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Takeyama

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[45] **Oct. 9, 1973**

[54] **VOLTAGE-CONTROLLED SINGLE TONE SELECTOR FOR USE IN ELECTRONIC MUSICAL INSTRUMENT**

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[52] **U.S. Cl.** **84/1.01,** 84/1.19, 84/DIG. 2, 84/DIG. 23, 84/DIG. 25

[51] **Int. Cl.** **G10h 1/00**

[58] **Field of Search** ..... 84/1.01, 1.17, 1.19, 84/1.22, 1.24, DIG. 2, DIG. 8, DIG. 23, DIG.25

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Assistant Examiner—Stanley J. Witkowski
Attorney—Robert D. Flynn et al.

[57] **ABSTRACT**

A single tone selector for an electronic musical instrument provided with a plurality of tone generators and the same number of keys. Tone signals from the tone generators are respectively shunted by being connected to normally conducting voltage controlled diode switchers which are selectively rendered nonconductive one at a time in response to the different predetermined magnitudes of voltage. A key controlled variable voltage source generates upon key depression such magnitude of voltage as render the corresponding one of the diode switchers nonconductive to stop shunting the tone signal. The output voltages of the variable voltage source are supplied to the diode switchers by a common conductor. The variable voltage source is designed to generate such magnitude of voltage as renders only one of the diode switchers nonconductive even when two or more keys are simultaneously depressed. A tone signal from a tone generator corresponding to the diode switcher thus rendered nonconductive can be conducted to a common output terminal.

14 Claims, 12 Drawing Figures

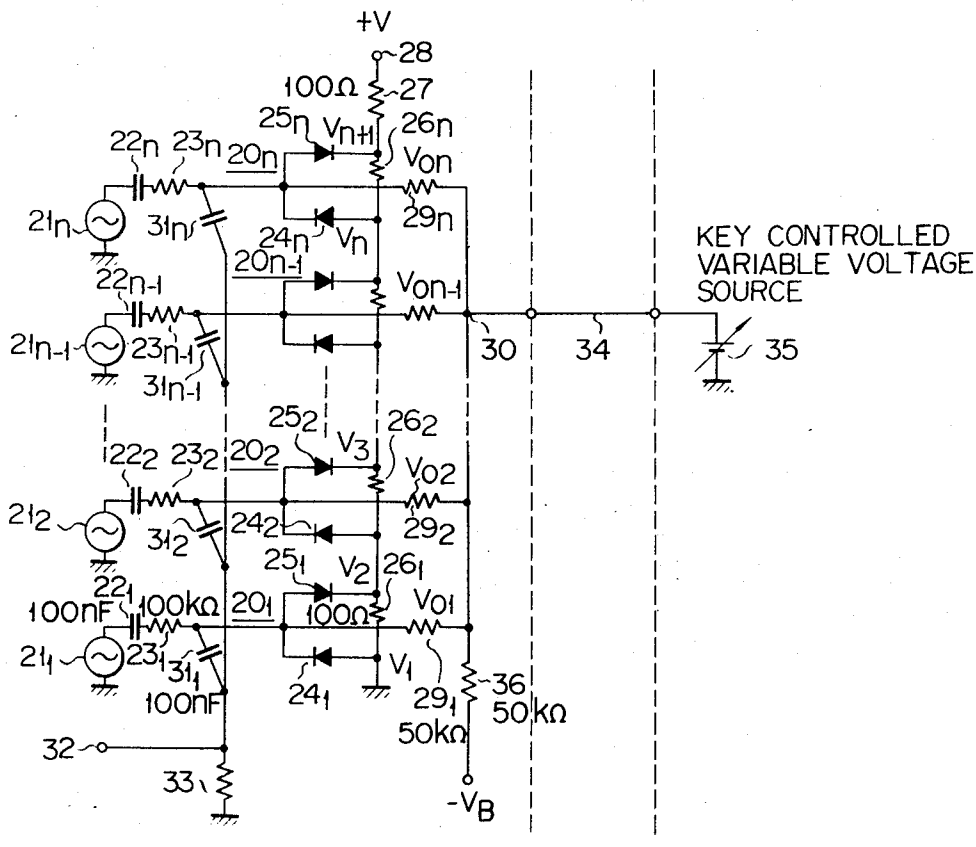


FIG. 1 PRIOR ART

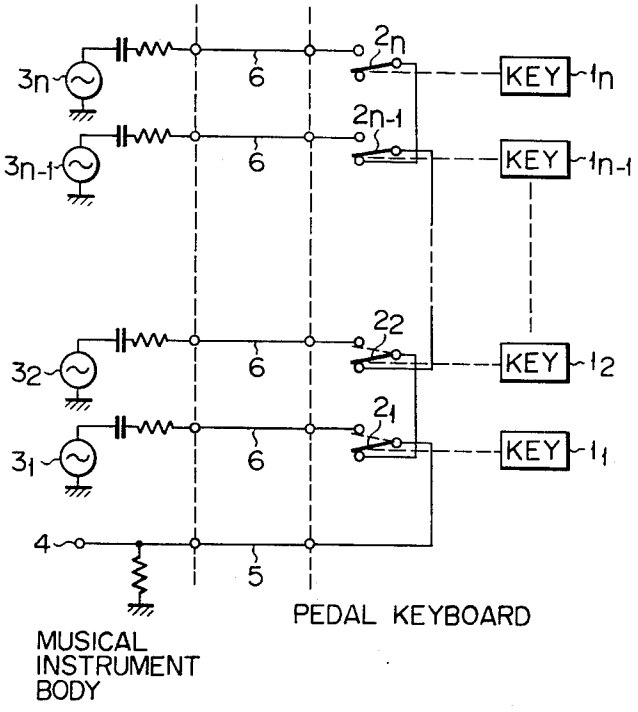


FIG. 2

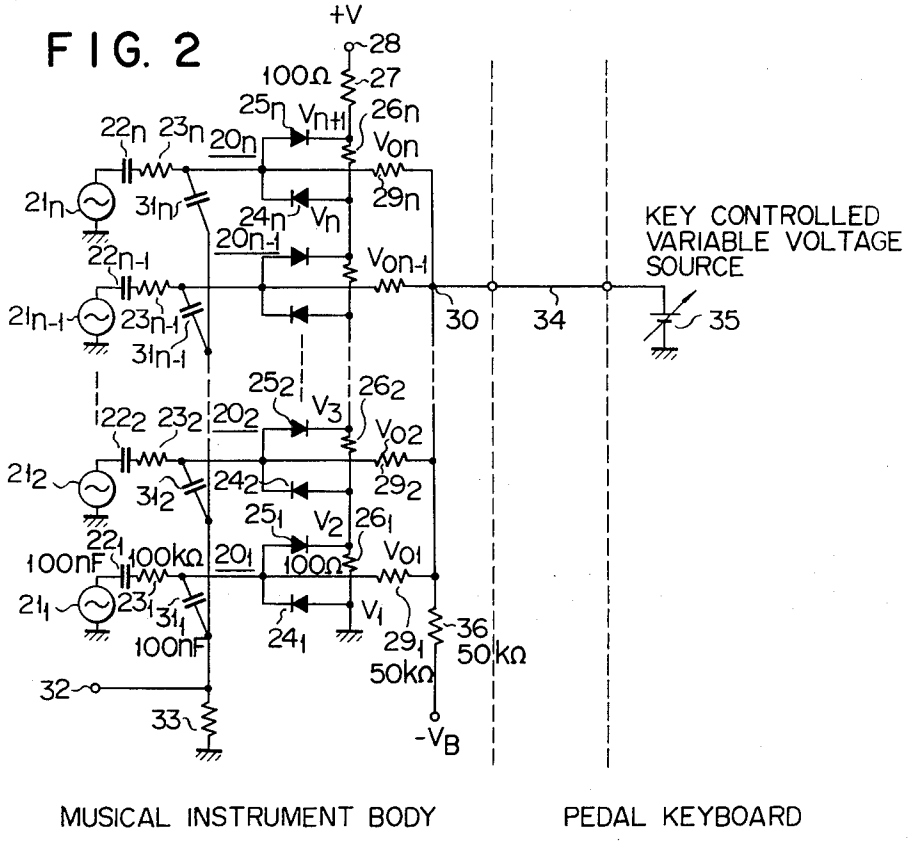


FIG. 3

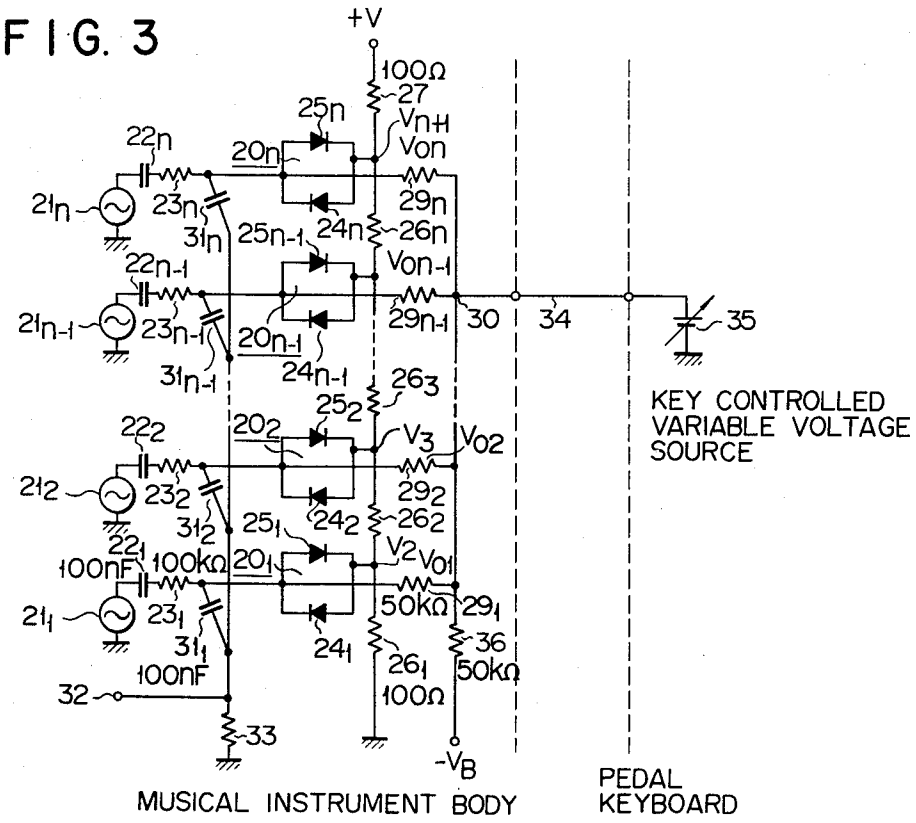

+V
100Ω
27
Vn+1
Von
25n
20n
22n
21n
23n
31n
29n
24n
26n
25n-1
Von-1
22n-1
21n-1
23n-1
20n-1
31n-1
24n-1
29n-1
30
34
35
KEY CONTROLLED VARIABLE VOLTAGE SOURCE
26₃
25₂
V₃
V₀₂
20₂
22₂
21₂
23₂
31₂
29₂
24₂
26₂
25₁
V₂
V₀₁
20₁
22₁
100nF
100kΩ
50kΩ
29₁
21₁
23₁
31₁
24₁
26₁
36
50kΩ
100nF
100Ω
32
33
-V_B
MUSICAL INSTRUMENT BODY
PEDAL KEYBOARD

FIG. 4

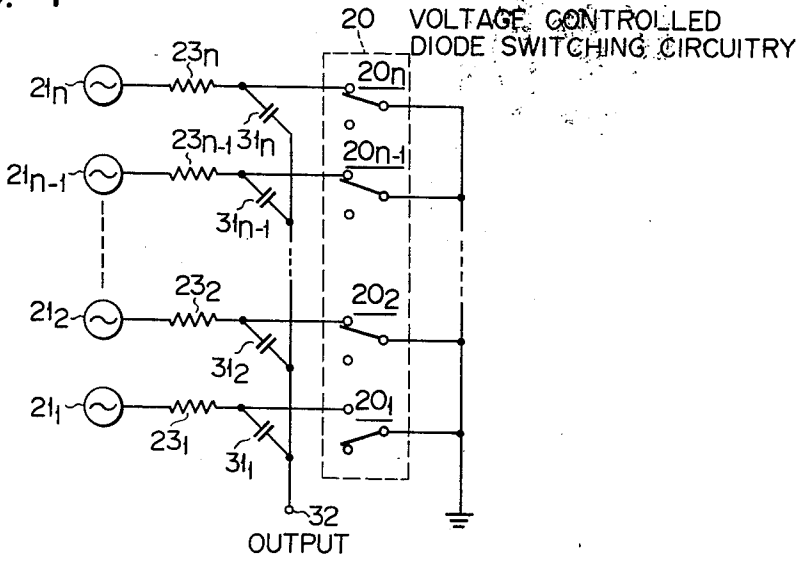
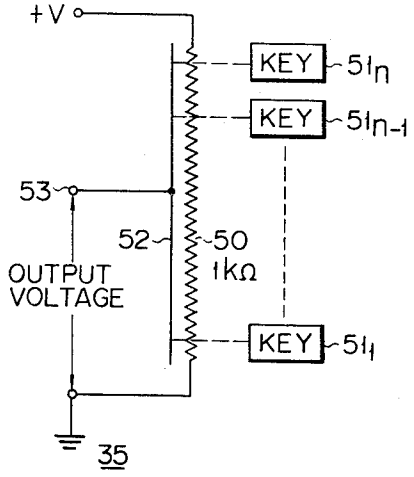
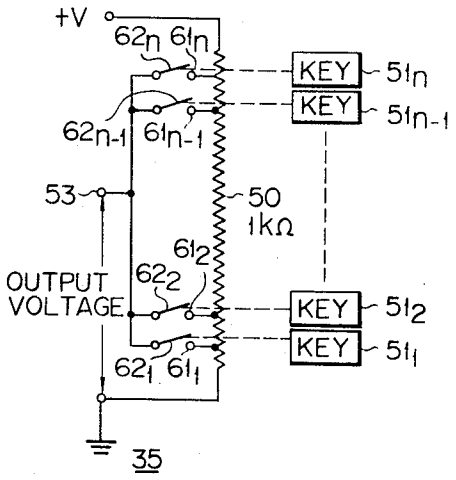

20 VOLTAGE CONTROLLED DIODE SWITCHING CIRCUITRY
23n
21n
20n
23n-1
31n
20n-1
21n-1
31n-1
23₂
20₂
21₂
31₂
20₁
21₁
23₁
31₁
32
OUTPUT

FIG. 5



KEY CONTROLLED
VARIABLE VOLTAGE SOURCE

FIG. 6



KEY CONTROLLED
VARIABLE VOLTAGE SOURCE

FIG. 7

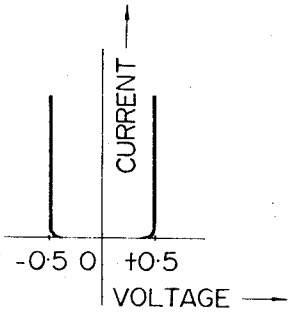


FIG. 8

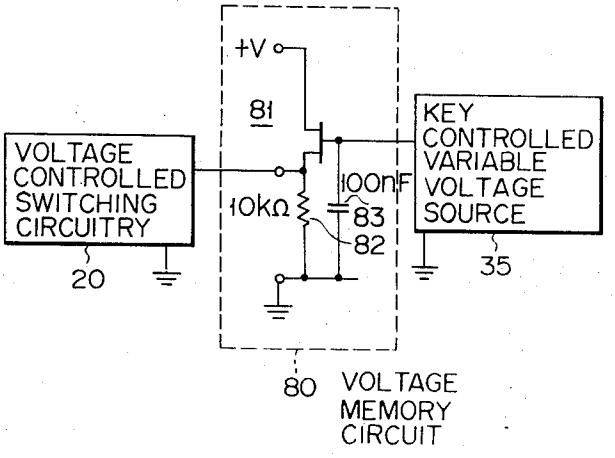


FIG. 9A

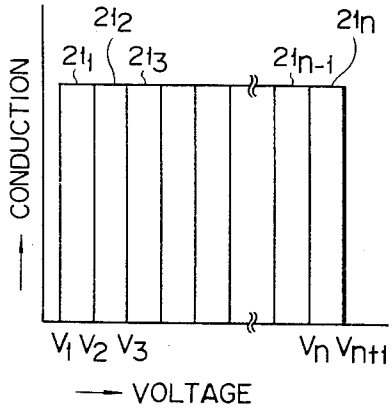


FIG. 9B

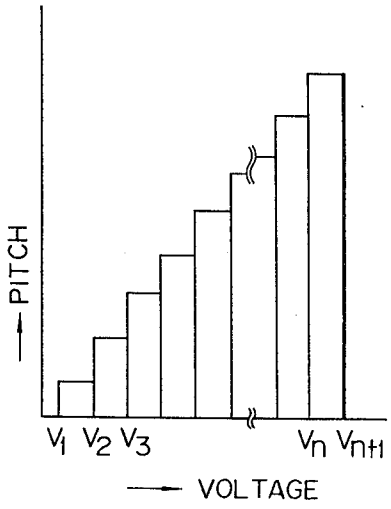


FIG. 10A

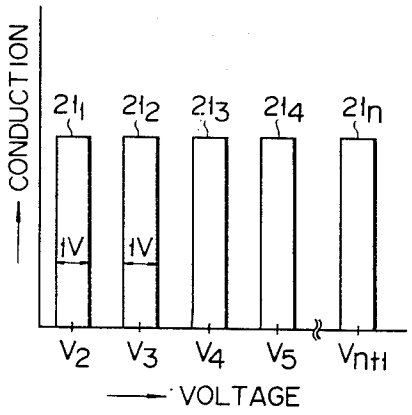
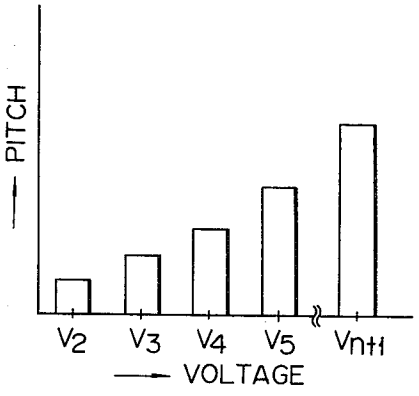


FIG. 10B



VOLTAGE-CONTROLLED SINGLE TONE SELECTOR FOR USE IN ELECTRONIC MUSICAL INSTRUMENT

BACKGROUND OF THE INVENTION

This invention relates to a keyboard type electronic musical instrument and more specifically to a single tone selector for use in such electronic musical instrument which, even when there are simultaneously depressed a plurality of keys on the keyboard, can selectively generate a tone signal corresponding to only a particular one of the notes represented by the depressed keys.

With an electronic musical instrument like an electronic organ provided with manual and pedal keyboards, a player can not operate the pedal keyboard while looking at it, so that he sometimes depresses two adjacent keys by mistake. In such case, there are naturally produced two tones at the same time, the resultant composite sound being not only far different from what is desired but also contaminated by turbidity.

Heretofore, there have been made various proposals to draw out a tone signal corresponding to only a desired one of a plurality of keys simultaneously depressed by mistake. Among the single tone selection circuits proposed to date, the one particularly associated with the pedal keyboard is important, so that there will now be described by reference to FIG. 1 a single tone selector for the pedal keyboard devised by the prior art.

Referring to FIG. 1, the right half represents the pedal keyboard section and the left half the body of a musical instrument. The pedal keyboard section includes a plurality of pedal keys 1_1 to 1_n (usually 13 keys) and the same number of one pole double throw type key switches 2_1 to 2_n actuated upon depression of the pedal keys. As illustrated, the movable contact member of a key switch is connected to the normally closed contact of an adjacent key switch. The movable contact member of a key switch at the extreme end (a key switch 2_1 at the lowermost end as indicated) is connected through a common conductor 5 to an output terminal 4 of a musical instrument body. The output terminal 4 is connected to the known circuit (not shown) for properly treating tone signals from the later described tone generators. The normally open contacts of the key switches 2_1 to 2_n are connected through conductors 6 to tone generators 3_1 to 3_n of the musical instrument which are arranged in the order of tone pitches of a chromatic scale.

Referring to a single tone selection circuit of the aforementioned arrangement, where the keys 1_1 and 1_2 are simultaneously depressed, the movable contact members of the corresponding key switches 2_1 and 2_2 are shifted as indicated by broken lines, causing only the tone generator 3_1 to be connected to the output terminal 4. Thus it will be apparent that even when there are simultaneously depressed a plurality of keys there is obtained at the output terminal 4 a tone signal corresponding to only one of the keys.

In the single tone selector of FIG. 1, however, there are used a large number of key switches and the normally closed contacts thereof are connected in series through movable contact members, most likely giving rise to poor contact and contact noises. To avoid such events, there must be used a key switch of high reliability, eventually leading to the increased cost of a musical instrument. Further, a large electronic musical instrument often has a pedal keyboard section and the body of a musical instrument constructed separately from each other. In such case, electrical connection between the pedal keyboard section and the body of the musical instrument has to be effected using a large number of conductors and connector pins for connecting the conductors to the tone generators of the musical instrument body and the key switches of the pedal keyboard section.

It is accordingly the object of this invention to provide a single tone selector eliminating the necessity of using any switch and enabling connection between the pedal keyboard section and tone generators to be effected by a small number of conductors.

SUMMARY OF THE INVENTION

An electronic musical instrument to which there can be applied the single tone selector of this invention is provided with a plurality of tone generators and a keyboard having the same number of keys. The tone generators are connected to a common output terminal and also to voltage controlled switching means having the same number as the tone generators. These voltage controlled switching means are normally in a conducting state substantially to shunt the tone generators, thereby preventing a tone signal from being produced at the output terminal. The voltage controlled switching means are selectively rendered nonconductive one at a time by the predetermined magnitudes of voltage supplied thereto, causing a corresponding single tone signal to appear at the output terminal of the single tone selector.

Further according to this invention, there is used a key controlled variable voltage source controlled by keys having the same number as the tone generators as well as the voltage controlled switching means so as to generate different magnitudes of voltage per key depression. The source generates such magnitude of voltage as renders the voltage controlled switching means corresponding to the depressed key nonconductive. Output voltage from the source is supplied simultaneously to all the voltage controlled switching means through a common conductor. However, the voltage controlled switching means are so designed as to be rendered nonconductive only one of them at a time in response to voltages in different ranges which do not overlap each other. Accordingly, not only when there is depressed a single key but also when there are simultaneously depressed two or more keys, the key controlled voltage source generates such magnitude of voltage as renders nonconductive the voltage controlled switching means corresponding to the single depressed key or one of the depressed keys, thereby causing a tone signal only from the tone generator connected to the voltage controlled switching means thus rendered nonconductive to be produced at the output terminal.

This invention is characterized in that each voltage controlled switching means includes first and second diodes, and there are provided serially connected plural resistors with a unit resistor at one end of the resistors connected to a D.C. voltage source and a unit resistor at the opposite end of the resistors grounded, thereby constituting a voltage divider providing various voltages. The cathode of the first diode is connected to the anode of the second diode. The junction is con-

nected to the corresponding tone generator through an impedance means and also to the output terminal of the key controlled variable voltage source through a common conductor. Where the first and second diodes of a voltage controlled switching means are germanium diodes, the anode of the first diode and the cathode of the second diode are connected to both ends of that of the serially connected resistors which corresponds to the switching means. The potential difference across the resistor defines the range of voltage which, when supplied to the voltage controlled switching means, renders it nonconductive.

Where the first and second diodes constituting a voltage controlled switching means are silicon diodes, then the anode of the first diode and the cathode of the second diode are connected to each other, the junction being connected to the corresponding junction of the aforesaid serially connected resistors. As apparent from the voltage-current characteristics of a silicon diode, there is required a certain magnitude of forward voltage in order to effect the passage of current through the diode. This forward voltage determines the range of voltage which, when supplied to a switching means formed of the silicon diodes, renders it nonconductive.

According to this invention, the aforemention ed impedance means includes a capacitor and a resistor which has a larger resistance value than that of the serially connected resistors. The output terminal is connected to the junction of the impedance means with the voltage controlled switching means. Therefore, under the normal condition where key depression does not take place, a tone signal obtained at the junction of the impedance means and the voltage controlled switching means is shunted by the serially connected resistors through either of the diodes of said switching means and consequently is not conducted to the output terminal. Where, however, supplied with a predetermined magnitude of voltage from the key controlled variable voltage source, then both first and second diodes of the voltage controlled switching means are rendered nonconductive to produce a tone signal at the output terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a single tone selector circuitry according to the prior art;

FIG. 2 shows a single tone selector circuitry according to an embodiment of this invention;

FIG. 3 illustrates the circuitry of a modification of FIG. 2;

FIG. 4 is an equivalent circuitry of the single tone selector circuitry of FIGS. 2 and 3;

FIG. 5 is a circuit diagram of the key controlled variable voltage source of FIGS. 2 and 3 according to an embodiment of the invention;

FIG. 6 is a circuit diagram of a modification of the key controlled variable voltage source of FIGS. 2 and 3;

FIG. 7 schematically shows the voltage-current characteristics of a silicon diode used in the circuitry of FIG. 3;

FIG. 8 indicates a voltage memory circuit added to the circuitry of FIGS. 2 and 3 for a particular effect;

FIGS. 9A and 9B illustrate the operation of the single tone selector circuitry of FIG. 2; and

FIGS. 10A and 10B set forth the operation of the single tone selector circuitry of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Since the single tone selector of this invention is particularly adapted for use with the pedal keyboard of an electronic musical instrument, the following description relates to the pedal keyboard.

Referring to FIG. 2, the left half shows the body of an electronic musical instrument and the right half the pedal keyboard section thereof. The body of the musical instrument includes tone generators 21_1 to 21_n (n normally denotes 13) for generating tone signals having different pitch frequencies. These tone generators may be concurrently used as those associated with the manual keyboard. In this case, tone signals from the tone generators 21_1 to 21_n may be subject to frequency divisions for a bass performance on the pedal keyboard.

The tone generators 21_1 to 21_n are connected to a plurality of voltages controlled switching means 20_1 to 2_n including first diodes 24_1 to 24_n and second diodes 25_1 to 25_n arranged parallel in successively paired relationship with opposite polarities through impedance means formed of capacitors 22_1 to 22_n and resistors 23_1 to 23_n connected in series in successively paired relationship. More particularly, the tone generators 21_1 to 21_n are connected to the junctions of the cathodes of the first diodes 24_1 to 24_n with the anodes of the diodes dopdes 25_1 to 25_n. The opposite end portions of the paired diodes, that is, the anodes of the first diodes and the cathodes of the second diodes are connected to both ends of the corresponding ones of serially connected resistors 26_1 to 26_n. The lowermost unit 26_1 of the serially connected resistors 26_1 to 26_n is grounded, while the uppermost unit 26_n is connected to a D.C. source terminal **28** through a separately provided resistor **27.** The junctions of the paired diodes with the aforesaid resistors 23_1 to 23_n are collectively connected to a convergence point **30** through corresponding resistors 29_1 to 29_n the point **30** being also connected to a negative D.C. source $-V_B$ via a resistor **36.** Further, the junctions of the paired diodes with the resistors 23_1 to 23_n are collectively connected to a common output terminal **32** through corresponding capacitors 31_1 to 31_n. The output terminal **32** is grounded through a resistor **33.** The aforesaid convergence point **30** is connected to a key controlled variable voltage source **35** of the pedal keyboard section by a common conductor **34.** The key controlled variable voltage source **35** supplies, as later described, different magnitudes of D.C. voltage to the convergence point **30** upon depression of the keys of the pedal keyboard. The resistors 23_1 to 23_n and 29_1 to 29_n are each chosen to have an appreciably larger resistance value than that of the serially connected resistors 26_1 to 26_n.

There will now be described by reference to FIGS. **5** and **6** the key controlled variable voltage source. Referring to FIG. **5,** numeral **50** denotes a resistor body having substantially the same length as the fully arranged length of the pedal keys 51_1 to 51_n having the same number as the tone generators 21_1 to 21_n of the pedal keyboard as well as the voltage controlled switching means 20_1 to 20_n. The resistor body **50** is connected to the D.C. source +V at one end and grounded at the other. There is provided a flexible contact plate **52** so as to face the resistor body **50** at a predetermined

space. The flexible contact plate **52** is connected to the aforesaid common conductor **34** through an output terminal **53**, and, upon key depression, is actuated to contact with the resistor body **50**. At the output terminal **53**, therefore, is obtained upon key depression the D.C. voltage whose magnitude is defined by that point of contact between the contact plate **52** and resistor body **50** which corresponds to the position of the depressed key.

There will now be described by reference to FIG. **6** a modification of the key controlled variable voltage source of FIG. **5**. The parts of FIG. **6** the same as those of FIG. **5** are denoted by the same numerals. According to FIG. **6**, there are provided taps 61_1 to 61_n at those portions of the resistor body **50** which correspond to the pedal keys 51_1 to 51_n. The taps 61_1 to 61_n are connected to the output terminal **53** through key switches 62_1 to 62_n actuated by the pedal keys 51_1 to 51_n. Thus it will be apparent that upon key depression, there is generated from the output terminal **53** the voltage whose magnitude corresponds to the position of the tap connected to the key switch actuated by the depressed key.

Before there is described the operation of the single tone selector circuitry of FIG. **2**, let it be assumed that the voltages at the junctions of the voltage controlled diode switching means 20_1 to 20_n with the serially connected resistors 26_1 to 26_n are set at the indicated values according to the voltage of the power source and the resistance values of the serially connected resistors 26_1 to 26_n, and that the variable voltage source generates different magnitudes of voltages V_{01} to V_{0n} upon depression of the pedal keys 51_1 to 51_n. Since the voltages V_{01} to V_{0n} respectively render non-conductive the voltage controlled diode switching means 20_1 to 20_n impressed therewith, the magnitudes of the voltages V_{01} to V_{0n} are indicated above the resistors 29_1 to 29_n connecting the diode switching means 20_1 to 20_n to the convergence point **30**.

The aforesaid voltages V_{01} to V_{0n} generated by the key controlled variable voltage source and the successively divided voltages V_1 to V_n appearing at both ends of the respective serially connected resistors 26_1 to 26_n have the following relationships of magnitude:

$V_1 < V_{01} < V_2$
$V_2 < V_{02} < V_3$
$V_3 < V_{03} < V_4$
.....
$V_{n-1} < V_{0n-1} < V_n$
$V_n < V_{0n} < V_{n+1}$

There will now be described by reference to FIG. **2** the operation of the single tone selector of this invention. Where the key controlled variable voltage source **35** does not generate any voltage, that is, where there is not depressed any of the pedal keys 51_1 to 51_n, then tone signals from the tone generators 21_1 to 21_n appearing at the junctions of the resistors 23_1 to 23_n with the voltage controlled diode switching means 20_1 to 20_n are substantially shunted through the conducting first diodes 24_1 to 24_n with a negative biasing voltage applied from the negative source $-V_B$ through a resistor **36** and consequently are prevented from being produced at the output terminal **32** through the coupling capacitors 31_1 to 31_n.

Where there is depressed, for example, the pedal key 51_1, then the voltage source **35** generates voltage V_{01}. Since, in this case, the voltage V_{01} is chosen to have a magnitude of $V_1 < V_{01} < V_2$ as previously indicated, the first and second diodes 24_1 and 25_1 of the first diode switching means 20_1 are rendered nonconductive. Accordingly, a tone signal from the tone generator 21_1 appears at the output terminal **32** through the resistor 23_1 and coupling capacitor 31_1. Referring to another diode switching means simultaneously impressed with the aforesaid voltage V_{01}, for example, the second diode switching means 20_2, the second diode 25_2 is reversed biased, whereas the first diode 24_2 is forwardly biased by the voltage V_{01}. Since a tone signal from the tone generator 21_2 is substantially shunted through the forwardly biased diode 24_2, the tone signal is not conducted to the output terminal **32**. This holds true with other diode switching means when they are jointly impressed with the voltage V_{01}. It will therefore be understood from the foregoing description that when there is separately depressed any other key, the corresponding diode switching means has its first and second diodes reversely biased, allowing a tone signal only from the corresponding tone generator to be conducted to the output terminal.

There will now be discussed the case where there are simultaneously depressed, for example, adjacent pedal keys 51_1 and 52_2. In this case, the voltage V_{00} generated by the key controlled variable voltage source **35** obviously has a magnitude of $V_{01} < V_{00} < V_{02}$. Therefore, according as the voltage V_{00} has a larger or smaller value than the voltage V_2, the diodes of either diode switching means 20_2 or diode switching means 20_1 are reversely biased, causing a tone signal from a tone generator connected to the diode switching means thus rendered nonconductive to be derived at the output terminal **32**. In this case, a tone signal representing a higher or lower pitch can be preferentially obtained by properly varying the resistance offered by the resistor body **50** and the distance between the respective taps associated therewith. This holds true with depression of other adjacent pedal keys.

From the foregoing description there results, as shown in FIG. **4**, an equivalent circuitry of FIG. **2**. The parts of FIG. **4** the same as those of FIG. **2** are denoted by the same numerals. FIG. **4** represents a voltage controlled diode switching circuitry in which the plural voltage controlled diode switching means are represented by one pole double throw type switches 20_1 to 20_n normally conducting to shunt tone signals to the circuit ground, particularly showing a tone generator 21_1 corresponding to a switch 20_1 connected to the output terminal **32**.

FIG. **9A** shows the manner in which there are generated tone signals from the tone generators 21_1 to 21_n when the key controlled variable voltage source generates voltage V_{01} ranging between V_1 and V_2, voltage V_{02} ranging between V_2 and V_3 and so forth.

FIG. **9B** indicates the manner in which there are successively generated tone signals from the tone generators 21_1 to 21_n arranged in the order of pitches when the keys are depressed successively in the order of pitches, thus producing the socalled glissando effect.

The single tone selector circuitry of FIG. **2** is adapted for the case where the voltage controlled diode switching means include germanium diodes. FIG. **3** shows a single tone selector circuitry used in the case where the voltage controlled diode switching means include silicon diodes. The parts of FIG. **3** the same as those of

FIG. 2 are denoted by the same numerals and description thereof is omitted.

According to the embodiment of FIG. 3, the anodes of the first diodes 24_1 to 24_n of the voltage controlled diode switching means 20_1 to 20_n are serially connected in successively paired relationship to the cathodes of the second diodes 25_1 to 25_n thereof, with the resultant junctions or the second junctions of said first and second diodes connected to the junctions of the serially connected resistors 26_1 to 26_n.

FIG. 7 is a schematic illustration of the voltage-current characteristics of a pair of silicon diodes parallel arranged in opposite direction, as prepared on the basis of the known voltage-current characteristics of silicon diodes. As apparent from FIG. 7, where there is impressed across the paired silicon diodes a voltage of less than ±0.5 V, then both diodes remain nonconducting. Where, however, the voltage exceeds ±0.5 V, then either of the diodes is rendered conductive. Where, therefore, there are used silicon diodes, it is unnecessary to connect the anode of the first diode and the cathode of the second diode to both ends of a resistor which have different potentials, as is the case with the single tone selector circuitry of FIG. 2.

Referring to FIG. 3, the voltage V_{01} for rendering the first voltage controlled diode switching means 20_1 nonconductive may be expressed as $V_{01} = V_2 \pm 0.5$. This corresponds to the case where the potential difference across each of the serially connected resistors 26_1 to 26_n of FIG. 2 is 1 volt. The single tone circuitry of FIG. 3 is operated in the same manner as that of FIG. 2 and consequently its equivalent circuitry may be shown as in FIG. 4.

FIGS. 10A and 10B illustrate the operation of the embodiment of FIG. 3, just as FIGS. 9A and 9B illustrate the operation of the embodiment of FIG. 2 The bars of FIGS. 10A and 10B are indicated in discontinuous arrangement unlike those of FIGS. 9A and 9B. This depends on the magnitude of potential difference across each of the serially connected resistors 26_1 to 26_n. Where the potential difference across one of the resistors 26_1 to 26_n is one volt, then the bars are brought close to each other, presenting a continuous formation as in FIGS. 9A and 9B. The width of the bars, that is, range of voltage by which the voltage controlled diode switching means is rendered nonconductive is determined by the voltage-current characteristics of silicon diodes used. In the case of FIG. 7, the range of voltage is about one volt.

In the single tone selector circuitry of FIGS. 2 and 3, where the key controlled variable voltage source 35 ceases to generate any output voltage, that is, where the depressed key is released to its original position, then the tone signal previously conducted to the output terminal 32 immediately disappears, thus preventing an electronic musical instrument to be played with a sustain effect. To avoid such drawback, it is advised to provide, as shown in FIG. 8, a voltage memory circuit 80 between the voltage controlled switching means 20 and the key controlled variable voltage source 35. The voltage memory circuit 80 includes, as shown in FIG. 8, a field effect transistor 81, whose drain is connected to a D.C. source, whose gate is connected to the key controlled variable voltage source 35 so as to receive output voltage therefrom, and whose source is grounded through a resistor 82 and connected to the voltage controlled switching circuitry 20. Further, the gate is grounded through a capacitor 83 for storing the magnitude of output voltage from the voltage source 35.

The above-mentioned voltage memory circuit 80 is operated in such a manner that output voltage from the key controlled variable voltage source 35 is charged or stored in the capacitor 83 and a source voltage thereby determined is to the voltage controlled switching circuitry 20. Even after the release of the key depression, output voltage from the key controlled varible voltage source 35 is still kept stored in the capacitor 83, enabling the same tone signal to be continuously derived from the output terminal 32. If, in this case, there is provided a known sustain effect producing circuit (gradually decaying keyer) in the path of a tone signal delivered from the output terminal 32, then there will be realized a good sustain effect.

What is claimed is:

1. A single tone selector for use in a keyboard type electronic musical instrument comprising:

a plurality of tone generators for producing tone signals;

a common output terminal connected to said plurality of tone generators;

a plurality of voltage controlled switching means of the same number as said plurality of tone generators and connected to said plurality of tone generators, said plurality of voltage controlled switching means being normally kept conducting so as to substantially shunt said tone generators thereby preventing said tone signals from being conducted to said common output terminal and being rendered non-conductive in response to voltages having predetermined different magnitudes, thereby enabling a tone signal to be produced at said output terminal;

a plurality of keys of the same number as said tone generators;

a key controlled variable voltage source means coupled to and controlled by operation of said plurality of keys so as to generate per key depression a voltage having a predetermined magnitude to render nonconductive the voltage controlled switching means corresponding to the depressed keys; and

a common conductor means for supplying output voltages from said key controlled variable voltage source simultaneously to said plurality of voltage controlled switching means.

2. A single tone selector according to claim 1 wherein said plurality of keys are pedal keys.

3. A single tone selector according to claim 1 wherein said voltage controlled switching means are each connected at one end to the corresponding tone generator through a first impedance means and also to said key controlled variable voltage source means through said common conductor means and further connected at the other end to a predetermined potential point grounded through a second impedance means; and wherein said common output terminal is connected to the junctions of said first impedance means and said voltage controlled switching means.

4. A single tone selector according to claim 3 wherein said first impedance means includes a capacitor and a resistor and said second impedance means includes a resistor; and wherein the resistance value of said resistor of said first impedance means is larger than that of said resistor of said second impedance means;

and wherein said output terminal is connected to the junction of said first impedance means and said voltage controlled switching means through a coupling capacitor.

5. A single tone selector according to claim 1 wherein said voltage controlled switching means are diode switching means each including first and second diodes each having an anode and cathode, with the cathode of said first diode connected to the anode of said second diode and the junction thereof further connected to the corresponding tone generator through a first impedance means and also to said key controlled variabe voltage source means through said common conductor means; there are further provided serially connected resistors, with a unit resistor at one end of said series connected to a D.C. source and another unit resistor at the opposite end of said series grounded, both ends of each of said serially connected resistors being connected to the anode of said first diode of the corresponding diode switching means and the cathode of said second diode thereof; and there are further provided coupling capacitor means for connecting the junction of said first impedance means and said diode switching means to said common output terminal.

6. A single tone selector according to claim 5 wherein said first and second diodes are germanium diodes.

7. A single tone selector according to claim 5 wherein said first impedance means includes a capacitor and a resistor which has a larger resistance value than that of said serially connected resistors.

8. A single tone selector according to claim 1 wherein said voltage controlled switching means are diode switching means including first and second diodes disposed parallel in opposite directions with the first junction of said first and second diodes connected to the corresponding tone generator through a first impedance means and also to said key controlled variable voltage source means through said common conductor means; there are further provided a plurality of serially connected resistors with a unit resistor at one end of said series connected to a D.C. source and another unit resistor at the opposite end of said series grounded, the junctions of said serially connected resistors being connected to the second junctions of said first and second diodes of the corresponding diode switching means; and there are further provided a plurality of coupling capacitor means for connecting the junctions of said first impedance means and said diode switching means to said common output terminal.

9. A single tone selector according to claim 8 wherein said first and second diodes are silicon diodes.

10. A single tone selector according to claim 8 wherein said first impedance means includes a capacitor and a resistor which has a larger resistance than that of said serially connected resistors.

11. A single tone selector according to claim 1 wherein said key controlled variable voltage source comprises:

a resistor body having substantially the same length as the fully arranged length of said plurality of keys;

a D.C. source connected across said resistor body; and

a common flexible contact means having substantially the same length as that of said resistor body, so disposed as to face said resistor body with a predetermined space therebetween and connected to said common conductor means, said common flexible contact means being adapted to be actuated by said keys to contact with said resistor body.

12. A single tone selector according to claim 1 wherein said key controlled variable voltage source means comprises:

a resistor body having substantially the same length as the fully arranged length of said plurality keys and provided with taps having the same number as said keys;

a D.C. source connected across said resistor body; and

key switches adapted to be actuated by said keys to connect said taps of said resistor body of said common conductor means.

13. A single tone selector according to claim 1 further comprising a voltage memory circuit connected between said key controlled variable voltage source means and said voltage controlled switching means so as to store output voltages from said key controlled variable voltage source means, thereby allowing said output voltages to be continuously supplied to said voltage controlled switching means even after the release of said keys.

14. A single tone selector according to claim 13 wherein said voltage memory circuit includes a field effect transistor having a drain, source and gate, said drain being connected to a D.C. source, said source being grounded through a resistor and connected to said voltage controlled switching means and said gate being connected to the output of said key controlled variable voltage source means and further grounded through a capacitor.

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