United States Patent [19]

Thomas et al.

[11] **3,855,894**

[45] **Dec. 24, 1974**

[54] **KEY ASSEMBLY**

[75] Inventors: **Howard M. Thomas; Robert F. Olszowka,** both of North Tonawanda, N.Y.

[73] Assignee: **The Wurlitzer Company,** Chicago, Ill.

[22] Filed: **May 6, 1974**

[21] Appl. No.: **467,207**

[52] **U.S. Cl.** **84/423,** 84/433, 84/DIG. 7

[51] **Int. Cl.** **G10c 3/12,** G10h 1/00

[58] **Field of Search** ..... 84/1.01, 423, 424, 430, 84/433–436, 438, DIG. 7; 200/1 R, 5 R, 237

[56] **References Cited**

UNITED STATES PATENTS

2,117,002	5/1938	Hammond	84/423
2,832,251	4/1958	Hayslett	84/433
3,110,211	11/1963	Elbrecht	84/423
3,120,146	2/1964	Stiles	84/433
3,205,754	9/1965	Becwar	84/433
3,306,152	2/1967	Klann	84/423
3,715,950	10/1972	Nordquist	84/433
3,740,448	6/1973	Olszowka et al.	84/1.01
3,797,357	3/1974	Thomas et al.	84/423

FOREIGN PATENTS OR APPLICATIONS

737,203	6/1966	Canada	84/433

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Stanley J. Witkowski
Attorney, Agent, or Firm—Olson, Trexler, Wolters, Bushnell & Fosse, Ltd.

[57] **ABSTRACT**

An octave of keys, as for an electronic organ, is formed as a unitary subassembly. A plastic hinge strip extending the length of an octave is provided. The sharp or black keys are formed integral with the hinge strip, while the key bars for the white or natural keys are likewise formed integral with the strip. White keys are snapped on to the key bars and the octave subassembly of keys is then mounted on the organ key bed as a unit and without individual adjustment of the respective keys.

13 Claims, 7 Drawing Figures

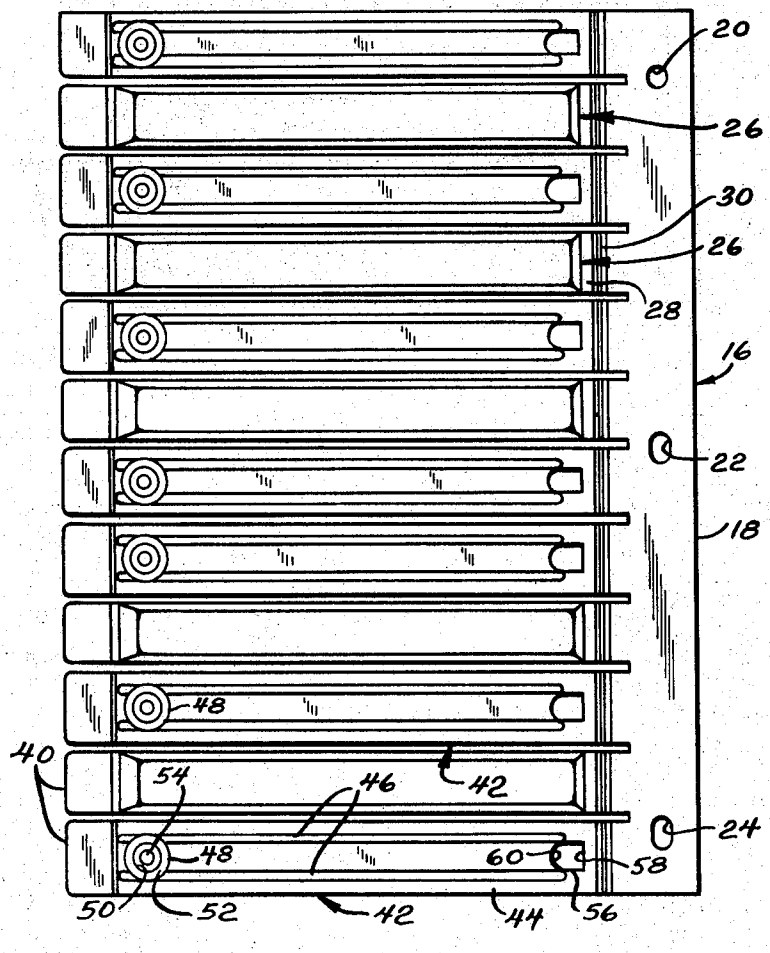
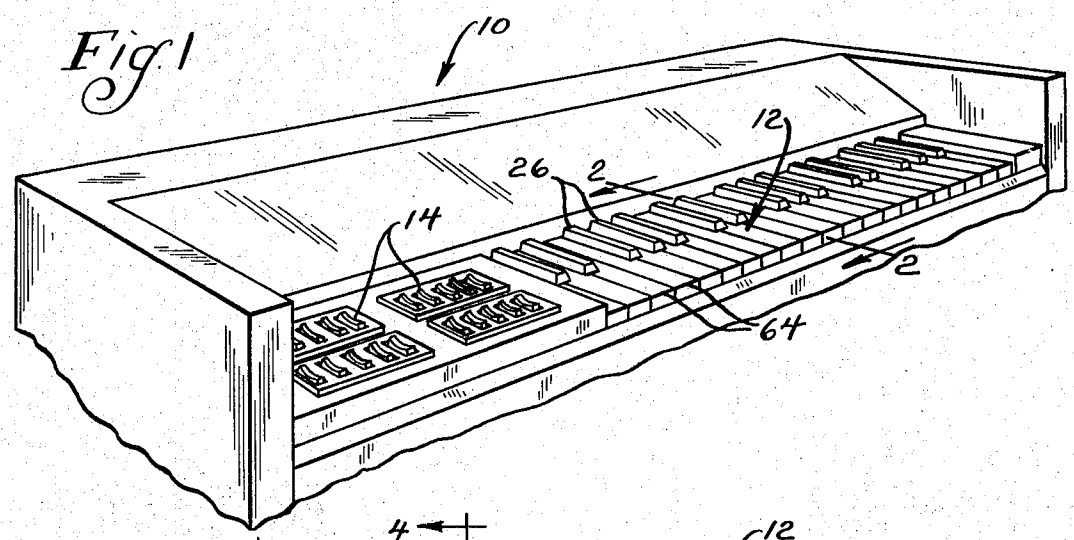


Fig. 1



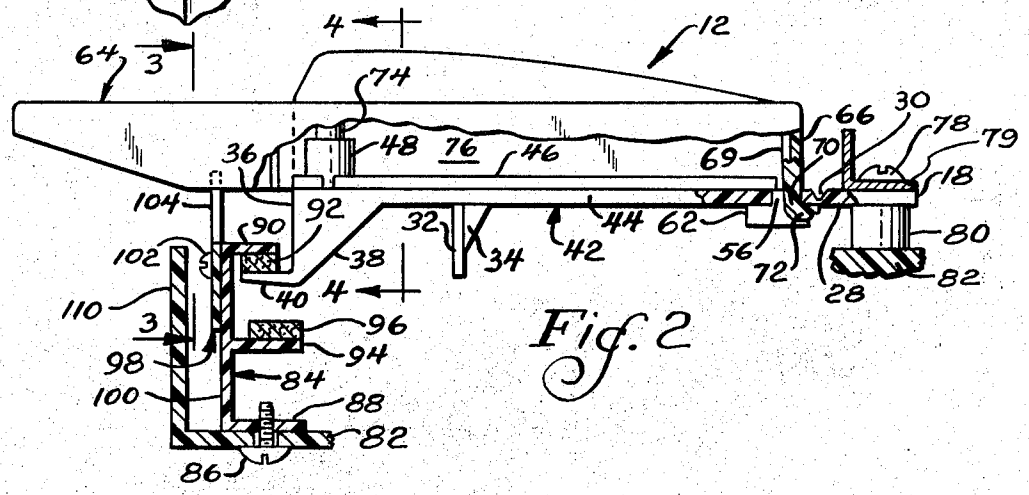


Fig. 2

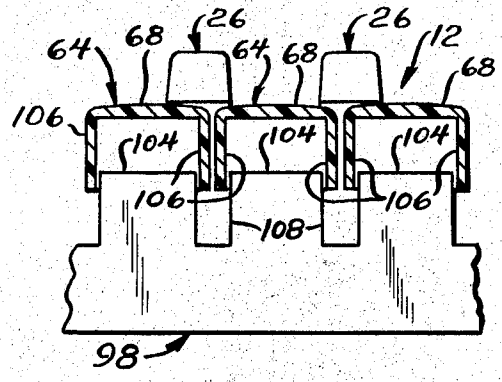


Fig. 3

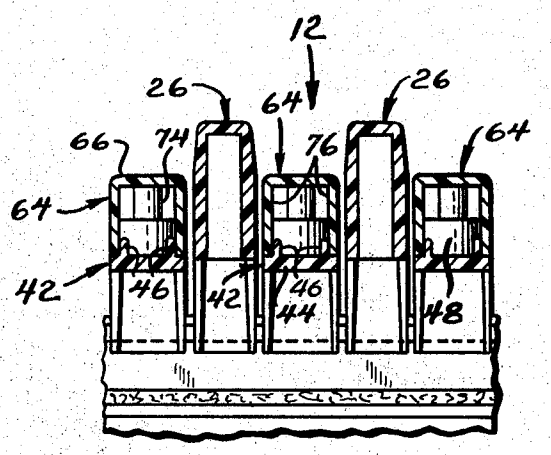


Fig. 4

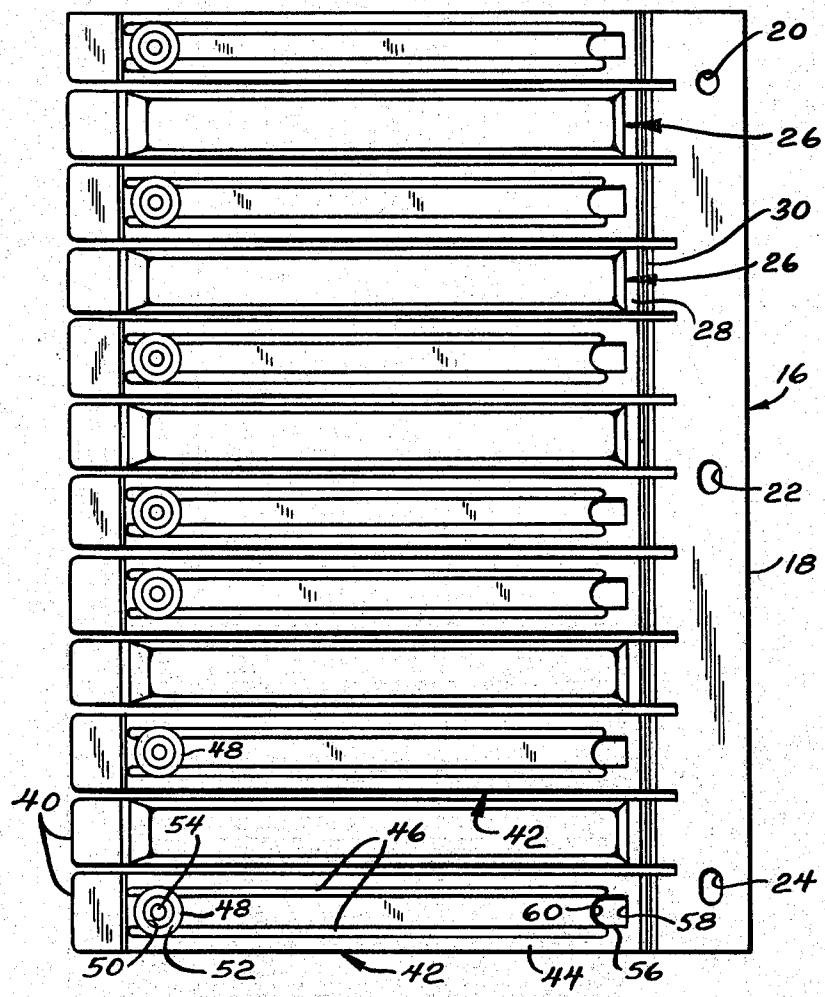


Fig. 5

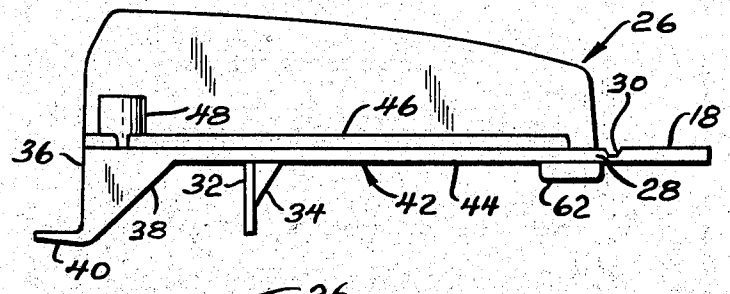


Fig. 6

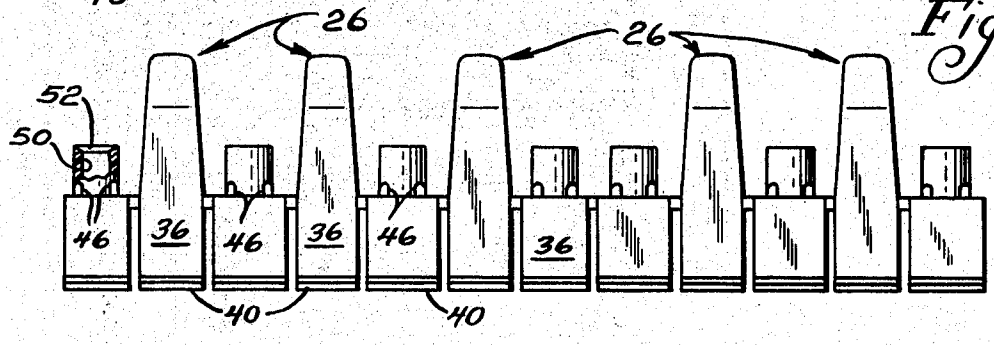


Fig. 7

KEY ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to improvements in the key and key mounting structure for keyboard musical instruments, particularly electronic organs and like instruments.

Historically, in the production of keys for musical instruments, and especially for electronic organs, it has been common practice to provide a key bar having a separate key mounted thereon, usually by means of screws, with the assembly being mounted by means of a mechanical hinge structure. Each key and key bar has had to be mounted individually, and considerable manual labor has been entailed for such mounting and for attendant ajustment.

In accordance with the invention disclosed and claimed in Howard M. Thomas et al U.S. Pat. No. 3,797,357, ELECTRONIC MUSICAL INSTRUMENT MECHANICAL CONSTRUCTION, subassemblies of keys are provided in which a plurality of plastic keys is formed integral with a mounting strip with a flexural section between each key and the mounting strip. In accordance with U.S. Pat. No. 3,797,357 it is necessary to have three subassemblies for each octave. In mounting this structure it is necessary to place three mounting strips on top of one another on a supporting base. The construction disclosed is generally satisfactory, but a certain amount of hand labor is necessary for placing each of the three assemblies in proper position and for securing the same in place.

A variation on the structure shown in Thomas et al U.S. Pat. No. 3,797,357 is found in R. A. Becwar U.S. Pat. No. 3,205,754. In this patent an octave group of white or natural keys is formed integral with a mounting strip, and there is an integral interconnecting flexural strip mounting each key on the mounting strip. Similarly, there is a separate group of sharp or black keys integrally molded with a single mounting strip with a flexural interconnecting strip between each kay and the mounting strip. This expedient still presents a problem in that two mounting strips must be mounted, one on top of the other, with screw receiving holes in each strip lined up with one another and with screw receiving structure on the organ key bed.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide plastic molded organ keys with all of the keys of an octave integrally joined to a single mounting strip by flexural plastic sections, whereby each subassembly comprising an octave of keys is mounted by securing only a single plastic strip in position on a key bed. More specifically, it is an object of the present invention to provide an organ key construction in which all of the keys of one color are molded integral with common mounting strip as are key bars corresponding to the keys of the other color, key caps or facings for the other keys being snapped into position on the key bars for mounting of the key assembly on a key bed.

In accordance with the foregoing objects an organ key and mounting structure is provided in which all of the black or sharp keys are integrally molded with a single mounting strip with flexural sections between the respective keys and the mounting strip. Likewise, all of the key bars corresponding to the natural or white keys

are formed integral with the single mounting strip with an intervening flexural section. White keys are snapped on to the respective key bars, whereupon the entire subassembly is readily mounted on a key bed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of the upper portion of an electronic organ constructed in accordance with and embodying the principles of the present invention;

FIG. 2 is a sectional view through the keyboard as taken substantially along the line 2—2 in FIG. 1;

FIG. 3 is a cross-sectional view on an enlarged scale and is taken substantially along the line 3—3 in FIG. 2;

FIG. 4 is a sectional view taken substantially along the line 4—4 in FIG. 2;

FIG. 5 is a top view showing the one-piece molding comprising mounting strip, flexural interconnecting strips; sharp or black keys, and key bars for the natural or white keys;

FIG. 6 is an end view of the structure in FIG. 5; and

FIG. 7 is a front view thereof.

DETAILED DESCRIPTION

Turning now in greater particularity to the drawings, and first to FIG. 1 there will be seen the upper portion of an electronic organ 10 having a keyboard 12. As will be understood, it is possible that the organ could have two keyboards, either one or two being common. In addition, the organ is provided with various sets of stop tablets 14 for effecting various controls on the organ, such as of voices or effects to be played.

Taking up the portions of the present invention in sequence, attention next should be directed to FIGS. 5–7. In these figures there is shown a keyboard subassembly corresponding to one octave of keys, and hence of organ notes. Such a subassembly is less than 6½ inches long, and the integral parts as hereinafter set forth can readily be molded in existing molding machines. It is contemplated that a complete keyboard subassembly could be molded in a larger machine. The present subassembly comprises a mounting strip 18 having three screw holes 20, 22 and 24 therein. The screw hole 20 is round for close coaction with a screw to locate the subassembly, while the other two holes are elongated or oblong to compensate for production tolerances.

The mounting strip has integrally molded therewith five black or sharp keys 26, each joined to the mounting strip 18 by a flexural strip 28 having a restricted area therein formed by a generally V-shaped notch 30 running transversely across the flexural strip 28. The plastic material preferably is polypropylene which is well adapted to the necessary flexing. The color used is black to correspond with the usual black color of the sharp keys. The flexural strips and mounting strips are not visible, and the color thereof accordingly is unimportant.

Each sharp key 26 (see also FIG. 4) comprises a downwardly opening box shaped structure having transverse reinforcing webs therein, one of which extends down as a yoke 32 reinforced by a triangular gusset 34, and having a pair of notches in the bottom thereof, generally as shown and described in Olszowka et al U.S. Pat. No. 3,740,448 to bear against a biasing spring and a whisker contact, generally in the same

manner as disclosed in the aforesaid Olszowka et al patent.

At the front or outer end of each sharp key **26** there is a depending wall **36** reinforced by triangular gusset walls **38** and having a forewardly or outwardly directing flange **40** thereon, which flange is cooperable with upstops and downstops as will be hereinafter set forth.

In addition, the mounting strip **18** further has integrally formed therewith a plurality of key bars **42** which likewise are joined to the mounting strip by flexural strips **28** and V-shaped notches **30** to enhance flexing. The V-shaped notches throughout are upwardly directed. Each natural key bar **42** has structure corresponding to some of the structure on the sharp keys, and hence identified by the same numerals, including the downwardly directed yoke **32** reinforced by gussets **34,** and including an end wall **36** reinforced by gussets **38,** and having an outwardly directed flange **40** for cooperation with an upstop and a downstop. Each key bar **42** further includes a flat, elongated base **44** (FIGS. **4–6**) with a pair of upstanding longitudinally ribs **46** spaced inwardly from the edges thereof.

Each key bar **42** adjacent the inner end thereof is provided with an upstanding hollow boss **48** having an outside diameter approximately equal to the space across the outsides of the ribs **46,** and having an inside diameter **50** with an inwardly tapered or beveled internal upper edge **52.** A small hole **54** is formed in the base **44** of each key bar within the hollow boss **48.**

Adjacent the opposite end of each key bar, and specifically just short of the notch **30,** there is formed a hole **56** (FIGS. **2** and **5**) having an inner right angle shoulder **58** and an outer arcuate edge **60.** The material in the vicinity of the hole **56** is reinforced by short ribs **62** on the underside of the base **44** and running beyond the hole in either direction longitudinally of the key bar.

Each key bar is provided with a natural key **64** having a relatively narrow inner end **66** fitting between the adjacent sharp keys **26** along a relatively wider outer end **68** extending beyond the sharp keys, each natural key being somewhat different from every other in shape, and the shape or outline being determined in accordance with the usual shape of organ and piano keys. Each natural key **64** is molded of white plastic material, polystyrene being a satisfactory example. Other suitable plastic materials are contemplated, and one other such good example is ABS. Each natural key is of a generally inverted box shape, and at the inner end thereof there is a depending wall **66** having a vertical reinforcing rib **69** on the inner surface thereof. The wall continues down as a relatively narrow projection **70** having a hooklike foot **72** thereon and extending forwardly therefrom, the rib continuing along the inner surface of the projection **70** and the undersurface of the foot **72.** The foot extends through the hole **56** with the key tipped at an angle, and locks beneath the right angle shoulder **58** thereof with the key lowered to horizontal position.

Each natural key **64** further is provided with a depending hollow post **74** aligned with the upstanding hollow boss **48.**

The external diameter of each post is such as to form a tight fit between side walls **76** of the narrowest natural keys, while the depending post **74** in each key forms a tight fit within the inner diameter or bore **50** of each boss.

To assemble a natural key **64** on the corresponding key bar the foot **72** of the depending projection is inserted through the hole **56** with the key at a shallow angle to the key bar. The post **74** is then pushed down into the corresponding boss **48,** the beveled edge **52** aiding in positioning. The aforesaid tight fits between the post and boss, and between the boss and side walls is sufficient to lock each key rather firmly on the key bar. It will be observed further that the ribs **46** lie in tight engagement with the side walls **76** of the keys whereby further to aid in retaining the keys on the key bars as well as in positioning the keys on the key bars. The inner diameter of each depending post **74** is substantially the same as the diameter of the hole **54** at the bottom of each boss **48.** Therefore, for conditions of severe usage, such as in schools and the like where children might be expected to pry up under the outer ends of the keys, a screw may be passed up through each key bar and threaded into the corresponding post **74** to form a pick-proof connection. However, without the aid of such screws the interference fit forms a sufficiently tight connection that is quite difficult to remove a key from the key bar short of prying with a screwdriver or the like.

Additional features of the present invention will be apparent with reference to FIGS. **2–4.** Screws **78** extend through holes in a clamping angle member **79** and through the holes **20, 22** and **24** in the mounting strip and are threaded into upstanding projections **80** on a key bed **82,** whereby to mount the keyboard subassembly **16** on the key bed. A plastic or metallic generally E-shaped molding or extrusion **84** is secured by means of screws **86** on a forward portion of the key bed **82,** the screws **86** being tapped into the lower flange **88** thereof. The upper flange **90** is somewhat narrower, and is provided on its underside with a strip of felt **92** or other suitable resilient material engageable with the flange **40** at the outer portion of each sharp key or key bar to serve as an upstop. Similarly, an intermediate flange **94,** all of the flanges being horizontal and in vertically spaced relation, is provided on its upper surface with a felt or other resilient strip **96** to serve as a downstop for engagement with the flange **40.**

A comb shaped plastic member **98** is secured to the outer surface of the web **100** of the E-shaped member **84** by means such as rivets or screws **102,** and has wide fingers **104** extending upwardly between the side walls **106** of the outer portions of the natural keys **64.** The broad fingers **104** are separated by slots **108** of suitable width to accomodate the side walls **106.** As will be seen particularly in FIG. **3** the fingers **104** of the member **98** serve as lateral positioning members for the natural keys to prevent undesired side-to-side movement of the keys. The sharp keys are, in turn, limited in lateral movement by the adjacent portions of the natural keys. In actual fact the flexural strip **28** joining each key bar to the mounting strip **18** has sufficient lateral stability that there is very little side-to-side wobbling of the keys in any event. However, since the natural keys are longer and can provide a greater lever action on the flexural strips, the upstanding teeth **104** of the comb shaped member **98** positively preclude more than the slightest lateral motion to these keys. The E-shaped member **84** and the lower portion of the comb shaped member **98** are hidden from view by an upstanding flange **110** at the outer edge of the key bed **82,** the entire key bed preferably being formed as a single piece

foamed plastic molding, generally of the nature shown in Thomas et al U.S. Pat. No. 3,797,357.

As will now be apparent we have provided a low cost keyboard subassembly for an electronic organ or the like requiring a minimum of manual labor in installing the keyboard subassembly. The two-piece construction of each natural or white key, i.e., key and key bar, requires a minimum of hand labor for assembly, whereby the entire keyboard can be produced at a most reasonable cost. Although the specific example of an octave subassembly of keys is practical in view of size limitations of molding machines, and to compensate for possible accumulative tolerances, it is contemplated that with suitable molding machinery the entire length of the keyboard could be made with a single mounting strip having all sharp keys and natural key bars integral therewith. The specific example of the invention as herein shown and described is for illustrative purposes only. Various changes in structure will no doubt occur to those skilled in the art, and 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 assembly for use as in a musical instrument keyboard comprising an elongated mounting strip for attachment to supporting structure, a plurality of keys of a first type, a plurality of flexural portions respectively integrally connecting said keys of said first type to said mounting strip, a plurality of key bars corresponding to keys of a second type, a plurality of flexible portions respectively integrally connecting said key bars to said mounting strip, and a plurality of keys of said second type respectively secured to said key bars.

2. A key assembly as set forth in claim **1,** wherein the keys of the first type comprise sharp keys and the keys of the second type comprise natural keys.

3. A key assembly as set forth in claim **1,** wherein the plurality of keys of the second type are respectively secured to the key bars.

4. A key assembly as set forth in claim **3** and further including means forming a hook connection between each key of said second type and a respective key bar.

5. A key assembly for use as in a musical instrument keyboard comprising a molded plastic elongated mounting strip for attachment to supporting structure, a plurality of plastic keys of a first type integrally molded with said mounting strip, an integrally molded plurality of flexure portions respectively integrally connecting said keys of said first type to said mounting strip, a plurality of integrally molded key bars corresponding to keys of a second type, a plurality of integrally molded flexible plastic portions respectively integrally connecting said key bars to said mounting strip, and a plurality of keys of said second type respectively secured to said key bars.

6. A key assembly as set forth in claim **5,** wherein the integrally molded plastic parts are of one type of plastic and the second type of keys are of a different type of plastic.

7. A key assembly as set forth in claim **5,** wherein each key of a second type is secured to its respective key bar by means of a hooklike interconnection and means providing a friction fit.

8. A key assembly as set forth in claim **5,** wherein each key bar is provided with a hollow upstanding boss and each key of a second type is provided with a depending post frictionally received in a respective boss to secure said key of a second type to the respective key bar.

9. A key assembly as set forth in claim **8,** wherein each key of a second type has depending side walls frictionally engaging exterior portions of a respective boss.

10. A key assembly as set forth in claim **8,** wherein each key bar has upstanding ribs extending longitudinally adjacent its side edges, and each key of a second type has depending side walls embracing said ribs.

11. A key assembly as set forth in claim **9,** wherein each key bar has upstanding ribs extending longitudinally adjacent its side edges, and each key of a second type has depending side walls embracing said ribs.

12. A key assembly as set forth in claim **8,** wherein each of said posts is hollow.

13. A key assembly as set forth in claim **12,** wherein each key bar has a hole through it within a respective boss and aligned with a respective hollow post to permit threading of a retaining screw into said post.

* * * * *