July 5, 1932. C. E. CAMERON, JR 1,866,152

PIANO ACTION

Filed April 16, 1931 3 Sheets-Sheet 1

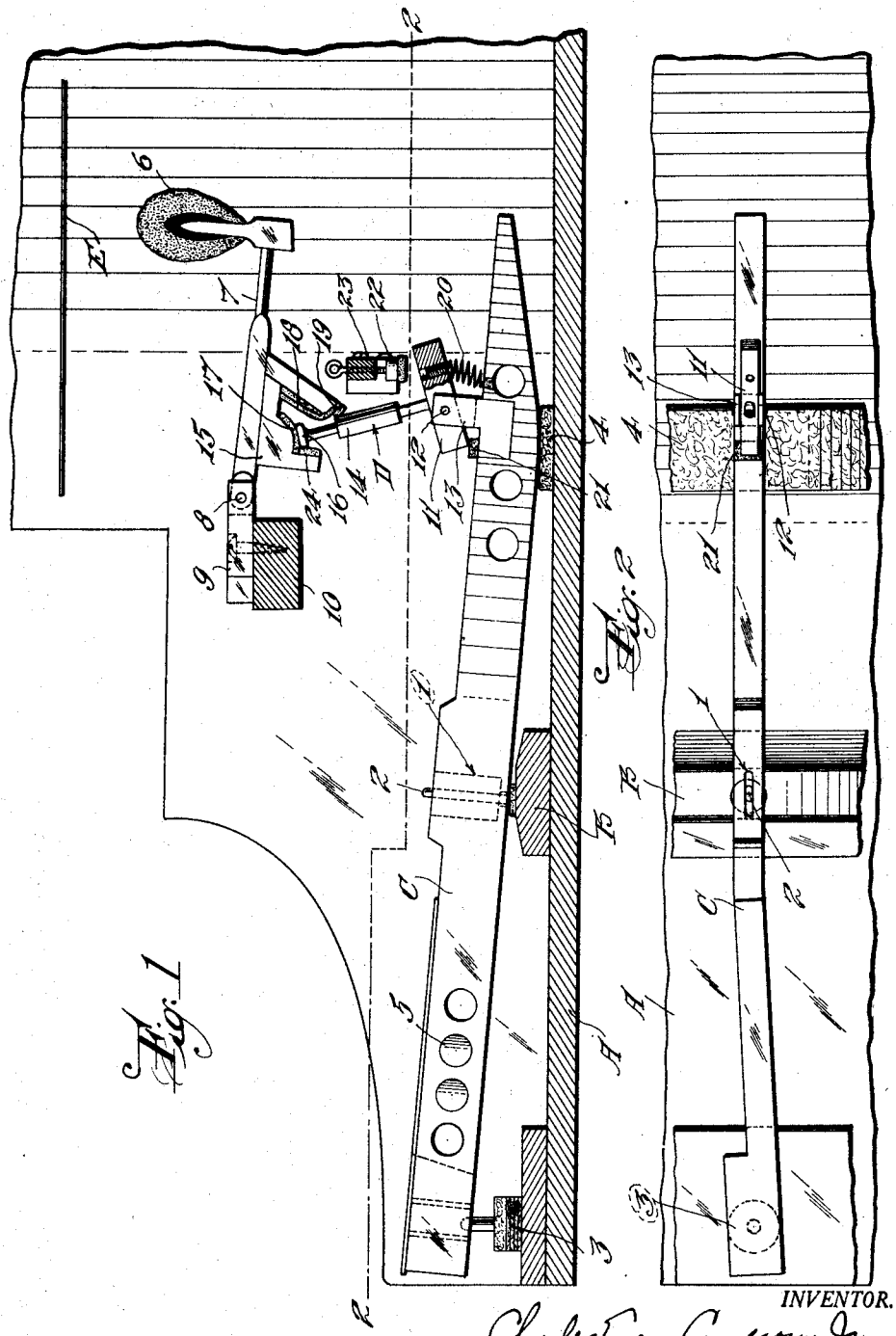


Fig. 1

Fig. 2

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PIANO ACTION

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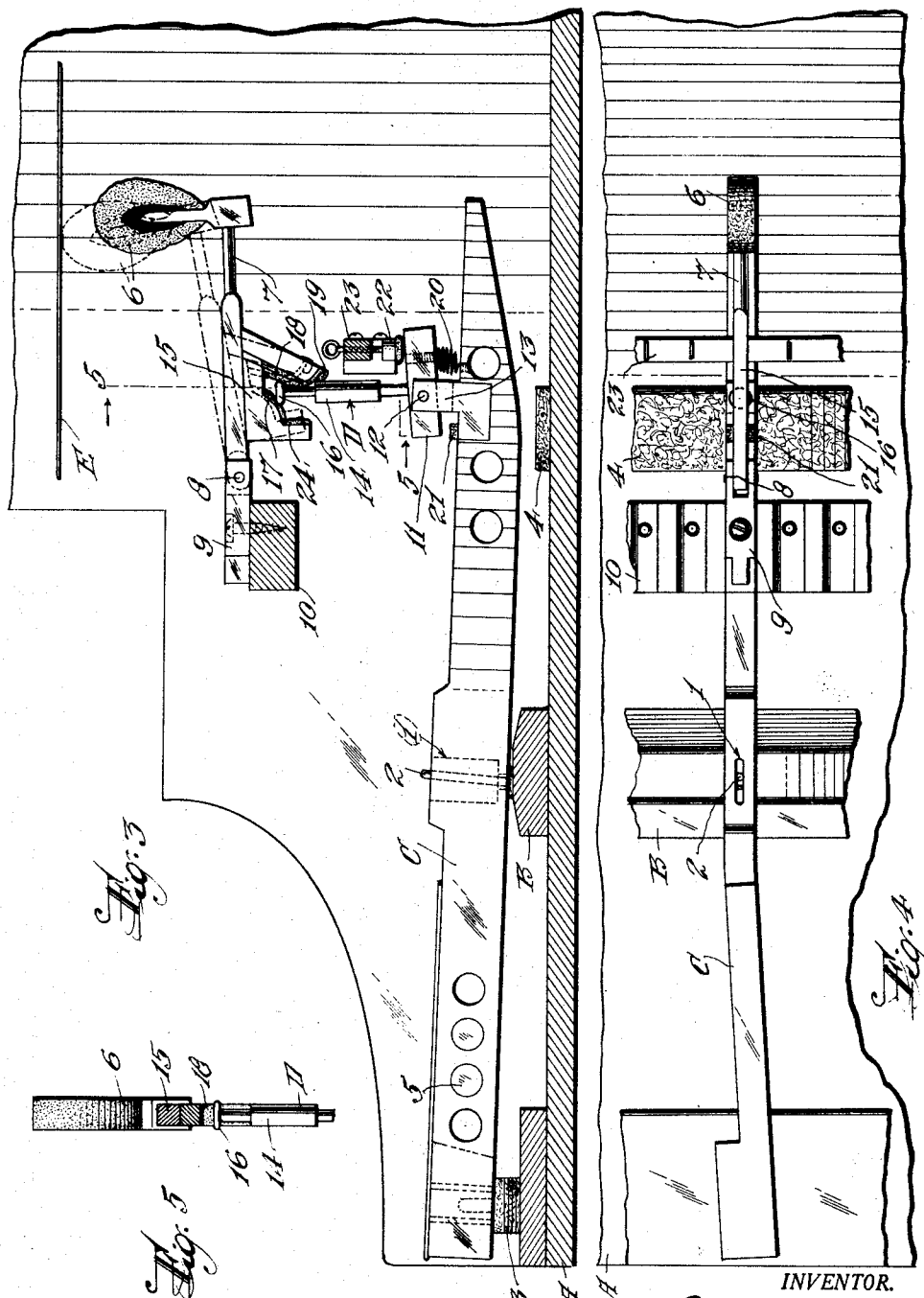


Fig. 3

Fig. 5

Fig. 4

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Fig. 6

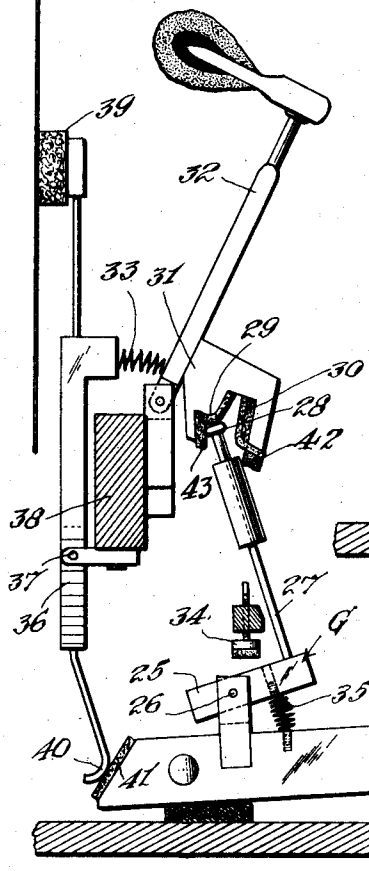
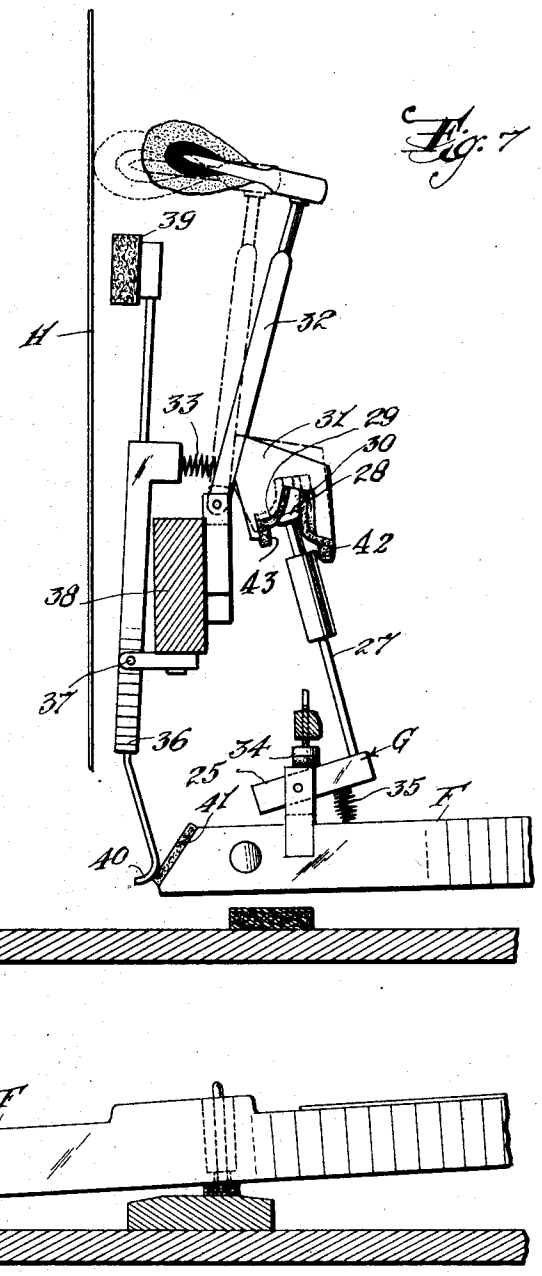


Fig. 7



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UNITED STATES PATENT OFFICE

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PIANO ACTION

Application filed April 16, 1931. Serial No. 530,454.

This invention relates in general to a novel and improved piano action, and is particularly directed to means for checking or preventing rebound of the hammer after it has once struck the string.

One object of the invention is to provide a piano action embodying novel and improved features of construction in the mechanism for striking the piano strings by the action of the associated "keys" whereby great sensitivity of the mechanism and rapid movement thereof may be obtained with ease of operation and resultant clearness and sharpness of tone.

The term "key" is intended to designate either the manually operated key used in hand played instruments or to designate similar parts for imparting movement to the hammers such as pneumatics such as are used in player pianos.

One object is to provide in a piano action of this character novel and improved means for preventing or checking the rebound of the hammer after it has once struck the string so as to avoid "trembling" or "stuttering" which is usually caused by the hammer striking the string several times upon one actuation of the key.

Other objects are to provide a piano action which shall be simple and inexpensive in construction and light in action or requiring a small amount of power to actuate the hammer in to contact with the string; to provide a novel and improved construction, combination and mounting of the key, hammer, and means for connecting them whereby the hammer is certain to properly strike a string upon both light and heavy touch of the player upon the key, and the rebound of the hammer against the string is prevented under all conditions; to provide in a piano action of this character novel and improved construction and combination of a hammer butt and a lifter or jack for connecting the hammer butt to the key, whereby quick and positive actuation of the hammer into contact with the string is ensured, and rebound of the hammer against the string is prevented or restrained, and to obtain other advantages and results as will be brought out by the following description.

Referring to the accompanying drawings in which corresponding and like parts are designated throughout the several views by the same reference characters,

Figure 1 is a side elevation of a piano action for grand pianos embodying my invention, showing the parts at rest, and the main action action or hammer supporting rail in transverse section.

Figure 2 is a horizontal sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1 but showing the parts as they appear after the hammer has struck the string and rebounded after a heavy blow, and before release of the hammer by the key.

Figure 4 is a top plan view of the piano action shown in Figure 3.

Figure 5 is a transverse vertical sectional view through the piano action taken on the line 5—5 of Figure 3.

Figure 6 is a view similar to Figure 1 showing my invention embodied in an upright piano action in which the parts are shown at rest, and

Figure 7 is a view similar to Figure 6 but showing the parts as they appear after the hammer has struck the string and rebounded and before release of the hammer by the key.

Specifically describing the illustrated embodiment of the invention, the reference character A designates a key frame of known construction having the usual balance rail B upon which are fulcrumed intermediate their ends, the keys C. As shown, each key preferably has a transverse tapered slot 1 which loosely receives a pivot pin 2 secured in the balance rail B, and beneath the outer end of each key is arranged a cushion stop 3 to limit swinging movement of the key in its hammer actuating movement. Beneath the other end of the key is arranged another cushion stop 4 to limit swinging of the key on its return from its hammer actuating movement. The usual key leads 5 are provided to insure the proper weight and balance of the keys.

The inner end of each key C has mounted thereon a lifter or jack D for actuating the

hammer 6 which is mounted at one end of a shank or stem 7, the other or butt end of which is pivotally connected at 8 to a flange 9 on the main action or hammer supporting rail 10. This lifter D is shown as comprising a foot portion 11 pivotally mounted intermediate its ends as at 12 upon a lug 13 rigidly secured to the corresponding key C. Rigidly secured to said foot portion at the inner side of the pivot 12, that is, at the side of said pivot away from the outer end of the key, is a shank 14 which is also preferably disposed at substantially right angles to said foot portion and extends toward the hammer butt 15. The upper or free end of the shank 14 has a head 16 which abuttingly and slidably engages a cushioned upwardly and rearwardly curved shoulder 17 on the hammer butt. The hammer butt also has in spaced and downwardly diverging relation to the shoulder 17, another cushioned shoulder 18 the lower end of which terminates in an abutment 19. The distance between the shoulders 17 and 18 is preferably less than the diameter of the head 16 on the shank 14 of the lifter D, and the proportions of the parts are preferably such that when the key is in its normal or at rest position, the hammer is in its normal position with the shoulder 17 resting upon the end of the shank 16 and the abutment 19 contacting with the side of the shank 14 as shown in Figure 1. The shank 14 is influenced into this position by a spring 20 interposed between the inner end of the foot portion 11 and the key, and by the abutment 19; and preferably a cushioned stop 21 is provided on the key beneath the end of the foot portion to assist in limiting this movement. Upon upward movement of the inner end of the key the head 16 of the lifter jack at first pushes upwardly on the shoulder 17 of the hammer butt so as to swing the hammer upwardly toward the string E, and as the inner end of the key approaches the limit of its movement the momentum imparted to the hammer causes it to swing away from the head 16 into contact with the string, as shown by dot and dash lines in Figure 3. The relative sizes of the parts are such that the head 16 cannot follow the hammer butt throughout the full movement of the hammer. As the shoulder 17 leaves the head 16, the inner end of the foot portion 11 of the lifter D engages an adjustable stop 22 mounted on a rail 23 so that the shank 14 of the lifter is swung rearwardly as shown in Figure 3 of the drawings. Upon rebound of the hammer from the string E the force of the rebound causes the shoulder 18 of the hammer butt 15 to frictionally engage under the head 16 of the shank 14 with a wedging action, as clearly shown in Figure 3 of the drawings, and this prevents or checks the hammer from returning to the string a second time during the same actuation of the key.

As the key C is released to permit the inner end to swing downwardly, the spring 20 and abutment 19 swing the lifter so as to move the head of the shank 14 forwardly over the shoulder 17 away from the check shoulder 18 and permit the hammer to return to its normal position as shown in Figure 1 of the drawings. The hammer butt is preferably formed with an abutment 24 which is engaged by the shank in opposition to the abutment 19, and the hammer comes to rest with the abutment 24 and abutment 19 of the hammer butt in contact with the shank 14 of the lifter at opposite sides of the shank and at spaced points longitudinally thereof. The lifter thereby serves as a rest for the hammer.

It will be observed that this piano action permits rapid movement of the hammer with a light touch and a small amount of power, and that more than one contact of the hammer with the string upon a single actuation of a key is positively prevented. The frictional or wedging contact of the shoulders 17 and 18 with the head 16 of the shank of the lifter varies with the force applied to the key; a heavy pressure on the key will cause the head of the shank to be forced into tighter engagement with the shoulder 18 through engagement of the foot portion 11 of the lifter with the stop 22, while a light pressure on the key will result in a light frictional engagement of the shoulder 18 with the lifter shank. The mechanism thus effectually compensates for heavy and light blows upon the key and ensures sensitivity and rapidity of hammer actuation and at the same time prevents stuttering or trembling under all conditions.

The invention may also be embodied in upright piano actions as shown in Figures 6 and 7 of the drawings. In these figures, the reference character F designates the key and G designates the lifter. Due to the position of the hammer in the upright action, the relation of the shank of the lifter to the pivotal connection of the lifter with the key, is in effect the reverse of that in the grand piano action hereinbefore described. Otherwise the upright action is substantially identical in construction and operation with that of the grand piano action.

As shown in Figures 6 and 7 the lifter G includes a foot portion 25 pivotally mounted at 26 intermediate its ends on the inner end of the key F. The shank 27 of the lifter is connected to the foot portion at the outer end thereof, that is, at the end toward the outer end of the key F. The head 28 of the shank cooperates with shoulders 29 and 30 on the hammer butt 31 corresponding to the shoulders 17 and 18 of the construction shown in Figures 1 to 5 inclusive. It will be observed that due to the approximately vertical position of the hammer stem 32, the shoulders 29 and 30 are disposed at a different

angular relation to the hammer stem than the shoulders 17 and 18, and because the action of gravity on the hammer tending to return the hammer to its normal position is not so great as in the grand piano action, a spring 33 is preferably provided to influence the hammer to its normal or at rest position. When the key F and the hammer are at rest, the shoulder 29 contacts with the end of the head 28, as shown in Figure 6, and said head is held in this position by a spring 35 interposed between the foot portion 26 of the lifter and the key.

In operation of the upright action, as the inner end of the key moves upwardly, the head 28 of the lifter shank pushes upwardly on the shoulder 29 of the hammer butt so as to swing the hammer toward the string H. The relative sizes of the parts are such that the head 28 may not follow the shoulder 29 throughout the movement of the hammer, and accordingly when the key comes to the end of its movement, the momentum imparted to the hammer causes the latter to swing into contact with the string as shown by dot and dash lines in Figure 7 of the drawings, so that the shoulder 29 moves out of contact with the head 28 of the shank. At this time, the foot portion 25 of the lifter engages a stop 34, corresponding to the stop 22 in Figure 1 of the drawings, so as to swing the lifter forwardly and move the head 28 into a position so that as the hammer rebounds from the string the shoulder 30 on the hammer butt will wedgingly engage the head 28 of the lifter shank, as shown by solid lines in Figure 7. A second striking of the string by the hammer is thereby prevented. Upon release of the key, the spring 35 and an abutment 42 on the hammer butt swing the lifter G to move the head 28 into its normal position, which permits the hammer to swing away from the string into its normal or rest position, shown in Figure 6 of the drawings. An abutment 43 and the abutment 42 on the hammer butt are provided to engage the shank 27 of the lifter at opposite sides and at spaced points longitudinally thereof to provide a hammer rest. The force of the frictional contact of the head 28 with the shoulder 30, will vary in accordance with the force exerted on the key, in the same manner as has been described in connection with the head 16 and shoulder 18 in the construction shown in Figures 1 to 5 of the drawings; and the invention as embodied in the upright action has all of the advantages of sensitivity, rapidity of operation, etc., which are found in a grand piano action embodying the invention.

Another feature of the invention is a combination of a damper construction with the key action so as to normally damp the strings and undamp them or move the damper from contact therewith as the hammer is actuated into contact with the string. This damper construction is shown in Figures 6 and 7 as including a damper lever 36 pivotally mounted intermediate its ends at 37 at the rear side of the main action rail 38, said lever having at one end a damper head 39 and being formed at its other end with a curved arm 40 contacting with a beveled surface 41 on the inner end of the key F. The damper head 39 is normally influenced into contact with the corresponding string by a spring which may be the spring 33 above described which is shown as interposed between the hammer stem 32 and the damper lever 36. As the key F is moved on its hammer actuating stroke, the beveled surface 41 rides under the curved arm 40 so as to swing the damper lever 36 and move the damper head 39 out of contact with the string as shown in Figure 7 of the drawings, while when the key moves to its normal position, the spring 33 swings the damper lever in the opposite direction to move the damper head 39 into contact with the string.

While I have shown and described my invention as embodied in two specific forms including certain details of construction, it should be understood that this is primarily for the purpose of illustrating the principles of the invention and that the invention may be embodied in many different details of construction without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim is:

1. In a piano action, a key, a hammer including a butt having two opposed shoulders, a hammer lifter comprising a foot portion pivotally mounted on said key and having a shank projecting angularly therefrom with a head at its free end disposed between said shoulders to abuttingly engage one thereof for actuating the hammer toward a string, and a stop to engage said foot portion during the hammer actuating movement of said key so that the head of said lifter will be moved into the path of the other said shoulder and the latter will frictionally engage under said head upon rebound of the hammer from the string to check return of the hammer to the string.

2. In a piano action, a key, a hammer including a butt having two opposed fixed shoulders in downwardly diverging relation to each other, a hammer lifter pivotally connected at one end directly upon said key and having at its other end a head disposed between said shoulders to abuttingly engage one thereof for actuating the hammer toward a string, and means operative during hammer actuating movement of said key for actuating said lifter about its pivot so that the head thereof will be frictionally wedged between said shoulders upon rebound of said hammer

from the string to check return of the hammer to the string.

3. In a piano action, a key, a hammer including a butt having two shoulders in downwardly diverging relation, a hammer lifter comprising a foot portion pivotally mounted on said key and having a shank projecting angularly therefrom with a disk-like head at its free end disposed between said shoulders to abuttingly engage one thereof for actuating the hammer toward a string, and a stop to engage said foot portion during the hammer actuating movement of said key for moving said lifter about its pivot so that the head of said lifter will be frictionally wedged between said shoulders upon rebound of the hammer from the string to check return of the hammer to the string.

4. In a piano action, a key, a hammer including a butt, a hammer lifter pivotally connected at one end directly upon said key and having at its other end a head to abuttingly engage said butt for actuating the hammer toward a string, said hammer butt having two opposed abutments to engage said shank at opposite sides and at spaced points longitudinally thereof as said hammer returns to its normal position whereby said lifter serves as a rest for the hammer.

5. In a piano action, a key, a hammer including a butt, a hammer lifter pivotally connected at one end directly upon said key and having at its other end a head to abuttingly engage said butt for actuating the hammer toward a string, said hammer butt having an abutment to engage said lifter shank as said hammer returns to its normal position, and means for limiting movement of said lifter under influence of the return movement of said hammer, whereby said lifter serves as a rest for the hammer.

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