboard locking arrangement as claimed in claim 1 comprising at least one third key means adjacent said second key means, and at least one other resilient locking means having a normal position located under the adjacent control portions of said second and third key means and under the gap between said second and third key means so that when said second key means is depressed to said depressed position, both said locking means are resiliently deformed to two opposite locking positions located under said control portions of said first and third key means locking said first and third key means against movement to said depressed positions.

12. Keyboard locking arrangement as claimed in claim 11 wherein said first, second, and third key means are disposed in a straight row.

13. Keyboard locking arrangement as claimed in claim 11 wherein said third key means is mounted on said supporting means on one side of said second key means forming a lateral gap with said second key means perpendicular to said gap.

14. Keyboard locking arrangement as claimed in claim 1 comprising a plurality of said key means arranged in crossing columns and rows so that each key means is located adjacent four other key means; and a plurality of said resilient locking means, each locking means being located between two adjacent key means.

15. Keyboard locking arrangement as claimed in claim 1 wherein each key means includes a key button, said key buttons having said adjacent control portions forming said gap and bounded by shoulders cooperating with said top portion of said locking means.

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U.S. Cl. X.R.

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