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[54] **PARTAMENTO MUSICAL INSTRUMENT HAVING A SINGLE TONE AND ENVELOPE CONTROL**
1 Claim, 3 Drawing Figs.

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[51] Int. Cl. **G10h 1/02**

[50] Field of Search **84/1.10,**
1.27, DIG. 7, DIG. 19, DIG. 22, 1.27 D

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ABSTRACT: An electronic musical instrument capable of rendering tones of a monophonic continuous scale comprises a performance member including an elongated resistor and an opposing flexible contact wherein a DC current and an AC current are supplied to the elongated resistor and a mixed signal consisting of a DC control signal and an AC control signal is taken out from the flexible contact under the manipulation of the performance member, the DC control signal being varied in magnitude in correspondence to the manipulating position along the performance member, a variable frequency tone generator delivering a tone of a pitch corresponding to the magnitude of the DC component of the mixed signal obtained from the performance member, an envelope forming circuit driven by the AC component of the mixed signal for rendering an envelope signal corresponding thereto, and a switching circuit for switching a tone signal from the tone generator in accordance with the envelope signal, whereby a tone signal having a desired keying (switching) envelope can be obtained from the musical instrument.

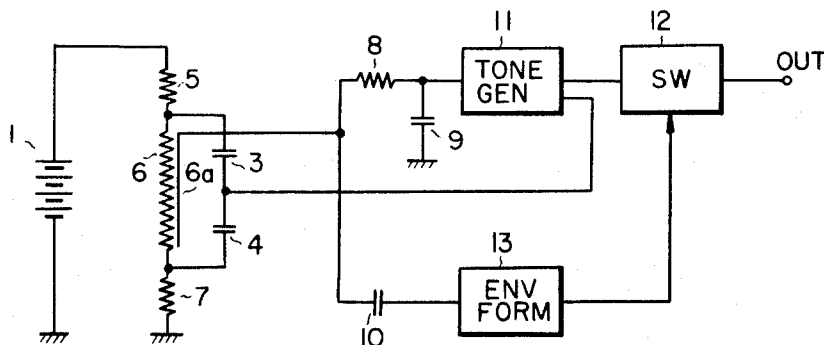


FIG. 1

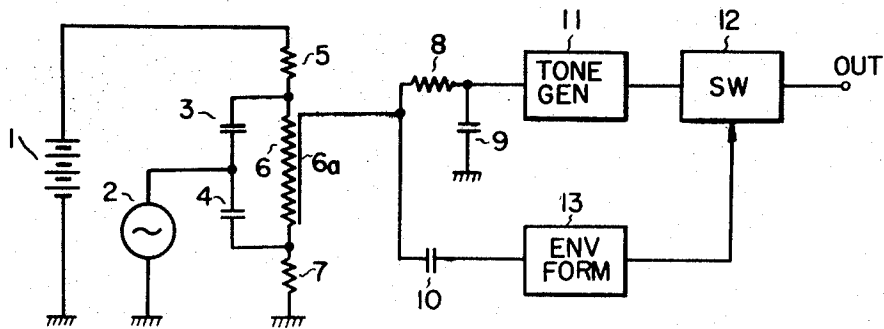
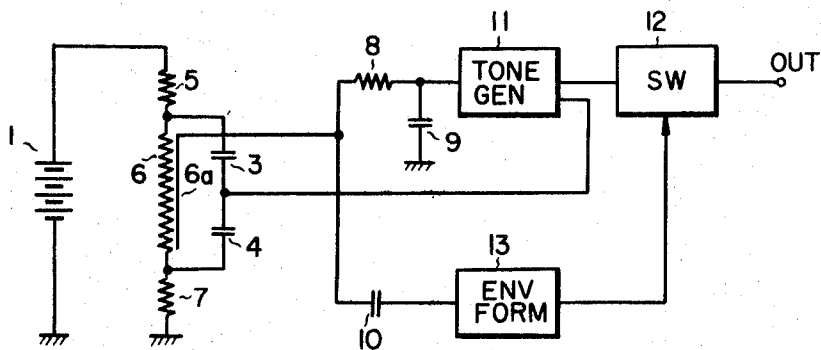


FIG. 2



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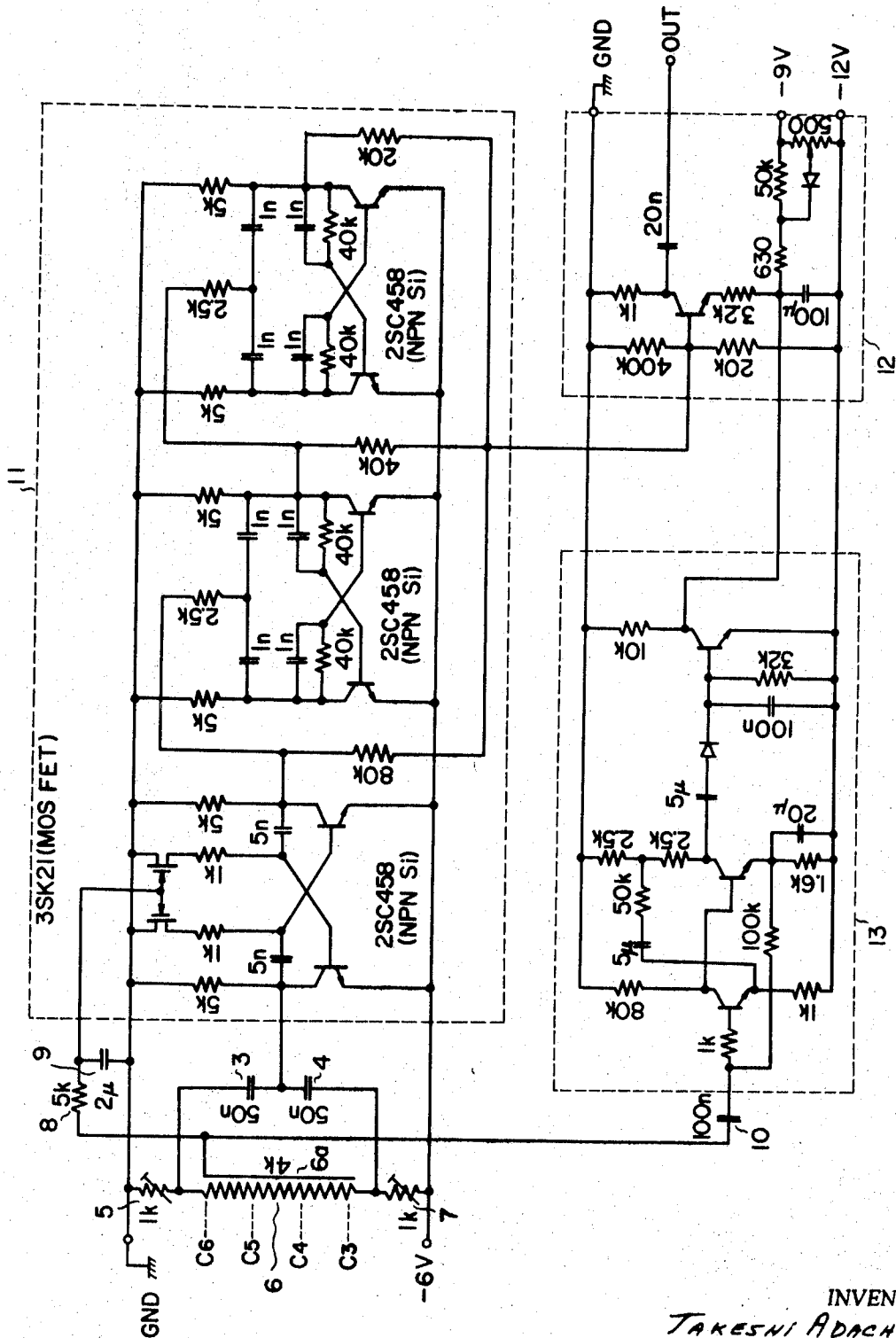


FIG. 3

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PARTAMENTO MUSICAL INSTRUMENT HAVING A SINGLE TONE AND ENVELOPE CONTROL

BACKGROUND OF THE INVENTION

This invention relates to electronic musical instruments, and more particularly to a type wherein the two functions of selecting a desired tone pitch and controlling an envelope for the tone are accomplished by the operation of a single electrical contact, and whereby a music performance in a so-called monophonic continuous scale for rendering portamento effect is made possible.

A type of electronic musical instrument including one oscillator has heretofore been known in which the frequency generated therefrom is varied continuously so that tone signals of different pitch covering a required scale range are obtained. However, such a musical instrument cannot produce a plurality of tones at the same time, and, for this reason, the instrument is called a monophonic continuous scale musical instrument.

Since this kind of electronic musical instrument has a simple organization, it is frequently practiced as a small-sized electronic musical instrument or as a part of a larger type electronic musical instrument.

Since the conventional organization of this type of musical instrument requires a plurality of rows of switches underneath the keyboard for respectively achieving the above-described two functions, it becomes extremely complicated, and the production cost thereof is also high.

Furthermore, in the above-described electronic musical instrument capable of producing tones of a continuous scale (portamento effect), it is not possible to employ an ordinary type keyboard which includes on-off control mechanism, such as switches, interlinked with a tone pitch selecting mechanism. Thus, the on-off mechanism must be provided separately and this has made the manufacture of the musical instrument more difficult.

SUMMARY OF THE INVENTION

Therefore, the primary object of the present invention is to provide a novel organization of the electronic musical instrument wherein all of the above-described drawbacks are substantially overcome.

Another object of the present invention is to provide a novel organization of musical instrument wherein the plurality of rows or electrical contacts are entirely eliminated.

Still another object of the present invention is to provide a novel type of electrical contact and an associated circuitry whereby the organization of the musical instrument is substantially simplified.

These and other objects of the invention can be achieved by a novel organization of an electronic musical instrument comprising a performance member which includes an elongated resistor and a parallelly opposing flexible contact wherein a DC current and an AC current are supplied to the elongated resistor and a mixed signal consisting of a DC control signal and an AC control signal is taken out from the flexible contact with the depression thereof against the elongated resistor, the DC voltage being determined corresponding to the depressed position, a variable frequency tone generator which delivers a tone signal having a frequency corresponding to said DC component of said mixed signal obtained from said performance member, an envelope-forming circuit which is driven by said AC component of the mixed signal and renders an envelope signal corresponding to said AC signal over said tone signal, and a switching circuit which switches a tone signal from the tone generator in accordance with the envelope signal, whereby the output tone signal formed into a certain envelope is delivered from said envelope forming circuit.

The invention will be more fully understood from the following detailed description with respect to preferred embodiment of the invention when read in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a circuit diagram showing an embodiment of the invention,

FIG. 2 is a circuit diagram showing another embodiment of the invention, and

FIG. 3 is a circuit diagram showing a practical circuit construction of FIG. 2 example.

In FIG. 1, there are shown a DC power source 1 for controlling the pitch of a tone and an AC power source 2 for controlling the envelope of the thus delivered tone. The DC power delivered from the DC power source 1 is supplied to an elongated resistor 6 through resistors 5 and 7, while the AC power delivered from the AC power source 2 is supplied the same elongated resistor 6 through capacitors 3 and 4. The resistor 6 is formed into a barlike configuration and is provided with a flexible contact 6a which is disposed parallelly opposing to and normally apart from the resistor 6, these two constituting a depressing-position-controlled potentiometer.

The contacting element 6a is so composed that it does not contact the barlike resistor 6 in the nonplaying state of the musical instrument. At the time of the playing, a desired position of the flexible contact 6a is depressed so that a corresponding part thereof contacts the resistor 6, and from that contacting point, the above described mixed signal is picked up. The thus picked up DC component of the mixed signal will be in the form of a voltage, the value of which is determined by the contacting position of the contact 6a with the resistor 6. On the other hand the AC component of the mixed signal picked up as described above will be a voltage having not much a relation with the contacting position of the contacting element 6a and the resistor 6.

The DC component out of the mixed signal is supplied through a resistor 8 to a frequency control terminal of a tone generator 11 of a DC voltage-controlled variable frequency characteristic. Between the control terminal and the ground, there is connected a capacitor 9, which acts to memorize the applied DC voltage for a time. The tone generator 11 is of a kind in which the frequency is controlled by the applied DC voltage and may be a relaxation oscillator, whereby a tone signal of a pitch (frequency) according to the applied DC signal is generated from the tone generator 11. The input resistance of the tone generator 11 as considered from the control terminal is set to a value sufficiently high with respect to the capacitance of the capacitor 9, so that the DC voltage at the control terminal of the tone generator 11 is maintained at the given value after the contacting condition of the resistor 6 and the contact 6a is interrupted, whereby the tone generator 11 continuously generates a tone of the same pitch thereafter.

The above described AC component of the mixed signal, on the other hand, is transmitted through a DC blocking capacitor 10 to an envelope-forming circuit 13, so that the AC component is therein rectified and shaped into an envelope-forming signal having a suitable rise time, duration, and decay time, which signal thereafter controls a switching circuit 12.

The switching circuit 12 opens or closes the output of the tone generator 11 in accordance with the envelope-forming signal and sends the output tone having a required envelope to the output terminal. It should be noted that the tone generator 11 may continuously generate a tone of a constant pitch corresponding to the terminal voltage after the depression of the flexible contact 6a has been released, and that, if the envelope-forming circuit 13 is so arranged that a pulse having an elongated decay time may be thereby formed, a tone having a gradually attenuating envelope (of sustain effect) can be obtained at the output terminal.

The output tone thus obtained at the output terminal may be thereafter passed through a suitable tone-color rendering circuit, an amplifier, or the like, as in the conventional electronic musical instrument, the description thereof, however, being omitted because these are not essential parts of the present invention.

In FIG. 2, there is shown a modification of above-mentioned arrangement, wherein the AC power source 2 is omitted and the output of the tone generator 11 is employed as the AC power to be supplied to the resistor 6, the rest being the same as in FIG. 1.

FIG. 3 shows a detailed circuit arrangement of the embodiment shown in FIG. 2, with value numerals described for better understanding of the operation. The legend numerals 3 through 13 show the same parts as in FIG. 2. The performance member including the resistor 6 and the flexible contact 6a covers three-octave range from C₃ (131 Hz.) note to C₆ (1047 Hz.) note. Tone generator 11 consists of a variable frequency oscillator of an astable multivibrator including two FET's and two transistors, and two stages of frequency dividers of bistable multivibrators each including two transistors. The oscillation frequency of the astable multivibrator is determined in the range of 523 Hz. through 4186 Hz. by the DC voltage supplied to gates of the FET's through the resistor 8, the FET's acting as voltage-controlled variable resistors, which vary the oscillation frequency as a result. The first divider produces a half of the frequency derived from the astable multivibrator and the second divider produces a further half of the frequency derived from the first divider. The tone signals from three multivibrators are mixed to be a tone signal within the range of C₃ (131 Hz.) through C₆ (1047 Hz.), and supplied to the switching circuit 12, which normally prevents the signal to appear at the output terminal and temporarily permits the signal to appear at the output terminal with a certain envelope when an envelope signal is supplied from the envelope-forming circuit 13. The envelope-forming circuit receives an AC component through the capacitor 10 from the flexible contact 6a,

the AC component being originated by the astable multivibrator in the tone generator 11, amplifies the AC signal, rectifies the AC signal into a DC pulse and amplifies the DC pulse to be an envelope signal. Therefore, when a point of the flexible contact 6a is depressed to contact the elongated resistor 6, the astable multivibrator starts to oscillate at a frequency determined by the applied DC voltage, and the AC components is fed to the envelope-forming circuit 13 to produce an envelope signal, which in turn makes the switching circuit 12 conduct with a predetermined rising envelope; and when the depression is relieved, the astable multivibrator continues to oscillate at the same frequency by the DC voltage remembered in the capacitor 9, and the switching circuit 12 turns into cutoff state with a predetermined decaying envelope, giving a sustain effect.

What is claimed is:

1. An electronic musical instrument comprising a performance member including an elongated resistor and a flexible contact which is disposed parallelly opposing to and normally apart from said elongated resistor, means to supply a DC current to said elongated resistor, a variable frequency tone generator including an oscillator whose oscillation frequency is determined by a DC voltage derived from said flexible contact, the output of said variable frequency tone generator further defining a source of AC current, means coupling said AC current to said elongated resistor, an envelope-forming circuit to produce an envelope signal when an AC signal is supplied from said flexible contact, and a switching circuit means for switching a tone signal from said tone generator in accordance with said envelope signal.

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