June 7, 1949. D. BARNETT 2,472,740

PIANO KEY ACTION

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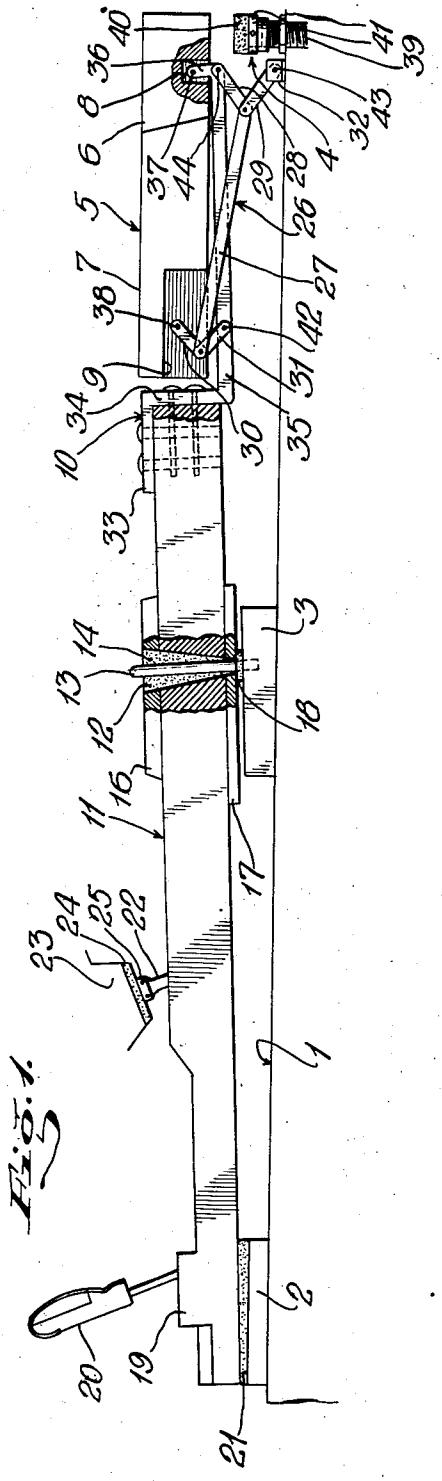

Fig. 1.

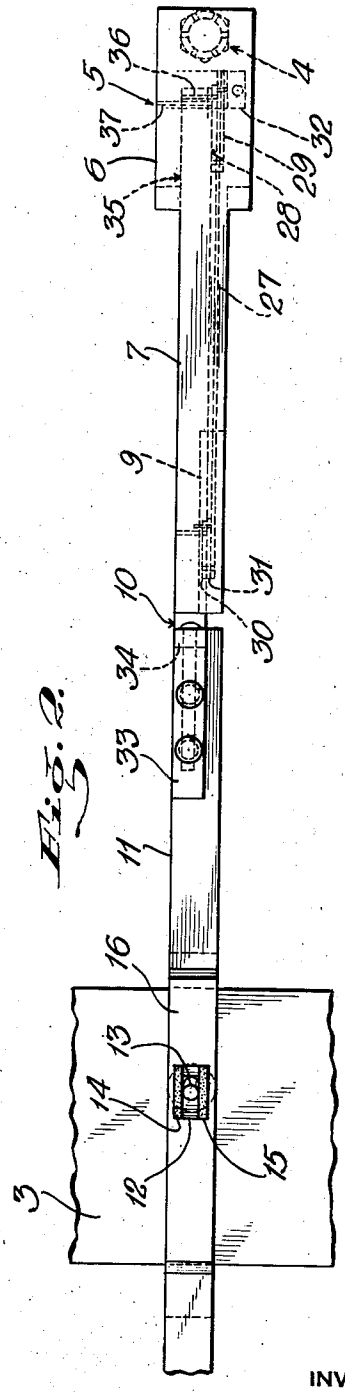

Fig. 2.

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PIANO KEY ACTION

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5 Claims. (Cl. 84—237)

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This invention relates to piano key actions.

Among the objects of the present invention it is aimed to provide an improved piano key action for the keys of a piano in which the finger engaging face of the key will at all times be maintained parallel or substantially parallel to its initial position of rest, so that the possible distance of movement of the player's fingers from any point of contact to the final depressed position of the key is substantially identical whether the player's fingers engage the outermost end of the contacting surface, the innermost end of the contacting surface or any intervening portion of the contacting surface, and consequently the player may with a niminum of effort control the volume whether the fingers are free to engage the outermost contacting faces of the keys or the intermediate contacting faces, so necessary when executing runs that include white keys as well as black keys.

It is a further object of the present invention to provide an improved piano key action for the keys of a piano in which the leverage will be uniform, or at least substantially uniform, with any one key, whether the finger engages the front, rear or any intervening portion of the finger engaging surface thereof, and consequently the key striking distance available to a player will be the same and the force transmitted to the hammer action in turn will be effected through the same striking distance, no matter what point on the playing surface of the key is engaged for a given playing force.

More specifically, the present invention aims to provide an improved linkage for connecting the key proper to the key lever whereby such parallel movement of the key will be effected.

These and other features, capabilities and advantages of the present invention will appear from the subjoined detail description of one specific embodiment thereof illustrated in the accompanying drawings, in which

Fig. 1 is a side elevation partly broken away of a key action including the key and key lever.

Fig. 2 is a plan view partly broken away of a part of the key action illustrated in Fig. 1 on a slightly enlarged scale.

In the embodiment shown, the key bed 1 has an innermost transversely extending support 2, an intermediate transversely extending support 3 and a plurality of abutment pins 4, one for each white key 5.

Each key 5, see particularly Fig. 2, has an enlarged end portion 6 and an elongated diminished inwardly extending portion 7. The enlarged end

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portion 6 has a recess 8 formed therein and extending upwardly from the bottom thereof. The elongated diminished portion 7, on the other hand, has a chambered recess 9 receding from the side of the portion 7 and extending upwardly from the bottom thereof. Each key 5 is pivotally connected to the bent metal bar 10 which is secured to the front end of the key lever 11.

Each key lever 11 has a tapering opening 12 in size at its lower end just sufficient to clear the pin 13 extending upwardly from and fixed in the transversely extending support 3, there being a pin 13 for each key lever 11. The front and rear faces of the opening 12, see Figs. 1 and 2, diverge in an upward direction while the two side walls are substantially parallel and provided with felt pads 14 and 15 in intimate engagement with the sides of the pin 13.

Preferably as shown, the key lever 11 is reenforced adjacent the opening 12 by securing a sheet 16 to the upper face of the key lever 11 and a sheet 17 to the lower face of the key lever 11 as shown. Preferably, also as shown, there is provided a felt washer 18 on the pin 13 and disposed between the sheet 17 and the support 3. Excellent results have been achieved when the sheets 16 and 17 were composed of wood.

Adjacent the rear end of the key lever 11 and extending upwardly from the enlargement 19 formed thereon there is provided the hammer check 20. The lower face of the rear end of the key lever 11 in its at rest position preferably rests on the felt sheet 21 secured to the outer face of the transversely extending support 2.

Intermediate the pin 13 and the hammer check 20 there is preferably provided the capstan screw 22 secured to the key lever 11 and extending upwardly therefrom as shown to engage the under carriage of the hammer action 23 and support the same. The lower face of the hammer action 23 is preferably provided with a felt sheet 24 for engagement with the screw 22. The head 25 of the capstan screw 22 is preferably adjustable to adjust the position of the hammer action 23 relative to the key lever 11.

The linkage 26 now to be described constitutes the main part of the present mechanism and is relied upon largely to effect volume control with a minimum effort on the part of the player. This linkage 26 consists essentially of one elongated link 27 and two pairs of short links pivotally connected to one another, the forward short links 28 and 29 and the rear short links 30 and 31. This linkage 26 connects the key 5 and bent bar 10 to the abutment or bracket 32.

The form of the bent bar 10 is important. It consists of a web 33 secured to the upper face of the key lever 11, continuing into the downwardly extending web 34 engaging the forward end of the key lever 11, then continuing into the forwardly extending elongated arm 35, and finally continuing into the short upright 36, the upper end of which is pivotally connected to the key 5 by the pin 37. As shown in Fig. 1, the upright 36 extends upwardly into the recess 8. Preferably as shown, the bracket 32 is secured to the key bed 1 and located directly below the recess 8 in the key 5. The short links 28 and 29 are pivotally connected to the front end of the elongated link 27 at one of their ends, with the other end of the short link 28 pivotally connected to the bar 10 at the angle or bend between the upright 36 and the elongated arm portion 35, while the other end of the short link 29 is pivotally connected to the bracket 32. The two short links 30 and 31 at one of their ends are pivotally connected to the rear end of the elongated link 27, and the other end of the short link 30 is pivotally connected in the recess 9 by the pin 38, while the other end of the short link 31 is pivotally connected to the elongated arm 35 just forwardly of the web portion 34.

The abutment pins 4, one for each key 5, is preferably provided with a screw threaded shank 39 secured in the key bed 1, a felt cap 40 at its upper end to receive the lower face of the key 5 and an adjustment head 41 at the upper end of the shank 39, the cap 40 being secured to the upper face of the adjustment head 41, the adjustment head 41 being provided to adjust the distance of fall or key fall of the key 5.

The provision of a key 5 separate from the key lever 11 and connected by the linkage 26 to the key bed 1 through the bracket 32 is provided so that the upper face of the key 5 in its at rest position, that shown in Fig. 1, as well as its final depressed position and all intermediate positions, will be maintained substantially parallel to the plane of the key bed 1. In other words, although the key fall according to convention may drop three-eighths of an inch before engaging the upper face of the cap 40, the rear finger contacting face of the key 5 will drop or fall the same distance as the front finger contacting face of the key 5. Consequently, whether the player's hands are required to be positioned so that the fingers engage the rear finger contacting face or the front finger contacting face, the fall will be the same at all times, and consequently the volume may be controlled with a minimum of effort by the player without regard to the position of the fingers when engaging the keys 5. The linkage 26 and the dimensions thereof here shown are merely illustrative of one connection whereby this parallel movement of the upper face of a piano key may be maintained when connected with a piano key action of the type here illustrated. Obviously, although the piano key action here shown is illustrated for use with a grand piano, the key lever 11 may just as well be connected for playing an upright piano without departing from the spirit of the present invention.

In view of the foregoing, the dimensions of the linkage and their connections may vary without departing from the general spirit of the invention. Excellent results have been achieved, however, when the key 5 and key lever 11 are movable relative to one another and connected by a linkage, such as the linkage 26, when the distance from the pin 13 adjacent the washer 18 to the pin 37 is about nine and three-eighths of an inch, the length of the elongated arm 27 is about three and eleven-sixteenths of an inch, the length of each of the short links 30 and 31 is one-half inch, the length of each of the short links 28 and 29 is about three-fourths of an inch, the distance from the pivot pin 38 to the pivot pin 37 is about four inches, and the distance from the pivot pin 42 to the pivot pin 43 in raised position is about four and three-thirty-seconds of an inch and in descended position is about four and one-thirty-second of an inch. Preferably also the distance from the pivot pin 44 to the pivot pin 37 does not exceed three-eighths of an inch and the key fall between the lower face of the key 5 and the upper face of the felt cap 40 is maintained at three-eighths of an inch.

The key 5 in the drawings is illustrative of a white key. However, when it is desired to equip the black keys with the improved linkage, it is only necessary, since the overall length of a black key and its key link is shorter than the overall length of a white key and its key link, proportionately to shorten the length of the linkage elements.

It is obvious that various changes and modifications may be made to the details of construction without departing from the general spirit of the invention as set forth in the appended claims.

I claim:

1. The combination of a pivotally mounted key lever operatively associated with a piano hammer action, a key, and a linkage pivotally connecting said key to said key lever to enable maintaining the upper face of said key parallel to a predetermined plane at all times.

2. The combination of a key bed, a key lever pivotally associated with said key bed and operatively associated with a piano hammer action, a key pivotally connected to said key lever, and a linkage including an elongated link and two pairs of short links, one pair of said short links pivotally connected at one of their ends to the rear end of said elongated link, the other end of one of said latter short links pivotally connected to said key and the other end of the other of said latter short links pivotally connected to said key lever, the other pair of short links pivotally connected at one of their ends to the front end of said elongated link, the other end of one of said latter short links pivotally connected to said key lever, and the other end of the other of said latter short links pivotally connected to said key bed.

3. The combination of a key bed, a key lever pivotally associated with said key bed and operatively associated with a piano hammer action, a key, a bar secured to the front end of said key lever and extending under said key and pivotally connected at its front end to said key, and a linkage including an elongated link and two pairs of short links, one pair of said short links pivotally connected at one of their ends to the rear end of said elongated link, the other end of one of said latter short links pivotally connected to said key and the other end of the other said latter short links pivotally connected to said bar, the other pair of said short links pivotally connected at one of their ends to the front end of said elongated link, the other end of one of said latter short links pivotally connected to said bar, and the other end of the other of said latter short links pivotally connected to said key bed.

4. The combination of a key bed, a key lever pivotally associated with said key bed and operatively associated with a piano hammer action, a key, a bar secured to the front end of said key lever and extending under said key, there being recesses in said key, an upright at the front end of said bar extending upwardly into one of said recesses and pivotally connected at its upper end to said key, and a linkage including an elongated link and two pairs of short links, one pair of said short links pivotally connected at one of their ends to the rear end of said elongated link, the other end of one of said latter short links extending up into the other of said recesses and pivotally connected to said key, the other end of the other of said latter short links pivotally connected to said bar, the other pair of said short links pivotally connected at one of their ends to the front end of said elongated link, the other end of one of said latter short links pivotally connected to said bar, and the other end of the other of said latter short links pivotally connected to said key bed.

5. The combination of a key bed having a pin extending upwardly therefrom, a key lever having an upwardly diverging opening therein to receive said pin and pivotally anchor said key lever, a key pivotally connected to the front end of said key lever, a hammer action resting on the rear end of said key lever, and a linkage pivotally connecting said key to said key lever and cooperating with the pivotal connection between said key and key lever to enable maintaining the upper face of said key parallel to a predetermined plane at all times.

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