March 12, 1940. E. W. DAVIS 2,193,060

MUSICAL INSTRUMENT

Filed Sept. 24, 1937

Fig. 4

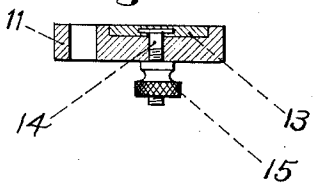


Fig. 5

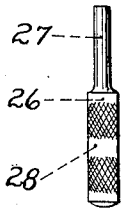


Fig. 3

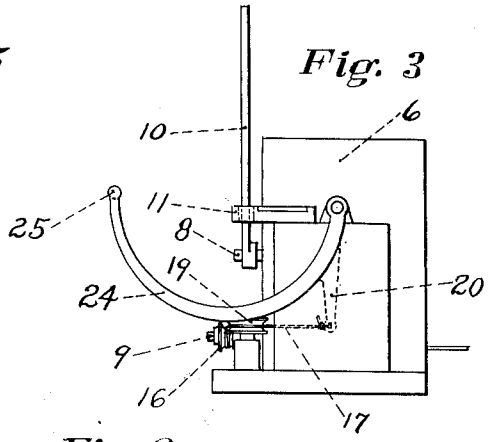


Fig. 2

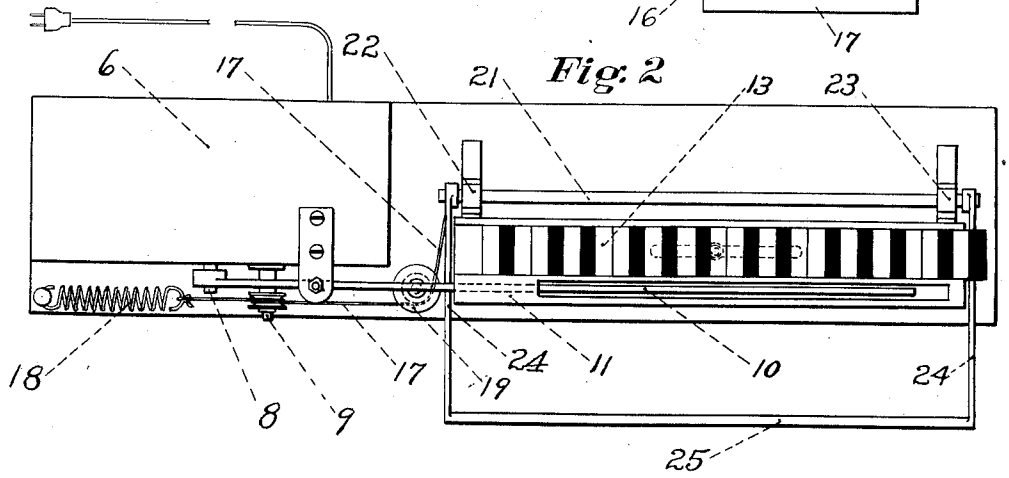
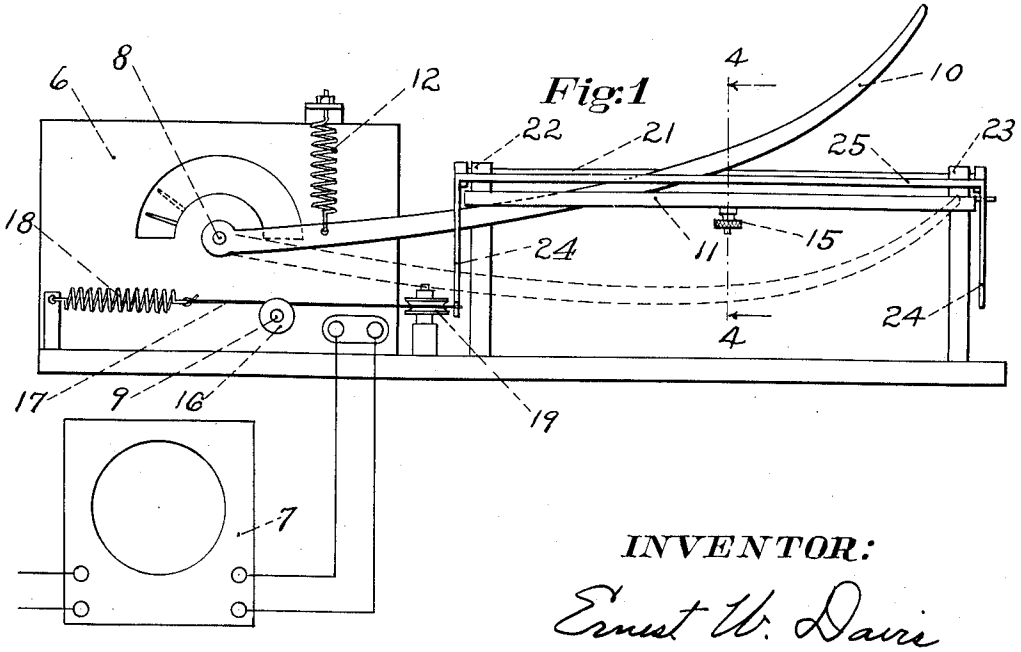


Fig. 1



INVENTOR:

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UNITED STATES PATENT OFFICE

2,193,060

MUSICAL INSTRUMENT

Ernest W. Davis, River Forest, Ill.

Application September 24, 1937, Serial No. 165,431

4 Claims. (Cl. 84—1.20)

My invention relates to musical instruments wherein volume and pitch are controlled manually. The general object of this invention is to provide a musical instrument which is adapted for artistic rendering of higher class music, and which readily responds to individual interpretation in a manner that is easily learned. Another object is to provide a musical instrument that will satisfy the desires of those who have a yearning to sing, but are lacking in voice quality or control.

A more specific object is to provide an instrument capable of controlling both volume and pitch simultaneously with one hand, and in a manner such that tremolo and vibrato effects are produced by vibratory movement of those muscles of the human arm which are naturally capable of producing such movements without special training or long practice.

Another object is to provide a musical instrument capable of producing expressive glissando, staccato, and slurring effects. A further object is to provide an instrument capable of readily transposing music from one key to another without any change in the manner of fingering.

These objects are accomplished by providing sound-producing means having volume and pitch varying mechanisms actuated by two manually operated members arranged for manipulation by manual movements substantially perpendicular to each other, and by arranging the manually operated members at a distance from each other, such that they may be operated simultaneously by a single hand of a performer; the range of movement of one manually operated member being substantially greater than the range of movement of the other manually operated member; and one manually operated member being shaped in a particular manner, as will be described specifically hereinafter.

In the drawing, Fig. 1 is a front elevation of the entire instrument. Fig. 2 is a plan view of the same. Fig. 3 is an end elevation. Fig. 4 is a section on the line 4, 4, as shown in Fig. 1. And Fig. 5 illustrates a manipulator which may be used in playing the instrument.

In the specific embodiment of this invention as herein shown and described, the sound producing means comprises an audio frequency oscillator 6, and a loud speaker 7. Both these instruments are well known, and neet not be described in great detail, especially as this invention concerns the method of controlling the sound producer, rather than the specific construction of the sound producer itself. The audio frequency oscillator 6, operates in accordance with the general principle that the interference between two radio frequency oscillators tuned to slightly different frequencies, produces an oscillation having audio frequency. Oscillators of this kind are commonly used in radio manufacturing and repair shops for testing the responsive characteristics of loud speakers. Such an oscillator is listed in the 1938 general catalog of the Clough-Brengle Co. of Chicago, Ill. In carrying out this invention, the purpose of the oscillator 6, is to produce oscillations of variable amplitude and frequency in an electric circuit, and the purpose of the loud speaker 7, is to convert these oscillations into audible sound waves.

The oscillator 6, as commonly constructed, is provided with shafts 8 and 9, the rotation of which regulates the pitch and volume respectively. These shafts are ordinarily provided with knobs, which may be removed in carrying out this invention. Rotation of the shaft 8, in a clockwise direction increases the frequency of the oscillations produced by the oscillator 6, and thereby raises the pitch of the sound produced by the loud speaker 7, and rotation of the shaft 9, in a clockwise direction, increases the amplitude of the oscillations produced in the oscillator 6, and thereby increases the volume of the sound produced by the loud speaker 7.

The controlling mechanism for regulating the pitch will now be described. The pitch lever 10, is rigidly secured to the shaft 8, so that downward movement of the pitch lever 10, will increase the frequency of the oscillator 6, and raise the pitch of the sound produced by the loud speaker 7. The finger rail 11 is used as a guide for actuating the pitch lever 10, and when a performer's finger is moved along the finger rail 11, from left to right, the pitch lever 10, will be moved downwardly, the shaft 8, will be rotated in a clockwise direction, and the pitch of the sound emitted by the loud speaker 7, will be raised, as will be readily understood. If the performer's finger is then moved towards the left, the tension spring 12, will move the pitch lever upwardly, and the pitch of the sound will be lowered. (The tension spring 12 is omitted in Fig. 3 in order to avoid confusion.)

A frequency range of 50 to 15,000 oscillations per second is usual in oscillators of the type illustrated, but for the purpose of this invention, only a small portion of this range is utilized, so that a relatively small movement of the shaft 8 is sufficient to give a workable range.

The guide plate 13, is provided with indicia

as shown in Fig. 2, so that a performer may place his finger at the proper location on the finger rail 11, for producing any desired note. The guide plate 13 is arranged to slide longitudinally on the finger rail 11, and may be held in any desired, adjusted position by means of the stud 14, and clamping nut 15. Shifting the guide plate 13, towards the right or left will raise or lower the pitch respectively. This is useful in either tuning the instrument when playing in concert, or for transposing music from one key to another.

The controlling mechanism for regulating the volume will now be described. The pulley 16, is rigidly secured to the shaft 9, controlling the volume. A cord 17, is fastened to the tension spring 18, and is looped around the pulley 16, and passes partially around the idler pulley 19, and is fastened to the arm 20. The arm 20, is rigidly secured to the rotatable shaft 21, which rotates in the bearings 22, and 23. The arm 24, is rigidly secured to the shaft 21, and is shaped similar to the arm 20, except that it lacks the downwardly extending portion shown by the dotted lines in Fig. 3. The volume bar 25, is connected with the arms 20, and 24, and is arranged in a horizontal position, sufficiently close to the finger rail 11, so that a performer may operate the pitch lever 10, with his finger, and simultaneously operate the volume bar 25, with the same hand.

When a performer moves the volume bar downwardly, the cord 17, is moved towards the right, thereby stretching the spring 18. This movement causes rotation of the pulley 16, and the shaft 9, in a clockwise direction, and thereby increases the volume of the sound emitted by the loud speaker 7. A stop (not shown) inside the oscillator limits the rotation of the shaft 9, in an anti-clockwise direction, so that the volume bar 25, occupies the normal position shown in Figs. 1 and 3, when it is not depressed. The oscillator is so constructed that when the volume bar 25 is in its normal position the volume of the loud speaker is zero, and as the volume bar is depressed, the volume is progressively increased.

In playing this instrument, a performer moves his fingers along the finger rail 11, and while doing so, he operates the volume bar 25, with that portion of his hand just forward of his wrist. Each time the volume bar 25, is depressed, a sound is emitted from the loud speaker 7. The pitch of this sound is determined by the position of the pitch lever 10; the volume is determined by the position of the volume bar 25; and the duration is determined by the length of time the volume bar is depressed.

A performer may use either one finger, or several fingers in manipulating the pitch lever 10, and if more than one finger is resting on the finger rail 11, at the same time, then the pitch will be determined by the longitudinal position on the finger rail, of that finger which is in simultaneous contact with the pitch lever 10, and the finger rail 11. If several fingers are resting on the finger rail 11, at the same time, then vertical reciprocating motion of those fingers towards the right will cause movement of the pitch lever 10, thereby producing changes in the pitch without any lateral movement of the performer's hand.

If desired, a performer may use the manipulator 26 (Fig. 5), instead of his fingers. This manipulator comprises a cylindrical, metal finger 27, adapted to be moved along the finger rail 11, and a handle portion 28, adapted to be held in the hand.

It will be observed that with this instrument, infinitely variable changes of pitch and volume are possible just as they are with a well controlled human voice. True glissando effects are produced by sliding a finger longitudinally along the finger rail 11, while the volume bar is depressed. Tremolo effects are produced by pressing downwardly on the finger rail 11, with one finger, and then rocking the finger laterally by means of rapid, oscillating, horizontal movement of the forearm. Vibrato effects are produced by similar vertical movement of the wrist while the volume bar 25, is being operated. Staccato effects are produced by very rapid depression of the volume bar 25; and slurring effects are produced by fingering the pitch lever 10, while the volume bar 25, is held in a depressed position.

It will be observed that the pitch lever 10, is curved. The shape of this curve is important, and the manner in which it is generated will be described. In this description the term "arithmetic" refers to a progression of the order 1—2—3—4 and the term "geometric" refers to a progression of the order 1—2—4—8.

The particular curve referred to is generated in the following manner: A piece of cardboard, or other sheet material, is rigidly secured to the shaft 8, in a vertical plane adjacent to the finger rail 11. The shaft 8, is then rotated clockwise in progressive steps in such manner as to produce a progression of geometric changes in the frequency of the sound emitted by the loud speaker 7, and simultaneously a point is advanced with arithmetic progression along the finger rail 11, from left to right. The resulting succession of points projected on the cardboard will then define the proper curve. With the pitch lever 10, shaped in this manner, arithmetic movement of a performer's finger along the finger rail 11, will produce geometric changes in the frequency of the sound emitted by the loud speaker 7, as will be readily understood.

Owing to this characteristic of the instrument, the graduations of the indicia on the guide plate 13, will all be equally spaced, thus making it possible to shift the guide plate without affecting its accuracy as a guide. Thus music may be readily transposed from one key to another without any change in the fingering, by merely shifting the guide plate 13, the required distance.

Another advantage of this construction is that it provides for uniform fingering throughout the entire range of pitch. In other instruments capable of producing true glissando effects, such as a violin, trombone, or slide whistle, the fingering becomes finer at high pitch. This makes it difficult for a beginner to play accurately over any considerable range. But with the instrument of this invention, the fingering is uniform throughout the entire range, thereby reducing the difficulties experienced by a beginner.

I claim:

1. A musical instrument comprising sound producing means; a finger rail arranged for convenient sliding movement of a performer's finger thereon; a volume bar substantially parallel with said finger rail, and spaced apart therefrom a distance such that a performer may conveniently slide his finger along said finger rail and operate said volume bar simultaneously with one hand; manually operated means co-acting with said finger rail for varying the pitch of the sound produced by said sound producing means; and

volume varying means responsive to movement of said volume bar.

2. A musical instrument comprising sound producing means; a finger rail arranged for convenient sliding movement of a finger thereon; a pitch lever in close proximity to said finger rail and intersecting the length of said finger rail at an acute angle thereto; and pitch varying means responsive to movement of said pitch lever.

3. A musical instrument comprising sound producing means; a finger rail arranged for convenient sliding movement of a finger thereon; a pitch lever in close proximity to said finger rail, and intersecting the length of said finger rail at an acute angle thereto; pitch varying means responsive to movement of said pitch lever; and a guide plate arranged substantially parallel with said finger rail; said guide plate having indicia thereon for indicating the various changes in the pitch of said sound producer when said pitch lever is moved to different positions.

4. A musical instrument comprising sound producing means; a finger rail arranged for convenient sliding movement of a finger thereon; a pitch lever in close proximity to said finger rail and intersecting the length of said finger rail at an acute angle thereto; pitch varying means responsive to movement of said pitch lever; a guide plate arranged substantially parallel with said finger rail, said guide plate having indicia thereon for indicating the successive pitches of said sound producer when a performer's finger is moved along said finger rail while in contact with said pitch lever; and means for adjusting the longitudinal position of said guide plate relative to said pitch lever.

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