April 29, 1947. S. C. SHILL 2,419,734

MUSICAL INSTRUMENT

Filed Sept. 19, 1944

Fig. 1.

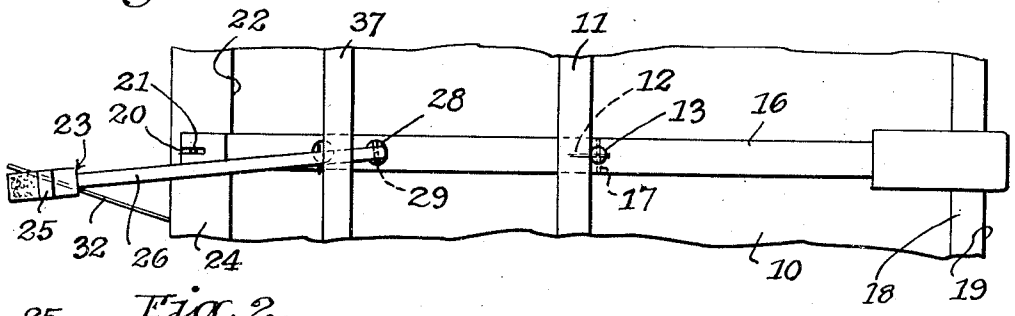


Fig. 2.

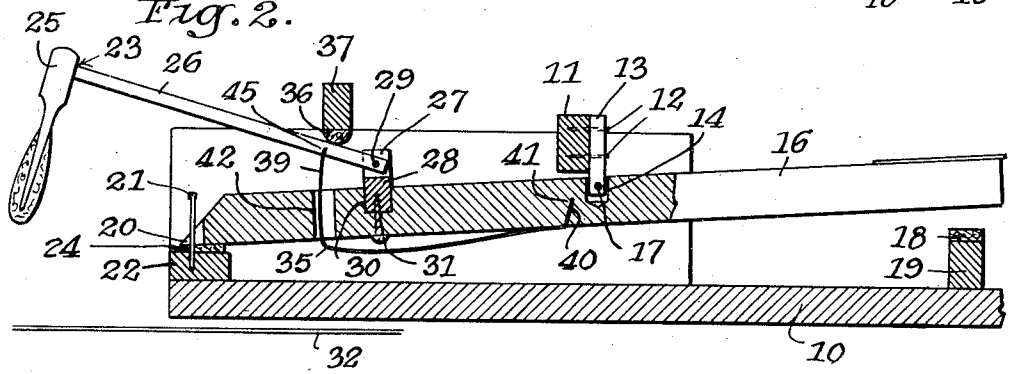


Fig. 3.

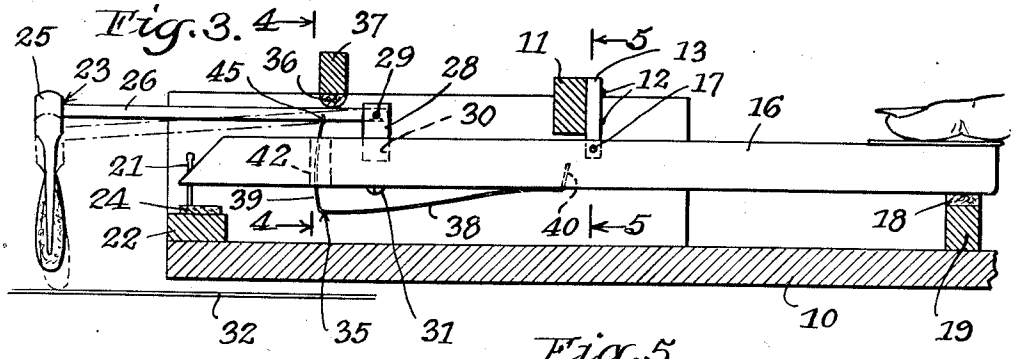


Fig. 4.

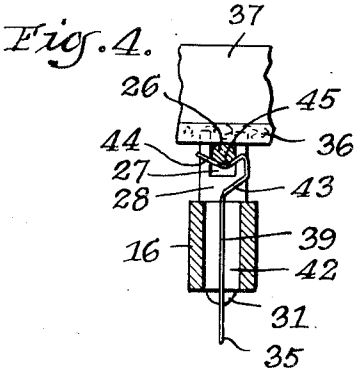
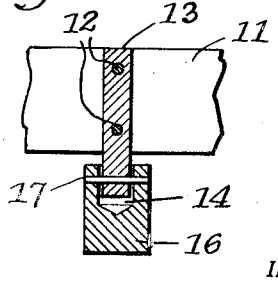


Fig. 5.



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UNITED STATES PATENT OFFICE

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MUSICAL INSTRUMENT

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Application September 19, 1944, Serial No. 554,793

9 Claims. (Cl. 84—238)

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This invention relates to musical instruments of the general character embodied in my co-pending application for Letters Patent filed August 17, 1943, under Serial No. 498,939, and wherein is disclosed, a horizontal, downstrike piano action which embodies the standard key dip and stroke; uses standard piano action parts; has the touch of the conventional piano action so that normal playing technique can be developed at the piano; whose parts are conveniently accessible for adjustment, inspection and repair without disturbing other parts; and which is comparatively light in weight, inexpensive to produce, and sufficiently compact to render it capable of being readily transported and stored in restricted spaces.

An object of the present invention is to provide a musical instrument of the above described character having all of the aforesaid advantages; whose action is adapted either for a pianoforte or xylophone; which is rendered extremely simple in construction by a substantial reduction in the number of parts so as to materially cheapen the cost of manufacture by utilizing stock materials to a greater extent, all while retaining satisfactory tone quality and normal playing technique in a product which can be sold at such reasonable cost as to reach the largest possible market.

Another object of this invention is to provide a horizontal, downstrike action wherein a hammer let-off mechanism is dispensed with, while providing a novel spring means for returning the hammer to raised position following momentum striking of the string, which spring means precludes, if not entirely prevents unintentional repeated striking of the string, and obviates telegraphing of shocks incident to hammer movement, through the key to the playing finger, all to the end of greatly simplifying construction of the action without sacrificing the touch of conventional actions, or adversely affecting the normal playing technique.

A further object of the invention is to provide an action as above set forth, which, in addition to the aforesaid novel hammer spring means, embodies a novel pivotal key mounting means; a novel lateral key guiding means co-acting with the rear end of the key; and a novel hammer mounting means enabling pivotal horizontal adjustment of the hammer laterally with respect to the key to be readily effected to dispose the hammer head in the correct position to strike its string.

With these and other objects in view, the invention resides in the combinations and arrangements of elements as set forth in the following

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specification and particularly pointed out in the appended claims.

In the accompanying drawing,

Figure 1 is a plan view of a single typical key and hammer unit embodied in the action of the musical instrument;

Figure 2 is a vertical transverse sectional view through the key frame of the action, and illustrating the working parts of the key and unit in normal position;

Figure 3 is a view similar to Figure 2 and illustrating positions of the working parts resulting from depressing the key as in playing; and

Figures 4 and 5 are enlarged fragmentary vertical transverse sectional views taken, respectively, on the lines 4—4 and 5—5 of Figure 3.

Referring specifically to the drawing, the musical instrument action embodying the present invention comprises a key bed or frame 10 having a center key rail 11 to which is secured by nails 12, vertical key pins 13 subtending from the rail 11 and projecting freely into pockets 14 in the keys 16 of the action, which pass immediately below the rail 11. Through each key and through the respective key pin 13 extends a pivot pin 17 (Figure 5) to mount the key approximately medially of its ends for vertical movement corresponding to the normal key dip of 3/8 of an inch, from the normal raised or playing position shown in Figure 2, to the fully depressed position shown in Figure 3, to which the key is limited by engagement of the forward portion of the key with the felt 18 on a stop rail 19 secured on the frame 10.

At its rear end the key 16 is provided with a vertical saw kerf or slot 20 closely receiving a guide nail 21 driven into a second stop rail 22 on the key frame. The key is overbalanced by the added weight of a hammer 23 to rest upon a felt 24 on the stop rail 22 so that the front end of the key is raised to the playing position as shown in Figure 2. By the provision of the simple nail 21 and saw kerf 20, the key is perfectly guided for its vertical movements, and is confined against any horizontal or lateral movements about the axis of the key pin 13, thus providing the essential rigid keyboard in which the keys will all be in alinement.

The hammer 23 includes the usual head 25 and shank 26, the free end of which latter projects into a slot 27 formed in the upper end of a cylindrical hammer flange 28 on which the shank is pivoted by means of a pin 29. The hammer flange 28 seats in a socket 30 formed in the key approximately midway between its fulcrum and rear end.

A fastening member such as a wood screw 31 is mounted in the key and is threaded into the flange 28 to secure same in the socket. When the screw 31 is loosened, the flange 28 can be rotated in the socket to shift the hammer head 25 to one side or the other of the key in order to dispose the head in proper relation to its string 32 as shown in Figure 1.

By means of a spring 35, the hammer 23 is normally urged upwardly to its raised position shown in Figure 2, wherein the shank 26 of the hammer engages the felt 36 of a stop rail 37. The spring 35 is preferably constructed from a length of spring wire formed into generally L-shape to provide a relatively long leg 38 and a relatively short arm 39. The free end of the leg 38 is provided with an angularly disposed attaching extension 40 which is forced into a bore 41 preferably located in the underside of the key 16 in proximity to its fulcrum and between same and the rear end of the key, all for a purpose to be hereinafter fully described.

The arm 39 of the spring 35 projects upwardly and freely through an opening 42 formed in the key adjacent the flange 28 and between same and the rear end of the key. The upper end of the arm 39 is bent laterally as indicated at 43 in Figure 4, and its free extremity is formed to provide a crotch 44 which enters a notch 45 cut into the shank of the hammer adjacent its fulcrum. The spring 35 is thus operatively connected to the hammer so as to normally urge the latter upwardly relative to the key and into engagement with the stop rail felt 36 in the operation of the invention which is as follows:

With the key 16 occupying its normal position under the action of gravity, aided by the action of the spring 35 in urging the hammer 23 to its fully raised position relative to the string 32 as shown in Figure 2, striking of the key will raise its portion rearwardly of the key fulcrum so as to impart downward movement to the hammer 23 against the action of the spring 35, and thus further load the latter as shown in Figure 3. Due solely to the momentum of the hammer resulting from a normal playing pressure upon the key, same is caused to strike the string as indicated in broken lines in Figure 3, and instantly be caused to clear the string under the action of the spring 35, so as to occupy the position shown in full lines in Figure 3 even though the key is held depressed as shown in this figure. Thus the string will be free to vibrate in a normal manner. In this connection, it will be understood that a suitable string damping mechanism (not shown) can be employed to damp the vibration of the string upon the release of the key. However, as such mechanism forms no part of the present invention, it has not been disclosed.

By virtue of the form of the spring 35, and the anchoring of its one extremity to the key in proximity to the key fulcrum 17, with the other extremity of the spring operatively connected to the hammer 23 adjacent its fulcrum 29, the spring reacts upon the hammer to effectively restrain the hammer against unintentional repeated striking of the string.

Furthermore, the proximity of the point of anchorage of the spring 35 to the key fulcrum 17 produces such a short lever arm in comparison to that which exists between the key fulcrum and the player's finger, that any shocks incident to hammer movement are effectively prevented from being transmitted to the finger with any such noticeable force as might prove distracting or annoying to the player. Therefore, there will be no adverse effect upon the player by the absence of a hammer let-off mechanism, nor will there be any noticeable change from the normal playing technique, all of which is achieved by the use of a lesser number of simply constructed and assembled parts, so that the cost of the instrument can be in a lower price range than any instrument of this type heretofore proposed.

It will be noted that by virtue of the absence of a hammer let-off mechanism, it is not necessary for the key to return to its fully raised position following a single striking of the string, in order to repeat the note intentionally one or many times as in "trilling." This is a distinct advantage over standard types of piano actions having a let-off mechanism between the hammers and keys for disrupting the operative connection therebetween, and necessitating the return of the key to its fully raised position in order to re-establish the operative connection between the hammer and key.

It will also be appreciated that the specific suspension fulcrum-forming means 13, 14 and 17; the specific lateral key guiding means 20 and 21; and the adjustable hammer mounting means 28, 29, 30 and 31, all contribute to the structural simplicity and the relatively low cost at which the instrument embodying this invention can be manufactured.

What is claimed is:

1. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key rockably mounted approximately medially between its ends for playing movement; a hammer; means pivotally mounting the hammer on the key between the key fulcrum and the rear end of the key to normally raise the front end of the key by the action of gravity overbalancing the rear end portion of the key; a generally L-shaped spring providing a relatively long leg and a relatively short arm; means anchoring the free end of said long leg to the key adjacent the key fulcrum; means operatively connecting the free end of said short arm to the hammer for the spring to urge the hammer upwardly; and a stop engaged by the hammer to limit its upward movement and to move the hammer downwardly to strike a string when the key is depressed as in playing thereupon.

2. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted approximately medially between its ends for playing movement; a hammer; means pivotally mounting the hammer on the key between the key fulcrum and the rear end of the key to normally raise the front end of the key by the overbalancing action of gravity upon the rear end portion of the key; a generally L-shaped spring; means operatively connecting one end of said spring to the hammer; means connecting the other end of the spring to the key at a location for the spring to urge the hammer upwardly relative to the key; and a stop engaged by the hammer to limit its upward movement and to move the hammer downwardly to strike its string when the key is depressed as in playing thereupon.

3. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted approximately medially between its ends for playing movement; a hammer; means pivotally mounting the hammer on the key between the key fulcrum and the rear end of the key to normally raise the

front end of the key by the overbalancing action of gravity upon the rear end portion of the key; a spring; means operatively connecting the spring to the hammer; means connecting the spring to the key for co-action therewith in urging the hammer upwardly relative to the key; and a fixed abutment disposed in the path of upward movement of the hammer at a location to move the hammer downwardly to strike its string when the key is depressed as in playing thereupon.

4. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted approximately medially between its ends for playing movement; a hammer including a shank and a head thereon; a flange on the key between the key fulcrum and the rear end of the key; a pin pivotally mounting the hammer shank on said flange for co-action of the hammer with the key in raising the front end thereof by the overbalancing weight upon the rear portion of the key; a generally L-shaped spring providing a relatively long leg and a relatively short arm; means securing the free end of said leg to the underside of the key adjacent the key fulcrum; said short arm having a crotch at its free end, passing freely upward through an opening in said key; the hammer shank having a notch receiving said crotch of the short arm for the spring to urge the hammer upwardly relative to the key; and a fixed stop engaged by the hammer shank to limit upward movement of the hammer and to move same downwardly to strike a string when the key is depressed as in playing thereupon.

5. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted approximately medially between its ends for playing movement; a hammer; means pivotally mounting the hammer on the key between the key fulcrum and the rear end of the key to normally raise the front end of the key by the overbalancing weight upon the rear portion of the key; a spring connected to the hammer and to the key for co-action therewith in urging the hammer upwardly relative to the key; and a stop engaged by the hammer to limit its upward movement and to move the hammer downwardly to strike its string when the key is depressed as in playing thereupon; the connection of the spring to the key being in such proximity to the key fulcrum as to provide a short lever arm compared to that which will exist between the key fulcrum and the point of contact of a player's finger on the key, so that shocks incident to movements of the hammer will be felt only negligibly if at all by the finger.

6. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted intermediate its ends for playing movement; a hammer having a shank and a head thereon; said key having a socket therein; a flange seating in said socket; a pin pivotally connecting the hammer shank to said flange; a fastening member co-acting with said key and flange to secure the latter in a selected position of rotatable adjustment in said socket; a spring operatively connected to said hammer shank and to said key for co-action therewith in urging the hammer upwardly relative to the key; and a stop disposed

in the path of upward movement of the hammer for moving the hammer downwardly to strike its string in response to depression of the key as in playing.

7. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key having an upwardly opening pocket therein; a rail; a vertically disposed key pin secured to said rail and subtending therefrom freely into said pocket; a pivot pin passing through the key pin and into the key to pivotally mount the latter on the key pin for playing movement; a hammer pivotally mounted on the key between the key fulcrum and its rear end; a spring operatively connected to the hammer and to the key to urge the hammer upwardly relative to the key; and a stop disposed in the path of upward movement of the hammer, for moving same downwardly to strike its string in response to depression of the key as in playing.

8. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key having an upwardly opening pocket therein; a rail; a vertically disposed key pin secured to said rail and subtending therefrom freely into said pocket; a pivot pin passing through the key pin and into the key to pivotally mount the latter on the key pin for playing movement; a hammer pivotally mounted on the key between the key fulcrum and its rear end; a spring operatively connected to the hammer and to the key to urge the hammer upwardly relative to the key; a stop in the path of upward movement of the hammer, operable to move the latter downwardly in response to depression of the key as in playing; the rear extremity of the key having a vertical notch therein; and a vertical guide pin freely received in said slot to confine the key against lateral rocking movement about the vertical axis of said key pin.

9. In a musical instrument, a horizontal action of the downstrike hammer and non-let-off type comprising: a key pivotally mounted intermediate its ends for playing movement; a hammer having a shank; means pivotally mounting the hammer shank on the key between the key fulcrum and its rear end to normally raise the key by the overbalancing weight upon the rear portion of the key; a spring for urging the hammer upwardly relative to the key; a stop disposed to be engaged by the hammer shank to limit upward movement of the hammer by the spring and to move the hammer downwardly to strike the string when the key is depressed as in playing thereupon; said spring being connected to the key adjacent its fulcrum, and to the hammer shank, for co-action with the key and hammer in obviating unintentional repetition of the hammer upon its string following momentum striking of the string by the hammer.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,377,582	Shill	June 5, 1945
149,232	Lincoln	Mar. 31, 1874
137,243	Schoenhut	Mar. 25, 1873