May 17, 1966 H. G. WICKHAM 3,251,102

METHOD FOR CASTING PIANO PLATE

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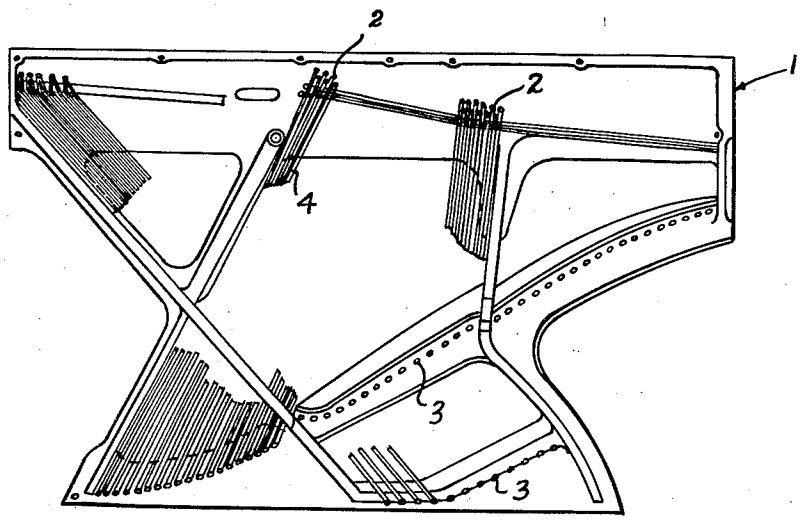


Fig-1

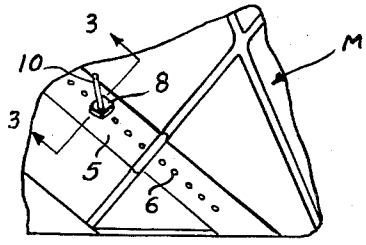


Fig-2

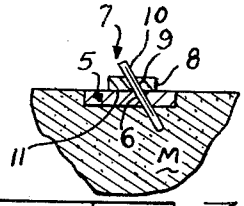


Fig-3

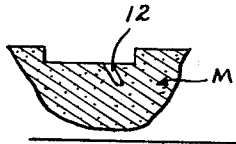


Fig-4

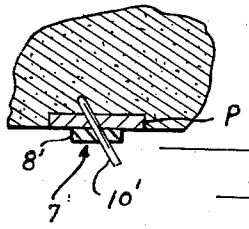


Fig-5

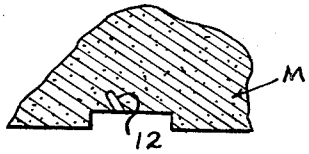


Fig-6

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METHOD FOR CASTING PIANO PLATE

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This invention relates to improvements in piano plates and more particularly to providing piano plates with integrated hitch pins. It affords both an improved end product and a novel relatively inexpensive method of effecting the same.

The art of fabricating piano plates is simple yet beset with problems. Among these problems are the difficulties experienced in applying hitch pins to the plates. Hitch pins are conventionally applied by an inefficient laborious procedure. The plate is first cast, following which the individual holes for each hitch pin must be carefully drilled, the pins individually inserted in the holes, fixed to the plate and then bent at the proper angle to the plate surface. Not only is this procedure time consuming and costly but it is difficult to properly orient the pins and many times the manner of their application causes them to break or come loose.

Efforts have been previously made to overcome these difficulties by preforming the hitch pins and incorporating them in the piano plates as they are cast. However, such efforts have met with little success. The joints effected between the preformed pins and the plates are generally poor. In addition, the preformed pins draw heat from the plate material in its fabrication in a manner to both weaken the pin and the plate structure in adjacent areas. The result is frequent failure of the hitch pins under load and in some instances serious failure in plate structure itself.

The present invention is the first to overcome the problems above mentioned. It provides a simple, economical and novel method of incorporating hitch pins in piano plates whereby the plates are caused to have a uniform high quality and strength throughout. The invention method reduces the procedure as to the application of the pins to an absolute minimum and pins so incorporated have substantially increased resistance to fracture. Moreover the problems of loose pins and brittle plates are eliminated.

A primary object of the invention is to improve the construction of piano plates as well as the method and means for integrating hitch pins therein whereby such piano plates are more economical to manufacture, more efficient and satisfactory in use and more durable in character.

A further object of the invention is to provide an improved piano plate having hitch pins so incorporated as to provide it with uniformly high quality and strength.

Another object of the invention is to provide a novel method of incorporating hitch pins in piano plates.

An additional object of the invention is to provide a method of providing hitch pins on piano plates reducing the procedures and cost in their application to a minimum.

A further object of the invention is to provide a piano plate possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is

shown one but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is a plan view of a piano plate in accordance with the invention;

FIG. 2 is a fragmentary view disclosing a procedure utilized in forming a plate such as shown in FIG. 1;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is a sectional view of the mold resulting from FIG. 3;

FIG. 5 is a fragmentary view disclosing a modified procedure for forming a plate such as shown in FIG. 1 in accordance with the invention; and

FIG. 6 is a sectional view of the mold resulting from FIG. 5.

Like parts are indicated by similar characters of reference throughout the several views.

The invention can be best described with reference to the accompanying drawings.

FIG. 1 illustrates a piano plate **1** in accordance with the invention having a conventional external configuration. The plate **1** mounts tuning pins **2** in projected relation to its upper surface adjacent one side and hitch pins **3** projected from the same surface of the plate adjacent an opposite side. The hitch pins **3** are oriented to respectively anchor loops in piano strings **4** which are conventionally stretched between the hitch pins and associated tuning pins. The pins **3** are uniformly inclined to the plate **1**, in their entirety, in a direction away from the associated tuning pins. Application of tension to the strings **4** at the respective tuning pins causes the looped portions of the strings to anchor to the base of the hitch pins over which they are positioned.

In accordance with the invention hitch pins **3** are formed integral with the piano plate per se as it is cast. While several means may be utilized to provide a piano plate with truly integrated hitch pins, only two are represented herein.

The plate **1** may be fabricated in accordance with the invention as follows. Conventional patterns are utilized to form the upper and lower sand molds for casting the plate. Molding flasks are placed over the patterns and sand injected and tamped down to thereby create depressions in the respective molds which together define the required configuration for the piano plate. In the process, the lower mold M for the top surface of the plate will be provided with depressions for forming the bridge portions of the plate which are to mount the hitch pins **3**. Jig plates **5** having a configuration to nest in the recesses in the lower mold portion which define the areas of the plate which mount the hitch pins are then placed in such depressions. The plates **5** are provided with a series of apertures **6** therethrough having a relative spacing corresponding to the spacing desired with reference to the hitch pins to be integrated in the end product piano plate. It will be seen from FIG. 3 of the drawings that the apertures **6** are inclined in plates **5** and oriented relative the base of the depressions which plates **5** abut at an angle identical to the angle at which the hitch pins are required to be inclined to the upper piano plate surface.

Having placed the jig plates **5** in the appropriate recesses in the mold M, gauge unit **7** is then applied thereto. The gauge **7** includes a plate **8** having one or more apertures **9** therethrough at an angle identical to the angle of apertures **6** in plates **5**. A rod **10** is projected through each aperture **9** and adjustably fixed relative plate **8** to project a predetermined distance from one surface **11** thereof. The surface **11** is adapted to abut and mate with the outermost surface of jig plates **5** as the gauge unit is applied thereto.

Referring to FIG. 3 of the drawings, the gauge unit **7** is applied to the jig plates **5** to have each rod **10** project axially through an aperture **6** as plate **8** seats to the outer-

most surface of plates 5. The orientation of the rods 10 is such that they smoothly project through apertures 6 to create rodlike depressions 12 in the base of the mold recesses in which the jig plates are applied. There is thus provided precision control of the movements of the rods 10 as the gauge unit 7 is applied so that, when the gauge unit is withdrawn, the depressions 12 made by the rods 10 are smooth and uniform in contour and inclination. Due to the character of the jig plates, plate 8 and the orientation of the apertures 6 and 9, the depressions 12 in the lower sand mold are so oriented and of a depth to precisely reproduce the configuration of the hitch pins which must be integrated in the final product piano plate.

The upper and lower sand molds are then superposed and clamped together. The material for casting the piano plates is introduced in a conventional manner to fill the cavity provided between the sand molds. In the process the material will seek and fill the depressions 12 to provide in the end product a piano plate having truly integral hitch pins, the internal structure of which is substantially identical with that of the piano plate per se. A bond is effected between the hitch pins 3, thus cast, and the plate per se which offers maximum strength at the joint therebetween and uniform quality throughout. The piano plate so formed eliminates the problems of loose pins, weak joints and faults usually found in piano plates to which hitch pins are conventionally applied. Moreover, the invention method produces a substantial reduction in time, effort and expense attendant the fabrication of piano plates.

It will of course be obvious that the gauge unit employed may include any number of recess forming pins 10 suitably projected from a common plate 8 which defines the limit of their capabilities in a precise fashion.

FIGS. 5 and 6 illustrate another method of forming the necessary depressions in the sand mold M to enable an improved piano plate to derive in accordance with the invention. In this instance, the same type gauge unit 7' is employed but applied directly through the lower mold pattern P, per se. Apertures 6' are formed in the pattern P relatively inclined in the same way as in the case of the jig plates 5. The apertures 6' are arranged in position and number corresponding to the spacing and orientation required for providing the piano plate 1 with hitch pins 3.

Thus, on positioning the pattern, a gauge unit 7' may be applied to its undersurface to project rods 10' through the apertures 6' and at an angle to the surface of the pattern corresponding to the required angle to the hitch pins 3 relative the piano plate 1.

In this modification, the conventional flask is placed over and about the pattern for the lower sand mold and sand poured into the flask and tamped down. Following this, gauge unit 7' is applied to the underside of the pattern to project rods 10' through apertures 6' until plate 8' abuts the undersurface of the pattern. Then gauge 7' may be withdrawn, the rods 10' smoothly sliding out of the mold and through the pattern. On withdrawal of the gauge unit, rod-like depressions 12' are left in the sand forming the lower mold conforming to the required shape and inclination of the hitch pins 3 to be effected in molding the piano plate. The lower sand mold so formed is then inverted and positioned under the upper sand mold which has been conventionally formed and the piano plate 1 cast as previously described. It will be seen that the hitch pins resulting on the piano plate are truly a completely integral part thereof. They are provided with an internal structure forming uniform joints of substantial strength with reference to the body of the piano plate per se.

It has been found that the strength and load characteristics of hitch pins 3 so incorporated in a piano plate are substantially greater than those of the preformed pin.

The very simplicity of the invention procedure enables mass production techniques to be applied to the fabrication of the piano plates. This has not before been possible. Moreover, the piano plate resulting has a more effective and efficient lifetime operation.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim.

1. A method of fabricating a piano plate with integral hitch pins, including the steps of forming a sand mold of piano plate configuration, said mold having a cavity with a principal plane to form a hitch pin mounting portion of the plate, seating in said cavity a guide plate having a configuration to nest therein, said plate having apertures therethrough disposed at an acute angle to the said principal plane of said cavity, placing on said plate a gauge member having rod-like projections from the bottom thereof at angles corresponding to the angle of said apertures, thereby inserting said projections through said apertures to form depressions of corresponding angularity in said mold, and utilizing the sand mold so formed to cast a piano plate in a conventional manner, said depressions producing a hitch pin mounting portion with integral hitch pins.

2. A method according to claim 1, characterized in that said rod-like projections are of a length to form depressions of predetermined depth in the sand mold, said projections being adjustable relative to said gauge member to vary said depth.

3. A method according to claim 2, wherein the bottom of said cavity defines the upper surface of said plate portion from which said hitch pins project, said guide plate resting on the said bottom of said cavity and said projections reacting on said gauge member to penetrate said sand mold through the bottom of said cavity and form communicating depressions having an angularity as described.

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