Sept. 22, 1959 O. J. ALVAREZ 2,905,039

VIBRATING TYPE OSCILLATOR AND PICKUP APPARATUS

Original Filed Nov. 12, 1952 3 Sheets-Sheet 1

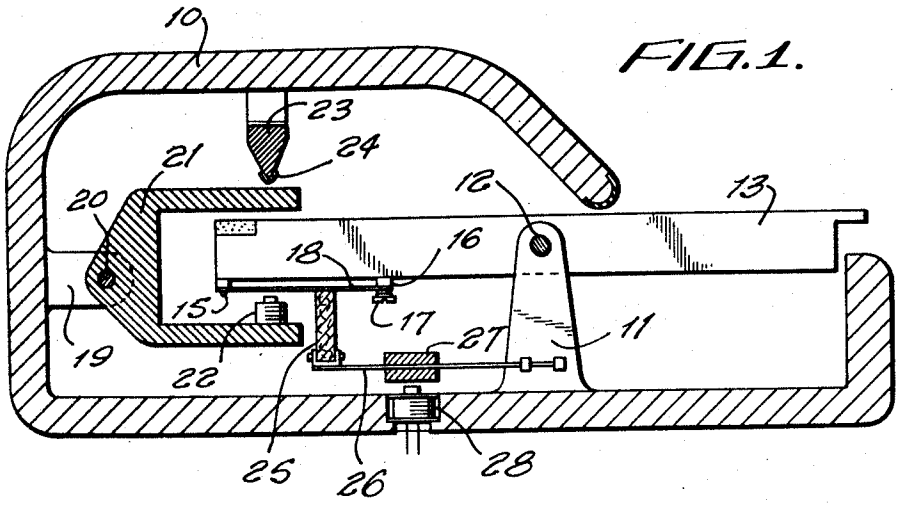


FIG. 1.

INVENTOR.
OCTAVIO J. ALVAREZ
BY Michael S. Striker
agt.

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VIBRATING TYPE OSCILLATOR AND PICKUP APPARATUS

Original Filed Nov. 12, 1952 3 Sheets-Sheet 2

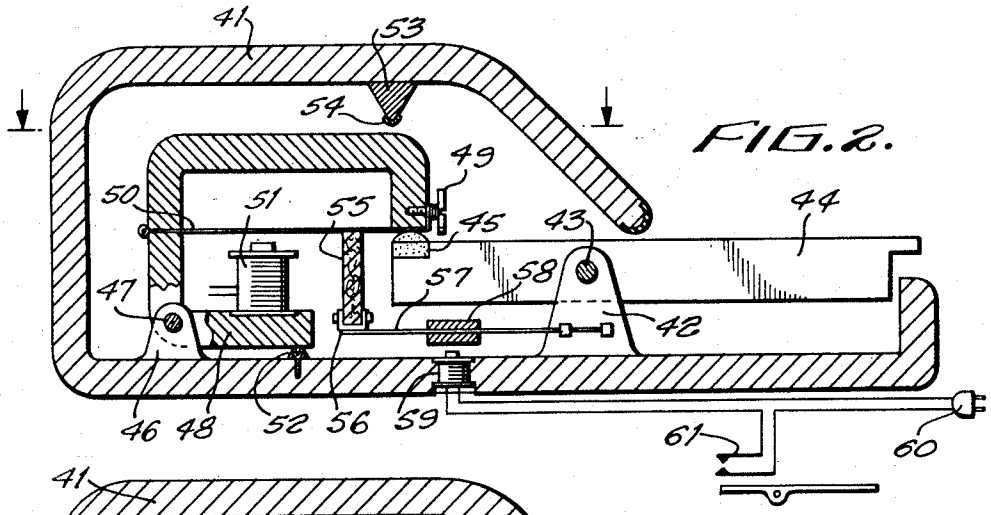


FIG. 2.

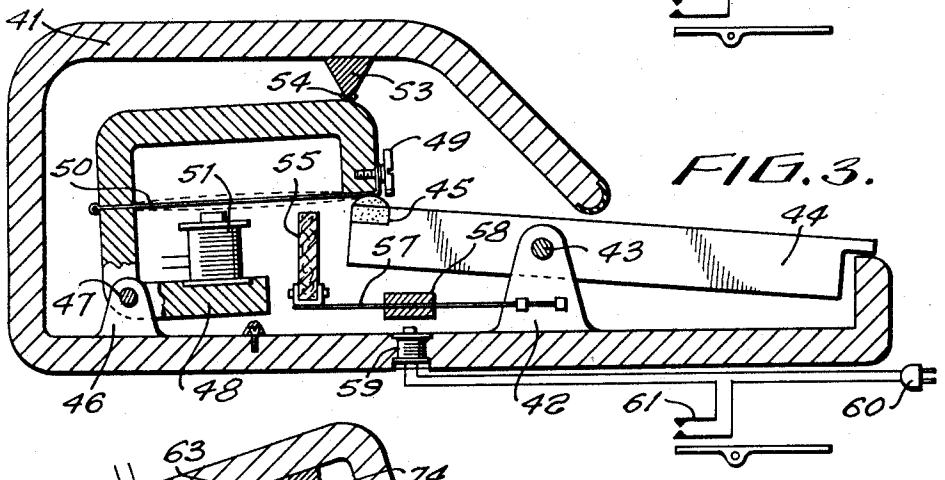


FIG. 3.

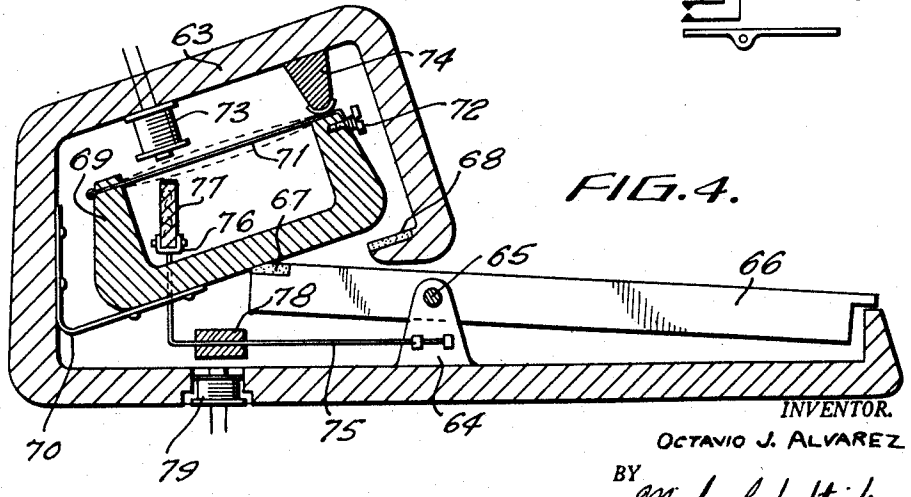


FIG. 4.

INVENTOR.
OCTAVIO J. ALVAREZ
BY Michael L. Striker
agt.

Sept. 22, 1959 O. J. ALVAREZ 2,905,039

VIBRATING TYPE OSCILLATOR AND PICKUP APPARATUS

Original Filed Nov. 12, 1952 3 Sheets-Sheet 3

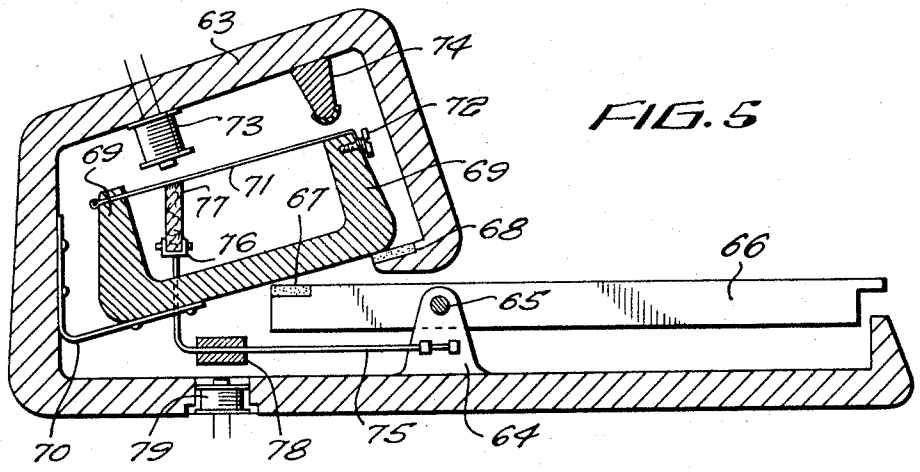


FIG. 5

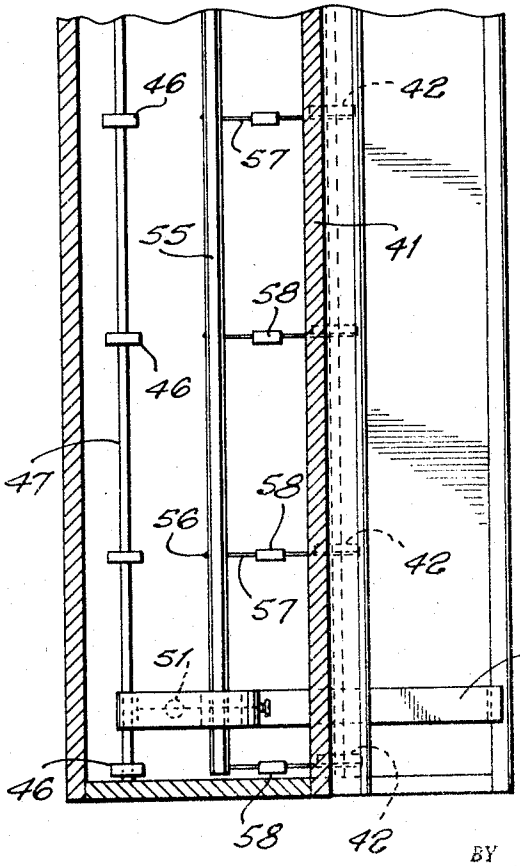


FIG. 6.

INVENTOR.
OCTAVIO J. ALVAREZ
BY
Michael L. Striker
agt.

United States Patent Office 2,905,039 Patented Sept. 22, 1959

2,905,039

VIBRATING TYPE OSCILLATOR AND PICKUP APPARATUS

Octavio Jose Alvarez, New York, N.Y.

Original application November 12, 1952, Serial No. 320,035, now Patent No. 2,799,196, dated July 16, 1957. Divided and this application March 21, 1957, Serial No. 647,595

20 Claims. (Cl. 84—1.04)

The present invention relates to musical instruments and in particular to stringed instrumnets.

A structure similar to that of the present invention is disclosed in U.S. Patent No. 2,486,545. The structure of this patent produces the sound by a vibrating steel reed which is associated with two sets of stationary coils.

This application is a division of copending application Serial No. 320,035, filed November 12, 1952 and entitled Musical Instruments, now Patent Number 2,-799,196, issued July 16, 1957.

One of the objects of the present invention is to provide a musical instrument with vibrating strings and a means for electrically picking up the vibrations of the strings to transform these vibrations into audible sounds.

A further object of the present invention is to provide a single set of coils to pick up the vibrations of the strings both when an operating key or the like has been depressed and when it is released.

Another object of the present invention is to provide a means for mounting the coils so that they are always in a predetermined relation with respect to the vibrating strings.

A still further object of the present invention is to provide a means for varying the tension of the vibrating strings.

Yet another object of the present invention is to provide a means for increasing the amplitude of the vibrations of the strings.

An additional object of the present invention is to provide an instrument capable of accomplishing all of the above objects while at the same time being made of relatively few, simple, ruggedly constructed parts.

With the above objects in view, the present invention mainly consists of a musical instrument which includes a support structure and a carrier structure mounted on the support structure for movement between a rest position and an operating position. A stop means is mounted on the support structure adjacent to the carrier structure and engages the latter when the carrier structure moves from its rest to its operating position, so as to impart vibrations to the carrier structure. An elongated vibrating member is fixed to the carrier structure and has two spaced points engaging the latter, this vibrating member being free between the spaced points thereof so as to vibrate between these points when the carrier structure strikes against the stop means upon movement of the carrier structure to its operating position. A pick-up means is provided on the carrier structure or the support structure and is located adjacent to the elongated vibrating member to pick up the vibrations thereof and transmit the same to an apparatus for changing the vibrations into an audible sound.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description

of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a side, sectional, partly diagrammatic view of one possible apparatus for carrying out the present invention;

Fig. 2 is a partly diagrammatic, side sectional view of still another embodiment of the present invention;

Fig. 3 illustrates the structure of Fig. 2 in a position different from that shown in Fig. 2;

Fig. 4 is a partly diagrammatic, side sectional view of a still further embodiment of the present invention;

Fig. 5 illustrates the structure of Fig. 4 in a position different from that shown in Fig. 4; and

Fig. 6 is a partly diagrammatic plan view taken along the line 6—6 of Fig. 2 in the direction of the arrows.

Referring now to the drawings, Fig. 1 shows a support **10** which e.g. extends horizontally along the length of a piano, or the like, this support **10** being shown in a transverse, vertical, sectional view in Fig. 1. At spaced points along the length of the support **10** there are a number of stationary ears **11** which carry an elongated rod **12** extending along almost the entire length of the support **10**. A plurality of keys **13**, e.g. equal in number to the number of keys of a standard key board, are turnably mounted between their ends on the rod **12**, as illustrated, these keys being located in side by side relation along the rod **12** and each having an outer free end portion accessible through an opening in the support **10** to the fingers of the operator of the instrument.

At its inner free end portion, each key **13** has fixed to its underside a pair of rigid members **15** and **16**, and a screw **17** threadedly engages the member **16**. An elongated vibrating member in the form of a string **18** is fixed at one end to the member **15** and at its opposite end to the screw **17** so that the tension of string **18** may be adjusted by turning of screw **17**. The several strings **18** which are respectively located on the keys **13** may vary as to length, thickness, and tension in proportion to conventional piano strings. The strings **18** may be made of a magnetic metal for a purpose to be described below.

A number of stationary ears **19** are located along the support **10** and are fixed to the inner rear face thereof, these ears **19** carrying an elongated rod **20** which extends along almost the entire length of the support **10**. A plurality of C-shaped members **21** are turnably mounted on the rod **20**, as shown in Fig. 1, and are equal in number to the number of keys **13** and located in side by side relation along the rod **20** respectively in alignment with the several keys **13**. Each of the C-shaped members **21** includes an upper and a lower arm respectively located on opposite sides of the inner free end portion of the key **13** aligned therewith.

As is apparent from Fig. 1, the lower arm of the C-shaped member **21** is located at a greater distance from the key **13** than the upper arm of member **21**, and a coil **22** is fixedly mounted on this lower arm and is located closely adjacent to the string **18**. Each of the members **21** is provided with a coil **22**, and these coils are all electrically connected to an amplifier and loud speaker (not shown), in the same way as the coils shown in U.S. Patent Number 2,486,545.

An elongated stop bar **23** is fixed to the underside of the top part of the supporting casing **10**, this bar **23** extending along almost the entire length of the support **10**. A strip of felt, rubber, foam plastic or the like **24** is fixed to the bottom side of the bar **23**. Thus, upon turning of a key **13** in a clockwise direction about rod **12**, as viewed in Fig. 1, the inner free end portion thereof will engage the top arm of the C-shaped member **21** and turn the latter in a counterclockwise direction, as viewed in Fig. 1, until the top arm thereof strikes against the bar **23** so as to transmit vibrations through the member **21**

and key 13 to the string 18 mounted on the latter. It will be seen that the coil 22 moves with the member 21 so as to be located close to the vibrating string 18 to pick up and transmit the vibrations thereof to an apparatus for changing these vibrations into an audible sound. Thus, the members 13 and 21 form a carrier structure for the string 18 and coil 22, this carrier structure being movable from the rest position illustrated in Fig. 1 to an operating position where the C-shaped member 21 engages stop bar 23 to set up vibrations in the string 18.

A damping means is associated with the strings 18 for damping the vibrations thereof. This damping means takes the form of an elongated strip 25 of felt or the like which extends along the entire length of support 10 beneath the strings 18. The strip 25 is carried by wire springs 26 which are respectively fixed to the ears 11 so as to urge the strip 25 to the position shown in Fig. 1 where it engages the strings 18 to damp out the vibrations thereof when the parts resume their rest position shown in Fig. 1.

A member 27 of a magnetic material is fixed to each of the springs 26, and an electromagnet 28 is located beneath each member 27, these electromagnets being mounted in the bottom wall of the casing 10 and being electrically operable, in a manner described below, by a pedal of the instrument. When this pedal is depressed, the electromagnets 28 are energized and attract the members 27 so as to move springs 26 downwardly to locate the strip 25 at a position lower than that shown in Fig. 1. In this way, the vibration of strings 18 will not be damped when the electromagnets 28 are energized, so that the vibrations of strings 18 will be continued to produce a long, drawn out tone.

Fig. 2 of the drawings illustrates a further embodiment of the invention which includes an elongated support 41 similar to the support 10 described above. A number of ears 42 are fixed to the bottom wall of support 10 along the length thereof and carry a rod 43 on which the keys 44 are pivotally mounted. Each key 44 carries at its inner end portion a cushion member 45.

A number of additional ears 46 are fixed to the bottom wall of the support 41 and carry a rod 47 upon which a plurality of C-shaped members 48 are turnably mounted, these members 48 being equal in number to the number of keys 44 and being respectively aligned therewith. Each member 48 is provided with a top arm having a downwardly extending free end located in engagement with the cushion 45 threadedly carrying a tuning screw 49. A string 50 is connected to this tuning screw, extends about the free end of the top arm of member 48 and is fixed to the latter at a point opposite this free end of the top arm thereof to provide string 50 with a free portion which is adapted to vibrate. A coil 51 is fixed to the lower arm of each member 48 and located closely adjacent to the string 50 to pick up the vibrations thereof and transmit the same to a sound producing apparatus, in the same way as was described above. The support 41 carries a rest 52 which engages the underside of member 48 when the parts are in the rest position shown in Fig. 2.

A stop bar 53 is fixed to the underside of the top wall of support 10 and extends over all of the members 48, this bar 53 being provided with a strip of felt, rubber, foam plastic or the like 54 along its under surface. Thus, upon depression of key 44, the C-shaped member 48 aligned therewith turns to the position shown in Fig. 3 and strikes against the stop bar to set up vibrations in the string 50 which are picked up by the coil 51.

A damping apparatus identical with that described above is provided to damp out the vibrations of the strings 50. This damping apparatus includes the elongated strip 55 of felt or the like mounted on a channel member 56 which is carried by a number of wire springs 57 fixed to the ears 42 (Fig. 6). Only one key 44 and its associated structure is shown in Fig. 6 for the sake of clarity. The springs 57 urge the strip 55 to the position shown in Figs. 2 and 3 so that the strings 50 engage the strip 55 when the parts are located in the position of Fig. 2 so as to thereby damp out the vibrations of the strings 50.

A number of magnetic members 58 are respectively mounted on the springs 57, and a number of electromagnets 50 are located in the bottom wall of support 41 respectively beneath the members 58. The coils of electromagnets 59 are connected to a source of electricity through a plug 60, and the circuit of these coils includes a switch 61 operable by a foot pedal 62 which, upon being depressed, closes the switch 61 to complete a circuit through the electromagnets 59 which thereby attract the members 58 and pull the springs 57 and the strip 55 therewith to a position lower than that shown in Figs. 2 and 3, so that when the parts are in the position of Fig. 2, the vibrations of the strings 50 will not be damped and the tone produced thereby will be continued and drawn out. The parts 60—62 described above are associated with the electromagnets 28 of the embodiments of Figs. 1 and 2 to operate the same in exactly the same way.

A further embodiment of the invention is illustrated in Figs. 4 and 5 where the elongated support 63 carries ears 64 spaced along its length. A rod 65 is supported by the ears 64, and the keys 66 are pivoted on the rods 65, each key 66 having at its inner end a cushion member 67. A cushion member 68 is also provided on the support 63.

A plurality of upwardly directed C-shaped members 69 are each carried by a leaf spring 70 which is fixed to the inner rear face of support 63 and urges the members 69 to the position shown in Fig. 5 where they abut against the cushion 68 and maintain the keys 66 in the horizontal position illustrated in Fig. 5. A string 71 is fixed to the left free end of each member 69, as viewed in Figs. 4 and 5, and extends across the same and about the opposite free end thereof where each string 71 is connected to a tuning screw 72 threadedly engaging the member 69 and being turnable to adjust the tension of each string 71.

A stationary pick-up coil 73 is mounted on the under surface of the top wall of support 63 in close proximity to the several strings 71, respectively, as is evident from Figs. 4 and 5. Also, a stop bar 74 is mounted on the underface of the top wall of support 63 opposite the right free end of member 69, as viewed in Figs. 4 and 5, so that when the key 66 is depressed, as shown in Fig. 4, the member 69 engages the stop bar 74 to transmit vibrations to the string 71 which are picked up by the coil 73 and transmitted to an apparatus for changing the vibrations to an audible sound. The coils 73 are located close enough to the string 71, when the parts are in the rest position shown in Fig. 5, to pick up the vibrations thereof after the key 66 is released.

A number of elongated wire springs 75 are respectively fixed to the several ears 64, two of these springs respectively being located at opposite ends of the row of C-shaped members 69 and the others of these wire springs each extending upwardly through a pair of adjacent members 69. The several springs support an upwardly directed, elongated channel member 76 which extends along almost the entire length of the support 63 and which carries the felt strip 77 which engages the strings 71 when the parts are in the position shown in Fig. 5.

A number of magnetic numbers 78 are respectively mounted on the springs 75, and a number of electromagnets 79 are respectively located beneath the members 78 to attract the latter when the electromagnets 79 are energized so as to draw the springs 75 and the felt strip 77 therewith down to a position below that shown in Figs. 4 and 5 so that when the parts are in position of Fig. 5 the vibrations of the strings 71 will not be damped and the tone will therefore continue and be drawn out. The

electromagnets **79** are energized by a structure identical with the parts **60—62** of Figs. 2 and 3. Thus, the embodiment of Figs. 4 and 5 is capable of accomplishing the same results as the above-described embodiments of the invention, although the pick-up coils **73** remain stationary.

It will be seen that in all embodiments of the invention the strings are shorter than the keys.

In the description above and in the claims which follow, the term "string" is intended to signify a metallic string for musical stringed instruments.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of musical instruments differing from the types described above.

While the invention has been illustrated and described as embodied in musical stringed instruments, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of said key member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof.

2. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of one of said members and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by said C-shaped member.

3. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of said key member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by said C-shaped member.

4. In a musical instrument, in combination, support means; an elongated key member supported for turning movement by said support means and adapted to be turned by the operator; a second elongated member also supported for turning movement by said support means, said second member being located in the path of turning movement of said key member to be turned when said key member is turned by the operator; a string stetched between a pair of portions of said key member; abutment means carried by said support means in the path of movement of said second member for limiting the turning movement of both of said members, said string vibrating when said second member engages said abutment means; and electrical pick-up means carried by said second member adjacent said string for picking up the vibrations thereof.

5. In a musical instrument, in combination, support means; a substantially C-shaped member having a pair of opposed legs, said member being supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and extending into the space between and engaging one of said legs for turning said C-shaped member when said key member is turned; a string stretched between a pair of portions of one of said members and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof.

6. In a musical instrument, in combination, support means; a substantially C-shaped member having a pair of opposed legs, said member being supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and extending into the space between and engaging one of said legs for turning said C-shaped member when said key member is turned; a string stretched between a pair of portions of one of said members and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means carried by said C-shaped member adjacent said string for picking up the vibrations thereof.

7. In a musical instrument, in combination, support means; a substantially C-shaped member having a pair of opposed legs, said member being supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and extending into the space between and engaging one of said legs for turning said C-shaped member when said key member is turned; a string stretched between a pair of portions of said key member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said

C-shaped member engages said abutment means; and electrical pick-up means carried by said C-shaped member adjacent said string for picking up the vibrations thereof.

8. In a musical instrument, in combination, a stationary support member; a substantially C-shaped movable member supported for turning movement by said support member; an elongated movable key member also supported for turning movement by said support member, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of one of said movable members and being freely vibratable between said pair of portions; abutment means carried by said support member in the path of movement of said C-shaped member for limiting the turning movement of both of said movable members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by one of said members which does not carry said string.

9. In a musical instrument, in combination, a stationary support member; a substantially C-shaped movable member supported for turning movement by said support member; an elongated movable key member also supported for turning movement by said support member, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of one of said movable members and being freely vibratable between said pair of portions; abutment means carried by said support member in the path of movement of said C-shaped member for limiting the turning movement of both of said movable members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by one of said members which does not carry said string; and damping means carried by said support means adjacent said string for engaging the latter to damp the vibrations thereof.

10. In a musical instrument, in combination, a stationary support member; a substantially C-shaped movable member supported for turning movement by said support member; an elongated movable key member also supported for turning movement by said support member, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of one of said movable members and being freely vibratable between said pair of portions; abutment means carried by said support member in the path of movement of said C-shaped member for limiting the turning movement of both of said movable members, said string vibrating when said C-shaped member engages said abutment means; electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by one of said members which does not carry said string; damping means carried by said support means adjacent said string for engaging the latter to damp the vibrations thereof; and electromagnetic means operatively connected with said damping means for operating the latter.

11. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of one of said members and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by said support means.

12. In a musical instrument, in combination support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of said C-shaped member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof.

13. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of said C-shaped member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by said C-shaped member.

14. In a musical instrument, in combination, support means; a substantially C-shaped member supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and said C-shaped member being located in the path of turning movement of said key member to be engaged and turned by the latter when said key member is turned by the operator; a string stretched between a pair of portions of said C-shaped member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by said support means.

15. In a musical instrument, in combination, a stationary support member; an elongated movable key member supported for turning movement by said support member and adapted to be turned by the operator; a second elongated movable member also supported for turning movement by said support member, said second member being located in the path of turning movement of said key member to be turned when said key member is turned by the operator; a string stretched between a pair of portions of one of said movable members; abutment means

carried by said support member in the path of movement of said second member for limiting the turning movement of both of said movable members, said string vibrating when said second member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof, said pick-up means being carried by one of said members which does not carry said string.

16. In a musical instrument, in combination, support means; an elongated key member supported for turning movement by said support means and adapted to be turned by the operator; a second elongated member also supported for turning movement by said support means, said second member being located in the path of turning movement of said key member to be turned when said key member is turned by the operator; a string stretched between a pair of portions of said second member; abutment means carried by said support means in the path of movement of said second member for limiting the turning movement of both of said members, said string vibrating when said second member engages said abutment means; and electrical pick-up means carried by said second member adjacent said string for picking up the vibrations thereof.

17. In a musical instrument, in combination, support means; an elongated key member supported for turning movement by said support means and adapted to be turned by the operator; a second elongated member also supported for turning movement by said support means, said second member being located in the path of turning movement of said key member to be turned when said key member is turned by the operator; a string stretched between a pair of portions of said second member; abutment means carried by said support means in the path of movement of said second member for limiting the turning movement of both of said members, said string vibrating when said second member engages said abutment means; and electrical pick-up means carried by said said support means adjacent said string for picking up the vibrations thereof.

18. In a musical instrument, in combination, support means; an elongated key member supported for turning movement by said support means and adapted to be turned by the operator; a second elongated member located in the path of turning movement of said key member to be turned when said key member is turned by the operator; a leaf spring fixed at one end to said second member and at an opposite end to said support means to support said second member for turning movement; a string stretched between a pair of portions of one of said members; abutment means carried by said support means in the path of movement of said second member for limiting the turning movement of both of said members, said string vibrating when said second member engages said abutment means; and electrical pick-up means located adjacent said string for picking up the vibrations thereof.

19. In a musical instrument, in combination, support means, a substantially C-shaped member having a pair of opposed upwardly directed legs; a leaf spring fixed at one end to said C-shaped member and at an opposite end to said support means to support said C-shaped member for turning movement; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and extending beneath and engaging said C-shaped member to turn the latter when said key member is turned; a string stretched between said legs of said C-shaped member and being freely vibratable between said legs; abutment means carried by said support means in the path of movement of said C-shaped member for engaging the latter to vibrate said string; and electrical pick-up means carried by said support means adjacent said string for picking up the vibrations thereof.

20. In a musical instrument, in combination, support means; a substantially C-shaped member having a pair of opposed legs, said member being supported for turning movement by said support means; an elongated key member also supported for turning movement by said support means, said key member being turned by the operator and extending into the space between and engaging one of said legs for turning said C-shaped member when said key member is turned; a string stretched between a pair of portions of said C-shaped member and being freely vibratable between said pair of portions; abutment means carried by said support means in the path of movement of said C-shaped member for limiting the turning movement of both of said members, said string vibrating when said C-shaped member engages said abutment means; and electrical pick-up means carried by said C-shaped member adjacent said string for picking up the vibrations thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,562,103	Little	Nov. 17, 1925
2,510,094	Fleury	June 6, 1950

FOREIGN PATENTS

509,259	Belgium	Oct. 16, 1952