United States Patent [19]

Ryon

[11] **3,854,367**

[45] **Dec. 17, 1974**

[54] **DUAL VIBRATO SYSTEM**

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[22] Filed: **Sept. 4, 1973**

[21] Appl. No.: **393,762**

[52] **U.S. Cl.** **84/1.25,** 84/1.01, 84/1.24

[51] **Int. Cl.** **G10h 1/04**

[58] **Field of Search** ..... 84/1.01, 1.24, 1.25; 331/47, 108 R, 108 B, 142, 55, 56, 106, 178, 172, 37, 38, 41

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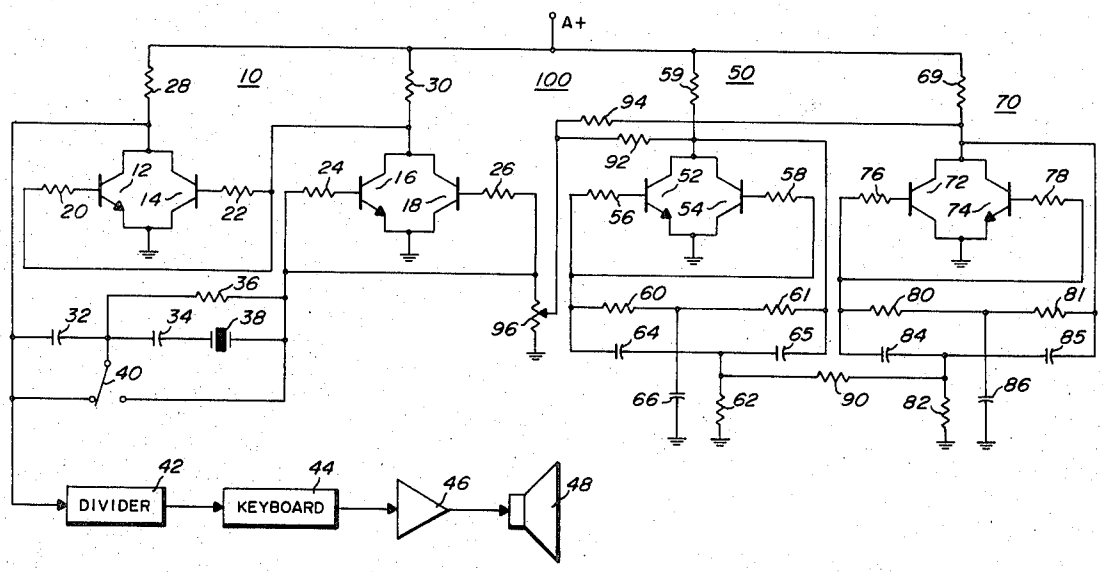
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[57] **ABSTRACT**

A vibrato system for a musical instrument including a first oscillator operating at a first frequency and a second oscillator operating at a second frequency that is a multiple of the first frequency. Means are provided to synchronize the oscillations produced by the oscillators and to combine the output signals thereof.

6 Claims, 2 Drawing Figures



A+
100
10
50
70
DIVIDER
KEYBOARD
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FIG. 1

FIG. 2

DUAL VIBRATO SYSTEM

BACKGROUND

1. Field of Invention

This invention relates generally to musical instruments, and more particularly to vibrato generating systems for musical instruments.

There are many applications wherein it is desired to provide a vibrato system for a muscial instrument. one such application is in an electronic organ. In this application, the vibrato signal is applied to the master oscillator of the organ to frequency modulate the master oscillator to provide the vibrato effect.

2. Prior Art

Several techniques for providing a vibrato signal are known. These techniques include simple vibrato oscillator systems which provide a substantially sinusoidal vibrato signal, and more complex systems which provide a vibrato signal having a particular desired wave shape.

Whereas these techniques provide a way to generate a vibrato signal, it has been found that a richer sounding effect can be achieved by providing a complex wave shape rather than the sinusoidal wave shape provided by the simple vibrato oscillators of the prior art. The complex wave generating systems of the prior art are generally complex and expensive to manufacture.

SUMMARY

It is an object of the present invention to provide an improved vibrato generating system that provides a richer sounding vibrato signal.

It is a further object of the invention to provide a simple vibrato system that provides a non-sinusoidal vibrato signal.

In accordance with a preferred embodiment of the invention, a first vibrato oscillator is operated at a low vibrato frequency such as 6 Hz. A second vibrato oscillator, similar to the first vibrato oscillator, it operated at a higher frequency, such as 12 Hz. The frequency determining circuits of the two oscillators are coupled to synchronize the oscillations from the two oscillators. A combining circuit is connected to each of the oscillators to receive the 6 Hz and 12 Hz signals, and to combine the received signals to provide the complex vibrato signal.

DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a schematic diagram of the vibrato generating system according to the invention, and shows a portion of an organ in a combined block and schematic diagram form; and

FIG. 2 shows a waveform represenative of the complex vibrato signal provided by the system according to the invention.

DETAILED DESCRIPTION

Referring to FIG. 1, there is shown a master oscillator 10 for an organ comprising transistors 12, 14, 16 and 18 and associated components. The transistors 12 and 14 have their collectors and emitters, respectively, connected together, and their bases connected together by means of resistors 20 and 22. Similarly, the transistors 16 and 18 have their collectors and emitters connected together, and the bases connected by means of resistors 24 and 26. The emitters of the transistors 12, 14, 16 and 18 are connected to ground, and the collectors of the transistors 12, 14 are connected to the power supply A+ through a resistor 28, while the collectors of transistors 16, 18 are connected to A+ by means of a resistor 30. The collectors of the transistor 16, 18 are connected to the bases of the transistors 12, 14 through the resistors 20, 22. Similiary, the collectors of the transistors 12, 14 are connected to the bases of the transistors 16, 18 through the resistors 24, 26 and a frequency determining network comprising capacitors 32, 34, a resistor 36, a crystal 38 and a switch 40. The collectors of the transistors 12, 14 are connected to a group of frequency dividers, shown as block 42, which generates musically related tone frequencies. The output of the dividers 42 is connected to a keyboard 44 which selectively applies a tone from the dividers 42 to an amplifier 46 for reproduction by a loud speaker system 48.

The vibrator system comprises a first vibrato oscillator 50 comprising transistors 52 and 54, and a second vibrato oscillator 70 comprising transistors 72 and 74. In the oscillator 50, the transistors 52 and 54 are connected in parallel by means of resistors 56 and 58 in a similar fashion to the parallel connection of transistors 12, 14 and 16, 18. The emitters of the transistors 52, 54 are connected to ground while the collectors are connected to the power supply A+ through a resistor 59. The collectors of the transistors 52, 54 are also connected to the bases thereof by means of the twin T feedback network comprising resistors 60–62 and capacitors 64–66.

The configuration of the oscillator 70 is similar to that of the oscillator 50, with the feedback between the collectors and bases of transistors 72, 74 being provided by the base resistors 76, 78 and the frequency determining network comprising resistors 80–82 and capacitors 84–86. The frequency determining networks of the two oscillators are coupled together by means of a resistor 90 having one terminal connected to the junction of resistor 62 and capacitors 64, 65 and another terminal connected to the junction of the resistor 82 and the capacitors 84, 85.

A combining network 100 comprises a variable resistor 96 connected to ground, a resistor 92 connected to the collectors of the transistors 52, 54 and a resistor 94 connected to the junction of the collectors of the transistors 72, 74. The junction of the resistors 24, 26 is connected to the junction of the resistors 92, 94 and 96.

In operation, the master oscillator 10 provides oscillations to the divider 42 which provide musically related tones to the keyboard 44. The keyboard 44 selects one or more of the notes to be played and passes the selected notes therethrough to the amplifier 46 for reproduction by the loudspeaker 48. The oscillator 10 has a switch 40, which when in the position shown, causes the frequency of the oscillator 10 to be controlled by the crystal 38. Moving the armature of the switch 40 to the other position takes the crystal out of the circuit and the oscillation frequency is determined by the value of the capacitor 32.

The oscillator 10 may be frequency modulated by applying a signal to the junction of the resistors 24 and 26 to change the base to emitter junction capacitance of the transistors 16 and 18, thereby changing the frequency of oscillation of the oscillator 10.

The oscillator **50** operates at a low frequency, such as, for example, 6 Hz, the frequency of oscillation being determined by the twin T network comprising resistors **60–62** and capacitors **64–66.** The frequency of oscillation of the oscillator **70** is selected to be a multiple of the frequency of oscillation of the oscillator **50,** such as, for example, 12 Hz. As in the case of oscillator **50,** the frequency of the oscillator **70** is determined by the network comprising resistors **80–82** and capacitors **84–86.**

The twin T networks of the oscillators **50** and **70** are connected together by the resistors **90** to cause the two oscillators to operate in synchronizism. The aforementioned interconnection causes the two oscillators to operate at a predetermined fixed phase relationship to provide a periodic complex waveform. The complex waveform is obtained by combining the 6 Hz signal from the oscillator **50** and the 12 Hz signal from the oscillator **70** by means of the resistors **92, 94** and **96.** A typical waveform obtained at the junction of the resistors **92, 94** and **96** is shown in FIG. **2.** The complex waveform appearing at the junction of the resistors **92, 94** and **96** is applied to the bases of the transistors **16, 18** to cause the frequency of the oscillator **10** to vary in accordance with the complex function of FIG. **2.** The amount of vibrato effect is adjustable by means of the variable resistor **96.**

The invention has found that the application of the complex wave resulting from the combination of the two harmonically related phase locked signals from the oscillators **50** and **70** provides a pleasing vibrato effect having a much richer tone or quality of that obtained by other methods. The system according to the invention may be readily fabricated through the use of an integrated circuit having four dual input gates therein, the gates being connected together as shown in FIG. **1** to provide the circuit of the invention. Alternately, the circuit can be fabricated using single transistors in place of each of the transistor pairs **12, 14; 16, 18; 52, 54** and **72, 74.** Other modifications contemplated by those skilled in the art may also be used and fall within the scope and spirit of the invention.

I claim:

1. A system for producing a non-sinusoidal vibrato signal having a periodic complex waveform, comprising:

a first low frequency vibrato oscillator including a frequency determining circuit tuned to a first frequency for providing first oscillations having the first predetermined frequency;

a second low frequency vibrato oscillator including a frequency determining circuit tuned to a second frequency higher than said first frequency and a predetermined even multiple thereof for providing second oscillations having the second predetermined frequency;

a coupling circuit connecting said first and second oscillators for synchronizing in phase locked relation said second oscillations to the predetermined frequency multiple of said first oscillations; and

a combining circuit connected to said first and second oscillators for receiving and combining said first and second oscillations, said combining circuit having an output terminal for providing said combined first and second oscillations to provide said periodic complex waveform.

2. A system as recited in claim **1** wherein each frequency determining circuit includes a twin T resistance capacitance network and wherein said coupling circuit includes a resistor.

3. A system as recited in claim **2** wherein said combining circuit includes a plurality of resistors.

4. A system as recited in claim **3** wherein the frequency determining network of said second oscillator is tuned to twice the frequency to which the frequency determining circuit of said first oscillator is tuned.

5. A system as recited in claim **1** further including a musical tone producing system connected to said combining circuit, said tone producing system being responsive to said non-sinusoidal signal for periodically changing the frequency of said musical tones in accordance therewith.

6. A system as recited in claim **5** wherein said muscial tone producing system includes a master oscillator connected to said combining circuit and responsive to said non-sinusoidal signal, and dividers connected to said master oscillator and responsive thereto for generating musical tones.

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