P. BISSING.

ACTION FOR KEYBOARD STRINGED MUSICAL INSTRUMENTS.

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899,096.

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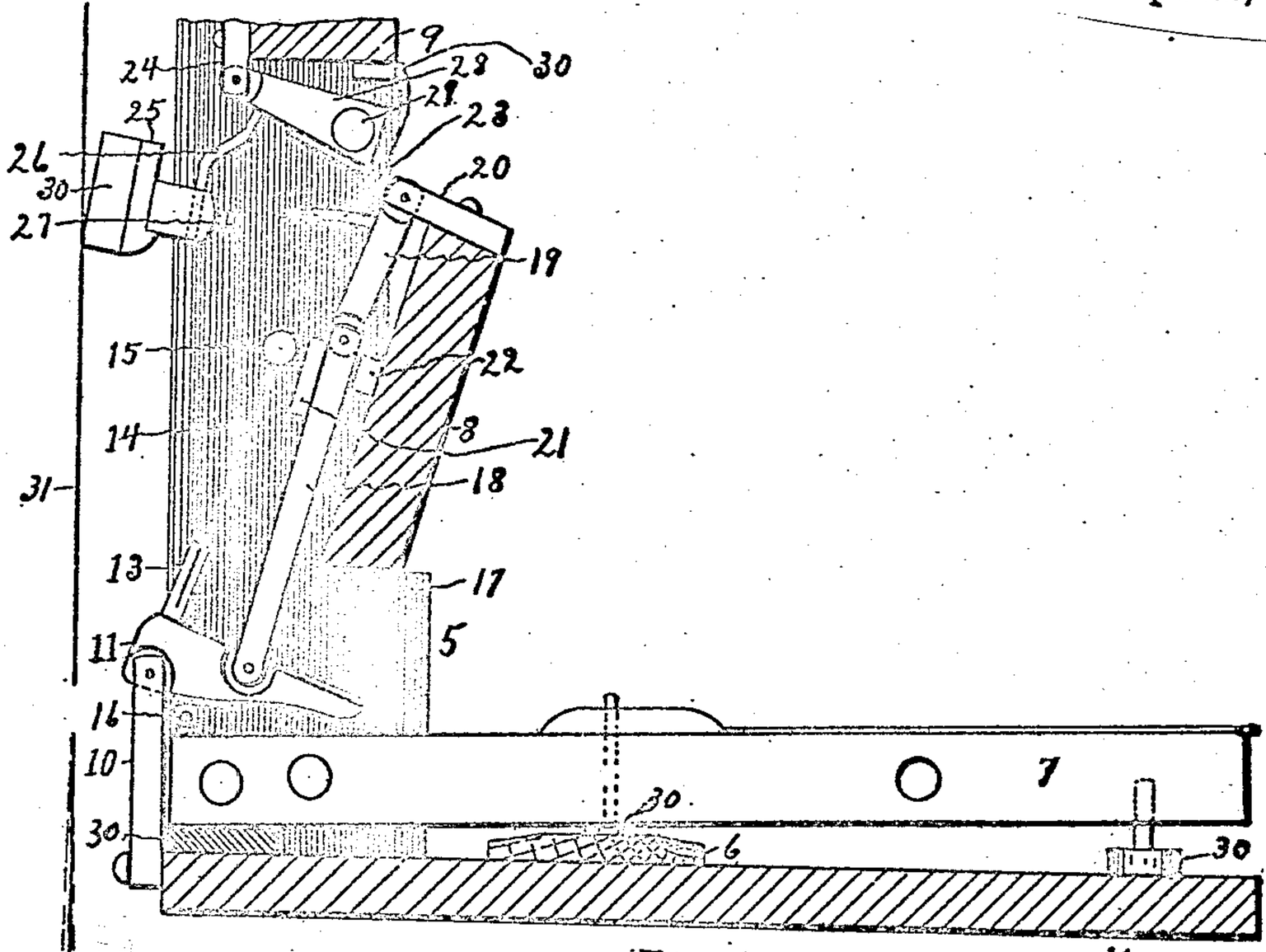

Fig. 1

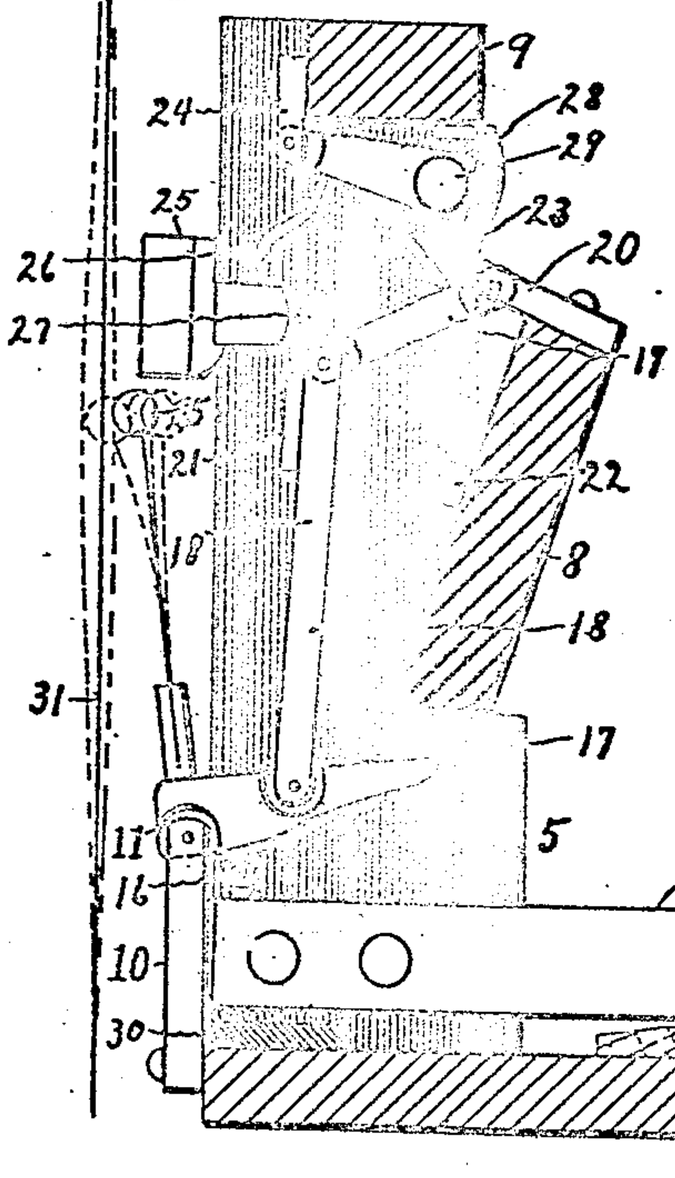

Fig. 2

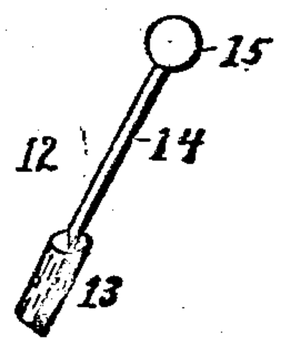

Fig. 3

Witnesses

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ACTION FOR KEYBOARD STRINGED MUSICAL INSTRUMENTS.

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Application filed November 29, 1907. Serial No. 404,242.

To all whom it may concern:

Be it known that I, PETROWITSCH BISSING, a citizen of the United States, residing in the city of Topeka, in the county of Shawnee and State of Kansas, have invented new and useful Improvements in Actions for Keyboard Stringed Musical Instruments, of which the following is a specification.

My invention relates to action mechanism of key-board stringed musical instruments.

The object is to provide such a mechanism which is adapted for the production both of single tones and of tremolo tones, and whereby a single operation of the key may produce a tone of either character, at the will of the operator.

The invention consists of the parts, improvements, and combinations herein pointed out and claimed.

In the drawings accompanying and forming part of this specification, and in the description thereof, I have shown my invention in its preferred form, and have shown the best mode of applying the principles thereof; but it is to be understood that the invention itself is not confined to these drawings and the description of these drawings, that it may be applied to other uses, that parts and combinations as separately claimed may be used either with or without other devices of similar general nature, and that I contemplate changes in form, proportions, materials, and arrangement, the transposition of parts, and the substitution of equivalent members, within the scope of the appended claims, without departing from the spirit of the invention.

Figure 1 is a side elevation view of an action mechanism constructed in accordance with the principles of my invention, the parts being in their normal position, that is, the position of rest; certain parts of the frame being shown in cross section. Fig. 2 is a similar view of the same mechanism showing the positions of the parts when the key is depressed, dotted outlines indicating vibrations of the string and the hammer-head and hammer-shank. Fig. 3 is a detached view of the hammer-head and hammer-shank.

Similar reference characters indicate like or corresponding parts throughout the several views.

4 and 5 are the base and upright, respectively, of a suitable frame; 6 is a key-lever balance-rail; and 9 is a damper-flange rail.

8 is a rail for supporting a flange to which is pivoted one part of a damper-operating and hammer-throwing element, hereinafter to be described; the said rail also serving with capstan screw 17 as a hammer-butt stop.

10 is a flange suitably secured to the frame, as to the base 4, and to which is pivoted a hammer-butt 11, on which is mounted a hammer. The hammer is of peculiar and particular construction. It consists of a head 15 and a flexible-spring shank 14 suitably mounted on the hammer-butt 11, as by means of a stud 13. The shank 14 must be of suitable resilience to cause the hammer-head to vibrate, as will hereinafter be explained, and I prefer for this purpose to use a flat steel spring, the broad surface facing the string 31 so that the vibration will always be in the proper plane to direct the hammer-head against the string.

18 and 19 are two members of a damper-operating and hammer-throwing element hereinbefore referred to, one member being pivoted to the hammer-butt and the other to the flange 20. They are pivoted together to form a knuckle-joint. When the parts are at rest, the member 18 rests against a cushion 22 on the rail 8, and the middle pivot does not come quite in alinement with the end pivots. When the hammer-butt is raised, the upper end of the lower member 18 is forced to the left (as viewed in the drawings), on account of the arc described by the upper member. A pad or cushion 21 on the lower member is located immediately in the rear of the hammer-head. These parts are so adjusted, as indicated in the drawings, that when the key is depressed and the hammer-butt thereby raised, the upper end of the bar or link 18 travels more rapidly and farther toward the hammer-head (to the left as viewed in the drawings), than the lower end, by reason of the arc described by the upper link 19, and yet the upper end does not travel far enough to the left to interfere with the vibrations of the hammer-head against the string. When the hammer-butt is raised quickly by a stroke on the key-lever, the movement of the member 18 will throw the hammer-head toward the string 31. This member or hammer-throwing element 18 is necessary because if the hammer has a resilient shank the head will lag or act slowly when the key-lever is given a sharp stroke downward; while the hammer-throwing element causes the hammer-head to be thrown quickly toward the string, thus giving a

quick response to the touch on the key, even with the resilient shank. The same member 18 with its cushion 21 also serves as a check to stop the vibrations of the hammer as soon as the key is released.

Extending from the upper member 19 is a spoon 23 for directly operating the damper element. The damper element consists of an L-shaped lever comprising a member 28 pivoted to the damper-flange 24 and provided with a weight 29 normally holding the damper against the string, and a rod 26 secured to the member 28 and having a head 25 adjustably fastened thereto by means of a set-screw 27. When the parts are at rest, the spoon or rod, 23 is wholly disengaged from the damper-lever, permitting the damper to rest against the string. On lifting the hammer-butt, as by a stroke on the key-lever, rod 23 lifts member 28 and withdraws the damper from the string (see Fig. 2). On the release of the key-lever, the parts are restored to their normal position, as shown in Fig. 1.

16 is a capstan-screw set in the key-lever 7 under the hammer-butt; and 17 is a capstan-screw set in the rail 8 in the path of the hammer-butt; by means of these capstan screws, the travel of the key-lever and of the hammer-butt may be adjusted.

The string 31 is properly tensioned over parts of the frame, as is usual in stringed musical instruments. The string thus tensioned has two distinct functions; first as a sound-producing element as in other stringed musical instruments; and second as a spring as part of the action mechanism to coöperate with the resilient hammer-shank to cause the hammer-head to vibrate against the string to produce a prolonged tremolo tone, as will now be explained. I so adjust the parts that when the key is depressed, the hammer-butt is checked in such position that the hammer-head if not vibrating (as shown in full lines in Fig. 2) will be close to but not in contact with the string: if the hammer-head is caused to vibrate through the vibration of the resilient shank (as will occur when the key is struck a blow and held depressed), it, the hammer-head, will strike the string with each vibration toward it. The rapidity of the vibrations of the hammer-head depends upon the weight of the hammer-head and the length and stiffness of the hammer-shank. With a hammer-shank made of a thin flat steel spring of considerable flexibility and about two and one-quarter inches in length, and other parts in approximately the proportions shown in the drawings, the best results are secured by allowing a space of approximately one-sixteenth of an inch between the string and the hammer-head when in position of rest with the key depressed (Fig. 2). With a mechanism of this kind, a blow on the key the key being then held depressed will produce a tremolo tone of perfect rhythm, and of sufficient duration for practical use in a musical instrument, there being from twenty to sixty strokes of the hammer-head against the string, depending upon the force of the blow on the key. The tremolo tone thus produced resembles the tone produced from a mandolin, but it is mechanically perfect, not depending on the player for its rhythm.

In practice, I contemplate the combination of the entire set or series of strings, each with its own key, hammer, damper, and connecting mechanism, the key-board being arranged as the key-board of a piano.

A single stroke on the key, the key being immediately released, produces a single tone from the string, as the tone from the piano or harp string. A stroke on the key, the key being held depressed, produces the tremolo tone as above described, and obviously this tremolo tone ceases the instant the key is released, or when the force of the stroke is spent in vibration.

Another feature of my action mechanism is its quick responsiveness owing to the fact that the rear end of the key-lever is always in connection with the hammer-butt (which is not the case in piano actions). The stroke of the hammer can be produced from any position of the key-lever.

What I claim is:

1. The combination of a frame; a tensioned string; a hammer having a resilient element; a device to operate the hammer; a check to limit the movement of the hammer toward the string; said string, hammer, and check being adjusted so as to cause the tensioned string and said resilient element to coöperate in maintaining a prolonged vibration of the hammer-head against the string.

2. The combination of a frame; a tensioned string; a hammer having a resilient shank; a device to operate the hammer; a check to limit the movement of the hammer toward the string; said string, hammer, and check being adjusted so as to cause the tensioned string and the resilient shank to coöperate in maintaining a prolonged vibration of the hammer against the string.

3. The combination of a frame; a tensioned string; a hammer having a spring shank; a damper; a device to operate the hammer and the damper; and a check to limit the movement of the hammer toward the string; said string, hammer, and check being adjusted so as to cause the tensioned string and the spring shank to coöperate in maintaining a prolonged vibration of the hammer against the string.

4. The combination of a frame; a tensioned string; a hammer having a spring shank; a damper; a lever to operate the hammer and the damper; and a check to limit the movement of the hammer and adjusted so as to naturally check the hammer

with the head close to but not in contact with the string and so as to permit the head by reason of the momentum acquired in its action toward the string and the flexure of the spring shank to strike the string, in which construction the tensioned string and the spring shank are adapted to coöperate in maintaining a prolonged vibration of the hammer-head against the string.

5. The combination of a frame; a tensioned string; a hammer having a resilient shank; a device to operate the hammer; a check to limit the movement of the hammer toward the string; said string, hammer, and check being arranged so as to cause the tensioned string and the resilient shank to cooperate in maintaining a prolonged vibration of the hammer against the string; and a hammer-throwing element coöperating with said hammer to initially throw the hammer-head toward the string.

6. The combination of a frame; a sound-producing element; a hammer having a resilient shank; a device to operate the hammer; and a hammer-throwing element coöperating with the hammer-operating device to initially throw the hammer-head toward the sound-producing element.

7. The combination of a frame; a tensioned string; a hammer having a spring shank; a key-lever to operate the hammer; a check to limit the movement of the hammer toward the string; said string, hammer, and check being arranged so as to cause the tensioned string and the spring shank to coöperate in maintaining a prolonged vibration of the hammer against the string; a damper operated by the key-lever; and a hammer-throwing element coöperating with the hammer to initially throw the hammer-head toward the string and to stop the vibrations of the hammer on its return to normal position.

8. The combination of a frame; a tensioned string; a hammer having a spring shank; a check to limit the movement of the hammer toward the string; said string, hammer, and check being arranged so as to permit the string and the spring shank to cooperate in maintaining a prolonged vibration of the hammer against the string; a damper; a knuckle-jointed element coöperating with the hammer to throw the hammer-head initially toward the string, and to stop the vibration of the hammer-head upon return of the parts to normal position.

9. The combination of a frame; a tensioned string; a pivoted hammer comprising a hammer-butt, a hammer-head, and a spring shank carrying the hammer-head and mounted on the hammer-butt; a check to limit the movement of the hammer-head toward the string; said string, hammer, and check being so adjusted as to naturally check the hammer with its head close to but not in contact with the string and so as to permit the head by reason of the momentum acquired in its movement toward the string and the flexure of the spring shank to strike the string, in which construction the tensioned string and the spring shank coöperate in maintaining a prolonged vibration of the hammer-head against the string; a damper pivoted to the frame; a knuckle-jointed hammer-throwing and damper-operating element to stop the vibrations of the hammer-head upon return of the parts to normal position; and a key-lever for operating said mechanism; substantially as set forth.

10. The combination of a frame; a tensioned string; a hammer having a spring shank; a damper; a lever to operate the hammer and the damper; and a check to limit the movement of the hammer toward the string and adjusted so as to naturally check the hammer with the head close to but not in contact with the string and so as to permit the head by reason of the momentum acquired in its action toward the string and the flexure of the spring shank to strike the string, in which construction the tensioned string and the spring shank coöperate to maintain a prolonged vibration of the hammer-head against the string; whereby a single stroke on the lever the lever being immediately released produces a single tone from the string, and a stroke on the lever the lever being held depressed produces a tremolo tone, substantially as set forth.

In testimony whereof I have hereunto signed my name in the presence of subscribing witnesses.

PETROWITSCH BISSING.

Witnesses:
C. B. WALTER,
J. E. LEADER.