July 30, 1968 S. D. REED 3,394,883

ONE KEY ONLY INTERLOCK

Filed Nov. 18, 1964 3 Sheets-Sheet 1

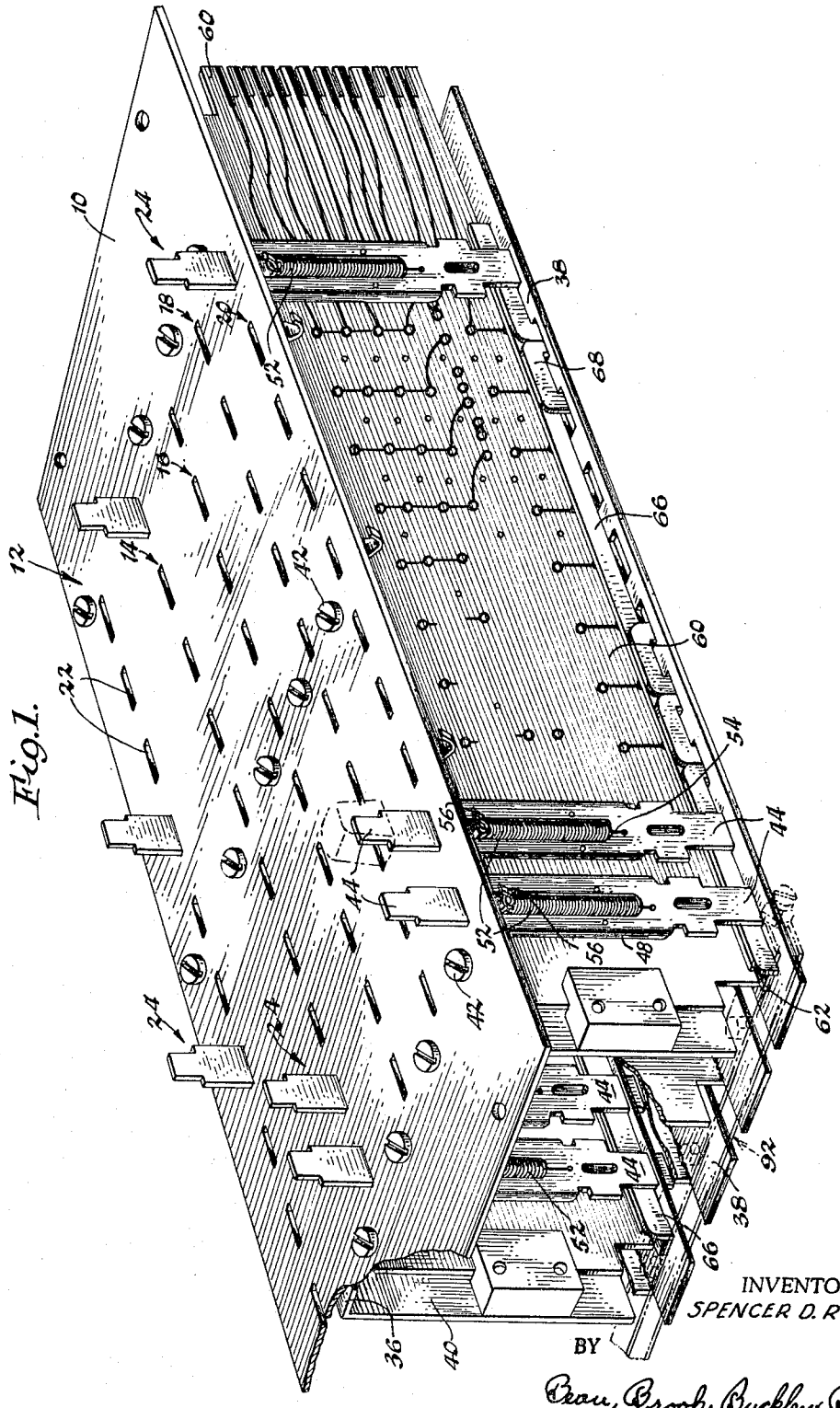


Fig. 1.

INVENTOR.
SPENCER D. REED

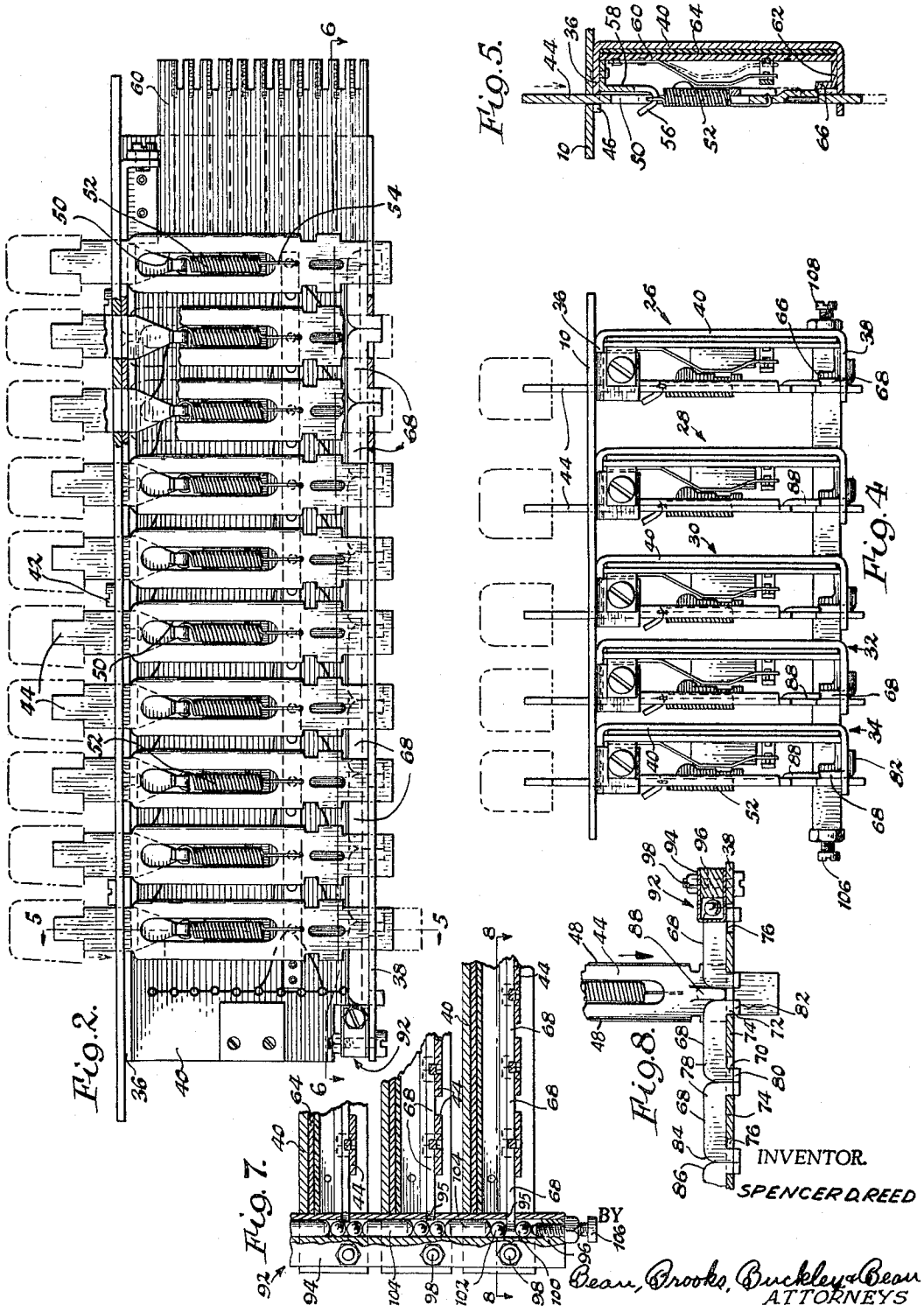
BY

Bean, Brooks, Buckley & Bean
ATTORNEYS

July 30, 1968 S. D. REED 3,394,883

ONE KEY ONLY INTERLOCK

Filed Nov. 18, 1964 3 Sheets-Sheet 2



July 30, 1968 S. D. REED 3,394,883

ONE KEY ONLY INTERLOCK

Filed Nov. 18, 1964 3 Sheets-Sheet 3

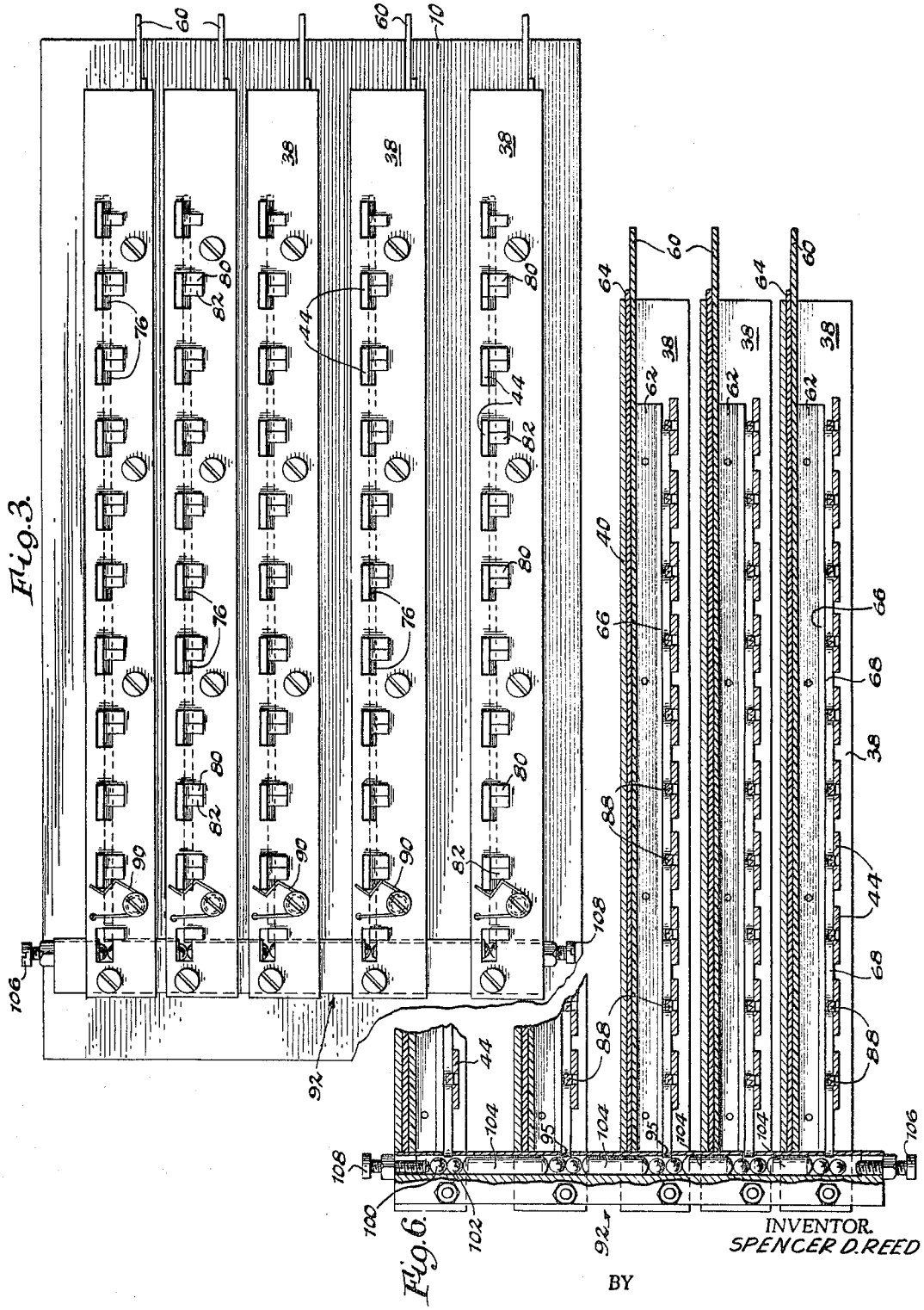


Fig. 3.

Fig. 6.

INVENTOR.
SPENCER D. REED

BY

Beam, Brooke, Buckley & Beam
ATTORNEYS

United States Patent Office 3,394,883 Patented July 30, 1968

3,394,883

ONE KEY ONLY INTERLOCK

Spencer D. Reed, Endicott, N.Y., assignor to Sensing Devices, Inc., Endicott, N.Y.

Filed Nov. 18, 1964, Ser. No. 412,150
8 Claims. (Cl. 235—27)

This invention relates to registering devices and in particular is directed to keyboard interlock mechanism for limiting the number of keys of the registering device which may be simultaneously depressed.

In the data registering art, it is common practice to provide a keyboard assembly which must be operated by actuation of only one key at a time. Consequently, in the interest of accuracy, it is necessary to provide some sort of interlock mechanism which will permit only one key of the keyboard to be depressed at any given time. Whereas numerous arrangements are extant for accomplishing this result, a real need exists for a one-key-only interlock which is both simple and effective and which also allows freedom in the arrangement of key rows within the bank of keys forming the keyboard. It is, accordingly, of primary concern herein to provide an interlock mechanism which meets these requirements.

More specifically, it is an object of this invention to provide an interlock system which comprises a key row interlock cooperable with a row-to-row interlock so as to admit of but a single key depression within a bank of keys composed of a plurality of key rows.

Another object of this invention is to provide a key row interlock which is integrated within and forms part of the key row assembly, the key row interlock being intimately cooperative with other structures, particularly, the key stems, of the key row assembly. Specifically, the key row interlock performs a guiding function for the keys and is otherwise so related structurally to the keys and their supporting and guiding mechanism as to achieve simplicity and economy of construction without sacrificing efficiency and effectiveness of operation.

Still another object of this invention resides in an improved key row interlock mechanism which minimally increases the force required to depress an individual key. More particularly, the key row interlock according to this invention involves a train of row-to-row interlock actuators which are, in themselves, an interlock mechanism for their associated row; the arrangement of the parts being such that any tendency to binding of the key stems is obviated while, at the same time, very little effort is required to set the train or a portion of the train of actuators in motion so as to achieve the interlock action.

Further, it is an object of this invention to provide an improved interlock assembly embodying a key row interlock operating in combination with a row-to-row interlock, in which these entities are so related as to allow for various and diverse spacings between key rows without imposing restrictions either upon the simplicity or upon the efficiency of the apparatus. In this way, great latitude is permitted in the arrangement of key rows within the bank of keys forming a particular keyboard.

Other objects and advantages of the invention will appear from the description hereinbelow and the accompanying drawing wherein:

FIG. 1 is a perspective view of a keyboard unit and associated circuit components utilizing key row interlock mechanism according to the present invention and illustrating, in phantom lines, the row-to-row interlock mechanism cooperating with the key row interlock mechanism,

and with portions of the key row interlock mechanism being omitted for the purpose of clarity;

FIG. 2 is a side elevational view of the assembly as shown in FIG. 1 but illustrating the row-to-row interlock mechanism in full lines therein;

FIG. 3 is a bottom plan view of the keyboard assembly according to the present invention;

FIG. 4 is an end elevational view of the assembly shown in FIGS. 1–3;

FIG. 5 is a cross sectional view taken substantially along the plane of section line **5—5** in FIG. 2 and showing details of one of the key assemblies;

FIG. 6 is a horizontal section taken substantially along the plane of section line **6—6** in FIG. 2 illustrating the interrelationship between the key row interlocks and the row-to-row interlock;

FIG. 7 is a view similar to FIG. 6 but illustrating one of the key row interlocks in entered position relative to the row-to-row interlock; and

FIG. 8 is a sectional view taken substantially along the plane of section line **8—8** in FIG. 7 and showing key stem interposition within the key row interlock mechanism.

With reference now more particularly to FIGS. 1 and 4, the reference character **10** indicates a mounting or keyboard plate which is provided with a plurality of rows **12**, **14**, **16**, **18** and **20** of individual openings **22** which receive and guide in part key elements such as those indicated generally by the reference character **24**. The keys in each of the rows **12**, **14**, **16**, **18** and **20** are part of individual key assemblies as indicated by the reference characters **26**, **28**, **30**, **32** and **34** and each of which assemblies embodies the principles according to Patent No. 3,259,806. Essentially, each of the assemblies **26**, **28**, **30**, **32** and **34** includes a channel member having upper and lower legs **36** and **38** and an intervening web portion **40**, the upper leg **36** of each being secured to the mounting plate **10** as by the fasteners **42**. The key stems **44** forming the individual rows **24** are guided in part by the mounting plate **10** and in part by the lower leg **38** in the manner which may be best seen in FIG. 5. In FIG. 5, it will be seen that the corresponding opening **22** in the mounting plate **10** guides the upper portion of the key stem **44** whereas a similar opening, in registry with the corresponding opening **22** of the mounting plate **10** guides the lower end portion of the key stem **44**. The upper leg **36** of the channel member, on the other hand, is notched as indicated by reference character **46** and thus does not wholly retain the key stem **44**. The reason for this construction is to permit ready assembly of the separate key assemblies as is pointed out in my above mentioned patent.

Each of the key stems **44** is provided with intermediate rigidifying flanges **48** along its opposite sides so as to rigidify and minimize bending or flexing of the key stems particularly in their central regions. Each key stem **44** is provided with a central opening or elongate slot such as that indicated by the reference character **50**, see particularly FIG. 2, and received within each of these openings is a tension spring **52** having its lower extremity **54** suitably anchored to the key stem (FIG. 5) and having its upper end anchored to a hook member **56**. The tension springs normally urge the key stems to upraised position substantially as is shown.

The hook members **56** are preferably formed as projections of a single angle member **58** for each row with the horizontal leg of each such angle member being secured

to the upper leg **36** of the channel member and terminating short of the web **40** so as to form a guide or channel for receiving the upper edge of the printed circuit board **60** which also forms a part of each of the key assemblies. Similarly, an angle member **62** forms a lower channel or guide for the lower edge of the printed circuit board **60** substantially as is shown in FIG. 5. These two channels or guides permit endwise withdrawal and insertion of the printed circuit plates **60** and their associated insulating plates **64** in a manner more particularly defined in my aforesaid patent. Additionally, the upstanding leg **66** of each of the angle members **62** forms a guide or backup plate for a train or series of interlock actuators **68** associated with each of the key assemblies **26, 28, 30, 32** and **34**.

As can be seen in FIG. 8, each of the actuators **68** is provided with a pair of legs **70** and **72** which straddle, with clearance, the web portions **74** of the lower channel leg **38** formed between the row of openings **76** in such bottom leg **38**. It will be noted that the openings **76** are also the openings which receive the lower extremities of the key stems **44** and the width of each opening is such as to freely but snugly pass the legs **70** and **72** and the key stems. It will also be noted that the upstanding leg **66** of the angle member **62** is disposed in opposed relationship to the row of key stems **44** and serves to retain the main body portions **78** of the actuators **68** substantially as is shown. The lower extremities of the legs **70** and **72** are respectively provided with horizontally projecting finger portions **80** and **82** which underlie the channel leg **38** and thus prevent the withdrawal of the actuators when the parts are in the assembled position. It will be noted, however, that the individual actuators may be inserted in place prior to installation of the key stems **44**, and that when the key stems **44** are in place, they serve to maintain the actuators in assembled position. It is a feature of this invention that the length of each of the actuators **68** is commensurate with the center-to-center spacing between adjacent key stems **44** and it will be noted that the upper corners of each of the actuators are rounded as indicated by reference characters **84** and **86**. Each of the key stems **44** is provided with an outwardly struck tongue portion **88** having a rounded nose which is adapted, when the key is depressed, to engage one of these rounded corners and by interposition between adjacent actuators **68** in the associated train of actuators to cause movement of a portion of the train as will hereinafter more clearly appear.

It will be noted that by providing the actuators **68** in close adjacency to the key stems **44** and by confining the reaction force of the actuators **68** against the depression of the key stems **44** essentially along a line coinciding with the center line of the key stem, very little tendency to binding of the key stem is inherent in the arrangement.

It will also be noted that the length of each of the openings **76** is equal to substantially twice the width of the two legs **70** and **72** plus the width of the tongue **88**. A spring device **90**, see FIG. 3, engages the leg **82** of the end actuator **68** and serves to urge the entire train of actuators in a direction away from the row-to-row interlock mechanism indicated generally by the reference character **92**. As will be evident from FIG. 8, when a key stem **44** is depressed, as is shown in that figure, all actuators **68** lying between such key stem and the row-to-row interlock mechanism **92** will be shifted laterally as indicated so that the terminal actuator of the train enters the row-to-row interlock mechanism **92**. It will be noted that in the depressed position of the key stem **44** as is shown in FIG. 8, all of the actuators are now so positioned that another key stem in that row cannot be depressed since, as aforesaid, the length of the openings **76** will permit only one tongue **88** at any given time to be interposed within the train.

The row-to-row interlock mechanism preferably consists of a U-shaped channel member **94** having its bight portion provided with notches as at **95** in registry with the end actuators **68** whereby to permit entrance of such end actuator into the interior of the channel member **94**. Between the legs of the channel member **94** and spaced from the bight portion thereof is a bar element **96** which is preferably affixed in place by the same fastener elements **98** which serve to mount the row-to-row interlock mechanism, the space between the bar **96** and the bight of the channel **94** defininig a raceway for the operative elements of the row-to-row interlock mechanism. These operative elements preferably comprise a pair of ball members **100** and **102** for each of the end actuators **68** and intervening spacer elements **104** interposed between adjacent pairs of balls, substantially as is shown in FIG. 7. The opposite ends of the bar **96** are widened to close the opposite ends of the raceway as aforementioned and adjustment screws **106** and **108** are engaged in these widened portions of the bar **96** to adjust the total movement permitted of the elements of the row-to-row interlock mechanism. If this adjustment is such as to permit the entrance of only one of the end actuators **68** to the exclusion of any other simultaneous entrance, only one key in the entire bank of keys may be depressed at any given instant. A particular advantage of this type of construction is that the elements of the row-to-row interlock mechanism **92** may conveniently be constructed to accommodate for any spacing between adjacent row assemblies **26, 28, 30, 32** and **34**. In the specific example shown, the spacers **104** are simply formed to the proper lengths to accommodate for such arrangement, it being noted, particularly in FIG. 4, that the spacing between the assemblies **26, 28, 30, 32** and **34** differs from assembly to assembly.

Thus, it will be manifest that the row interlock mechanism forms an integral part of each of the row assemblies and is intimately and cooperatively associated therewith, the construction being such that a simple row-to-row interlock **92** accommodates for as many rows as are needed, regardless of the spacing therebetween and is operative to permit, in combination with the row interlock mechanisms, depression of only one key at any given instant.

It is to be understood that certain changes and modifications as illustrated and described may be made without departing from the spirit of the invention or the scope of the following claims.

1. A keylock for punch keys positioned in a keyboard, said keyboard having keys arranged in a plurality of rows closely adjacent to one another, a first means operated by a punched key in one row for locking all the remaining keys in said row against operation, and a second means at one end of the keylock and comprising a series of members movable into direct contact with one another by operation of said first means by said key for locking all the keys of the remaining rows against operation whereby only one key can be punched into operation at one time.

2. In a registering device having a bank of keys consisting of a plurality of rows thereof,

a train of interlock actuators along each row of keys, there being one interlock actuator for each key,

a row-to-row interlock mechanism extending transversely of said rows of keys adjacent the end actuators of the several trains and including guide means defining a channel of predetermined length and a series of members slidably received in said channel and incompletely filling the length thereof by an amount equal to the thickness of an end actuator,

means normally urging all actuators of each train in a direction away from said interlock mechanism,

and means on each key for moving the interlock actuator corresponding to the key and all other interlock actuators in the associated train lying between the interlock mechanism and the stated interlock actuator toward said interlock mechanism and interposing the end actuator of the stated train within said series of members in response to depression of the stated

key whereby all of the remaining keys of said bank are locked against depression.

3. In a registering device having plural key rows disposed in parallelism, each row containing a plurality of individually depressible keys,

a train of abutting actuators for each key row and arranged in parallelism therewith, there being an actuator for each key in a row,

means on each key for interposition between adjacent actuators in an associated train in response to key depression to shift all actuators beyond the depressed key in a direction toward one end of the train,

the terminal actuator at said one end of each train presenting an end edge, with all of said end edges normally lying in a common plane normal to the key rows,

an interlock mechanism disposed adjacent said end edges of the actuator trains and adapted to be entered by the terminal actuator of each train in response to depression of a key in any row, said mechanism including a series of members movable into direct contact with one another in response to entrance by a terminal actuator to limit the number of terminal actuator entrances which may be made simultaneously.

4. In a registering device having plural key rows disposed in parallelism, each row containing a plurality of individually depressible keys,

a train of abutting actuators for each key row and arranged in parallelism therewith, there being an actuator for each key in a row,

means on each key for interposition between adjacent actuators in an associated train in response to key depression to shift all actuators beyond the depressed key in a direction toward one end of the train,

the terminal actuator at said one end of each train presenting an end edge, with all of said end edges normally lying in a common plane normal to the key rows,

an interlock mechanism disposed adjacent said end edges of the actuator trains and adapted to be entered by the terminal actuator of each train in response to depression of a key in any row, said mechanism including a series of members movable into direct contact with one another in response to entrance by a terminal actuator to limit the number of terminal actuator entrances which may be made simultaneously,

and means mounting said actuators of each train for preventing simultaneous depression of plural keys in one row.

5. In a registering device, in combination,

a mounting plate,

a key row frame member depending from said mounting plate and including a leg member disposed in spaced parallelism with said mounting plate, said mounting plate and said leg member being provided with aligned rows of openings, with the openings in said leg member being wider than the openings in said mounting plate,

a plurality of keys slidably received in said openings,

an interlock actuator for each key, each actuator having a body portion provided with depending legs at its opposite ends, said legs being disposed in adjacent openings in said leg member with said body portion bridging therebetween,

means urging said actuators in one direction to abut in end-to-end relation and form an actuator train,

each key having a tongue adapted to be interposed within said train of actuators in response to depression of the key to shift one end of the train,

and a row-to-row interlock mechanism disposed adjacent said one end of the train and including a series of members movable into direct contact with one another in response to shifting of any actuator train for locking all the remaining actuator trains against shifting.

6. In a registering device, in combination,

a mounting plate,

a key row frame member depending from said mounting plate and including a leg member disposed in spaced parallelism with said mounting plate, said mounting plate and said leg member being provided with aligned rows of openings, with the openings in said leg member being wider than the openings in said mounting plate,

a plurality of keys slidably received in said openings,

a guide member secured to said leg member providing an upstanding wall extending along said leg member adjacent said row of openings therein,

an interlock actuator for each key, each actuator having a body portion slidably embraced between a pair of said keys and an opposed portion of said upstanding wall of the guide member, and having depending legs at its opposite ends disposed in adjacent openings in said leg member,

means urging said actuators in one direction to abut in end-to-end relation and form an actuator train,

each key having a tongue adapted to be interposed within said train of actuators in response to depression of the key to shift one end of the train,

and a row-to-row interlock mechanism disposed adjacent said one end of the train and including a series of members movable into direct contact with one another in response to shifting of any actuator train for locking all the remaining actuator trains against shifting.

7. In a registering device, in combination,

a mounting plate,

a key row frame member depending from said mounting plate and including a leg member disposed in spaced parallelism with said mounting plate, said mounting plate and said leg member being provided with aligned rows of openings, with the openings in said leg member being wider than the openings in said mounting plate,

a plurality of keys slidably received in said openings,

a guide member secured to said leg member providing an upstanding wall extending along said leg member adjacent said row of openings therein,

an interlock actuator for each key, each actuator having a body portion slidably embraced between a pair of said keys and an opposed portion of said upstanding wall of the guide member, and having depending legs at its opposite ends disposed in adjacent openings in said leg member,

means urging said actuators in one direction to abut in end-to-end relation and form an actuator train,

each key having a tongue adapted to be interposed within said train of actuators in response to depression of the key to shift one end of the train.

8. In a registering device, in combination,

a mounting plate,

a key row frame member depending from said mounting plate and including a leg member disposed in spaced parallelism with said mounting plate, said mounting plate and said leg member being provided with aligned rows of openings, with the openings in said leg member being wider than the openings in said mounting plate,

a plurality of keys slidably received in said openings,

an interlock actuator for each key, each actuator having a body portion provided with depending legs at its opposite ends, said legs being disposed in adjacent openings in said leg member with said body portion bridging therebetween,

means urging said actuators in one direction to abut in end-to-end relation and form an actuator train,

each key having a tongue adapted to be interposed within said train of actuators in response to depression of the key to shift one end of the train,

and a row-to-row interlock mechanism disposed adjacent said one end of the train and including a series of members movable into direct contact with one another in response to shifting of any actuator train for locking all the remaining actuator trains against shifting.

said openings in the leg member being of a length substantially equal to the widths of the two actuator legs disposed therein plus the width of said tongue.

References Cited

UNITED STATES PATENTS

481,037	8/1892	Knapp et al.	235—26
590,946	9/1897	Hess	235—26 X
898,114	9/1908	Keiper	235—54
2,014,432	9/1935	Gerhold	235—146
2,935,577	5/1960	Dumke et al.	253—145 X
3,024,988	3/1962	Wagemann	235—145
3,069,674	12/1962	MacNeill et al.	235—145 X
3,152,759	10/1964	May	235—145
3,207,429	9/1965	Crossland et al.	235—145 X

RICHARD B. WILKINSON, *Primary Examiner.*

STANLEY A. WAL, *Assistant Examiner.*