Aug. 19, 1930. G. E. LA MARCHE 1,773,230

KEY MECHANISM FOR KEYED MUSICAL INSTRUMENTS AND THE LIKE

Filed Feb. 17, 1926

Fig. 1

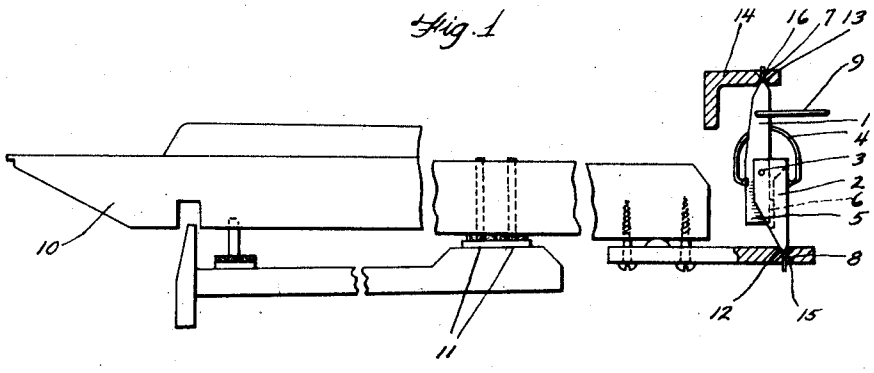


Fig. 2

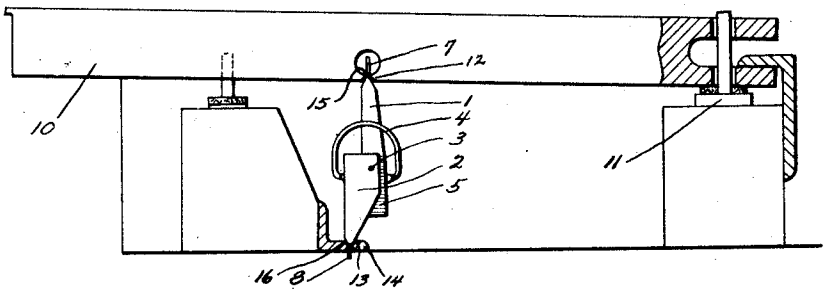
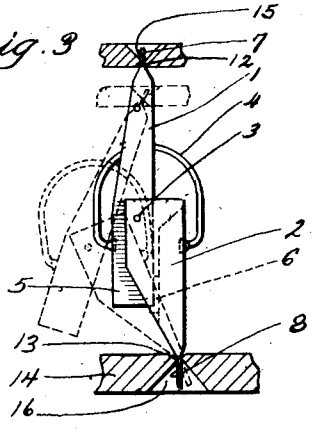


Fig. 3



Inventor

George E. La Marche

By. J. Clarke Hagey

Atty.

Patented Aug. 19, 1930 1,773,230

UNITED STATES PATENT OFFICE

GEORGE E. LA MARCHE, OF CHICAGO, ILLINOIS

KEY MECHANISM FOR KEYED MUSICAL INSTRUMENTS AND THE LIKE

Application filed February 17, 1926. Serial No. 88,921.

This invention relates to key mechanism for keyed musical instruments and the like, and more particularly concerns the provision of simply constructed and efficient devices designed to be employed to offer a desired resistance to the manual depression of the individual keys.

One object of the invention is to provide devices of this character so designed and constructed that, when properly associated with the respective keys, they will produce a desirably peculiar effect in the touch and manipulation thereof.

Another object of the invention is to provide devices of the aforesaid character and purpose which may be manufactured and supplied as a stock article to musical instrument manufacturers.

Further objects and advantages of the invention will appear from the detailed description to follow.

In the accompanying drawings—

Figure 1 is a broken and partly sectional side elevation of one form of key-mechanism involving my invention;

Fig. 2 is a similar view of another form of key-mechanism also involving my invention; and

Fig. 3 is a view, upon an enlarged scale, of my key-touch-regulating device.

Before proceeding with the detailed description of my invention, and in order to give a better understanding thereof, it should be explained that, in certain types of keyed musical instruments, it has been customary to have the manually operable keys directly connected with the note-sounding mechanism and that, as a natural consequence, the key-touch varies throughout the scale. The proper sounding of the lower notes usually requires more cumbersome note-sounding mechanism than the upper notes and, when the keys are directly connected as aforesaid, the key-touch must necessarily be heavier in the bass than in the treble section. Furthermore, and for the same reason, inequalities in the action of the note-sounding mechanism produces corresponding inequalities in the key-touch.

In organs, for example, the chest-valves for the lower notes are considerably larger than those for the upper notes, and it was formerly customary to have the manually operable keys directly connected by "trackers" with their respective chest-valves. In such instruments, known as tracker-action organs, the pressure of the air in the chest upon the valves was such as to cause them to so hug to their seats as to produce more or less reluctance in the initial part of the movement of the keys. Co-incident with the starting of the valves from their seats, this initial reluctance in key-movement would be suddenly reduced or, in effect, released, and further depression of the keys would be comparatively easy. In the smaller organs, wherein it was not necessary, even in the bass section, to employ large chest-valves or to provide more than one or two key-manuals, this initial reluctance in key-movement was not so pronounced as to be objectionable—in fact, it afforded a certain desirable firmness and a reliability in the key-touch which, among other advantages, avoided the sounding of undesired notes by the accidental touching of wrong keys during rapid or difficult key-manipulation. In the larger tracker-action instruments, however, the correspondingly larger chest-valves were much more difficult to start from their seats, and the effect was a disagreeable stickiness in the key-touch, very pronounced in the bass register, which was fatiguing to the performer and interfered materially with the proper manipulation of the keys in rapid or difficult fingering. Of course, the then prevalent use of mechanical couplers for connecting the different key-manuals added to and emphasized this difficulty. Efforts to obviate this objectionable stickiness of key-touch resulted in the devising and employment of various forms of chest-valves, valve-springs, and levers, but their use appeared to introduce other objectionable effects, such, for instance, as one which became known as "double-touch."

It is now the preferred practice to employ, even in the smaller organs, pneumatically or electrically operable devices to actuate the chest-valves or other note-sounding mecha-

nism and to control the operation of these devices pneumatically or electrically (as the case may be) from one or more key-manuals, each key actuating one or more key-valves or circuit-controlling switches, the previously employed mechanical key-couplers being supplanted by coupling air-channels or electric circuits. In the present type of organ, therefore, it does not matter which part of the key-scale is employed, how many stops are used, or how many divisions of the organ are in service; the key-touch remains the same. However, while the hereinbefore described stickiness and scale-variation in key-touch has been eliminated in the pneumatically or electrically controlled instrument, other objectionable features have been noticed. The former firmness and reliability in key-touch has been sacrificed, and there is a marked lack of uniformity in the key-touches of different instruments.

In these later types of organs, it is highly desirable that the individual key-actuated valves or switches should be very light and responsive in action, in order to insure their proper operation under the most rapid manipulation of the keys, but it is equally desirable that the keys should possess a certain definite and uniform firmness of touch under the fingers of the performer, sufficient to avoid annoying super-sensitiveness without offering a fatiguing resistance. Super-sensitiveness and lack of firmness in the key-touch are today as well recognized as objectionable characteristics of the pneumatically or electrically controlled instrument as was the stickiness of touch which was objectionable in many of the tracker-action instruments, and variously shaped springs, levers, and weights have been devised and applied in different ways to resist, balance, or counterbalance the key-movement in efforts to provide a key-touch which would be generally satisfactory. Organists appear to be unable to define with any degree of exactness the key-touch which they individually prefer and do not generally agree upon any desired standard, and the efforts of the different manufacturers have been to provide, each in his own way, the peculiar key-touch which he believes to be the most desirable or which will be the most acceptable. The result is that at present there is a complete and confusing lack of uniformity. For years, the conditions have been such that visiting organists must necessarily familiarize themselves with the various key-touches individually peculiar to the different instruments, whether the instruments were made by the same manufacturer or by different manufacturers.

My invention is designed to rectify this lack of uniformity and to provide for the standardization of key-touch, and I purpose to do this by providing a device, complete in itself, which may be supplied as a stock article to manufacturers, to be applied by them in different positions along the keys, or elsewhere, as they may prefer, in order to conform to the requirements of the particular instrument, to afford the desired initial resistance and firmness in key-touch. This initial resistance and firmness may be determined according to a pre-arranged standard by the well known method of "weighing the touch"—that is, my key-touch-regulating device may be properly positioned, with respect to the leverage of the key, by placing a suitable weight upon the forward end-part of the key and locating my device so that it will afford the proper initial resistance to counterbalance or just support the weighted key. When its location has once been decided upon, an entire set may be installed, all of the devices being so uniformly designed and constructed that they will provide the proper degrees of resistance for the different stages of movement of the keys.

Referring, now, to the drawings, and more particularly to Fig. 3 thereof, it will be observed that my key-touch-regulating device is a unitary structure comprising a pair of levers 1 and 2, pivoted together at 3 to form a toggle. Levers 1 and 2 are acted upon by a spring 4 to yieldingly hold the toggle normally expanded, and a stop-hinge effect is provided to prevent the toggle from being completely straightened out. As viewed in the drawings, the upper end-part of lever 2 is bifurcated to receive and partially box the lower end-part 5 of lever 1, which extends below the pivotal connection 3 and is acted upon by one arm of the U-shaped spring 4, a pad 6, of felt or buckskin, being positioned as shown to cushion the contact of the end-part 5 against one of the walls of the box-like bifurcation and thus noiselessly interfere with the aforesaid straightening out of the toggle. The pivot-pin 3 is preferably tight in lever 1 and turns in bushed bearings in lever 2. At their oppositely extending ends, levers 1 and 2 are provided with positioning pins 7 and 8, respectively.

In Fig. 1, I have shown a conventional form of key which is fulcrumed between its ends, to be found in most organs and pianos, and have illustrated my device as positioned above the after part of said key. I have also shown a connection 9 pivotally attached to the upper lever 1 of my device, which connection may constitute a link or tie extending to any form of key-actuated mechanism, but this interpositioning of my device as a connecting element between the key and the key-actuated mechanism of the instrument is, of course, entirely optional.

In Fig. 2, I have shown a modified form of key which is used in some types of keyed musical instruments, and which may be employed with my device as a practice clavier. Here the fulcrum of the key is near the rear-

ward end thereof, and my device is shown as positioned beneath the forward part of the key.

It will be readily understood that the location of the device along the key 10, with respect to the key-fulcrum 11, will determine the degree of resistance which the device will offer to the depression of the key, but the resistance offered by the spring 4 in the flexing of the toggle will not be affected by such location, so that, with the device properly positioned to give the desired firmness and resistance to the initial part of the movement of the key, the properly proportionate degrees of resistance to the further depression of the key will be afforded and determined by the resisting qualifications which are inherent characteristics of my key-touch-regulating device.

I have shown the device as positioned with its opposite ends stepped one in a shallow groove or notch 12 in the key and the other similarly stepped in a shallow channel 13 in a spring-rail 14 which is fixed to extend transversely with respect to all of the keys of each manual. The positioning pins 7 and 8 project into openings 15 and 16 provided therefor in the bottoms of the respective notches 12 and channel 13. The length of pins 7 and 8, the provision for their accommodation in the keys and spring-rails, the bushing of the openings 15 and 16, and the bushing or "black-leading" of the notches 12 and channel 13 are details of construction which may be varied by the manufacturer without interfering with the proper operation and effectiveness of my device.

In Figs. 1 and 2, I have shown the device as applied directly to a key and as vertically positioned with relation thereto, but it is to be understood that this is but one of several ways in which it may be applied and positioned. The construction of the device is such that it may be applied to resist the movement of key-actuated parts, rather than the keys, and may be turned about, inverted, and arranged horizontally without in any manner impairing its action or effectiveness. Furthermore, the stop-hinge effect of the pivotally connected levers 1 and 2 may be obtained without employing the exact construction which I have shown and described.

When the device is in position, pressure upon the end of either, or upon the ends of both, of the levers 1 and 2 will flex the toggle in opposition to the action of spring 4, the pivotal connection 3 of the levers being at one side of the direct line of pressure. The shape, strength, position, and strength-gathering power of spring 4 is such as to provide the properly proportionate resistance in the different stages of flexing of the toggle. Consequently, when the device has been properly located, as aforesaid, with respect to the leverage of the key, to provide the desired resistance to the initial part of the key-movement, manual depression of the key will flex the toggle, and the compound action of the two levers 1 and 2 in opposition to the action of the spring 4 will produce an initial firmness and reliability in key-touch and an elastic, lively and responsive resistance throughout the entire key-movement, simulating to a certain extent the hereinbefore described desirable qualifications of the tracker-action organ and providing that peculiar effect in the key-touch which I have therefore described as a "tracker-touch." This effect is decidedly different from that produced by the application of mechanism which simply affords a gradually decreasing resistance to the depression of the keys, and I do not wish my invention to be confused therewith.

In addition, it will be noted that, by providing a unitary structure such as I have described, of uniform construction and design, which may be supplied as a stock article to manufacturers, adapted to be differently applied by them in different instruments to properly allow for the individual requirements and characteristics thereof, I have provided a means through the employment of which a standardized key-touch may be afforded.

I claim—

1. The combination, with a depressible key in a manual key-board, of a key-touch-regulating device for resisting the depression of said key, comprising a normally expanded toggle and means acting upon said device to yieldingly hold said toggle expanded.

2. The combination, with a depressible key in a manual key-board, of a key-touch-regulating device for resisting the depression of said key, comprising a toggle flexed through endwise compression thereof by the depression of said key and means acting upon said device to yieldingly resist the flexing of said toggle.

3. The combination, with a depressible key in a manual key-board, of a toggle positioned to act directly upon said key and be flexed by the depression thereof, and means acting upon said toggle to yieldingly hold it expanded.

4. The combination, with a depressible key in a manual key-board, of a toggle positioned to act directly upon said key and be flexed by the depression thereof, and a spring acting upon said toggle to resist the flexing thereof.

5. A musical instrument action mechanism comprising an abutment, a relatively movable, manually operable element, a toggle expanded between said abutment and said element to be compressed endwise by the movement of said element, and means acting upon said toggle to yieldingly hold it expanded.

6. A musical instrument action mechanism

comprising an abutment, a relatively movable, manually operable element, a toggle positioned between said abutment and said element to be flexed through endwise compression thereof by the movement of said element, and a spring acting upon said toggle to resist the flexing thereof.

7. A musical instrument action device comprising a pair of pivotally connected levers and means acting upon said levers to yieldingly hold their swinging ends oppositely extended with respect to each other.

8. A musical instrument action device comprising a pair of pivotally connected levers, means acting upon said levers to yieldingly hold their swinging ends oppositely extended with respect to each other, and a stop acting upon said levers to interfere with the action of said means.

9. A musical instrument action device comprising a pair of pivotally connected levers, means acting upon said levers to yieldingly resist their relative movement in one direction, and a stop acting upon said levers to prevent their relative movement beyond a certain point in the opposite direction.

10. As an article of manufacture, a key-touch-regulating device comprising a pair of pivotally connected levers and a spring acting upon said levers to yieldingly hold them in relative position to form an expanded toggle.

11. As an article of manufacture, a key-touch-regulating device comprising a pair of pivotally connected levers, a spring acting upon said levers to yieldingly hold them in relative position to form an expanded toggle, and a stop acting upon said levers to prevent said toggle from being completely expanded.

12. As an article of manufacture, a key-touch-regulating device comprising a pair of levers pivotally connected together to form a toggle, the end-part of one of said levers extending beyond its pivotal connection with the other of said levers and forming a stop thereagainst, and a spring acting upon said levers to yieldingly hold said toggle expanded to the point of interference of said stop.

13. As an article of manufacture, a key-touch-regulating device comprising an endwise compressible toggle formed by a pair of pivotally connected levers, the pivotal connection of said levers being offset from the direct line of compression of the toggle, a stop to maintain the offset position of said pivotal connection, and a spring acting upon said levers to yieldingly hold said toggle expanded as far as said stop will permit.

14. As an article of manufacture, a key-touch-regulating device comprising a pair of levers pivotally connected together to form a toggle, a pin projecting from the unconnected end of each of said levers, the end-part of one of said levers extending beyond its pivotal connection with the other of said levers to act as a stop thereagainst, and a spring acting upon said levers to yieldingly hold said toggle expanded and to cause said end-part of one of said levers to bear against the other of said levers.

15. The combination, with the manually operable keys and the note-sounding mechanism of a musical instrument, of devices operated by the depression of said keys to effect the actuation of said mechanism, each of said devices comprising a toggle flexed through endwise compression thereof by the depression of its respective key, means acting to yieldingly resist the flexing of said toggle, and means connected with said toggle and forming a part of said mechanism, whereby depression of each of said keys will flex a corresponding toggle against the action of its respective resisting means and cause said toggle to actuate the said means connected therewith.

16. The combination, with the manually operable keys and the note-sounding mechanism of a musical instrument, of devices operated by the depression of said keys to effect the actuation of said mechanism, each of said devices comprising an endwise compressible toggle formed by a pair of pivotally connected levers, a spring acting upon said levers to yieldingly hold said toggle expanded, and means connected with one of said levers and forming a part of said mechanism, whereby depression of each of said keys will compress a corresponding toggle against the action of its respective spring and cause its respective one of said levers to actuate the said means connected therewith.

17. A musical instrument action device comprising a pair of levers pivotally connected together, and means acting upon said levers to yieldingly hold their outer ends extended in substantially opposite directions, with the pivotal point of their connection offset from but in substantial alignment with their said outer ends.

18. A musical instrument action device comprising a pair of levers pivotally connected together, means acting upon said levers to yieldingly hold their outer ends extended in substantially opposite directions, and means acting upon said levers to prevent the pivotal point of their connection from being moved into alignment with their said outer ends.

19. A musical instrument action device comprising a pair of levers pivotally connected together, and means carried by said levers and acting thereupon to yieldingly hold their outer ends extended in substantially opposite directions, with the pivotal point of their connection offset from but in substantial alignment with their said outer ends.

20. A musical instrument action device comprising a pair of levers pivotally con-

nected together, means acting upon said levers to yieldingly hold their outer ends extended in substantially opposite directions, and means carried by one of said levers and acting upon the other thereof to prevent the pivotal point of their connection from being moved into alignment with their said outer ends.

21. A musical instrument action device comprising a pair of levers pivotally connected together, means carried by said levers and acting thereupon to yieldingly hold their outer ends extended in substantially opposite directions, and means carried by one of said levers and acting upon the other thereof to prevent the pivotal point of their connection from being moved into alignment with their said outer ends.

22. A musical instrument action device comprising a pair of levers pivotally connected together, and means acting at predetermined points upon each of said levers to yieldingly hold their outer ends extended in substantially opposite directions, the pivotal point of connection of said levers being offset in one direction from alignment with their said outer ends and offset in another direction from alignment with the aforesaid predetermined points thereupon, whereby a movement of either of said levers to increase the offset of said pivotal point in said one direction will decrease the offset thereof in said other direction.

23. A musical instrument action device comprising a pair of levers pivotally connected together, means acting at predetermined points upon each of said levers to yieldingly hold their outer ends extended in substantially opposite directions, the pivotal point of connection of said levers being offset from alignment with said predetermined points, and means acting upon said levers to prevent said pivotal point of their connection from being moved into alignment with their said outer ends, whereby an endwise compression of said levers will increase the offset of said pivotal point from alignment with said outer ends and decrease the offset thereof from alignment with said predetermined points.

In witness whereof, I have hereunto subscribed my name this fifteenth day of February, A D. 1926.

GEORGE E. LA MARCHE.