Feb. 1, 1955 D. BARNETT 2,700,914

PIANO KEY ACTION

Filed June 21, 1952

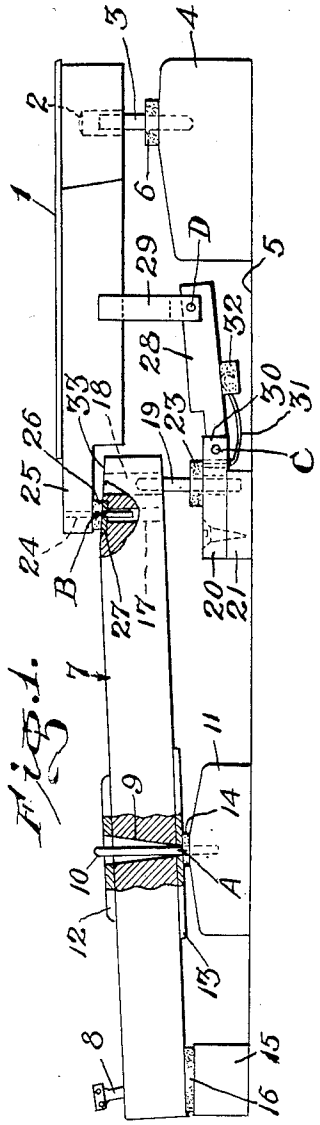

Fig. 1.

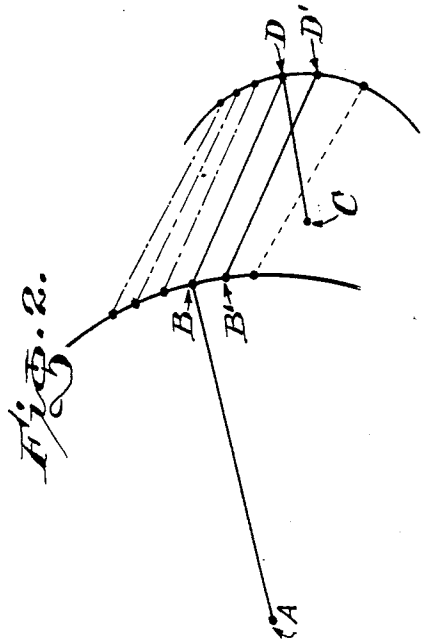

Fig. 2.

INVENTOR
David Barnett
BY Gustav Drews
his ATTORNEY

United States Patent Office 2,700,914
Patented Feb. 1, 1955

2,700,914

PIANO KEY ACTION

David Barnett, Wellesley, Mass.

Application June 21, 1952, Serial No. 294,805

4 Claims. (Cl. 84—423)

This invention relates to piano key actions.

Among the objects of the present invention, it is aimed to provide an improved piano key action whereby the key may descend in a substantially parallel motion as distinguished from a rocking motion, as a result of which the finger in engagement with the front end of the contacting face of the key will descend substantially the same distance as it will descend when engaging the rear end or any other part of the contacting face of the key.

More specifically, the present invention aims to provide an improved key action including a key lever fulcrumed about a point on a fixed base, the rear end of which lever supports the hammer action and the front end of which supports the rear end of the key, and a link pivotally connecting an intermediate part of the key to said fixed base whereby advantage is taken of the substantially parallel paths of movement transcribed by the pivotal connection of the key with the key lever and the pivotal connection between the link and the key in order to effect the uniform descent of the operator's finger whether the finger engages the rear or front end of a key.

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

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

Fig. 2 is a diagram showing the relationship of the pivot points of the key lever with the base and key relative to the pivot points of a link with the base and key to effect the motion achieved.

In the embodiment shown, the key **1**, in the present instance illustrative of a white key, has a recess **2** extending upwardly from the lower face of the front end of the key **1** to receive the pin **3** extending upwardly from the extension **4** of the base **5**. Preferably as shown, a felt cap or washer **6** surrounds the lower exposed portion of the pin **3** resting on the extension **4** to serve as a buffer or stop for receiving the key **1** when depressed.

The key lever **7** in turn is provided with the conventional capstan screw **8** extending upwardly from its rear end to receive the hammer action, not shown, and a tapering hole **9** positioned slightly to the rear of the middle thereof, the lower diminished end of which hole **9** just clears the pin **10** fixed in the extension **11** formed on the base **5**. Preferably to reenforce the key lever **7**, the reenforcement sheets **12** and **13** are secured to the upper and lower faces of the key lever **7** adjacent the hole **9**. Preferably also a felt cap or washer **14** is secured around the pin **10** and positioned on the extension **11** and between the extension **11** and the sheet **13**. Excellent results have been achieved when the sheets **12** and **13** are composed of wood, making sure, however, that the wood sheet **12** has an opening corresponding to the outer enlarged part of the hole **9** and that the wood sheet **13** has an opening just corresponding to the diminished lower end of the opening **9** so that the key lever **7** may be positively anchored to pivot about the pin **10** at the lower end of the hole **9** as a fulcrum. Preferably as shown, between the rear end of the key lever **7** and the extension **15** of the base **5**, there is interposed the felt buffer **16**.

The front end of the lever **7** is provided with two openings **17** and **18**. The opening **18** freely clears the pin **19** secured in the block **20** which in turn is secured to the extension **21** formed on the base **5** by any suitable means, such as the screw **22**. The pin **19** cooperates with the opening **18** primarily as a guide for the key lever **7**. On the upper face of the extension **21** and surrounding the pin **19** there is preferably provided a felt washer or buffer **23** to serve as a buffer or stop for receiving the lower face of the front end of the key lever **7** when depressed by a key **1**.

The opening **17** positioned just to the rear of the opening **18** is provided to receive the pin **24** secured to the rear diminished end **25** of the key **1**. Secured to the pin **24** adjacent the lower face of the diminished end **25** and surrounding the pin **24**, there is provided the felt washer or buffer **26**. The upper face of the front end of the key lever **7** is preferably countersunk to receive the metal insert **27**, provided with an opening just large enough to clear the pin **24** and effect a positive pivotal point for the key **1** relative to the key lever **7** where the pin **24** clears the insert **27**.

The key **1** is pivotally connected to the block **20** by the link **28**, the front end of which is pivotally connected, in the present instance, to the lower end of the bar **29** fixed to and extending down from the key **1** at about the middle thereof. The rear end of the link **28**, on the other hand, is pivotally connected to the finger **30** extending from the front end of the block **20**. In order to counterbalance the weight of the key **1** but not sufficient also to raise the key lever **7** and key **1** into the position shown in Fig. 1, the spring **31** is provided extending from the finger **30** and resting in a cleft formed in the felt pad **32** secured to the bottom of the link **28**. In other words, a hammer action, not shown, according to convention must be relied upon normally to retain the front end of the key lever **7** in raised position, the spring **31** merely being relied upon to counterbalance the weight of the key **1** in the interest of the sensitivity of the action.

In order effectively to clear the diminished portion **25** of the key **1**, the upper face of the front end of the key lever **7** is inclined as shown at **33**.

The fulcrum point A effected by the cooperation of the pin **9** with the opening in the sheet **13**, the pivot point B effected by the cooperation of the pin **24** with the opening in the insert **27**, the pivot point C of the link **28** with the finger **30**, and the pivot point D of the link **28** of the bar **29** in normal position will assume the relative positions shown in the diagram, Fig. 2, while in the depressed position of the key **1**, the pivot point B and the pivot point D will drop to the positions indicated by B′ and D′, indicating that the key **1** will be moved in a substantially parallel direction, that is, that the front end will not descend any farther than the rear end during this movement from the normal raised position of the key **1** to its depressed position.

From the foregoing, it will thus appear that the force required to actuate the key **1** will be substantially the same irrespective of the point of application of the force on the upper face of the key **1**, that is, whether at the extreme front, extreme rear, or any intervening point. In other words, the actual leverage obtained depends upon the relative length of the arms of the key lever **7**, the key **1**, the link **28** and the distance from the fulcrum point A to the pivot point C.

Although changes in dimensions may be made without departing from the general spirit of the invention, it should be noted that excellent results have been achieved when the relative dimensions of the several parts selected conform to those illustrated which have been reproduced at substantially one-half of the actual size of a conventional piano key action.

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. In a piano key action, the combination of a base, a key lever pivotally mounted on said base intermediate its ends in position to receive a hammer action on its rear end normally to depress such rear end, a key having its rear end resting on the front end of said key

lever and pivotally connected thereto, a bar rigidly fixed to and extending down from said key intermediate its ends and in front of the front end of said key lever, a link pivotally connected at its rear end to said base in front of the front end of said key lever and pivotally connected at its front end to the lower end of said bar, and stops for determining the descent of the front ends of said key and key lever and cooperating with said key lever, key and link to effect the descent of the front ends of said key lever and link through substantially parallel arcs in turn to effect the substantially parallel descent of both the front and rear ends of said key.

2. The combination as set forth in claim 1 characterized by a spring extending from said base to the lower face of said link to urge the same upward to counterbalance the weight of said lever.

3. In a piano key action, the combination of a base, a key lever pivotally mounted on said base intermediate its ends, stops on said base below the front and rear ends of said key lever to predetermine its movement, the rear end of said key lever being positioned to receive a hammer action normally to depress the rear end into engagement with the stop below such rear end, a key having its rear end resting on the front end of said key lever and pivotally connected thereto, a bar rigidly fixed to and extending down from said key intermediate its ends and in front of the front end of said key lever, a link pivotally connected at its rear end to said base in front of the front end of said key lever and pivotally connected at its front end to the lower end of said bar, and a stop below the front end of said key to determine the descent of said key, the distances of the front ends of said key lever and key from their respective stops being substantially equal, the distance from the pivotal connection of said key lever with said base to the pivotal connection of said key lever to said key being slightly less than the distance from the pivotal connection of said key lever with said base to the pivotal connection of said link with said base and the distance from the pivotal connection of said link with said base to the pivotal connection of said link with said bar being slightly less than the distance from the pivotal connection of said key lever with said key to the pivotal connection of said bar with said link to effect the descent of the front ends of said key lever and link through substantially parallel arcs in turn to effect the substantially parallel descent of both the front and rear ends of said key.

4. The combination as set forth in claim 3 characterized by a spring connected to said base and extending to and engaging the lower face of said link to counterbalance the weight of said key.

References Cited in the file of this patent

UNITED STATES PATENTS

137,544	Goffrie et al.	Apr. 8, 1873
2,472,740	Barnett	June 7, 1949

FOREIGN PATENTS

493	Great Britain	of 1890
20,001	Great Britain	of 1906