Dec. 9, 1952 S. C. SHILL 2,620,700

PIANO ACTION

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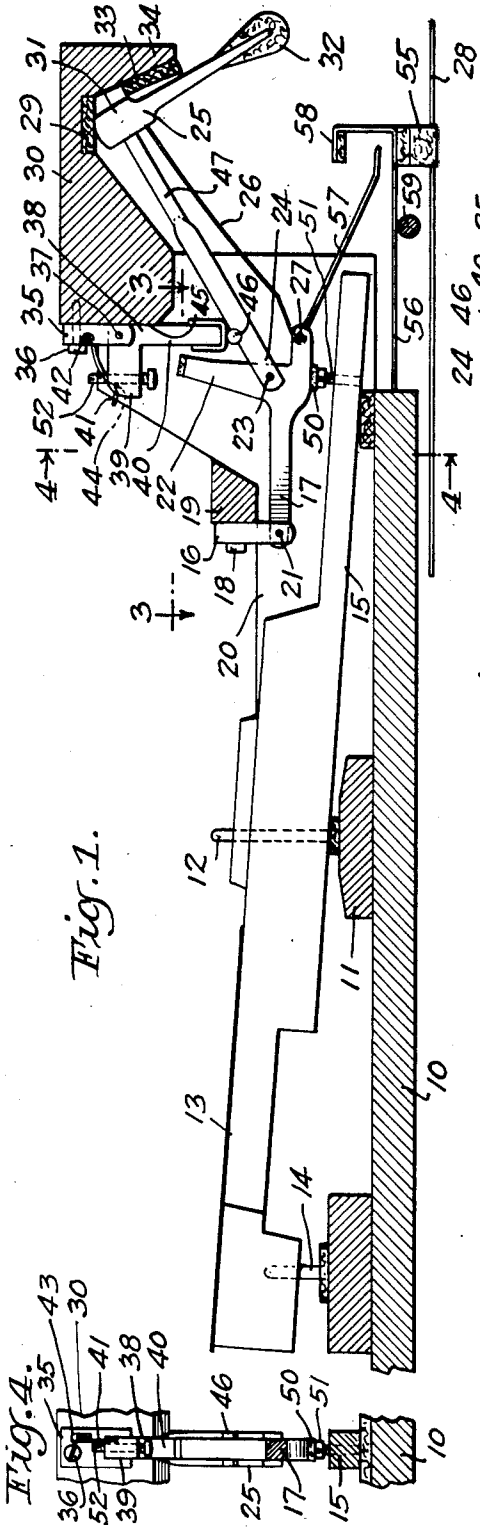


Fig. 1.

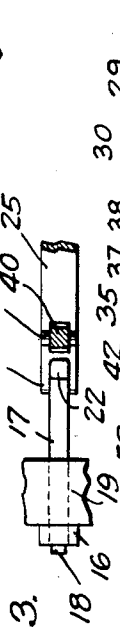


Fig. 3.

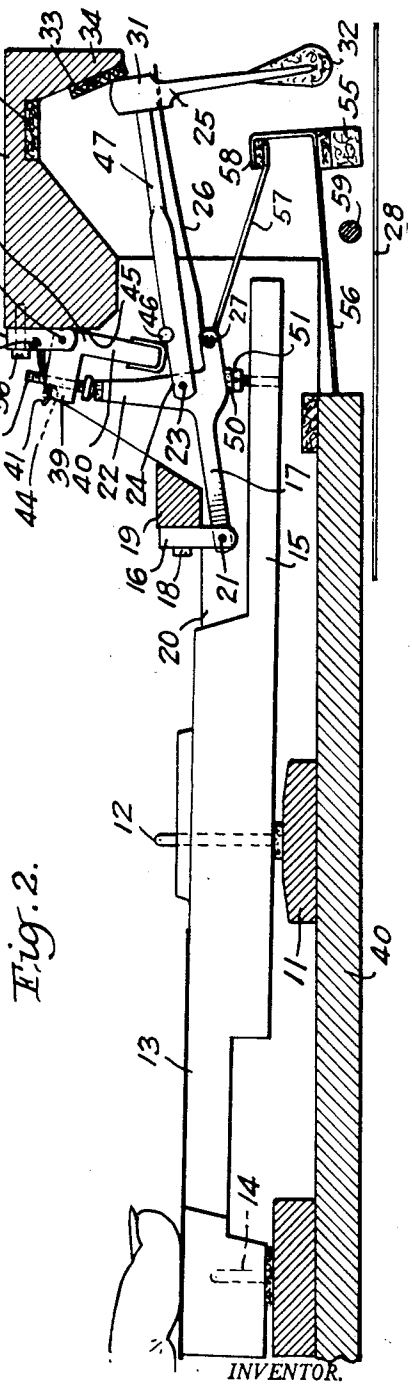


Fig. 2.

Fig. 4.

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PIANO ACTION

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7 Claims. (Cl. 84—238)

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My invention relates to pianofortes and more particularly to pianos 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 piano action of the horizontal, downstrike, let-off type particularly adapted, although not necessarily, for use in constructing an extremely compact, portable piano comparatively light in weight and inexpensive; which embodies the standard 3/8 inch key dip and 1 7/8 inch hammer stroke; which uses standard piano action parts; which has the touch of a conventional piano action so that the normal playing technique may be developed at the piano; and which enables each key and hammer unit to be individually removed for adjustment, inspection, or repair without disturbing other units.

An object of my present invention is to provide a horizontal, downstrike piano action of the let-off variety having all the advantages of the action of my patent above identified, and, in addition, being structurally characterized in a manner to transmit playing movement of each key to its hammer by interposing a connection between them which enables the hammer to be accurately guided to strike its string with exactly the same hard, indented or grooved portion of the hammer head felt irrespective of any lateral looseness in the key resulting either from wear or design to assure non-sticking and easy movement of the key, all to the end of obtaining a tone of uniformly high quality from the string each time it is struck.

Another object of my invention is to provide a horizontal, downstrike, let-off type of piano action which enables a precise and individual adjustment of each hammer knuckle with respect to its jack to be effected with the utmost ease and dispatch; which enables the keys to be removed for leveling, cleaning and polishing without affecting the regulation of the action; and which enables the action to be built as a complete unit separately from the keys, so as to assure precision regulation of the action at a minimum cost.

With these and other objects in view, my invention in its present embodiment, 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, and

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illustrating in its normal position, a typical key and hammer unit embodying my invention;

Figure 2 is a view similar to Figure 1 and illustrating the key fully depressed;

Figure 3 is a fragmentary horizontal sectional view taken on the line 3—3 of Figure 1; and

Figure 4 is a fragmentary vertical sectional view taken on the line 4—4 of Figure 1.

Referring specifically to the drawings, the piano action embodying my present invention is composed of the usual key bed or frame 10 having a center rail 11 supporting the balance key pins 12 on each of which latter a key 13 is pivotally mounted approximately medially between its ends for movement corresponding to the normal key dip of 3/8 of an inch from the normally fully raised or playing position shown in Figure 1 to the fully depressed position shown in Figure 2. A front key pin 14 co-acts with each key to confine the latter to its vertical movement with sufficient lateral looseness to prevent sticking of the key.

The inner end of the top portion of each key 13 is cut away to leave a relatively narrow end portion 15, and above the portion 15 of each key is supported a flange 16 for a connector member 17. The flange 16 is fixed by a screw 18 to a rail 19 which spans the end plates 20 of the frame 10.

Each connector member 17 is in the form of a lever pivotally mounted at one end on the respective flange 16 by a pin 21 and having adjacent to its other end a lateral extension 22 which projects vertically and has pivotally mounted thereon by a pin 23 the bifurcated butt end 24 of a hammer 25. A wire spring 26 has one end coiled about a pin 27 in said other end of the member 17 which is bifurcated to receive the spring and for co-action therewith in urging the hammer 25 upwardly to its fully raised position relative to its string 28, which, like all other strings of the piano, is horizontally disposed at a level immediately below the key frame 10.

As shown in Figure 1, the upward movement of the hammer 25 under the action of its spring 26 is definitely limited by the felt 29 of a hammer rail 30. In its raised position, the heel portion 31 of the hammer head 32 is opposite to and slightly clears the felt 33 of a fixed back check 34 on the hammer rail 30.

A jack flange 35 is fixed by a screw 36 to the hammer rail 30. By means of a pin 37, a jack 38 of generally L-shape is pivotally mounted at the junction of its horizontal and depending vertical arms 39 and 40, respectively, on the jack. A spring 41 has one end coiled about a pin 42 in a

slot 43 in the jack 38, and has its other end seating in a groove 44 in the arm 39 of the jack so as to urge the latter against a stop 45 formed by one side of the hammer rail 30, in the fully raised position of the hammer wherein the free felted lower end of the jack arm 40 abuts a knuckle 46 on the hammer shank 47 adjacent to the butt end 24 of the hammer, as clearly shown in Figure 1.

A felt 50 on the underside of the connector member 17 rests upon the head of a capstan screw 51 threadedly mounted for adjustment in the portion 15 of the key 13, so that upon depressing the key at its forward end as in playing the piano, the member 17 will form a separable connection between the key and the hammer 25, operable to swing the hammer downwardly as the hammer pivot 23 on the member 17 is raised, with the knuckle 46 engaging the jack.

An adjusting screw 52 threadedly mounted on the arm 39 of the jack 38 is disposed in the path of upward movement of the felted upper end of the extension 22 on the member 17, to the end that the extension and the arm 39 will co-act in providing a let-off means by which the other arm 40 of the jack will be moved clear of the knuckle 46 when the key 13 has been depressed slightly less than the necessary distance for the hammer to travel to complete its "strike" of 1⅞ inches, to thus disrupt the operative connection between the key and hammer.

A damper 55 is secured to one end of a spring lever 56 and is adapted to be lifted from the string 28 by a wire extension 57 on the connector member 17 engaging an overhanging portion 58 of the lever 56. The usual sustaining pedal bar 59 common to the dampers 55 of all strings 28, is arranged beneath the levers 56.

The operation of the invention is as follows:

Upon initial depressing movement of the key 13 by finger pressure on the outer end of the key, the inner end of the key will be raised and this movement transmitted to the member 17 through the capstan screw 51 so as to swing the member 17 upwardly about the pivot pin 21, thus causing the hammer 25 to be swung downwardly about the pin 23 as the hammer knuckle 46 abuts the jack 38 as shown in Figure 1.

As depressing movement of the key approaches the position shown in Figure 2, the let-off extension 22 of the member 17 engages the screw 52 on the arm 39 of the jack 38 and swings the latter against the action of the spring 41, in a direction to disengage the other arm 40 of the jack from the knuckle 46 as shown in this figure, when the hammer reaches a point about ⅛ of an inch from the string 28, to thus disrupt the operative connection between the key and hammer, so that the latter, by its acquired momentum, will be free to strike the string without blocking thereon even if the key is held depressed.

During this movement of the key, the damper 55 is lifted from the string 28 just prior to striking of the latter by the hammer, whereby to render the string free to vibrate. Upon releasing the key, the hammer spring 26 restores the hammer to its fully raised position shown in Figure 1. As this return movement of the key progresses, the spring 41 restores the jack 38 to its normal position in operative engagement with the knuckle 46, so that repetition playing of the note may be effected from a partly depressed position of the key and without the need for waiting until the key reaches its fully raised position shown in Figure 1 to again actuate the hammer.

From the foregoing description it will be manifest that by the provision of the pivoted connector member 17 and its structural and functional relationships to the key 13 as well as to the novel form of jack 38 and to the hammer 25, the hammer will be accurately guided irrespective of any lateral looseness which is present in the mounting of all keys to insure non-sticking and easy movement, or resulting from wear.

The hammer is positively maintained against lateral displacement by the co-action of the tight flange 16 and member 17, and the tight flange formed by the extension 22 of the member 17 on which the hammer is pivoted. Thus, exactly the same portion of the hammer will strike the string 28 every time the note is played, which is extremely important and essential to uniform tone quality. The hammer tip develops a hard indentation or groove from the string, which must strike the string each time the note is played, otherwise a totally different tone will be produced from the string, as for example, when striking the string with a soft part of the hammer tip at one side or the other of the groove.

Furthermore, by mounting the hammer on the connector member 17 rather than on the key, the capstan screw 51 enables a precise and individual adjustment of the hammer knuckle 46 relative to the jack to be effected with the utmost convenience. This mounting of the hammer independently of the key also renders the keys free for removal for leveling, cleaning and polishing without disturbing the regulation of the action. Thus, the action can be built as a complete unit separately from the keys, so as to insure precision regulation of the action at low cost.

I claim:

1. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key rockably mounted for playing movement; a connector member pivotally mounted above the inner portion of the key for movement upwardly thereby in response to depression of the key as in playing; a hammer pivotally mounted on said connector member for movement downwardly to strike a string; means urging the hammer upwardly to an extreme position; a jack mounted for pivotal movement above said connector member; means urging the jack in one direction to an extreme position wherein the jack operatively engages the hammer for downward movement of the hammer by the jack in response to upward movement of said connector member by depression of the key as in playing; said connector member and jack having let-off means co-acting to move the jack out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

2. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key rockably mounted for playing movement; a connector member pivotally mounted above the inner portion of the key for movement upwardly thereby in response to depression of the key as in playing; a hammer pivotally mounted on said connector member for movement downwardly to strike a string; a spring co-acting with the connector member and with the hammer to urge the latter upwardly to an extreme position and to urge the connector member downwardly to bear upon the key; a jack mounted for pivotal movement above said connector member; a spring urging said jack in one direction to an extreme position wherein the jack operatively

engages the hammer for downward movement of the hammer by the jack in response to upward movement of said connector member by depression of the key as in playing; said connector member and jack having let-off means co-acting to move the jack out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

3. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key rockably mounted intermediate its ends for playing movement; a connector member having an upwardly projecting let-off extension and being pivotally mounted above the inner portion of the key for movement upwardly thereby in response to depression of the key as in playing; a hammer pivotally mounted on said connector member for movement downwardly to strike a string; means urging the hammer upwardly to an extreme position; a generally L-shaped jack mounted for pivotal movement above said connector member; means urging said jack to one extreme position; said jack providing two angularly related arms, one of which operatively engages said hammer in said extreme position of the jack for downward movement of the hammer by the jack in response to upward movement of the connector member by depression of the key as in playing; said let-off extension of the connector member co-acting with the other of said jack arms to move said one of the jack arms out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

4. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key rockably mounted intermediate its ends for playing movement; a connector lever extending above the inner portion of the key and pivotally mounted about a fixed axis at one end and to engage the key for upward movement by the key in response to depression of the key as in playing; said lever having a let-off extension projecting upwardly therefrom remote from the pivoted end of the lever; a hammer pivotally mounted on said lever for movement downwardly to strike a string; means urging the hammer upwardly to an extreme position; a generally L-shaped jack mounted for pivotal movement above the connector member; means urging said jack to one extreme position; said jack providing two angularly related arms, one of which operatively engages said hammer in said extreme position of the jack, for downward movement of the hammer by the jack in response to upward movement of said lever by depression of the key as in playing; said let-off extension of the lever co-acting with the other of said jack arms to move said one of the jack arms out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

5. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key rockably mounted intermediate its ends for playing movement; a connector lever extending above the inner portion of the key and pivotally mounted about a fixed axis at one end and to engage the key for upward movement by the key in response to depression of the key as in playing; said lever having a let-off extension projecting upwardly therefrom remote from the pivoted end of the lever; a hammer pivotally mounted on said lever for movement downwardly to strike a string; a spring co-acting with said lever and with the hammer to urge the latter upwardly to an extreme position and to urge the lever downwardly to bear upon the key; a generally L-shaped jack mounted for pivotal movement above the connector member; means urging said jack to one extreme position; said jack providing two angularly related arms, one of which operatively engages said hammer in said extreme position of the jack, for downward movement of the hammer by the jack in response to upward movement of said lever by depression of the key as in playing; said let-off extension of the lever co-acting with the other of said jack arms to move said one of the jack arms out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

6. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key mounted for playing movement; a connector member movably mounted for movement by the key in response to depression of the key as in playing; a hammer mounted on said connector member for movement downwardly to strike a string; means urging the hammer upwardly to an extreme position; a movably mounted jack; means urging the jack in one direction to an extreme position wherein the jack operatively engages the hammer for downward movement of the hammer by the jack in response to movement of said connector member by depression of the key as in playing; said connector member and jack having let-off means co-acting to move the jack out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string.

7. In a pianoforte, a horizontal action of the downstrike, let-off type comprising: a key mounted for playing movement; a connector member movably mounted for movement by the key in response to depression of the key as in playing; a hammer mounted on said connector member for movement downwardly to strike a string; means urging the hammer upwardly to an extreme position; a movably mounted jack; means urging the jack in one direction to an extreme position wherein the jack operatively engages the hammer for downward movement of the hammer by the jack in response to movement of said connector member by depression of the key as in playing; said connector member and jack having let-off means co-acting to move the jack out of operative engagement with the hammer when the latter reaches a predetermined point in its downward movement, so as to prevent blocking of the hammer on the string; a damper normally damping the string; and means carried by said connector member and co-acting with said damper to move the damper clear of the string during movement of the connector member by the key, so as to free the string for vibration when struck by the hammer.

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No references cited.