July 11, 1967 H. O. SCHWARTZ ETAL 3,330,176

KEY AND KEY MOUNTING STRUCTURE

Filed Jan. 27, 1964 3 Sheets-Sheet 1

Fig. 1.

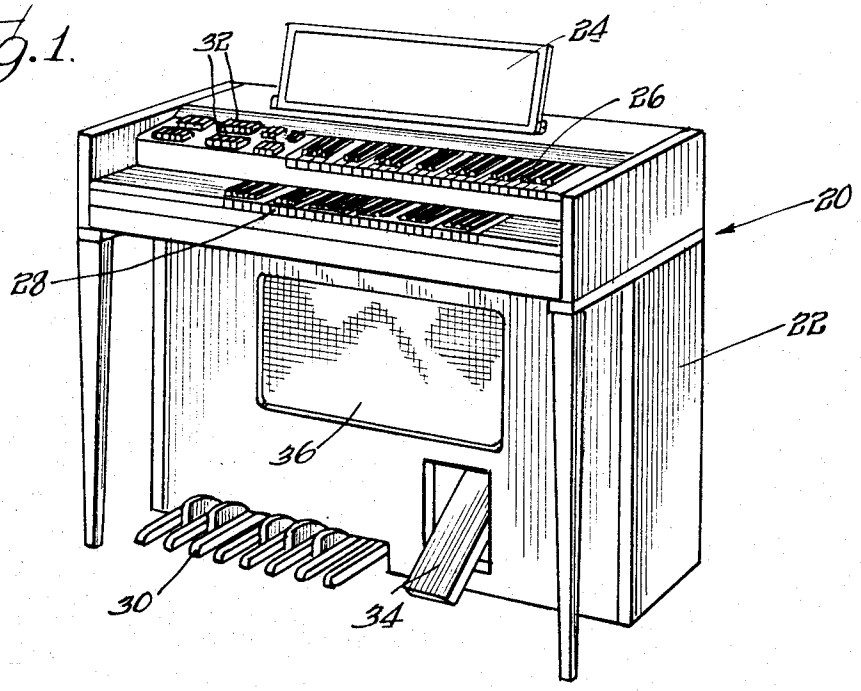
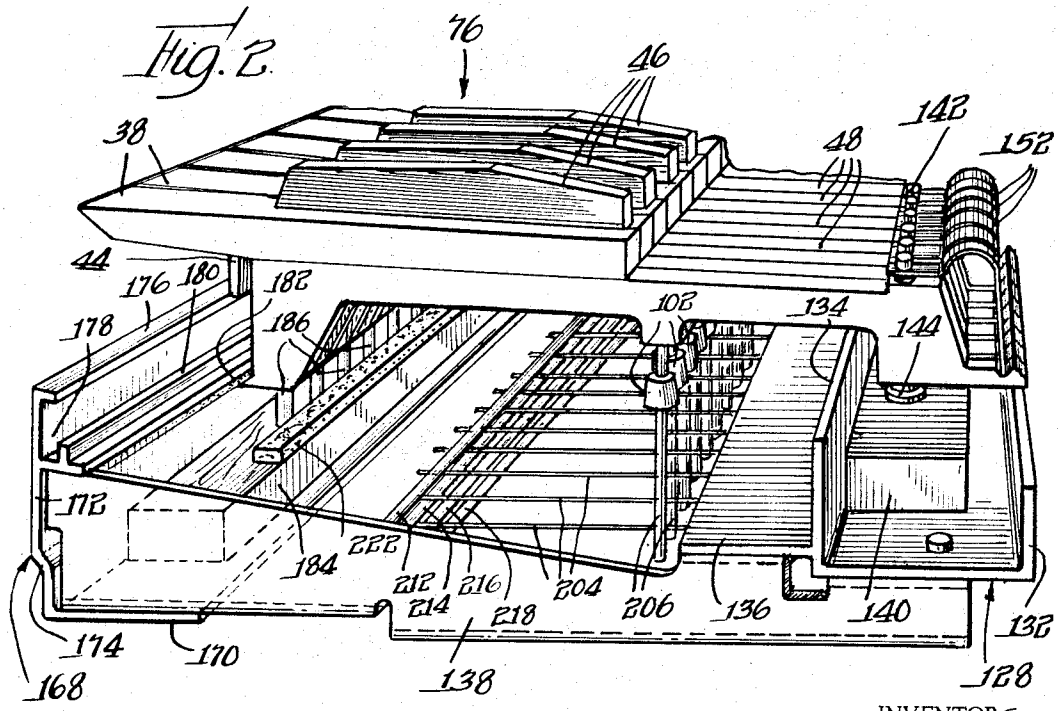


Fig. 2.



INVENTORS

Howard M. Thomas

Harold O. Schwartz

By: Olson, Trexler, Wolters & Bushnell

attys

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Filed Jan. 27, 1964 3 Sheets-Sheet 2

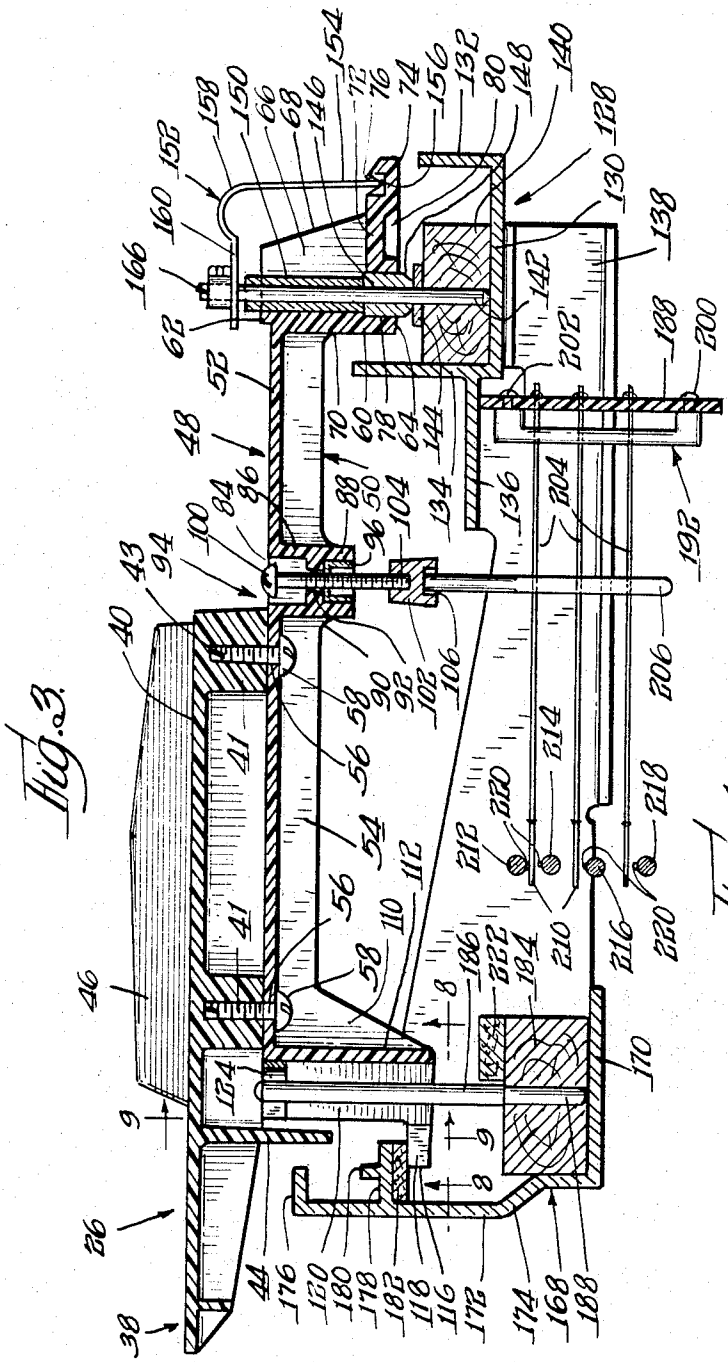


Fig. 3.

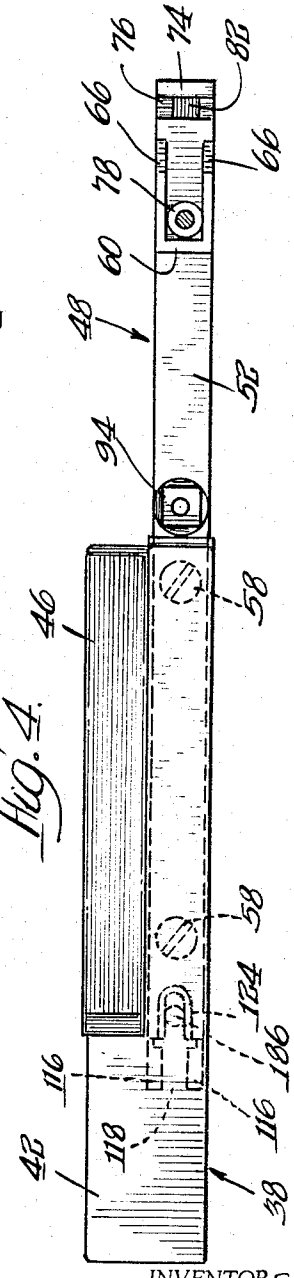


Fig. 4.

INVENTORS
Howard M. Thomas
Harold O. Schwartz
By Olson, Trexler, Wolters & Bushnell
Attys.

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Filed Jan. 27, 1964 3 Sheets-Sheet 3

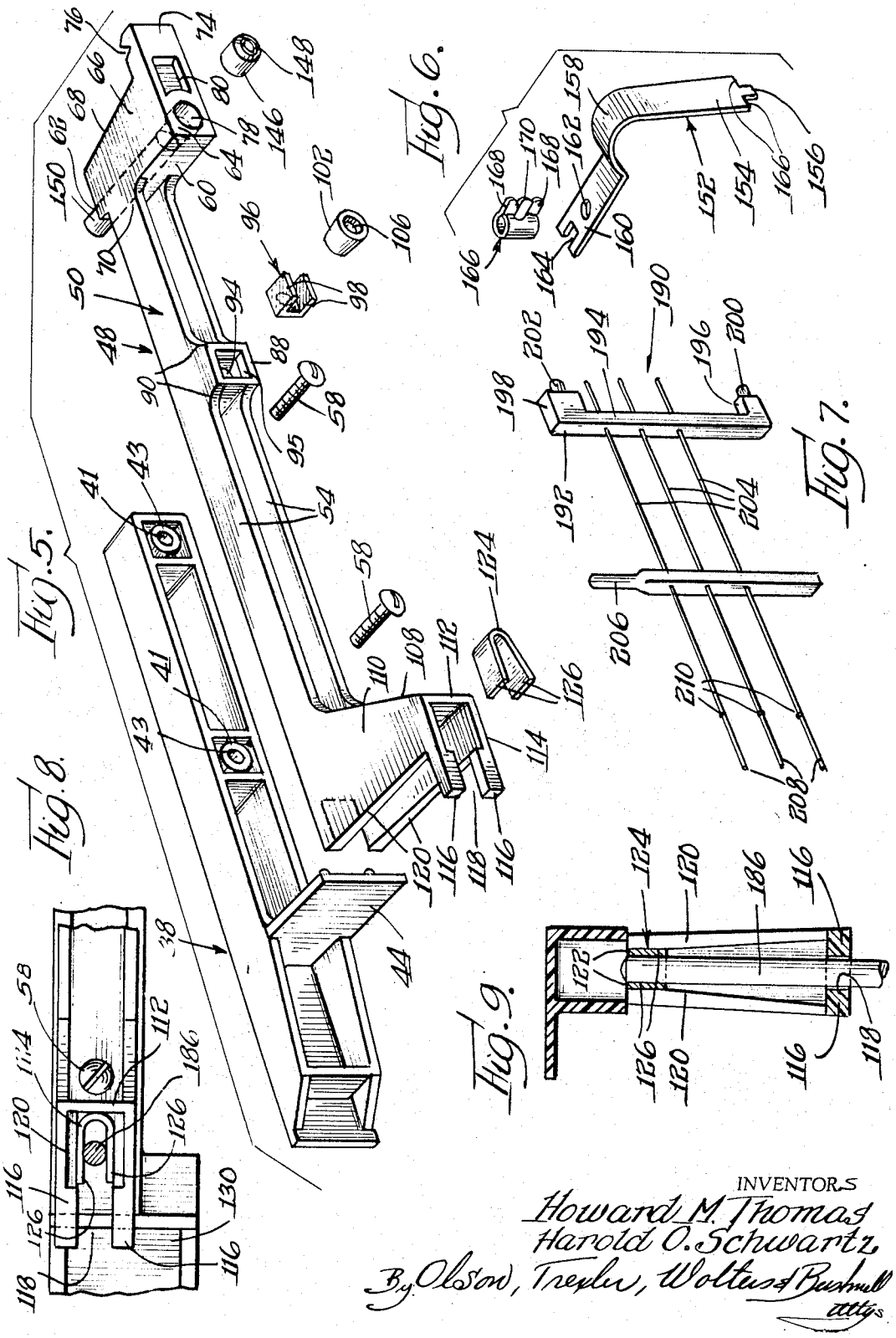


Fig. 5.

Fig. 8.

Fig. 6.

Fig. 7.

Fig. 9.

INVENTORS
Howard M. Thomas
Harold O. Schwartz
By Olson, Trexler, Wolters & Bushnell
attys

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KEY AND KEY MOUNTING STRUCTURE

Harold O. Schwartz and Howard M. Thomas, North Tonawanda, N.Y., assignors to The Wurlitzer Company, Chicago, Ill., a corporation of Ohio

Filed Jan. 27, 1964, Ser. No. 340,273
20 Claims. (Cl. 84—433)

This invention relates to the musical arts, and more particularly to an improved key and key mounting structure for an electronic musical instrument such as an organ.

In the construction of an electronic organ keyboard there are many requirements which are not necessarily always compatible. The keys must be retained in place in such manner as to resist accidental loosening or withdrawal, yet the keys must be easy to mount in place, and must be easy to remove for purposes of servicing. The parts must be strong in order to resist deformation, yet they must be light in weight to avoid undue noise in operation, and to retain inertia at a minimum. Large areas of movable metal parts can cause difficulties due to changes in electrostatic capacitance.

It is, therefore, an object of the present invention to provide an improved key construction and improved means for mounting the same in an electronic musical instrument.

It is a further object of this invention to provide a key and key bar made of two distinctly different plastic materials each chosen for optimum qualities.

It is a further object of this invention to provide an electronic musical instrument or organ key construction and mounting means therefor which facilitates ready installation and removal or replacement of a key.

Yet another object of this invention is to provide an organ key and mounting construction which facilitates removal of keys and installation thereof from the top.

Yet another object of this invention is to provide a musical instrument key construction and mounting means therefor wherein each key is simultaneously mounted and retained in position and profited by us by but a single spring.

It is yet another object of this invention to provide an organ key mounted by means of balance pins, somewhat in the nature of a piano key.

Still another object of this invention is to provide improved means for coupling an organ key to a switch operator.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying claims wherein:

FIG. 1 is a perspective view of an electronic organ constructed in accordance with the principles of this invention;

FIG. 2 is a fragmentary perspective view of the keyboard of the instrument;

FIG. 3 is a longitudinal, vertical sectional view through one of the keys and accompanying parts;

FIG. 4 is a fragmentary top view of the key of FIG. 3 and a portion of the key bar to which it is secured;

FIG. 5 is a fragmentary, exploded perspective view taken from beneath the key and key bar;

FIG. 6 is an exploded perspective view of the mounting and biasing spring;

FIG. 7 is a perspective view of the movable switch means;

FIG. 8 is a fragmentary horizontal sectional view looking up along the lines 88 in FIG. 3; and

FIG. 9 is a detail vertical sectional view as taken along the line 99 in FIG. 3.

Reference now should be made to FIG. 1 wherein there is shown an electronic musical instrument, specifically an organ **20** including a case or housing **22** of more or less conventional design, and including an upstanding music rack **24**. The organ includes an upper manual **26**, a lower manual **28**, and a pedal board **30** for controlling the notes to be played. In addition, various stop tablets **32** are provided to the left of the upper manual **26**, more or less in accordance with conventional practice. A swell pedal **34** is provided, and the front of the housing **22** is provided with a grill **36** behind which is mounted the usual loudspeaker system consisting of one or more loudspeakers.

Further reference now should be had to FIGS. 2–5 wherein certain of the keys **38** of the keyboard or manual **26** are shown. Each key **38** is molded of plastic material, Implex being a preferred example, in-as-much as this plastic is of an attractive, white, shiny finish. Each key is of hollow, box-like construction and, having an inner or back end in the form of a channel **40**. The channel is provided with two slugs or plugs **41** of integral plastic material having vertical bores **43** therein. Each channel shaped portion is in the nature of a shank, and there is a wider finger piece **42** at the outer end of each key, which finger piece portion is offset one way or the other, or both from the shank **40** depending on the note position in the keyboard. Each finger piece is also in the form of a box-like structure opening downwards, and is provided near the shank with a depending flange **44** of substantial depth to hide internal parts of the organ as will be understood.

Each key **38** (and also the black keys **46**) is secured to a key bar **48**. Each key bar is molded of plastic material. The requirements for the key bar are different from those of the key. It need not be so attractive in appearance, but it must be quite strong and dimensionally stable. Accordingly, the key bar in each instance is molded of a (fiber) glass-filled alkyd resin. The key bar **48**, also referred to as a key frame, comprises an elongated shank **50** of channel shape having a horizontal web **52** and depending flanges **54** along the longitudinal edges thereof. Spaced apertures **56** are provided in the web **52**, and screws **58** are passed through these apertures and are threaded into the slugs or plugs **41**. The bores **43** therein need not be prethreaded since the screw threads readily cut into the plastic material.

The back or inner end of each key bar or key frame is provided with a vertical transverse partition or wall **60** which upstands a short distance above the shank to the limit noted as **62**, and which depend a substantial distance below the shank to the bottom edge **64**. Sidewalls or flanges **66** forming continuations of the flanges **54** extend from top to bottom of the wall or flange **60**. The walls or flanges **66** extend rearwardly away from the shank **50** and are terminated at the rear edge by a diagonally downwardly directed edge **68**. The flanges **54** of the shank **50** are joined to the transverse wall **60** and hence to the flanges **66** by fillets or gussets **70** for reinforcement, and to avoid corners at which fracture might otherwise tend to occur.

A horizontal, transverse web **72** extends between the bottom edges of the flanges **66** and rearwardly thereof to form a thickened base **74**. This base is provided in its upper surface with a transverse V-shaped notch **76**. A circular bore **78** extends vertically up through the web **72** immediately to the rear of the partition or wall **60**. The web **72** is recessed at the bottom thereof as at **80** intermediate the bore **78** and the base **74**. The base **74** also is recessed at the central portion of the V-shaped notch **76**, as indicated at **82** in FIG. 4.

Intermediate the ends of the key bar or key frame, but relatively toward the back end thereof, there is provided an opening **84** in the web **52**. Depending transverse walls **86** lie on opposite sides of this opening, and the flanges **54** depend at **88** between the walls **86**. The depending position is connected or joined to the remainder of the sidewalls or flanges **54** fore-and-aft of the transverse walls **86** by fillets or gussets **90**. A horizontal partition **92** is provided approximately on a level with the bottom edges of the major portion of the flanges **54**, and this partition is provided with a central aperture **94**. As will be seen, the partition combined with the walls **86**, and the depending flange portions **88** forms a well **95** extending into the key frame from the bottom thereof.

A sheet metal nut **96** having downturned flanges **98** thereon fits in this well and is held in place by the flanges **98** which have a slight outward tension on them.

A switch actuating screw **100** extends through the wall **94** and is threaded down through the sheet metal nut **96**. The screw has secured to its lower end a switch actuating button **102** thereon.

The switch actuating button **102** is formed of an elastomeric material, such as rubber or a synthetic rubber, neoprene being a satisfactory example. As may be seen in FIGS. 3 and 5, the button is provided with an upper vertical bore **104** of smaller diameter than the threaded shank of the screw **100**. The bottom end of the screw thus may be threaded into the button which will remain aggressively in place thereon. The outer configuration of the button is frusto-conical, and the bottom surface of the button is recessed at **106** for cooperation with a switch actuator, as hereinafter will be set forth.

At the front or outer end of the key frame, the flanges **54** extend diagonally downwards from back to front as indicated at **108** to provide depending sidewalls **110**. The sidewalls are joined by a vertical transverse wall **112**, and the sidewalls extend slightly upwardly and forwardly therefrom along a bottom edge **114**. The sidewalls continue forwardly at the bottom edge **114** as projections **116** which are somewhat thickened relative to the wall thickness, but which are provided with a longitudinal center space or opening **118** therebetween.

As best may be seen in FIGS. 5, 8 and 9, the sidewalls **120** forwardly of the wall **112** become progressively thicker from bottom to top. The walls are spaced apart at the top **122** a slightly greater distance than the width of the opening **118** between the projections **116**.

A strip of polyethylene **124** is folded over to more or less U-shape and is cemented between the sidewall portions **120** at the upper edges thereof. The thickness of the polyethylene insert **124** is such that the space between the confronting portions thereof as indicated at **126** is substantially the same as the width of the opening **118**.

Now that the key and key bar or key frame have been described, it is in order to consider additional parts of the action on which the key is mounted, and with which the key cooperates.

Beneath the rear end of the key frames there is provided a channel or extrusion **128** having a lower horizontal wall **130**, a back upright flange **132**, an immediate and higher upright flange **134**, and a forward floor or horizontal wall **136** somewhat above the wall **130**. This extrusion extends completely across the key board or manual **26** (and note that the construction of the lower manual is similar). It is supported at the ends by suitable brackets **138**, and also intermediate the ends by means which are not shown.

A back balance pin rail **140** is secured to the extrusion on top of the wall **130** and against the front flange **134**. This back balance pin rail extends almost the full length of the extrusion **128** and is made of wood. It is secured to the extrusion in any suitable manner. Back balance pins **142** are driven into the rail **140**, and the rail may be predrilled for this purpose to avoid splitting. The

pins are high enough that they extend some distance above the tops of the key frames **148** when the key frames are assembled therewith as hereinafter set forth.

A felt washer **144** encircles each pin **142** on top of the back balance pin rail. A plastic bushing **146** is received in the bore **78** of each key frame **148**. The bore is somewhat in the nature of a counterbore beneath the sidewalls or flanges **66**, whereby upward movement of the bushing **146** is limited. The bottom end of the bushing is conical or frusto-conical in shape at **148** so as to form a pivot bearing. The bushing **146** preferably is made of Delrin or nylon plastic.

A fibre tube **150** is received between the walls or flanges **66** and rests on the top of the bushing **146**, being received over the pin **142**. The tube **150** is slideably moveable between the flanges **66** so as to serve as a lateral bearing for the key and key frame.

A leaf spring of somewhat unusual shape is used for holding each key and key frame in position about each pin **142**. This spring, hereinafter identified by the numeral **152**, and seen best in FIG. 6, although also shown in FIGS. 2 and 3, comprises a substantially vertical portion **154** with a depending central tongue or lug **156** thereon. At the upper end of the vertical portion or leg **154**, the spring is provided with an arcuate or reentrant portion **158** which is joined to a horizontal arm **160**. The horizontal arm **160** is provided substantially centrally thereof with a hole **162** of substantially the same diameter as the pin **142**. The free end of the horizontal arm **160** is provided with a notch **164** which results from stamping out successive springs end to end from a strip of sheet stock, the notch **164** corresponding to the tongue **156** of the next succeeding spring.

A small spring clip **166** somewhat in the nature of a hose clamp is made of spring sheet material, preferably steel, and is provided at one end with two radially extending axially spaced tongues **168** and at the other end with a central radially extending tongue **170**. The tongues overlap one another somewhat circumferentially so that they may be squeezed by a suitable tool, such as a pair of pliers, to expand the clip radially.

As readily may be seen in FIGS. 2 and 3, the tongue **156** is received in the recess **82**, while the lower end shoulders **166** of the spring on either side of the tongue are received in the V-shaped notch **76**. The aperture **162** is received over the corresponding pin **142**. The top of the spring is normally flexed up, and the spring in FIG. 6 may be seen to have an initial tension providing an obtuse angle between the leg **154** and the arm **160**. The arm **160** is held down, as the spring clip **166** is affixed to the upper end of the pin, whereby to hold the spring down. The arm typically is spaced above the upper end of the tube **150**, and the arm may be adjusted up or down upon loosening of the clip **166**, whereby to vary the spring force imposed on the base **74**. This allows ready variation of the finger pressure required to pivot the key down, and hence provides convenient touch regulation from above the key. It will be appreciated that the spring holds the key and key frame down, and also tends to hold the key and key frame in a horizontal, raised position, the spring force being exerted in a clockwise direction in FIG. 3.

At the front end of the keyboard there is provided an extrusion **168**, also secured to the brackets **138** and suitably supported at intermediate positions. The extrusion **168** includes a horizontal floor **170** and a front wall **172** upstanding therefrom and having a forward offset **174** therein. The forward wall **172** extends upwards a sufficient distance to overlap the depending flanges **44** of the keys, whereby to cooperate therewith in hiding the internal parts of the action. A rearwardly directed horizontal flange **176** is provided along the upper edge.

Spaced somewhat downwardly from the upper flange **176** and parallel thereto is a rearwardly directed upstop flange **178** having a reinforcing vertical rib **180** thereon, and an underlying strip of felt **182**. The projections **116**

of each key frame press up against the felt **182**, whereby to limit the upward position of the key frames and keys as urged by the respective springs **152**.

A front balance pin rail **184**, also of wood, is secured on top of the floor **170** and against the inner face of the forward wall **172**. Front balance pins **186** are driven into the wood of the rail **184**, and the rail may be predrilled for this purpose to avoid splitting, in accordance with conventional practices. The pin **186** is provided with a depending lower portion **188** received in the wood, and with a thickened upper portion received between the sidewall portions **120** and by the bearing insert **124**.

An insulating board **188** is secured in vertical position beneath the horizontal wall or floor **136** of the rear or back extrusion **128** in vertical position. This board supports a plurality of movable switch assemblies as hereinafter set forth.

Each movable switch assembly is identified generally by the numeral **190**, and one thereof is shown in FIG. 7. Each movable switch assembly includes a bracket **192** having an elongated shank **194**. At the lower end of the shank **194** the bracket **192** is provided with a rearward extension **196**, and a similar, somewhat more massive extension **198** is provided at the upper end. The entire bracket is molded of suitable thermoplastic material, and integral pins **200** and **202** extend rearwardly of the respective projections **196** and **198**. In order to mount the bracket on the insulating board **188**, these pins are inserted through apertures of the same diameter as the pins, and subsequently a soldering iron or other hot implement is touched to the ends of the pins **200** and **202** to soften and enlarge them, thereby permanently to mount the brackets on the insulating board **188**.

The bracket **192** is molded with flexible or whisker contacts **204** extending forwardly therefrom in horizontal, vertically spaced relation. These contacts also are molded in a vertical actuator bar **206** of suitable plastic material, conveniently the same as that of the bracket **192**. The upper end of each actuator bar **206** is received in the bottom recess **106** of the corresponding actuator button **102**. The screw **100** corresponding thereto provides for vertical adjustment to insure proper contact. The contacts **204** throughout most of their extent must be flexible, and to this end they preferably are made of a suitably flexible, conductive material such as bronze or copper or an alloy thereof. In order to provide for best electrical properties, the tips **208** of the contact preferably are welded on at **210**, and these tips may be of silver or an alloy thereof.

As may be seen in FIGS. 2 and 3, the ends **210** of the contacts **204** are disposed adjacent stop rods **212**, **214**, **216** and **218**. These stop rods are made of nonconductive material, such as fibreglass-reinforced plastic, and each is provided with a longitudinally extending conduct element **220**. The uppermost contact **210** normally engages the underside of the rod **212** and is spaced above the rod **214**. The other two contact portions **210** are spaced above the respective rods **216** and **218**. The rods are mounted for rotation in accordance with known practice to position the contact elements **220** thereof for engagement or nonengagement by the contact tips **210** depending upon the selection of stops set up by the organist.

When a key is to be installed in its proper position in the keyboard, the projections **116** are hooked under the felt upstop **182** on the flange **178**. (It will be seen that there is a strip of felt **222** in the nature of a downstop extending across the front rail **184** immediately to the rear of the pins **186**.) The bushings **148** have previously been positioned about the rear pins **142**, and the apertures **78** in the rear ends of the keys are inserted over the pins **142** and over the bushings **146** concomitant with insertion of the projections **118** beneath the upstop **182**. Since the space between the key frame walls **66** is open at the rear, it will be apparent that there is a sufficiency of play in that direction. Since the walls **66** are spaced considerably greater than the diameter of the pin **142**, there is also a good deal of play in this direction. Thereafter, the fibre bushing or sleeve **150** is placed over the pin, thereby taking up the play between the pin **142** and the side walls **66**. It will be appreciated that the space **118** between the projections **116** is sufficient to allow the key frame to be slipped over the pin **186** with a partial endwise movement of the key frame. Lateral play at the front end of the key is prevented by the polyethylene insert **124**.

Subsequent to installation of the key and key frame as just described, the spring **152** is inserted in the notches **76** and recess **82** and the aperture **162** thereof is pushed down over the top of the pin **142**. The spring clip or clamp **166** then is installed over the top of the pin **142**, and is lowered to the position necessary to insure proper spring tension on the key frame, and hence on the key. The screw **100** is adjusted up or down in order for the member **102** to make proper contact with the top of the actuator member **206**.

As will be appreciated, removal of a key and key frame is as easy as installation, the operation being precisely the reverse of that just described. The accompanying movable switch assembly is also installed and removed with equal facility. It previously has been noted that the pins or projections **200** and **202** on the bracket **192** are simply inserted into holes in the circuit board **188**, following which the ends of the projections **200** and **202** are touched with a soldering iron to cause them to melt, thereby permanently to hold them in place. It will be observed that the flexible switch elements **204** themselves project through this board, and readily may be soldered to printed circuits thereon. Removal of a movable switch assembly is effected by an opposite sequence to that just discussed, as will be understood.

It will now be apparent that there has been disclosed and described herein a key and key bar which are simple in construction, and which are extremely easy to install initially, and subsequently to disassemble and reassemble for servicing. The two-piece plastic construction allows a plastic to be chosen for appearance's sake for the key, and another plastic to be used for the key bar which is strong and durable, and dimensionally stable. It will be appreciated that the plastic key bar is quieter in operation and presents no electrostatic problems as compared with a metal key bar.

As will be appreciated, various changes in structure will no doubt occur to those skilled in the art. The exemplary embodiments are to be understood as being for purposes of illustration only, and changes that will occur to those skilled in the art will be understood as forming a part of the present invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A key action comprising key means including a finger engageable front portion and a rear portion having substantially vertical aperture means therein, said rear portion further having a reaction base means thereon disposed on the opposite side of said aperture means relative to said front portion, mounting base means, pin means upstanding from said mounting base means and received in said aperture means and extending above said key means, and spring means secured to said pin means above said key means and bearing against said reaction base means resiliently to hold said key means down about said pin means, said reaction base means having spring anchor means thereon engaging and fixing one end of said spring means relative to said reaction base means.

2. A key action as set forth in claim **1** wherein the mounting base means includes a strip of wood, and wherein said pin means is driven into said strip of wood.

3. A key action comprising key means including a finger engageable front portion and a rear portion having substantially vertical aperture means therein, said aperture means including a pair of substantially parallel

side walls extending longitudinally of said key means in spaced relation, said rear portion further having reaction base means thereon disposed on the opposite side of said aperture means relative to said front portion, mounting base means, pin means upstanding from said mounting base means and received in said aperture means and extending above said key means, lateral bearing means on said pin pivot bearing means encircling said pin means and interposed between said key means and said mounting base means, said aperture side walls sliding past said lateral bearing means upon pivoting of said key, and spring means secured to said pin means above said key means and bearing against said reaction base means resiliently to hold said key means down against said bearing means.

4. A key action as set forth in claim **3** wherein said aperture means includes a downwardly opening counterbore, and wherein said bearing means comprises an insert received in said counterbore and extending below said key means.

5. A key action as set forth in claim **4** wherein said bearing means insert has a bevelled lower end.

6. A key action comprising key means including a finger engageable front portion and a rear portion having substantially vertical aperture means therein, said aperture means including a pair of longitudinally extending spaced apart sidewalls having confronting faces spaced a predetermined distance, mounting base means, pin means upstanding from said mounting base means and of lesser diameter than said predetermined distance, said pin means being received in said aperture means, and sleeve means encircling said pin means and slidably engaging said confronting faces of said spaced apart sidewalls, said aperture means including a downwardly opening counterbore, and further including a bearing insert received in said counterbore and extending below said key means.

7. A key action comprising key means including a finger engageable front portion and a rear portion having substantially vertical aperture means therein, said rear portion further having reaction base means thereon disposed on the opposite side of said aperture means relative to said front portion, mounting base means, pin means upstanding from said mounting base means and received in said aperture means and extending above said key means, and leaf spring means secured to said pin means above said key means and having a portion adjacent one end thereof bearing against said reaction base means resiliently to hold said key means down about said pin means, said reaction base means having means thereon engaging said spring portion to preclude movement thereof longitudinally of said key means.

8. A key action as set forth in claim **7** wherein said leaf spring means includes a pair of integral arms initially forming an obtuse angle and tensioned substantially to a right angle in installation.

9. A key action as set forth in claim **8** wherein said leaf spring further includes a looped portion integrally interconnecting said pair of arms.

10. A key action as set forth in claim **8** wherein one of said arms is substantially horizontal and is provided with an aperture received over said pin means, and wherein the other of said arms is substantially vertical and has a lower end with a protruding, central tongue, said lower end including said tongue being received by said bearing base means.

11. A key action as set forth in claim **7** and further including a clip resiliently secured to said pin means above said leaf spring and selectively positionable on said pin means to determine the tension on said leaf spring.

12. A key action comprising key means including a finger engageable front portion having a manually engageable first top surface and a rear portion having a second top surface on a lower level than said first top surface, said rear portion having substantially vertical aperture means therein, said rear portion further having reaction base means thereon disposed on the opposite side of said aperture means relative to said front portion and on a lower level than said second top surface, rear mounting base means, rear pin means upstanding from said rear mounting base means and received in said aperture means and extending above said key means, spring means secured to said pin means above said key means and bearing against said reaction base means resiliently to hold said key means down about said rear pin means, said reaction base means having means thereon engaging said spring means to secure said spring means against relative movement longitudinally of said key means front mounting base means disposed below said finger engageable front portion, front pin means upstanding from said front mounting base means, and guide means on said key means below said finger engageable front portion and slidingly interfitting with said front pin means for guiding the front portion of said key means.

13. A key action as set forth in claim **12** wherein the key guide means comprises a pair of longitudinally extending spaced apart walls, said walls having confronting faces spaced apart a predetermined distance adjacent the bottom and spaced a lesser distance adjacent the top.

14. A key action as set forth in claim **12** wherein the key guide means cooperable with the front pin means comprises a pair of spaced apart longitudinally extending walls, and further including a substantially U-shaped bearing insert disposed adjacent the top of said walls and having substantially parallel sidewalls slidingly cooperable with said pin means.

15. A key action as set forth in claim **14** wherein the guiding walls have confronting faces, said confronting faces being spaced a greater distance adjacent the bottom than adjacent the top.

16. A key action comprising key means including a finger engageable front portion and a rear portion having spring anchor means thereon, mounting base means disposed adjacent said rear portion, pivot means interposed between said mounting base means and said key means rear portion, and a single spring operatively acting between said mounting base means and said spring anchor means on said key means rear portion to urge said key means longitudinally of itself and against said pivot means and said mounting base and simultaneously resiliently to bias said key means with said finger engageable front portion in a raised position.

17. A key action as set forth in claim **16** wherein the single spring comprises a leaf spring.

18. A key action as set forth in claim **16** and further including front guide means comprising a front base and means projecting upwardly therefrom, a pair of spaced walls on said key means below said finger engageable front portion and fitting on opposite sides of said upwardly projecting means, said walls being spaced apart a predetermined distance, and upstop means comprising a fixed stop adjacent said pair of walls, and a forward projection on each of said walls disposed beneath said fixed stop, said forward projections being spaced apart a lesser distance than said spaced walls but a sufficient distance to allow passage of said upwardly projecting means.

19. A key action comprising key means including a finger engageable front portion and a rear portion having substantially vertical aperture means therein, said rear portion further having reaction base means thereon disposed on the opposite side of said aperture means relative to said front portion, mounting base means, pin means upstanding from said mounting base means and received in said aperture means and extending above said key means, spring means secured to said pin means above said key means and bearing against said reaction base means means resiliently to hold said key means down about said pin means, a front guide means base

disposed below the finger engageable front portion of said key means, an upstanding pin mounted on said guide means, a pair of spaced apart walls on said key means below said finger engageable front portion and straddling said front pin, said walls being spaced apart greater than the diameter of said pin, a fixed stop forwardly of said walls, and a pair of projections respectively on said walls and underlying said fixed stop, said projections being spaced apart a distance less than the spacing of said walls but great enough to permit relative transverse passage of said front pin means.

20. A key action as set forth in claim **19** and further including a guide insert between said walls adjacent the

tops thereof and of substantially the same spacing as said projections, said guide insert forming sliding engagement with said front pin means.

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RICHARD B. WILKINSON, *Primary Examiner.*