

Jan. 26, 1943.

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2,309,537

KEY ACTION MECHANISM

Filed May 31, 1941

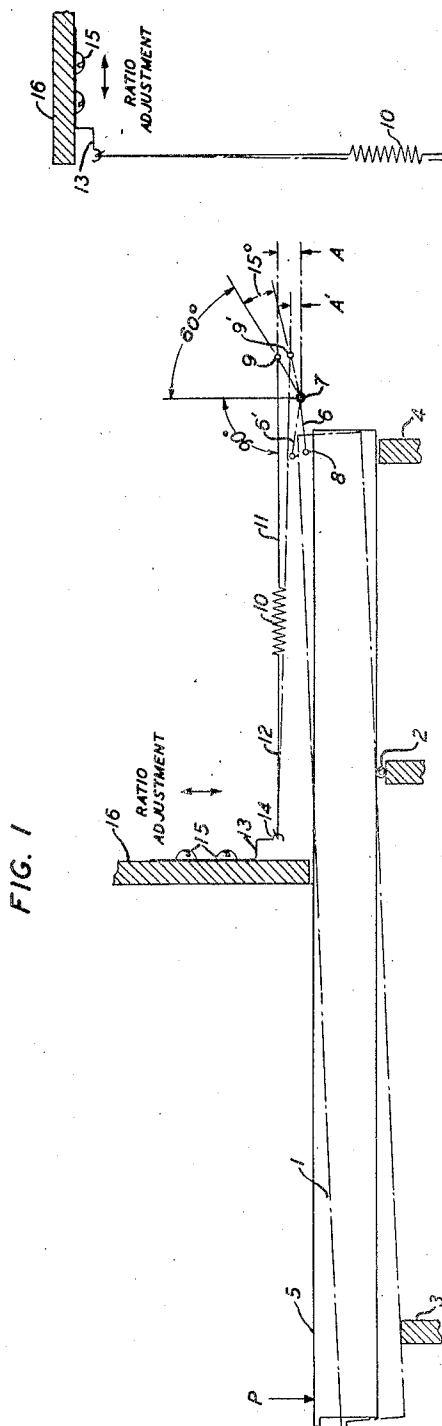


FIG. 1

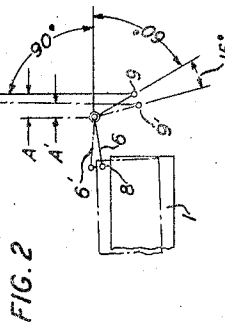


FIG. 2

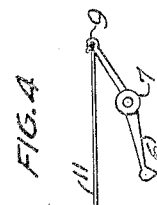
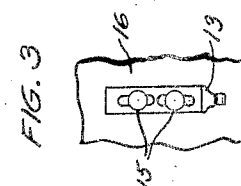


FIG. 2



2/5.3

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2,309,537

KEY ACTION MECHANISM

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Application May 31, 1941, Serial No. 396,139

2 Claims. (Cl. 84-440)

This invention relates to keyboard musical instruments and more particularly to a key action mechanism therefor.

It is desirable that the pressure required to operate the keys of an organ keyboard decrease as the key is pressed. The Standardization Committee of the American Guild of Organists has specified that the pressure at the front edge of the keys be four ounces and two ounces, respectively, for the normal and operated positions.

It is, therefore, the object of this invention to provide a key action mechanism for keyboard musical instruments in which the keying pressure decreases as the key is operated.

This invention attains the foregoing object by providing in combination a key lever, an action lever so positioned that one end thereof engages one end of the key lever, and a spring attached to the other end of the action lever and so positioned with respect thereto as to present a decreasing effective moment arm when the key lever is pressed.

The invention may be better understood by referring to the accompanying drawing, in which:

Fig. 1 shows the invention applied to a key lever wherein the tension spring is positioned substantially parallel with the key lever;

Fig. 2 is similar to Fig. 1 except that the tension spring is positioned substantially 90 degrees with respect to the key lever;

Fig. 3 is a front view of the ratio adjustment mechanism; and

Fig. 4 shows one of the many forms of action levers which may be used.

Fig. 1 shows a side view of one of the key levers of a keyboard in which key lever 1 is fulcrumed about an axis 2 disposed intermediate its ends. Key lever 1 is limited in its travel by stops 3 and 4. Surface 5 of this key lever will be recognized as the point at which the fingers engage the key during playing.

An action lever 6, shown schematically, is fulcrumed about an axis 7 which is shown parallel with axis 2 but need not necessarily be parallel. One end of this action lever engages one end of the key lever at point 8. A spring 10 is attached to the other end of action lever 6 at point 9 through spring extension 11. A similar spring extension 12 of spring 10 is attached to fixed support 13 at point 14. Support 13 is attached to frame 16 by means of two screws 15. The screw holes in support 13 adapted to take the bodies of screws 15 are elongated as shown in Fig. 3 so as to permit vertical adjustment of the sup-

port 13 for a purpose to be hereinafter more fully disclosed.

One form of well-known lever which may serve as action lever 6 in the practice of this invention is shown in Fig. 4. Many other well-known forms of levers equally operative will readily suggest themselves to those skilled in the art.

In operation, pressure is applied to the outer end of key lever 1 at point 5 so as to move the lever down against stop 3. This causes the inner end of key lever 1 to rise and carry with it action lever 6. Action lever 6 thereupon rotates about its axis 7 to a position 6' thereby carrying the other end of action lever 6 to point 9'. It is obvious that this will slightly extend spring 10 but for the proportions shown the extension will be very slight so that the tension of spring 10 will remain substantially constant. It is clear, however, that the length of the effective lever arm through which the force from spring 10 acts on action lever 6 is reduced to A' which is approximately one-half its original length A, thereby reducing the force of contact between action lever 6 and key lever 1 at point 8 to about one-half its original amount. Therefore, if the original pressure P at point 5 of key lever 1 is four ounces, this pressure will be two ounces when the key lever 1 is operated.

It is obvious that by changing the proportion of the parts and their angular relationship, the principles of this invention may provide other ratios of the original force to the final force required to operate the key lever. To secure uniformity of force ratio from key to key, spring support 13 may be adjusted with respect to frame 16 so as to change slightly the line of force from spring 10 with respect to action lever 6. To do this screws 15 are loosened and spring support 13 is moved back or forth as indicated by the double-headed arrow until the desired ratio is attained. Screws 15 are then tightened to secure spring support 13 in a fixed position with respect to frame 16. If the parts are proportioned substantially to the scale indicated in Fig. 1, with the angular relationships for key lever 6 and tension spring 10 as shown, and tension spring 10 is adjusted to a tension of approximately sixteen ounces, it will require an initial pressure of about four ounces to start key lever 1 in its downward direction and will continuously decrease until a pressure of only two ounces is required to hold key lever 1 against stop 3. The reduction in pressure will be uniform and substantially linear with the distance through which key lever 1 is moved.

The angle between the two ends of action lever 5 need not be any particular angle. For example, in Fig. 1 this angle is shown to be approximately 157 degrees. In fact, this angle may be any convenient angle. The only requirement is that the length of the effective lever arms A and A' corresponding with the unoperated and operated positions of key lever 1, respectively, bear a ratio to each other which is equal to the ratio of the desired operating forces at point 5 on key lever 1.

In Fig. 2 the invention is shown in essentially the same form as shown in Fig. 1 with the exception, however, that the angle between the two ends of action lever 6 has been changed. In this figure this angle is approximately 247 degrees. The operation is essentially the same as described for Fig. 1.

The electrical contacts controlled by the key are not shown but may be of any of the forms well known in the art. It is preferable, however, that the key lever control only a single pair of contacts using relatively light contact pressures to avoid disturbing the pressure adjustment provided by this invention. Where a plurality of circuits must be controlled by the key it is preferred that a relay be used as disclosed in Fig. 30 of U. S. Patent 2,169,842 to Kannenberg, issued August 15, 1939. If a plurality of contacts must be operated directly by the key lever or if only a single pair is operated and must produce an appreciable effect at the playing point 5 it is very easy to compensate for

this additional load so that the desired force ratio at the playing point is achieved. For example, if the effective contact pressure at the playing point is negligible for the unoperated position but increases to one ounce for the operated position, the action mechanism of this invention must supply four ounces for the unoperated position and only one ounce when operated, or a force ratio of four instead of two.

What is claimed is:

1. A key-action mechanism for keyboard musical instruments requiring an operating force which decreases as the key lever is operated, comprising in combination, a key lever having an operating end and a bearing, an action lever having a bearing in contact with the bearing on said key lever, a fulcrum for each lever, a spring attached to said action lever at a predetermined distance from its fulcrum and arranged to direct its force along a line forming an oblique angle with a line passing through the fulcrum of said action lever and the point of attachment of the spring to the action lever to exert variable pressure on said key lever as said key lever turns about its fulcrum.

2. The combination of claim 1 and an adjustable spring support attached to the spring to adjust the magnitude of said oblique angle whereby the ratio of the initial force to the final force required to operate the key lever is adjusted.

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