Jan. 24, 1950 S. C. SHILL 2,495,427

PIANO

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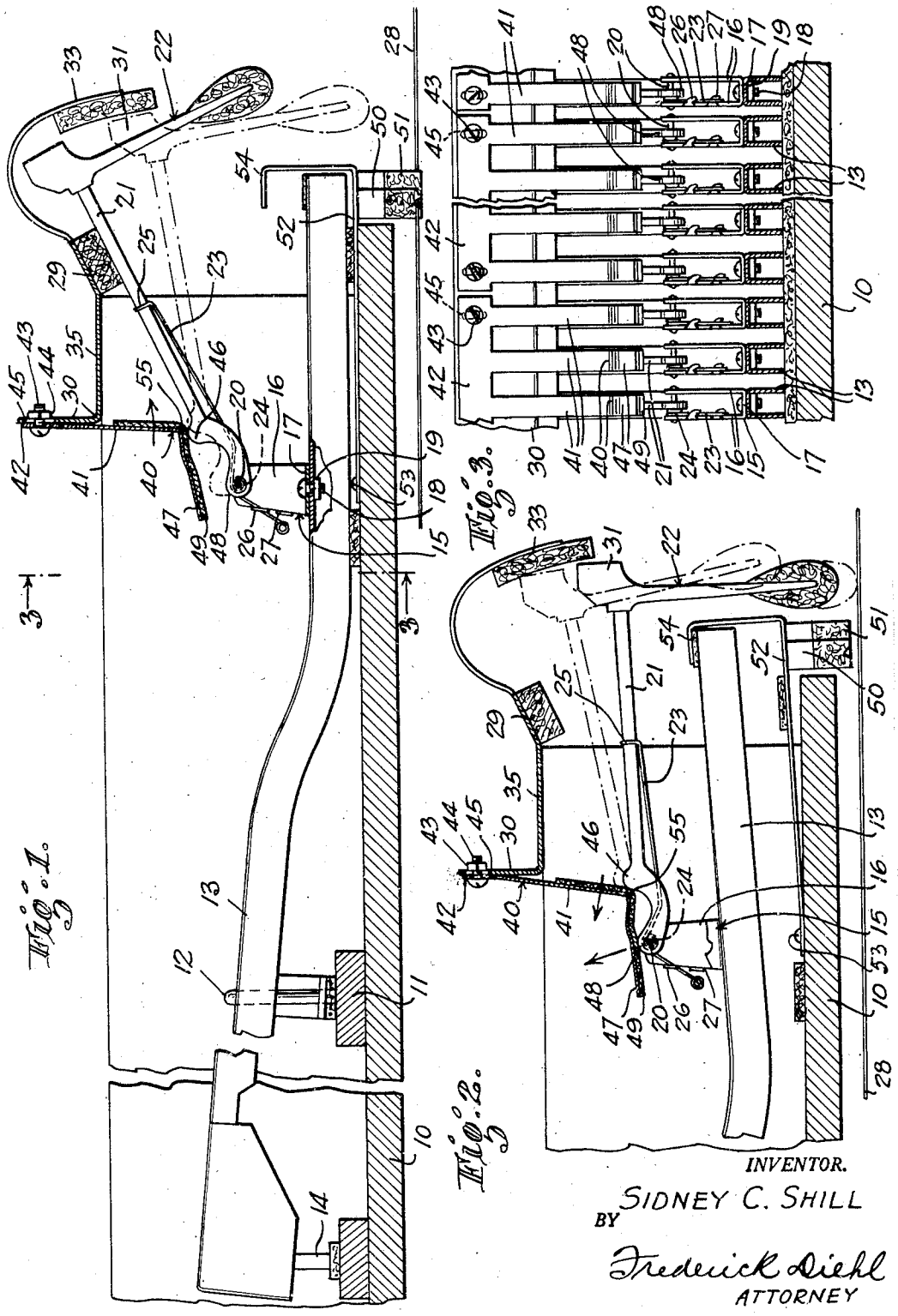


Fig. 1.

Fig. 2.

Fig. 3.

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9 Claims. (Cl. 84—238)

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My invention relates to pianofortes of the general character embodied in my United States Letters Patent No. 2,377,582, issued June 5, 1945, and wherein is disclosed and claimed a horizontal, downstrike hammer action particularly adapted, although not necessarily, for use in a lightweight, portable piano.

An object of my present invention is to provide a piano action of the horizontal, downstrike, let-off type which has all the advantages of the piano action disclosed in my patent above referred to, and which accomplishes superior results with a simplified structure having less parts, particularly with respect to the jack and let-off means as constructed and arranged to automatically establish and disrupt the operative connection between the key and hammer in a manner to insure superior repetition; smooth momentum striking of the string by the hammer as is essential in producing a rich tone; noiseless return of the jack to its operating position following let-off of the hammer to prevent blocking of the hammer on the string; negligible relative wiping movement between contacting portions of the jack and hammer knuckle prior to let-off of the hammer; so as to reduce wear on the jack felt to a minimum; and prevention of derangement of the jacks with respect to the hammers should the piano be subjected to rough handling and jarring during transportation, so as to eliminate the need for mechanical servicing of the action in order to restore it to playing condition.

Another object of my invention is to provide a piano action of the above described character whose simplified jack, jack flange and spring construction can be economically manufactured in multiple corresponding to any number of key and hammer units up to the total number comprised in the action; which can be installed in multiple in the action to effect a large saving in time and material; and which can be regulated in multiple rather than by an individual adjustment of the jack of each key and hammer unit, so as to greatly simplify this adjustment and reduce to a negligible minimum the maladjustment of individually adjustable jacks; all to the end of reducing the cost of the action without detracting from its playing quality.

With these and other objects in view, my invention resides in the combinations, arrangements and functional relationships of elements as set forth in the following specification and particularly pointed out in the appended claims.

In the accompanying drawings,

Figure 1 is a vertical transverse sectional view through the key frame of the piano action, with a typical key and hammer unit embodying my present invention illustrated in full lines in its normal position;

Figure 2 is a fragmentary view similar to Figure 1 and illustrating in full lines the let-off position of the jack and hammer to effect momentum striking of the string; and

Figure 3 is a fragmentary longitudinal sectional view taken on the line 3—3 of Figure 1.

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Referring specifically to the drawings, the piano action embodying my present invention may be inexpensively and simply constructed by quantity production methods mainly of metal parts either stamped or die cast, and comprises a key frame 10 having a center rail 11 supporting the balance key pins 12, on each of which latter is pivotally mounted approximately medially of its ends a key 13 for movement corresponding to the normal key dip of 3/8 of an inch, from the normally raised playing position shown in full lines in Figure 1, to the fully depressed position shown in full lines in Figure 2.

As shown in Figure 1, a front key pin 14, coacts with each key to confine same to its vertical movement and against lateral displacement. Between the balance pin 12 and the inner end of the key 13, there is fixed to the latter a hammer flange 15 which is generally U-shaped to provide spaced, parallel vertical arms 16 rising from a base 17 through which latter extends a headed screw 18 having a nut 19 to secure the flange on the top surface of the key in a selected position of pivotal adjustment about the axis of the screw.

Pivotally mounted by a pin 20 on the hammer flange 15 between the arms 16 thereof is the shank 21 of a hammer 22. A wire spring 23 is coiled at 24 about the pivot pin 20 at one side of the hammer shank, and is wrapped at one end around the hammer shank at 25. The other end of the spring can be adjustably anchored under either of two hooks 26 and 27 on one of the arms 16 of the hammer shank, to vary the loading of the spring in urging the hammer upwardly to its fully raised position relative to its string 28, which latter is typical of all strings of the piano in being horizontally disposed at a level immediately below the key frame 10.

As shown in Figure 1, the upward movement of the hammer under the action of the spring 23 is definitely limited by a felt 29 secured to the under side of a jack rail 30 of L-shaped cross section. In the fully raised position of the hammer, the heel portion 31 of the hammer head 32 is opposite to and slightly clears the felt of a back

check 33 which is part of and projects in an arching curve from the horizontal portion 35 of the jack rail 30.

A jack 40 in the form of a generally L-shaped resilient metal member, preferably is one of a number of identical jacks, the resilient vertical arms 41 of which form part of a metal body strip 42 receiving headed screws 43 provided with nuts 44, the screws passing through vertical slots 45 at relatively widely spaced intervals along the length of the jack rail 30, for unitary vertical adjustment of all the jacks on the strip in one operation, with respect to the knuckles 46 formed on the shanks 21 of the respective hammers 22 adjacent to the pivoted ends of the hammers as shown in Figures 1 and 2.

From the lower end of the depending vertical arm 41 of each jack 40, the jack extends generally horizontally towards the front of the action, to provide an actuating arm 47 which overlies the hub 48 of the hammer shank, the hub forming a let-off means for the jack. The back of the vertical portion 41 and the bottom of the actuating arm 47 are covered with a layer of felt 49 for noiseless co-action with the knuckle 46 and hub 48, respectively.

A damper 50 having the usual damper felt 51, is secured to one end of a flexible arm 52 anchored at 53 to the key frame 10 beneath the respective key. A portion 54 of the arm extends upwardly beyond the inner end of the key 13 and overlies the latter so as to be engaged thereby to lift the damper from the string upon depressing the key.

In operation, initial depressing movement of the key 13 will raise the inner end of the key and hence the hammer at its pivotal mounting 20 on the hammer flange 15. As the knuckle 46 is abutting the actuating arm 47 of the jack adjacent to its rounded corner juncture 55 with the vertical arm 41 of the jack, downward movement of the hammer 22 about the axis of the pin 20 and against the action of the spring 23 will be effected. During this initial movement of the key, the upward pressure of the knuckle 46 against the actuating arm 47 of the jack adjacent to the vertical arm 41, causes the latter arm to be flexed rearwardly as indicated by the arrow in Figure 1, as the knuckle moves rearwardly and downwardly of the action as shown in broken lines in this figure, thus reducing to a minimum any wiping movement between the knuckle and jack which would excessively wear the jack felt 49.

Continued depressing movement of the key causes the rising hub 48 of the hammer 22 to engage the actuating arm 47 of the jack, so as to swing the latter upwardly and forwardly of the action about the juncture of the vertical arm 41 of the jack with the body strip 42, and against the inherent resiliency of the jack. As depressing movement of the key approaches a position in proximity to the string 28, as shown in full lines in Figure 2, the let-off means formed by the rub 48 will co-act with the actuating arm 47 to flex the vertical arm 41 forwardly of the action a sufficient amount for the rounded corner 55 of the jack to ride off of the knuckle 46, to thus free the hammer from the jack and effect momentum striking of the string and rebounding of the hammer therefrom, so as to be held by the back check 33 as shown in broken lines in this figure.

As the jack 40 does not require any type of stop on the hammer shank 21, the loading or spring tension inherent in the jack may be materially increased over that which would otherwise be possible, thus insuring a more rapid return of the jack to its normal position, with attending improvement in the repetition quality of the action, as it will be appreciated that the stronger the spring loading, the more quickly will the operative connection between the hammer and jack be restored to make more rapid repetition possible. This improved functioning is obtained from the jack 40 without the heavy touch caused by a strong spring loading of types of jacks heretofore proposed; without the noise of the jack striking a stop under the action of a strong spring; and with such whip and snap to the momentum striking of the string as would enhance the essential rich tone.

I claim:

1. In a piano action of the horizontal, downstrike let-off type, a key; a hammer pivotally mounted on the key for movement downwardly to strike a string, and being urged upwardly to an extreme position; a generally L-shaped jack defining a resilient arm and an actuating arm projecting laterally from one end thereof; means coacting with said resilient arm to support the jack above the hammer; means on the hammer coacting with said actuating arm to move the hammer downwardly in response to depression of the key; and let-off means responsive to depression of the key to engage said jack and move said resilient arm thereof in a direction for the last said means to be cleared from the actuating arm when the hammer reaches a predetermined position in its downward movement, so as to prevent blocking of the hammer on the string.

2. In a piano action of the horizontal, downstrike let-off type, a key; a hammer pivotally mounted on the key for movement downwardly to strike a string, and being urged upwardly to an extreme position; a generally L-shaped jack defining a resilient arm and an actuating arm projecting laterally from one end thereof; means coacting with said resilient arm to support the jack above the hammer, with said resilient arm in a depending position and said actuating arm at the lower end thereof overlying the pivoted portion of the hammer; a knuckle on the hammer coacting with said actuating arm to move the hammer downwardly in response to depression of the key; and let-off means movable with the key and engageable with said jack to move same and flex said resilient arm thereof in a direction for said knuckle to be cleared from the actuating arm when the hammer reaches a predetermined position in its downward movement, so as to prevent blocking of the hammer on the string.

3. In a piano action of the horizontal, downstrike, let-off type, a key; a hammer having a shank and a hub, which latter is pivotally mounted on the key for movement of the hammer downwardly to strike a string, and is urged upwardly to an extreme position; a generally L-shaped jack of resilient material defining an attaching arm and an actuating arm projecting from one end thereof; means co-acting with said attaching arm to support the jack above the hammer; and a knuckle on the hammer shank co-acting with said actuating arm to move the hammer downwardly in response to depression of the key; said actuating arm overlying the hub portion of the hammer for engagement thereby when the hammer reaches a predetermined position in its downward movement, to actuate said actuating arm and flex said attaching arm in a direction for the actuating arm to ride off of said knuckle

and free the hammer to prevent blocking thereof on the string.

4. In a piano action of the horizontal, downstrike, let-off type, a key; a hammer pivotally mounted on the key for movement downwardly to strike a string, and being urged upwardly to an extreme position; a generally L-shaped jack defining a resilient arm and an actuating arm projecting laterally from one end thereof; means co-acting with said resilient arm to support the jack above the hammer, with the resilient arm in a depending position and said actuating arm at the lower end thereof overlying the pivoted portion of the hammer; a knuckle on the hammer co-acting with said actuating arm to move the hammer downwardly in response to depression of the key; and let-off means responsive to depression of the key to engage said actuating arm and move same and flex said resilient arm in a direction for said knuckle to be cleared from the actuating arm when the hammer reaches a predetermined position in its downward movement, so as to prevent blocking of the hammer on the string; said knuckle engaging said actuating arm under the upwardly urging tendency of the hammer with sufficient force to reversely flex said resilient arm and move same with the knuckle during initial movement of the hammer, so as to reduce to a minimum, relative wiping movement between the actuating arm and knuckle in order to reduce wear thereon.

5. In a piano action of the horizontal, downstrike, let-off type, a key; a hammer having a shank provided with a knuckle and being pivotally mounted on the key for movement downwardly to strike a string; means urging the hammer upwardly; a generally L-shaped jack of resilient material defining an attaching arm and an actuating arm; means for supporting the jack above the hammer with said attaching arm in a depending position and the actuating arm projecting from the lower end thereof and overlying said knuckle; said knuckle abutting the actuating arm adjacent to its junction with the attaching arm, for co-action with the actuating arm in moving the hammer downwardly when the key is depressed; and means movable with the key and engageable with said actuating arm between its free end and said knuckle, to move the actuating arm and flex said attaching arm in a direction for said knuckle to ride off of the actuating arm when the hammer reaches a predetermined position in its downward movement, so as to free the hammer to prevent blocking thereof on the string.

6. In a piano action of the horizontal, downstrike, let-off type, a key; a hammer having a shank provided with a knuckle and being pivotally mounted on the key for movement downwardly to strike a string; means for urging the hammer upwardly; a generally L-shaped jack of resilient material defining an attaching arm and an actuating arm; means supporting the jack above the hammer with said attaching arm in a depending position and the actuating arm projecting from the lower end thereof and overlying said knuckle; said knuckle abutting the actuating arm adjacent to its junction with the attaching arm, for co-action with the actuating arm in moving the hammer downwardly to strike the string when the key is depressed; the actuating arm overlying the pivoted portion of said hammer for actuation thereby to flex said attaching arm in a direction for the actuating arm to disengage the knuckle when the hammer reaches a predetermined position in its downward movement, so as to free the hammer to prevent blocking thereof on the string.

7. In a piano action of the horizontal, downstrike, let-off type, a key; a hammer having a shank provided with a knuckle and being pivotally mounted on the key for movement downwardly to strike a string; means urging the hammer upwardly; a jack composed of a length of resilient material bent intermediate its ends to provide angularly related arms; means co-acting with one of said arms to support the jack in a depending position above the hammer with the other arm overlying said knuckle and abutting same for co-action therewith in moving the hammer downwardly to strike the string when the key is depressed; and let-off means engageable with said other arm between its free end and said knuckle, to actuate said other arm and flex said one arm in a direction for said other arm to disengage the knuckle when the hammer reaches a predetermined position in its downward movement, so as to free the hammer to prevent blocking thereof on the string.

8. In a piano action of the horizontal, downstrike, let-off type, keys; hammers pivotally mounted on the keys for movement downwardly to strike their respective strings, and being urged upwardly to an extreme position; a multiple jack structure comprising an attaching strip and resilient jacks for the respective hammers projecting laterally from said strip at intervals along its length, and each defining angularly related arms; means co-acting with said attaching strip to support said jack structure above the hammers for vertical adjustment of the jacks as a unit with respect to their hammers; means on each hammer co-acting with one arm of the respective jack to move the hammers downwardly to strike the respective strings upon depression of the respective keys; and let-off means, one for each key, co-acting with the respective jack, to sufficiently flex the other arm thereof when the key reaches a predetermined position in its downward movement, that the respective hammer will be freed from said one arm of the jack so as to prevent blocking of the hammer on the respective string.

9. In a piano action of the horizontal type, a key pivotally mounted intermediate its ends; a hammer pivotally mounted on the key for movement downwardly to strike a string, and being urged upwardly; a jack; means mounting the jack to move the hammer downwardly to strike the string in response to raising of the inner end of the key by depressing the outer end thereof; a damper for the string; and an arm urged downwardly and disposed below the inner end of the key, with a portion of said arm extending upwardly and overlying the inner end of the key so as to be engaged and moved thereby to lift the damper from the string upon depressing the key.

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

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