

[54] **WOODEN KEY SHANK ASSEMBLY FOR  
KEYBOARD MUSICAL INSTRUMENT**

165,024	6/1875	Pratt .....	84/438
423,076	3/1890	Newell .....	84/437
442,166	12/1890	Boyes .....	84/433

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[57] **ABSTRACT**

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[52] U.S. Cl. .... **84/438, 84/423, 84/452**

[51] Int. Cl. .... **G10c 3/12**

[58] Field of Search .....

84/423, 430, 431,
84/433, 438, 437, 452

A wooden key shank assembly as for a piano including a plurality of elongated key shanks juxtaposed in the order of musical notes. The key shanks each consist of a front half portion depressed by player's fingers in performance and a rear half portion so arranged as to move a piano action mechanism to strike a corresponding string, the lengthwise direction of the rear half portion being deviated from that of the front half portion. The front and rear half portions are connected to one another by a dovetail joint, with their grains extending along the respective lengthwise directions of the two portions. Thus, the assembly, especially the rear portions thereof, increase their mechanical strength.

[56] **References Cited**

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**3 Claims, 9 Drawing Figures**

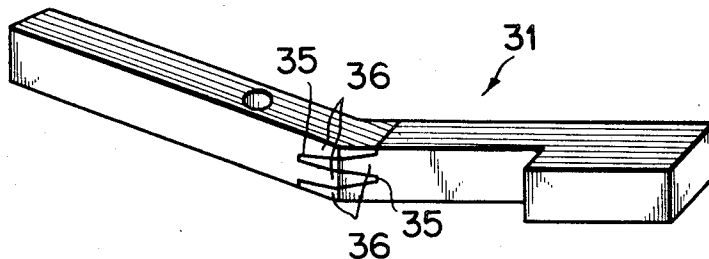


FIG. 1 PRIOR ART

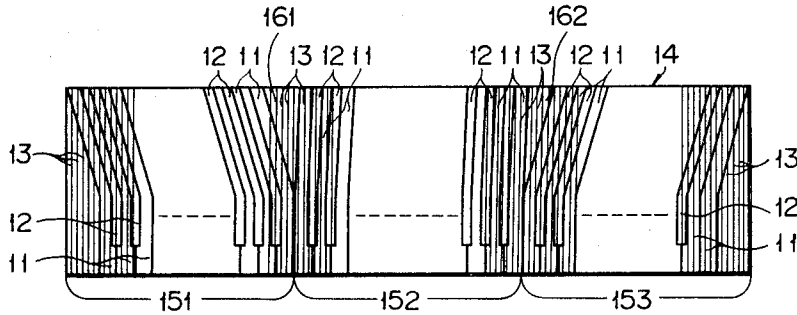


FIG. 2 PRIOR ART

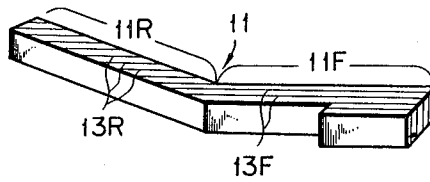


FIG. 3A

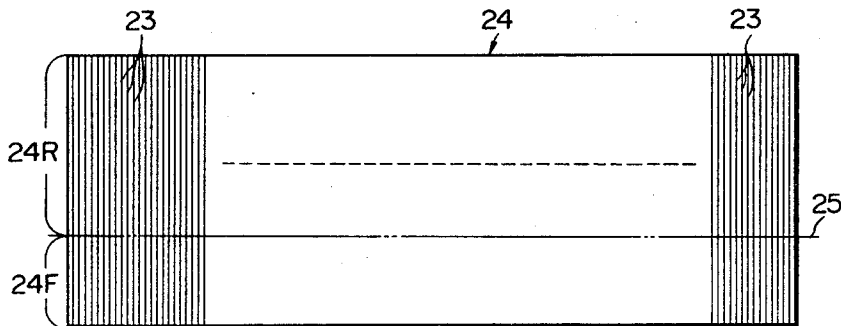


FIG. 3B

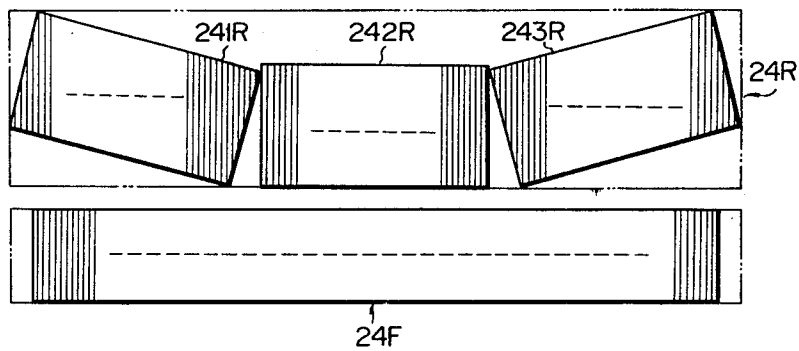


FIG. 3C

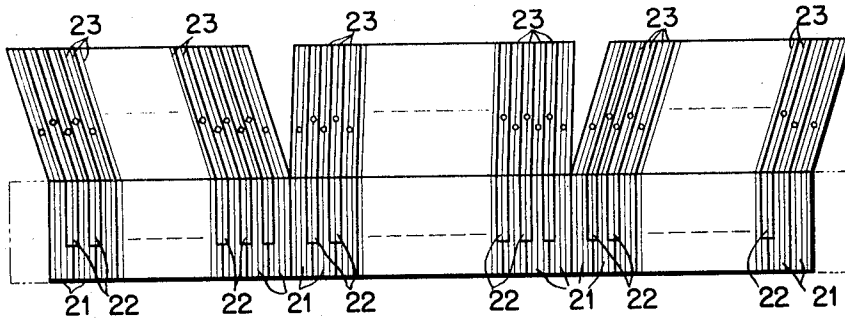


FIG. 3D

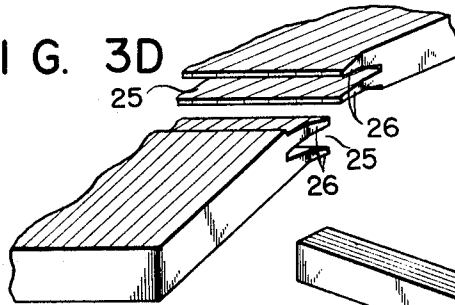


FIG. 3E

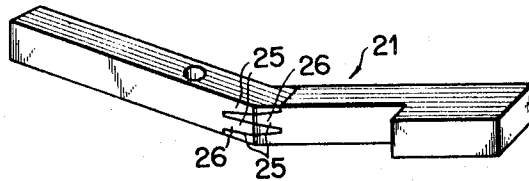


FIG. 4

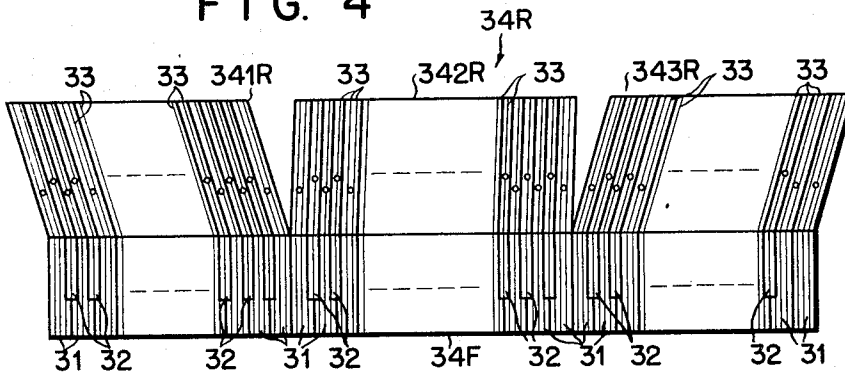
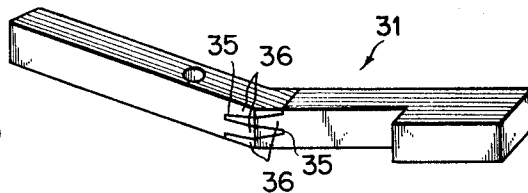


FIG. 5



## WOODEN KEY SHANK ASSEMBLY FOR KEYBOARD MUSICAL INSTRUMENT

### BACKGROUND OF THE INVENTION

This invention relates to wooden key shank assemblies used in musical instrument keyboards and also to a method of manufacturing the same and more particularly to improvements therein most suitable for a piano keyboard.

FIG. 1 is a schematic plan view by way of illustrating the method of manufacturing the prior art typical wooden piano key shanks. A single piece of rectangular wooden plate 14 is first provided having sufficient dimensions to cut out all elongated black and white (natural, sharp, and flat) key shanks 11 and 12 of one keyboard, which are arranged in juxtaposed relation in the order of musical notes, and bearing grains 13 extending in the same direction, that is, substantially in the lengthwise direction of the key shanks 11 and 12. The wooden plate 14 is then continuously cut to obtain all of the required shanks 11 and 12 in conformity with the prescribed arrangement and dimensions thereof, followed by covering them with black and white key caps.

The piano key shanks generally consist of a front half portion that is selectively depressed by a player's fingers and an integral rear half portion extending from the front half portion and acting so as to strike a corresponding string through the known piano action mechanism, thereby producing by the vibration of the string a musical sound having a predetermined pitch. In performance, therefore, the rear half portion of the key shank is subject to a greater depression force than the front half portion.

The key shanks 11 and 12, which lie in the intermediate musical note section 152, are so formed, as shown in FIG. 1, as to have the front and rear half portions arranged substantially linearly, whereas the key shanks 11 and 12 which lie in the low and high musical note sections 151 and 153 each have the rear half portion 11R bent outward at a prescribed angle (generally about 15°) relative to the front half portion 11F to match the arrangement of the piano action mechanism. There is shown in FIG. 2 a single white key shank 11 belonging to the high musical note section 153. The rear half portion of the key shank located at the inner end of the low musical note section 151 and that of the intermediate musical note section 152 disposed opposite thereto, as well as the rear half portion of the key shank fitted at the inner end of the high musical note section 153 and that of the intermediate musical note section 152 positioned opposite thereto, define the waste portions 161 and 162 of the material wooden plate 14 when the key shanks are cut out therefrom. It will be noted that FIG. 1 shows part of the grains 13 and part of the black and white key shanks 11 and 12 belonging to the low, intermediate and high musical note sections 151, 152 and 153.

The piano key shanks 11 and 12 which are manufactured, as described above, from a single piece of wood present a relatively small mechanical strength. Thus, the piano key when depressed in performance, with the depression force being concentrated as it is applied to the middle part, that is, near the border area between the front and rear half portions, give rise to breakage near the border area. And what is worse, a through hole is bored in the rear half portion near this border area, making the border area weaker. Therefore, the prior

art manufacturing method has the drawbacks that the material wooden plate 14, constituting the key shanks 11 and 12, should be relatively thick, resulting in the increased volume, weight and cost of the keyboard.

The grains 13R, FIG. 2, of the rear half portions 11R of the key shanks 11 and 12 which are associated with the low and high musical note sections 151 and 153 are inclined to the lengthwise direction of the rear half portion at a substantially equal angle to that at which the front and rear portions 11R and 11F are bent toward each other. Namely, the grains 13F and 13R of the front and rear half portions 11F and 11R indicate lack of uniformity in respect of the angle which they define with the respective lengthwise directions of the half portions 11F and 11R. Accordingly, there result the following difficulties. As compared with the key shanks of the intermediate musical note section 152 wherein the direction of the grains 13 of the front and rear half portions 11F and 11R is substantially aligned with that in which the half portions 11F and 11R are cut out, the key shanks of the low and high musical note sections 151 and 153 wherein the grains of the front and rear half portions 11F and 11R present unequal arrangements, as described above, have a smaller mechanical strength and render the bent portion near the border area between the front and rear half portions subject to a more frequent occurrence of breakage. In addition, the key shanks of the low and high musical note sections 151 and 153 more often present prominently different degrees of warpage and distortion resulting from variations in ambient humidity and temperature between the front and rear half portions than the key shanks of the intermediate musical note section 152, thus giving rise to unavoidable abutment between adjacent hammers actuated by the key shanks.

### SUMMARY OF THE INVENTION

It is accordingly the object of this invention to provide wooden key shanks, including the manufacturing method thereof, which have a great mechanical strength to a depression force applied thereto in performance and are less subject to the effect of variations in ambient humidity and temperature.

According to one aspect of the present invention, there is provided a wooden key shank assembly for a keyboard musical instrument having a plurality of elongated key shanks juxtaposed in the order of musical notes wherein each of the key shanks comprises an elongated front half portion, and an elongated rear half portion joined to the front half portion, the grains of the front and rear half portions being directed along the respective lengthwise directions of the front and rear half portions.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view of a single plate or piece of wooden material from which there have been cut out piano key shanks according to the prior art;

FIG. 2 is an enlarged perspective view of a single white (natural) key shank taken out of those locating the high musical note section of FIG. 1;

FIGS. 3A to 3E illustrate the sequential steps of cutting out key shanks from a single piece or plate of wooden material according to an embodiment of the invention: FIGS. 3A to 3C are schematic plan views of an entire key shank; FIG. 3D is a partial enlarged exploded perspective view of a key shank as shown in

FIG. 3C, indicating the joint structure of the front and rear half portions; and FIG. 3E is an enlarged perspective view of a joined white key shank of the high musical note section;

FIG. 4 is a schematic plan view illustrating the steps of cutting out wooden key shanks according to another embodiment of the invention; and

FIG. 5 is an enlarged perspective view of a white key shank taken from the high musical note section of FIG. 4 which has been fully assembled by joining the front and rear half portions that have been cut out according to the embodiment of FIG. 4.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

There will now be described by reference to FIGS. 3 to 5 wooden piano key shank assemblies manufactured according to the preferred embodiments of this invention. FIGS. 3A to 3C are schematic plan views illustrating the sequential steps of manufacturing all elongated black and white (natural and sharp and flat) key shanks required for one piano from a single wooden plate according to an embodiment of this invention. A rectangular wooden plate 24 is first provided having sufficient dimensions to cut out all required black and white key shanks 21 and 22 (FIG. 3C) and bearing grains 23 extending substantially parallel to each other in one direction. The wooden plate 24 is cut into two rectangular blocks 24F and 24R along a broken line 25 of FIG. 3A running at right angles to the direction of the grains 23. As will be explained hereinafter, the block 24F constitutes the front half portions of the key shanks 21 and 22 which are adapted to be selectively depressed by a player's fingers in performance and another block 24R constitutes the rear half portions of the key shanks 21 and 22 which are designed to strike the respective strings of corresponding musical notes through the known piano action mechanism.

The blocks 24F and 24R of the front and rear half portions separated from the wooden plate 24 are further cut up for the respective key shanks 21 and 22. In this case, the block 24F constituting the front half portions is cut up in such a manner that the direction of the grains 23 is aligned with that in which the front half portions are to be cut out, irrespective of whether they belong to the low, intermediate or high musical note section. In contrast, if the block 24R constituting the rear half portions is cut up in the same way as that of the front half portions, then the direction of the grains 23 will be inclined to that in which the rear half portions of the low and high musical note sections are to be cut out, by as much as the angle at which the rear half portions are bent outward to match the arrangement of the piano action mechanism, though the grains 23 are aligned with the direction in which the rear half portions of the intermediate musical note section are to be cut out.

According to this invention, therefore, before there are cut out the front and rear half portions from the blocks 24F and 24R separated from the wooden plate 24, the rear half block 24R is further split into a first division 241R representing the low musical note section, a second division 242R associated with the intermediate musical note section and a third division 243R belonging to the high musical note section so as to cause the direction of the grains 23 to be aligned with that in which the rear half portions 24R are to be cut

out. The divisions 241R, 242R and 243R are cut out of those parts of the material wooden plate 24 which are indicated in FIG. 3B. Thereafter, the block 24F of the front half portions and the block 24R of the rear half portions, divided into the three divisions 241R to 243R denoting the low, intermediate and high musical note sections, are set in place, as shown in FIG. 3C, in conformity with the arrangement of the key shanks 21 and 22. Then the shanks 21 and 22 are continuously cut out according to their arrangement and dimensions. At the mutually facing ends of the front and rear half portions 24F and 24R are formed dovetail joints which are capable of tight bonding as illustrated in FIG. 3D in which the concave portion is indicated by 25 and the convex portion by 26. The dovetail joints are tightly fixed with an adhesive, for example, glue. Of the block 24R constituting the rear half portions, the divisions 241R and 243R representing the low and high musical note sections should be cut out in a form inclined to the division 242R of the intermediate musical note section. Further, the mutually facing ends of the key shanks 21 and 22 have to be provided with dovetail joints. Therefore, it is necessary to use a wooden plate of light material 24 having sufficiently larger dimensions than the actual key shanks 21 and 22 to provide the joints.

As mentioned above, the key shank of this invention consists of a front half portion selectively depressed by a player's fingers in performance and a rear half portion extending therefrom to strike the string of a corresponding musical note through a piano action mechanism. The direction of the grains of the front and rear half portions of each key shank are aligned with the lengthwise directions of the respective half shank portions, and the mutually facing ends of the front and rear half portions of each shank are integrally joined by dovetail joints. Therefore, the key shanks of this invention (which are finished by mounting plastic or ivory caps thereon) have a far greater mechanical strength to a depression force applied thereto than the conventional key shanks manufactured as illustrated and described by reference in FIG. 1. Generally, the key shanks of the low and high musical note sections in which the rear half portion is inclined outwardly at an angle to the front half portion have a smaller mechanical strength to a depression force than the key shanks in which the front and rear half portions are arranged substantially linearly. However, the key shanks of the low and high musical note sections in which the front and rear half portions are joined in the aforementioned manner, that is, the grains of each half shank portion extend along the lengthwise direction of the half shank portion, can display a much greater mechanical strength to a depression force than the prior art key shanks wherein the grains of the rear half portions are not extended in the lengthwise direction of the rear half portions. This has the effect of balancing the mechanical strength of the key shanks of a keyboard as a whole to a depression force applied thereto. Accordingly, the key shanks can be manufactured from as thin a material wooden plate as possible, offering the advantage of reducing the volume, weight and cost of a piano.

Further, the piano key shanks manufactured according to this invention are far less subject to warpage or distortion resulting from variations in ambient humidity and temperature than the prior art key shanks prepared in the manner illustrated in FIG. 1, thus effectively pre-

venting the abutment of adjacent hammers actuated by the key shanks.

The foregoing description refers to the case where all piano key shanks are cut out from a large single plate of wooden material. However, such wooden material is difficult to procure and considerably expensive.

Further, the rear half portion should have, as previously mentioned, a greater mechanical strength to a depression force than the front half portion. In view of these facts, therefore, there may be manufactured wooden piano key shanks in a different way according to another embodiment of this invention. The steps being illustrated in FIGS. 4 and 5.

There is used a plurality of wooden plate like members in manufacturing all of the black and white (natural, sharp, and flat) key shanks required for one piano. That is, the front half portions 34F and the rear half portions 34R are made of different wooden materials as later described. In this case the rear half portions 34R are prepared from such raw wooden material as has a greater mechanical strength to a depression force than that which constitutes the front half portions 34F.

The wooden plate 34R forming the rear half portions is split into three divisions 341R, 342R and 343R representing the low, intermediate and high musical note sections respectively so as to cause the direction of the grains 33 to be aligned with that in which the rear half portions are to be cut out (see FIG. 3B). The single material wooden plate 34F and the aforesaid three divisions 341R to 343R of the wooden plate 34R are arranged in accordance with the order of the key shanks 31 and 32. Under this condition, front and rear half portions are continuously cut out in conformity with the prescribed dimensions thereof (see FIG. 3C).

The mutually facing ends of the front and rear half portions 34F and 34R of the individual key shanks 31 and 32 are connected, as illustrated and described in FIG. 3D, by means of dovetail joints, of which the concave portion is indicated by 35 and the convex portion by 36. The dovetail joints are later firmly bonded with an adhesive, for example, glue. FIG. 5 is a perspective view (see FIG. 3E) of a single white (natural) key shank 31 taken out of those belonging to the high musical note section which have been manufactured in the aforementioned manner.

As is apparent from the above explanation, the bonding between the front and rear half portions may be done before each key shank is cut out of the wooden plates. That is, the wooden plates constituting the front and rear half portions 34F and 34R may be dovetailed and bonded before they are cut into key shanks, and thereafter the wooden plates 34F and 34R may be continuously cut away into key shanks having rigidly connected front and rear half portions.

The trees whose timbers are deemed suitable to man-

ufacture piano key shanks include the birch, maple, silver fir, spruce, linden and pine, of which the birch has the greatest mechanical strength to a depression force, the mechanical strength becoming less in the order mentioned.

Experiments associated with this invention show that the combinations of wooden materials listed in the table below are particularly preferred for manufacture of the front and rear half portions 34F and 34R of the key shanks 31 and 32.

TABLE

Combination	Key shanks	
	Front half portion	Rear half portion
1	spruce	silver fir
2	silver fir	birch
3	linden	silver fir
4	spruce	maple
5	pine	silver fir

It will be apparent that provided the rear half portion can be made mechanically stronger than the front half portion, any other wooden materials than those given in the table above may be combined as desired.

Wooden piano key shanks manufactured in the manner shown in FIGS. 4 and 5 offer the advantage that material wooden plates may be of relatively narrower width and are more easily procurable and can be used in a appreciably thinner form than those required to manufacture key shanks according to the method illustrated in FIGS. 3A to 3E. The advantage will be further increased if the wooden material 342R used as the rear half portions 34R representing the intermediate musical note section may be of different grade from the wooden materials 341R and 343R forming the rear half portions 34R belonging to the low and high musical note sections with the latter wooden materials chosen to present a greater mechanical strength than the former.

We claim:

1. A keyboard for a keyboard musical instrument comprising a plurality of keys juxtaposed in the order of musical notes, each of said keys having a front portion and a rear portion, said rear portion being inclined at an angle to said front portion, each of said portions consisting of a shank made of a single piece of wooden material having the grain thereof running entirely in the lengthwise direction of said each portion, and said front and rear portions join together into an integral structure.

2. A keyboard as in claim 1 wherein said front portion is made of one material and said rear portion is made of a different material.

3. A keyboard as in claim 2 wherein the wooden material of the rear portion has a greater resistance to impact than the material of the front portion.

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