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VIBRATO DEVICES

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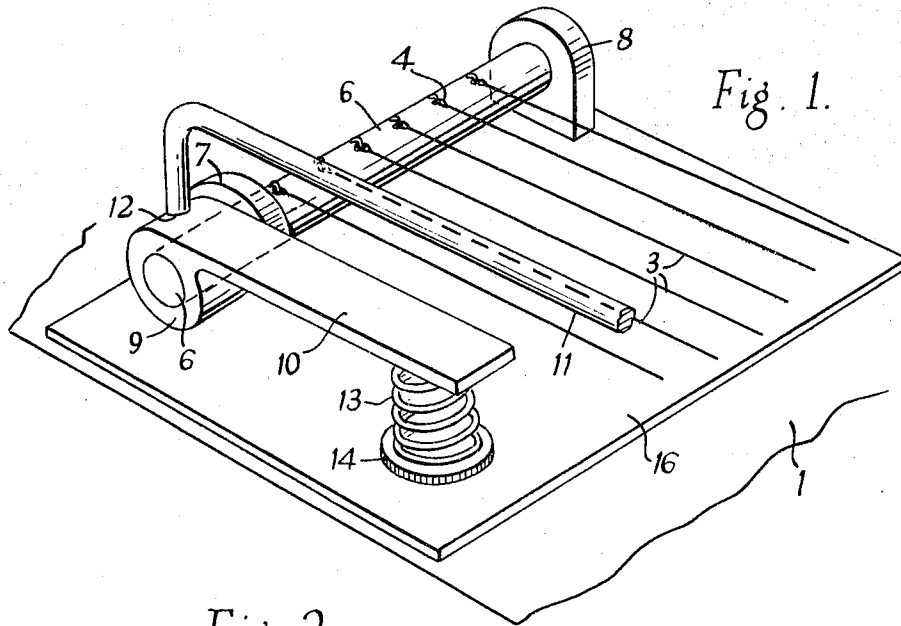
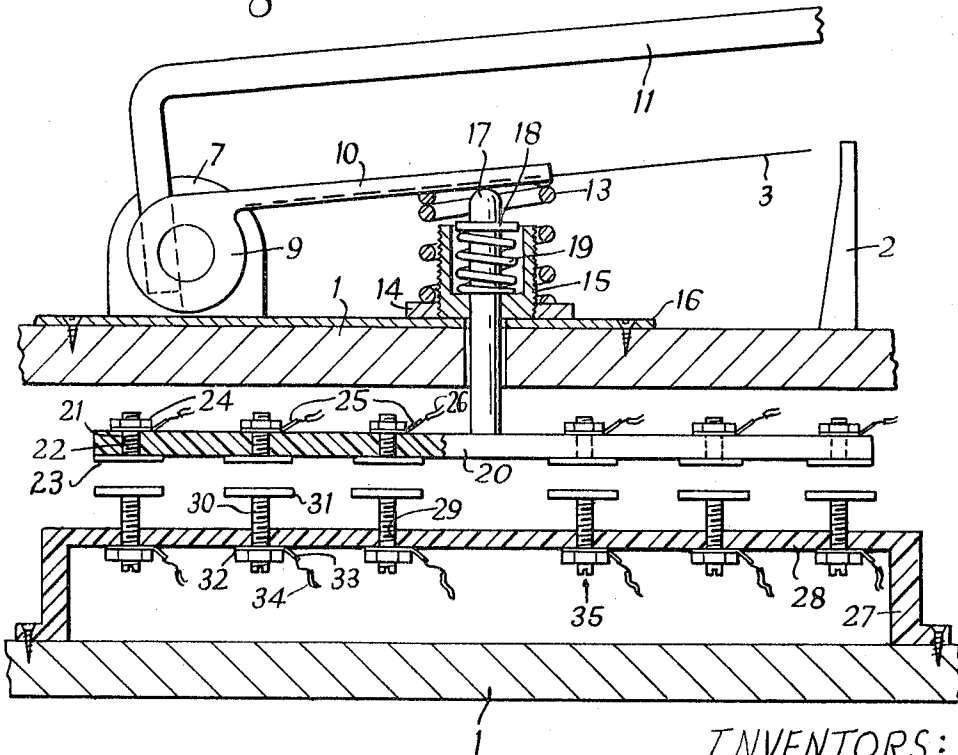


Fig. 2.



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VIBRATO DEVICES

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This invention relates to the application of vibrato effects to musical instruments.

The variable characteristics of vibrato are (i) the amplitude of the change of pitch involved, and (ii) the rate at which the change of pitch occurs.

It is known, for certain stringed instruments and particularly multi-stringed guitars to provide a vibrato device consisting essentially of a shiftable anchoring device for one end of the strings, and a lever coupled to the anchoring device and positioned for easy operation by the player, usually with the right hand. The player can control the rate of change of pitch by varying the rate at which he moves the lever, and the amplitude of change of pitch by bearing with greater or lesser pressures on the lever. Commonly, the lever operated against a return loading, such as a compression spring.

It has also previously been suggested, in a stringed instrument such as a multi-stringed guitar, to utilise the "stopping" action of one hand for the purpose of controlling the output of an electronic tone source, e.g. by having switches placed at or adjacent to the usual frets, or by utilising the contact of the (metal) spring itself with the fret or a sub-division thereof as a switch. Such switches, however operated, are used to modify characteristics of a tone-source circuit in an electronic instrument coupled to the stringed instrument. It will be well known that many so-called electric organs have a keyboard in which the depression of the keys closes electrical circuits, and the switch means applied to the finger board of the stringed instrument may replace those of such a manual. This permits the player to play the electronic instrument by stopping the strings of the stringed instrument, and the note emitted is irrespective of the natural pitch of the string.

The object of the present invention is to provide means for the electronic application of vibrato effects, particularly in such a combination of stringed instrument and electronic instrument.

According to the present invention a vibrato device comprises a support, a hand lever reciprocally mounted on the support, one or more electronic components whose characteristic value is adjustable by shifting of one element thereof in relation to another element thereof, and means coupling said hand lever to one or other of the elements of the or each component.

With such an arrangement, movement of the hand lever modifies the characteristics of the component and accordingly varies the pitch of the note produced by the tone-source circuit in which the component is incorporated.

The coupling means may serve to couple the hand lever to the elements for both directions of reciprocal movement, or alternatively the coupling means may be arranged to act between the hand lever and the shiftable element only in a first direction, the shiftable element being loaded so as to follow the movement of the hand lever in the reverse direction.

Preferably there are provided loading means acting between the support and the hand lever and resisting movement of the hand lever in both directions away from a rest position.

Where the vibrato device is utilised in conjunction with a stringed musical instrument, the hand lever may

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also be coupled to a tension-varying device for one or more strings thereof, whereby vibrato may be produced simultaneously in an electronic instrument and in the stringed instrument.

5 The shiftable element of the component may be, for example, a plate of a variable condenser, or the core of associated coil of a variable inductance, or a wiper or the associated track of a variable resistance, or a pusher for a compression-type variable resistance.

10 The coupling means may serve to couple the hand lever to a plurality of independently variable components, so as to be able to modify the characteristics of a corresponding number of circuits simultaneously. Similarly, where the hand lever is utilised for varying the tension of strings of a stringed instrument, it may be coupled to one or a number of strings.

15 Preferably, the lever is arranged to operate some convenient form of return-loading, e.g. a spring or springs acting on the lever or some part to which it is coupled, or, when used on a stringed instrument, the lever may act simply against the natural tension of the strings themselves.

20 Where the coupling means serve to couple the hand lever to a plurality of shiftable elements, such elements are preferably individually adjustable with respect to the coupling means. To permit pre-setting of the components, e.g. for fine control of pitch of an oscillator circuit, the other element of each component may be individually adjustable.

30 The coupling between the lever and the shiftable elements may be made variable, and in particular may be made adjustable steplessly or in steps, i.e. to obtain a desired amplitude of pitch-change for a given amplitude of movement of the lever.

35 In order that the nature of the invention may be readily ascertained, an embodiment of vibrato device in accordance therewith is hereinafter particularly described with reference to the accompanying drawing in which:

40 FIG. 1 is a perspective elevation of the device.

FIG. 2 is a side elevation, with parts in section.

The device to be described is intended to give simultaneous vibrato mechanically to the strings of the instrument, and electronically to other note sources.

45 It is well known to those skilled in the art of electronic musical instruments that one conventional form of instrument comprises essentially a number of sources of fundamental frequencies and their useful harmonics, means for mixing of selected frequencies at selected amplitudes, means for amplifying the mixed frequencies, and means for reproducing the result as musical sounds. In general the frequency sources are usually either electromagnetic devices such as toothed wheels rotated at constant speed adjacent to electromagnetic pick-up heads, or conventional valve or transistor oscillator circuits, and it is to the latter type of tone generator that the present invention is applicable.

55 The frequency of oscillation of a valve or transistor oscillator circuit may be made dependent upon any one or more of the three characteristics: capacitance, inductance, and resistance. Accordingly, if a variable component of the oscillator circuit is actuated so as to vary its characteristic value about a mean point, there will be obtained a corresponding variation of the frequency of oscillation about a mean point. The rate of change of frequency will depend upon the rate of change of the characteristic value of the component, and the amplitude of change of frequency will depend upon the amplitude of change of characteristic value of the component.

70 In the embodiment of vibrato device described hereunder, the characteristic which is varied is the capacitance of a number of condensers each of which is arranged in a

respective oscillator circuit of an electronic musical instrument.

Referring now to the drawing, there is shown part of the bodywork 1 of a guitar on which there is mounted the usual bridge 2 carrying a number of strings 3 in conventional manner. The strings 3 are secured at their end remote from the bridge 2 to conventional tension adjusters (not shown) for tuning purposes. At their ends adjacent to the bridge 2, the strings 3 each have a loop 4 engaged over a hook 5 mounted on a common roller 6. The roller 6 is a cylindrical rod and is journalled adjacent each end in bearing races in a pair of apertured lugs 7, 8. At one end the roller is extended and carries thereon a collar 9 having a tangential cam arm 10 integrally formed thereon. The collar 9 is keyed against rotation with respect to the roller 6 by providing a flat on the roller and by inserting one end of a lever arm 11 into a tangential bore 12 in the collar. The lever arm extends approximately parallel to the strings and terminates in a fingerplate (not shown) for operation by the player's striking hand.

The cam arm 10 abuts against one end of a strong compression spring 13 which is seated at its other end on a knurled nut 14 screw-threaded on a hollow sleeve 15 which seats onto a baseplate 16 for the mechanism. It will be seen that the tension of all the strings 3 will act on the roller 6 to tend to cause it to rotate clockwise in this drawing, and that this movement is resisted by the spring 13 acting on the cam arm 10. The strength of the spring 13 is accordingly selected so that it may adequately counterbalance the forces exerted by the strings, i.e. in the rest position adopted by the movable system the strings are in their normally tuned condition. Adjustment of the pressure exerted by the spring 13 can be made by raising or lowering the knurled nut 14 on the threaded sleeve 15.

As so far described, the device constitutes a conventional "mechanical" vibrato device for the strings, and it will be apparent that an up and down oscillating movement imparted manually to the lever arm 11, against the counter pressure of the spring 13, will cause the tension of all of the strings to be alternately increased and decreased to impart a vibrato to the notes produced.

The sleeve 15 acts as a housing for a slidable push-rod 17 which abuts at its upper end against the underside of the cam arm 10. The push-rod has secured thereon a collar 18 and a compression spring 19 abuts at one end against the collar and at the other end against the base of the sleeve 15, thereby acting to keep the push-rod 17 permanently bearing upwardly against the cam arm 10.

At its lower end the push-rod carries a bar 20 which is provided at intervals along its length with screw-threaded holes 21 each receiving a screw-threaded stem 22 carrying a condenser plate 23. Each stem also has a locknut 24 which secures thereon a soldering tag 25 to which is secured a wire 26 coupling the plate to its oscillator circuit.

Within the bodywork of the instrument there is provided a support 27 having a bridge portion 28 which is generally spaced away from the bodywork 1 and which is provided with screw-threaded bores 29 to receive a plurality of threaded stems 30 each carrying at their upper end a condenser plate 31. Each stem also has a locknut 32 which serves to retain on the stem a soldering tag 33 to which is soldered a wire 34 coupling that plate of the condenser to its respective oscillator circuit. Each stem 30 is provided with a cross-cut 35 for screw-driver adjustment of the spacing of the plates 23 and 31. Each condenser can be separately adjusted in its spacing.

When the lever arm/cam arm system is at rest, and with the push-rod 17 abutting the underside of the cam arm, the whole of the condenser plates 23 are retained at a spacing from the plates 31. If the lever arm 11 is operated in the manner described precedingly, the push-rod 17 is oscillated vertically, against its spring-loading,

and the bar 20 carries the condenser plates 23 towards and away from the condenser plates 31. Accordingly the capacity of each of the six condensers is varied simultaneously, the rate of variation being as determined by the rate of movement of the lever arm 11, and the amplitude of variation being as determined by the amplitude of movement of the lever arm 11.

It will be apparent that the respective movable and fixed plates of the series of condensers could be replaced by any of the following arrangements:

(i) The bar 20 could carry, instead of the condenser plates 23, a series of conventional iron-dust cores for a series of associated inductances mounted on the bridge 28, each inductance being coupled in an associated oscillator circuit.

(ii) The bar 20 could carry, instead of the condenser plates 23, a series of wiper contacts adapted to coact with associated linear wire-wound or carbon-block resistances mounted on the bridge 28, each resistance being coupled in an associated oscillator circuit.

(iii) The bar 20 could carry, instead of the condenser plates 23, a series of spring-loaded pressure fingers adapted to coact with individual associated resistances of the pressure-variable type mounted on the bridge 28, each resistance being coupled in an associated oscillator circuit.

If the vibrato device described was to be used on a non-stringed instrument, i.e. solely for modifying the pitch of tone-sources in an electric instrument, the tension of the strings 3 acting on the roller 6 could be replaced by any other force, such as another spring, acting in counter-pressure to the spring 13, so as to have a centralising effect on the hand lever movements.

We claim:

1. A vibrato device comprising a support, a hand lever reciprocably mounted on the support, an electronic component including a first element and a second element and whose characteristic value is adjustable by shifting of the first said element with respect to the second said element, and means coupling said hand lever to said first element of the component.

2. A vibrato device comprising a support, a hand lever reciprocably mounted on the support, an electronic component including a first element and a second element and whose characteristic value is adjustable by shifting of the first said element with respect to the second said element, means coupling said hand lever to said first element to cause said first element to follow movements of said hand lever in one direction of reciprocation, and loading means acting on said first element and arranged to cause said first element to follow movements of said hand lever in the other direction of reciprocation.

3. A vibrato device comprising a support, a hand lever reciprocably mounted on the support, loading means acting between said support and said hand lever and arranged to resist movement of said hand lever in both directions of reciprocation away from a rest position of said hand lever, an electronic component including a first element and a second element and whose characteristic value is adjustable by shifting of the first said element with respect to the second said element, and means coupling said hand lever to said first element of the component.

4. A vibrato device comprising a support, a hand lever reciprocably mounted on the support, an anchoring member for the strings of a stringed musical instrument, said anchoring device being movably mounted on the support and being coupled to the hand lever, an electronic component including a first element and a second element and whose characteristic value is adjustable by shifting of said first element with respect to said second element, and means coupling said hand lever to said first element of the component.

5. A vibrato device, as claimed in claim 1, wherein

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said first and second elements of the component are condenser plates.

6. A vibrato device, as claimed in claim 1, wherein said first and second elements of the component are selected from the core and the coil of a variable inductance. 5

7. A vibrato device, as claimed in claim 1, wherein said first and second elements of the component are selected from the wiper and track of a variable resistance.

8. A vibrato device, as claimed in claim 1, wherein said first element of said component is adjustable with respect to said coupling means. 10

9. A vibrato device, as claimed in claim 1, wherein said second element of said component is adjustable with respect to said first element of said component. 15

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10. A vibrato device, as claimed in claim 1, comprising a plurality of said variable components, the first said element of each said component being separately adjustable with respect to said coupling means.

11. A vibrato device, as claimed in claim 1, comprising a plurality of said variable components, the second said element of each said component being separately adjustable with respect to the first said element thereof.

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LOUIS J. CAPOZI, *Primary Examiner.*