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PEDAL SWITCHING SUSTAIN AND CANCELLATION CIRCUIT FOR AN
ELECTRONIC MUSICAL INSTRUMENT

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3 Sheets-Sheet 2

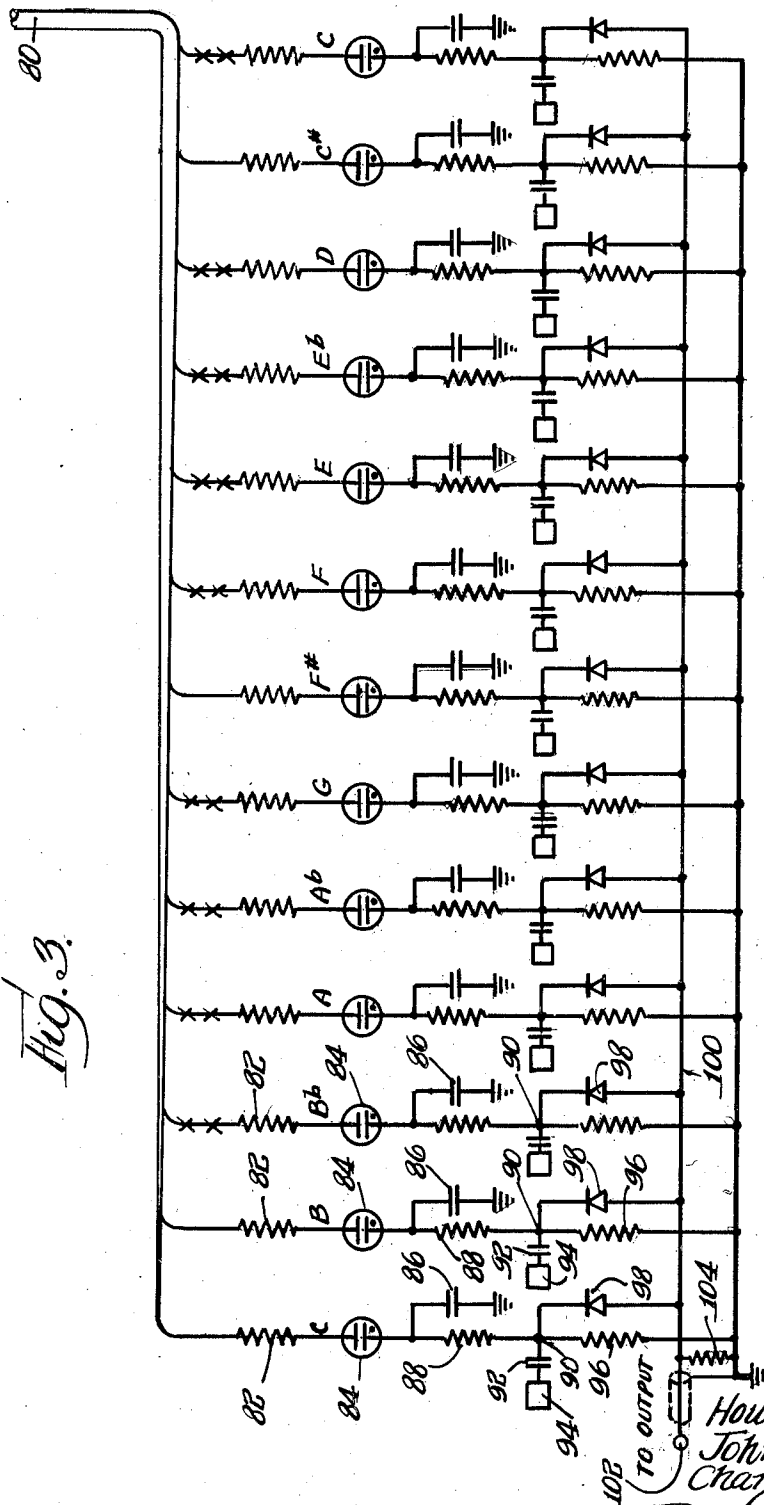


Fig. 3.

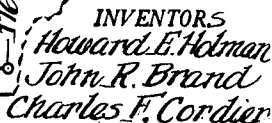
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ELECTRONIC MUSICAL INSTRUMENT

3 Sheets-Sheet 3



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1

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PEDAL SWITCHING SUSTAIN AND CANCELLATION CIRCUIT FOR AN ELECTRONIC MUSICAL INSTRUMENT

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22 Claims. (Cl. 84-1.26)

This invention is concerned with an electronic organ, and more particularly with the pedal notes thereof.

As is well known, it is common for electronic organs to have one or two manuals or keyboards, plus a pedal board. Commonly, the pedals are connected to "borrow" notes from the generators controlled by the manuals, the frequency of such notes sometimes being divided to produce lower tones. Generally speaking, only one pedal tone is played at a time. In fact, it is extremely undesirable to play more than one adjacent pedal tone at a time, since the notes are sufficiently low in frequency that a very bad beat is produced between adjacent, or even near notes controlled by the pedal board.

Accordingly, it is an object of this invention to provide improved means whereby playing of one note by the pedal board cuts off sustained playing of any other pedal note.

More particularly, it is an object of this invention to provide electronic means for positively cutting off sustained playing of all other pedal notes when any pedal note is played.

It is further an object of this invention to provide an electronic organ having a series of pedal notes controlled by pedals on the organ, and further having a chord unit having controls thereon for playing pedal notes, wherein the chord unit and the pedals share circuit components for producing pedal notes, and for positively cutting off all pedal notes other than the one played.

Other and further objects and advantages of the present invention will be apparent from the following description when taken in connection with the accompanying drawings wherein:

FIG. 1 is a fragmentary side view of the pedal and pedal-controlled switch structure;

FIG. 2 is a schematic wiring diagram of the pedals;

FIG. 3 is a schematic wiring diagram of the pedal control or latching circuit;

FIG. 4 is a combination block and schematic wiring diagram of the divider stages of the pedal tone generators; and

FIG. 5 is a schematic wiring diagram of the chord unit.

Referring now in greater particularity to the drawings, and first to FIGS. 1 and 2, there will be seen a pedal frame 10 supporting a plurality of pedals 12. The frame 10 has an upstanding flange 14 with an integral horizontal flange 16. The pedals 12 are mounted on this flange by means of flexure springs 18 respectively riveted to the pedals and secured to the flange 16 as by screws 20.

Threaded studs 22 extend up from the frame 10 respectively through suitable holes bored in the pedals 12. A felt washer 24 encircles each threaded stud 22 and is backed up by a steel washer 26 and a nut 28 threaded on the stud. The felt washer 24 in each instance serves as an upstop for the corresponding pedal 12, and the upstop position is adjustably determined by threading the nut 28 up or down on the stud 22.

Spaced insulated posts 30 support in insulated relation four common contacts 32, 34, 36 and 38 extending

2

transversely across and above the pedals. As will be apparent from FIG. 1, the contact 32 has a downturned flange, while the remaining three contacts 34, 36 and 38 have upturned flanges.

Each pedal 12 carries an upstanding insulating support 40 relatively adjacent the contacts 32, 34, 36 and 38. The supports 40 respectively carry vertically spaced brackets 42, 44 and 46. Adjacent each bracket a flexible wire or whisker contact 48, 50, and 52, respectively, extends into proximity with the fixed contacts spanning the pedals. The bracket 42 has a laterally extending finger 54, while the bracket 44 has a similar finger 56 and bracket 46 has a similar finger 58. These fingers respectively engage the contact wires or whiskers, and limit the upward positions thereof.

As is shown physically in FIG. 1 and schematically in FIG. 2, all of the contacts 48 in the "at rest" position engage the fixed contact or bus bar 32. This bus bar is connected by means of a wire 60 to the contact or bus bar 36. When a pedal 12 is depressed, the corresponding wire or whisker 48 moves from the contact or bus bar 32 into engagement with the contact or bus bar 34, the remaining contacts 48 remaining in engagement with the bus bar 32. The bus bar 34 is connected through a resistor 62 to a line or bus 64 of high negative potential, for example -134 volts.

All of the contacts 50 are connected in common, and are normally spaced above the bus bar 36. The contacts are connected through a resistor 66 to a wire or bus 68 of fairly high positive potential, for example +105 volts. Upon depression of any pedal 12, the corresponding wire contact or whisker 50 is moved down into engagement with the bus bar 36, the remaining whiskers 50 remaining above this bus bar.

The bus bar 38 is connected through a resistor 70 to the aforesaid wire or bus 68 of positive potential. The wire contacts or whiskers 52 normally are spaced above the bus bar 38, and are respectively connected through resistors 72 to a collector 74 leading to an output connection 76. The output connection preferably goes to a wave shaping filter (shown in FIG. 4 and referred to hereinafter), and through one or two stages of dividers, such as ordinary Eccles-Jordan dividers (also shown in FIG. 4 and referred to hereinafter). When any pedal 12 is depressed, the corresponding contact wire or whisker 52 is moved down into contact therewith, the remaining whiskers 52 remaining above the bus bar 38.

The wire contacts or whiskers 48 are respectively connected to wires 78 which are cabled together at 80. In FIG. 2 the individual wires 78 are provided with their respective note designations to allow tracing thereof from the opposite end of the cable in FIG. 3.

Reference now should be had to FIG. 3 wherein the pedal latching and cancellation circuit is shown. The cable 80 previously referred to is branched out into the individual or component wires thereof, and these wires are respectively connected through resistors 82 to neon bulbs 84. The individual note designations are applied adjacent the neon bulbs as an aid in tracing the wires from FIG. 2.

The opposite side of each neon bulb is shunted to ground through a capacitor 86, and is connected through a resistor 88 to a junction 90. Each junction 90 is connected through a capacitor 92 to an input connection 94. These input connections are from the respective note generators of the electronic organ (not shown), and supply the various note or musical tone oscillations to the circuit of FIG. 3.

Each junction 90 is grounded through a resistor 96 of rather high value.

In addition, each junction 90 is connected through a diode 98 to an output bus line 100 leading to a common output connection 102. The bus line 100 is shunted to ground by a resistor 104.

The output connection 102 is suitably connected to an input connection 106 of an amplifier 108 (see FIG. 4). The amplifier is connected to a first Eccles-Jordan frequency divider 110 comprising tubes 112 and 114. The frequency divider 110 is in turn coupled to and drives a second Eccles-Jordan frequency divider 116 comprising tubes 118 and 120. The cross-coupling circuits of the dividers are quite conventional in nature, and description thereof accordingly would be superfluous.

The tubes 112 and 118 are triode tubes, conveniently the two halves of a dual triode such as a 12AX7. The tubes 114 and 120 are of a somewhat different nature. Conveniently they are both halves of a common dual tube, each half comprising a single cathode, a single control grid, and two plates. The two plates in each instance are of equal size and importance. This does not represent the inferior practice of using the beam forming plates of a pentode as a plate more or less controlled in parallel with the main plate. On the contrary, this represents a tube newly developed for this purpose, specifically a 12FQ8. The second plate 122 of the tube 114 is connected to a line 124, while the second plate 126 of the tube 120 is connected to a line 128.

The output connection 76 of the bus 74 (FIG. 2) is suitably connected through an input connection 130 (FIG. 4) which is connected to a resistor 132 and in parallel therewith to a resistor 134. The resistor 132 is connected to a junction 136, and the resistor 134 is connected to a junction 138. The junction 136 is grounded through a capacitor 140, while the junction 138 is grounded through a capacitor 142. In addition, the junction 136 is connected to the line 124, and the junction 138 is connected to the line 128. The two junctions 136 and 138 are independently connected to filters 144. The filters also include various stop tablets (not shown), and are connected to an amplifier 146 which is in turn connected to a loudspeaker 148.

The output of the frequency divider 110, corresponding to the 16 foot stop of the organ, appears on the second plate 122. When no keys are depressed, any spurious output that might appear on such plate produces no effect, since this plate section will not conduct until voltage is applied at 130, by closing of one of the whisker contacts 52 against the bus 38. However, once such a contact is closed, simultaneously with closing of one of the whiskers 48 against the bus 34, the plate section 122 becomes conductive, and the output thereof is applied to the line 124. The same situation prevails relative to the output of the 8 foot pedal stop comprising the divider 116 on the plate 126.

Operation of latching and cancellation circuit

When any pedal 12 is depressed, the corresponding whiskers 48, 50 and 52 are lowered. For purposes of illustration, consider the note C at the left of FIGS. 2 and 3. The wire contact or whisker 48 for note C engages the bus 34. Since this bus or common contact is charged to -134 volts, this negative potential is applied to the neon bulb 84 of the C note. The corresponding capacitor 86 quickly charges, and potential is applied at the point 90. This causes the corresponding diode 98 to conduct, and the corresponding note signal as applied at the square 94 is carried through the diode to the output bus 100. Thus, the note is passed on to the divider stages to produce the desired 8 or 16 foot pedal note.

Simultaneously with the foregoing, the corresponding wire contact or whisker 50 is depressed into contact with the common or bus 36. Since all of the contacts 50 are connected to a positive 105 volts to through the resistor 66, this immediately places a potential of 105 volts on the bus 36, and through the wire 60 on the bus 32. This, of

course, places a high positive voltage on all of the remaining contacts 48 except for the illustrative C note which is being played. Accordingly, a high positive voltage is applied to all of the remaining neon bulbs. This causes these neons to fire and to apply positive potential to the adjacent capacitors 86, cancelling any negative voltage thereon, thereby biasing the corresponding diodes off. Accordingly, all of the remaining notes are quite effectively latched out. Furthermore, when any one note is played, the others are immediately cut off or cancelled.

Since the maximum positive or negative voltages on capacitors 86 are not enough to fire two neons in series, the latching circuits are isolated from one another even though they are all connected together through the bus 32.

It might be thought that the negative charge on the capacitor 86 of a sustaining note and the positive charge on other capacitors 86 would be connected in series through the switch contacts 32 and 43 to cause the neons to fire in series. However, since it takes a finite time for the contact 43 of the note which has just been played to move from fixed contact 34 to fixed contact 32, all of the capacitors start to discharge during such time. The neons are extinguished during the open circuit time as the contact 43 moves from fixed contact 34 to fixed contact 32 and the capacitors during this time discharge sufficiently (bearing in mind the initial steep slope of the discharge characteristic) that there is not sufficient potential to fire the neons in series.

As previously has been indicated, the corresponding contact 52 at the same time engages the bus 38, whereby to apply plate potential to the output plates of the divider stages, whereby to derive the output therefrom.

Chord unit

The pedal latching and cancellation circuit is also adaptable to be used with a chord unit, without duplication of parts other than the actual contacts found in the chord unit. Chord playing units are known in the art, and one satisfactory unit is that shown in Osborne et al., Patent 2,969,704, Mechanism for Playing Chords. Such a chord unit comprises a plurality of switch mechanisms 150 (FIG. 5) for the chord combinations, and a plurality of switch mechanisms 152 for playing the bass notes. The entire chord unit is indicated by the numeral 154.

Referring first to the chord playing switches, there is a common bus or output line 156 leading to an output connection 157. A plurality of normally open chord playing switches 158 is connected to the bus 156. Each such switch is connected through a wire 160 and a resistor 162 to an input connection 164. These input connections receive signals from the tone generators (not shown) in the same manner as the input connections 94 in FIG. 3. The various chord notes are indicated on FIG. 5, and the switches 158 are closed in various combinations by mechanical actuators (not shown) in accordance with which buttons of the chord unit are depressed.

The bass notes of the chord unit are quite similar to the pedal switches as shown in FIG. 2. Thus, similar numerals are used in FIG. 5 to identify similar parts, with the addition of the suffix *a*. Insofar as the parts and wiring are the same, extended description is believed unnecessary. It will be observed that the showing is somewhat different, due to the use of individual switches. Thus, 34*a*, rather than being a continuous bus bar, comprises a plurality of switch contacts which are electrically connected or ganged together by means of a wire 166. Similarly, there is a plurality of fixed contacts 36*a* electrically connected or ganged together by a wire 168, and a plurality of fixed contacts 38*a* electrically connected or ganged together by a wire 170. The wire 170 is connected through a resistor 70*a* to a connection 68*a* to a source of a positive 105 volts. This same connection 68*a* is connected through a resistor 66*a* to the various movable wire or whisker contacts 50*a*. Similarly, the output con-

5

nection 76a is connected by a common wire 74a to the various resistors 72a leading to the flexible wire or whisker contacts 52a.

From this point, there is some change in the circuit. The contacts 32a are individual contacts, and are not ganged together. They are connected respectively through wires 172 to terminals marked x. Similarly, the flexible wire contacts or whiskers 48a are connected through respective wires 174 to terminals marked x. The individual note tones are indicated on FIG. 5, and the connection to the latching and cancellation circuit of FIG. 3 is above the resistors 82. Thus, it will be observed that in most of the notes in FIG. 3, specifically all of the notes which correspond to the notes of FIG. 5, there are marked terminals x—x above the resistors 82. Thus, the switching of FIG. 5 is inserted more less in series with that of FIG. 2, as will be explained in greater detail shortly hereinafter.

In completing the circuit of FIG. 5, the wire 166 is connected to a resistor 62a to a terminal 64a of negative 134 volts. A further distinction from the circuit of FIG. 2 is that the wire 168 connecting together all of the contacts 36a is not returned to the contacts 32a. Rather, it leads to a terminal 176 which is suitably connected to the common contact or bus 32 of FIG. 2. For convenience, the note Ab at the left edge of FIG. 5 may be considered exemplary. If the button (not shown) corresponding to the Ab bass tone is depressed, the contacts 48a is moved away from the contact 32a, thus opening up the connection from the corresponding contact 48 and bus bar 32. The whisker 48a engages the contact 34a, and hence the large negative voltage on the wire 166 is applied to the contact 48a, and through the wire 174 to the terminal or connection x, and hence to the top of the resistor 82 of the Ab note in FIG. 3, namely the fifth note from the left. This causes the subjacent neon bulb 84 to conduct, with corresponding conduction of the diode 98 and transmission of the signal of the Ab note, as previously discussed in connection with FIG. 3.

At the same time, the whisker or flexible wire contact 50a is depressed into engagement with contact 36a. Accordingly, the large positive voltage applied through the resistor 66a is connected to the wire 168, and hence through the connection 176 to the common contact or bus bar 32, thus effectively cancelling any previous note and latching out further notes. There is no need to apply the positive cutting off voltage directly to the various contacts 32a, since these contacts are connected to the connections x—x to the contacts 48.

At the same time as the foregoing takes place, the flexible wire or whisker 52a engages the contact 38a, whereby the large positive voltage is applied to the wire 74a and connection 76a, and hence to the output plates of the pedal frequency dividers.

It will now be apparent that a superior switching system for playing the pedal notes of an electronic organ has been provided. Relatively inexpensive components, namely neon bulbs and diodes are used in addition to the usual circuit elements. When the chord unit is also incorporated, the connections are such that there is substantially no duplication of parts, other than the switches.

The specific example of the invention as herein shown and described is for illustrative purposes only. Various changes will no doubt occur to those skilled in the art, and are to be understood as forming a part of the invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A switching circuit for an electronic musical instrument comprising a plurality of like signal input connections, a common signal output connection, a plurality of like means interconnecting said signal input connections and said signal output connection and each including a series connected diode normally blocking transmission of a signal from the respective signal input connection to said signal output connection, a normally

6

nonconducting gas tube, means connecting said gas tube to one side of said diode, a common source of direct current potential of first polarity, a second source of direct current potential of opposite polarity, means including a plurality of normally open manually controlled switches respectively interconnecting said first and second sources of direct current potential and said gas tubes, means providing a common return from the opposite side of each diode to said source of potential, closure of one of the switches causing conduction of the respective gas tube and applying direct current potential from said source to the respective diode to effect conduction thereof, conduction of said respective diode being effective to carry a signal through from the respective signal input connection to said signal output connection, closure of said one of said switches effecting connection of said second source to all of said gas tubes except said respective gas tube to effect firing thereof and thereby applying direct current potential from said second source to all of said diodes except said respective diode positively to bias such diodes off.

2. A switching circuit as set forth in claim 1 wherein each diode is connected with the negative side thereof toward the respective signal input connection, said source of potential being of negative polarity, each gas tube being connected to the signal input side of the respective diode, and the return being a ground return connected through resistor means to the signal output side of each diode.

3. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a plurality of means respectively interconnecting said signal input connections and said signal output means and each including a series connected normally nonconducting electronic switch rendered conductive by application of a predetermined direct current potential of predetermined polarity whereby to carry a signal through from the respective input connections to said output means, a source of at least said predetermined direct current potential and polarity relative to ground, a source of direct current potential of opposite polarity relative to ground, and means including a plurality of selectively manually operable switch means each including at least a pair of ganged switches, a corresponding one of each of said ganged switches upon operation thereof respectively interconnecting said first mentioned source and said electronic switch for selectively rendering said electronic switch conductive to convey a respective signal from a respective one of said signal input means to said output means, and a corresponding other of each of said ganged switches upon operation thereof respectively interconnecting said source of opposite polarity and all of said electronic switches except the one to which the source of predetermined potential is connected whereby to preclude conduction thereof.

4. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a plurality of means respectively interconnecting said signal input connection and said signal output means and each including a series connected normally non-conducting first electronic switch rendered conductive by application of a predetermined direct current potential of predetermined polarity whereby to carry a signal through from the respective input connection to said output means, a first source of at least said predetermined direct current potential and polarity, means including a source of direct current potential of opposite polarity, a plurality of second electronic switches normally non-conductive and connected to said first electronic switches and rendered conductive by application of at least said predetermined potential whereby to apply said predetermined direct current potential to said first electronic switches selectively, and means including a plurality of selectively manually operable switch means each including at least a pair of ganged switches, a correspond-

ing one of each of said ganged switches upon operation thereof respectively interconnecting said first source and one of said second electronic switches for selectively rendering said electronic switches conductive to effect conveyance by a respective first electronic switch of a respective signal from a respective one of said signal input means to said output means, and a corresponding other of each of said ganged switches upon operation thereof respectively interconnecting said source of opposite direct current potential and all of said second electronic switches except the ones to which the source of predetermined potential is connected whereby to preclude conduction thereof.

5. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a plurality of means respectively interconnecting said signal input connection and said signal output means and each including a series connected normally nonconducting electronic switch rendered conductive by application of a predetermined direct current potential of predetermined polarity whereby to carry a signal through from the respective input connection to the output means, a direct current source of at least said predetermined potential and polarity, a source of direct current potential of opposite polarity, and means including a plurality of selectively manually operable switch means, said switch means including first fixed contact means, second fixed contact means, third fixed contact means, and first and second movable contact means, all of said first movable contact means normally engaging said first fixed contact means and being selectively movable from said fixed contact means into engagement with said second fixed contact means, said second movable contact means normally being free of engagement with any other of said contact means and being selectively movable into engagement with said third fixed contact means, said first and third fixed contact means being connected together, said second fixed contact means being connected to said direct current source of at least said predetermined potential and polarity, said second movable contact means being connected in common to said direct current source of opposite polarity, and the first and second movable contact means being respectively ganged for manual operation, said first movable contact means being operatively connected respectively to said electronic switches, manual operation of the ganged first and second movable contacts connecting said source of predetermined potential and polarity to a respective electronic switch and connecting said direct current source of opposite polarity to all of the remaining first movable contact means.

6. A switching circuit as set forth in claim 5 wherein the first, second and third fixed contacts comprise respectively three common busses.

7. A switching circuit as set forth in claim 5 wherein the means interconnecting the first movable contact means and the electronic switches comprises a plurality of second electronic switches which are normally non-conductive, and which are respectively rendered conductive upon application of said predetermined direct current potential and polarity thereto by movement of a respective first movable contact into engagement with the second fixed contact, whereby to apply said predetermined direct current potential and polarity respectively to the first mentioned electronic switches.

8. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a normally inoperative signal output stage operatively connected to and receiving signals from said signal output means, a plurality of means respectively interconnecting said signal output means and said signal input connections, and each including a series connected normally non-conducting electronic switch rendered conductive by application of a predetermined direct current potential of a predetermined polarity whereby

to carry a signal through from the respective input connection to said output means, a direct current source of at least said predetermined potential and predetermined polarity, means including a source of direct current potential of opposite polarity, and a plurality of selectively manually operable switch means, said switch means comprising a plurality of first, second, third and fourth fixed contacts and a like plurality of first, second and third movable contacts, all of said first fixed contacts being connected in parallel, all of said first movable contacts being independently connected respectively to said electronic switches, all of said second fixed contacts being connected in common and to said direct current source of predetermined potential and polarity, said first movable contacts normally all engaging said first fixed contacts and being respectively selectively movable into engagement with said second fixed contacts, said second movable contacts being connected in parallel and to said direct current source of opposite potential and normally out of engagement with any other contact, said third fixed contacts being all connected in parallel and connected in parallel to said first contacts, said second movable contacts being respectively movable into engagement selectively with said third fixed contacts, said fourth fixed contacts all being connected in parallel and connected to said direct current source of opposite potential, said third movable contacts being connected in parallel to said output stage and normally being out of engagement with any other contact and respectively selectively movable into engagement with said fourth fixed contacts, said movable contacts being respectively ganged in groups at corresponding first, second, and third movable contacts, but each gang of three movable switches being movable independently of all others thereof, manual operation of any one switch applying said predetermined direct current potential and polarity to said electronic switch means to effect conduction thereof and applying said opposite polarity some of direct current potential to all of the remaining first movable contact means, and further applying said opposite polarity direct current source of potential to said signal output stage to render said signal output stage conductive.

9. A switching circuit as set forth in claim 8 wherein the first, second, third and fourth fixed contacts comprise four common busses.

10. A switching circuit as set forth in claim 8 wherein the first movable contact means are respectively connected to the electronic switches through second electronic switches, said second electronic switches being normally non-conductive and rendered conductive by application of said direct current source of predetermined potential and polarity.

11. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a plurality of means respectively interconnecting said signal input connections and said signal output means and each including a series connected normally non-conducting electronic switch rendered conductive by application of a predetermined direct current potential of predetermined polarity whereby to carry a signal through from the respective input connection to said output means, a direct current source of at least said predetermined potential and polarity, a direct-current source of opposite polarity, a plurality of selectively manually operable switch means, each switch means having first and second movable contacts and first, second and third fixed contacts, all of said second fixed contacts being connected in common, all of said first and third fixed contacts being connected in common, said first movable contacts normally engaging said first fixed contacts and respectively selectively being movable into engagement with said second fixed contacts, all of said second movable contacts being electrically connected in common and respectively being ganged with the first movable contacts, the second movable contacts normally

being out of engagement with all other contacts and being respectively selectively movable into engagement with said third fixed contacts, said second fixed contacts being connected to said direct current source of predetermined potential and polarity and said second movable contacts being connected to said direct current source of opposite polarity, and additional manually operable switch means, said additional manually operable switch means including a plurality of first, second and third fixed contacts and a like plurality of first and second movable contacts, said first fixed contacts of said additional switch means respectively being connected to the first movable contacts of the first mentioned manually operable switch means, the first movable contacts of the additional switch means respectively being connected to at least some of said electronic switches, the second fixed contacts of the additional switch means being connected to said source of predetermined potential and polarity, the third fixed contacts of said additional switch means being connected to the first fixed contact means of the first mentioned manually operable switch means and hence to said opposite polarity when the second movable contacts of the first switch means engage the corresponding third fixed contacts, and said second movable contacts of said additional switch means being connected to said source of opposite polarity, the first movable contacts of said additional switch means normally being in engagement with the first fixed contacts of the additional switch means and movable respectively into engagement with the corresponding second fixed contacts, the second movable contacts of the additional switch means normally being out of engagement with any other contact and respectively movable into engagement with the corresponding third fixed contacts, the respective first and second movable contacts of said additional switch means being ganged, whereby manual operation of any of the first mentioned contact means or additional switch contacts applies said direct current source of predetermined potential and polarity to said electronic switch means to render the same conductive to convey a respective signal from a respective one of said signal input means to said output means, and additionally connects said direct current source of opposite potential to all of the first movable contacts.

12. A switching circuit as set forth in claim 11 and further including a non-conductive output stage connected to and receiving signals from said signal output means, said stage being rendered conductive by application of direct current potential of said opposite potential, both the first mentioned manual switch means and the additional switch means including respective third movable switch contacts and fourth fixed contacts, all of said third movable contacts being connected to said output stage and all of said fourth fixed contacts being connected to said direct current source of opposite potential, the third movable contacts respectively being ganged with the first and second movable contacts, whereby selective manual operation of any of said switches moves the third movable contacts out of non-engaging position into engaging position with the fourth fixed contacts to apply said source of opposite potential to said output stage to render said direct current output stage conductive.

13. A switching circuit as set forth in claim 11 wherein there is further included a plurality of second electronic switches, said first movable switch contacts of the additional switch means being respectively connected through said second electronic switches to the first mentioned electronic switches, said second electronic switches being normally non-conductive and being rendered conductive upon application of said predetermined direct current potential and polarity.

14. A switching circuit as set forth in claim 13 and further including resistance means series connected between said second electronic switches and the first movable switch contacts of the additional switch means.

15. A switching circuit as set forth in claim 14 wherein the second electronic switches comprise two element gas tubes, each of said gas tubes being connected through a respective resistor to an input connection, and a plurality of capacitors respectively connected between the gas tubes and series resistors and ground.

16. A switching circuit for an electronic musical instrument comprising a plurality of signal input connections, signal output means, a plurality of means respectively interconnecting said signal input connections and said signal output means and each comprising a series connected diode normally non-conducting and rendered conductive by application of a predetermined direct potential of predetermined polarity whereby to carry a signal through from the respective input connection to said output means, a direct current source of at least said predetermined potential and polarity, a plurality of junctions respectively connected between said input connections and said diodes, a plurality of normally non-conductive two-element gas tubes, means respectively connecting said gas tubes to said junctions, said gas tubes being rendered conductive upon application of said direct current source of predetermined potential and polarity, means providing a direct current source of opposite polarity, and a plurality of selectively manually operable switch means, each of said switch means including at least a pair of ganged switches, a corresponding one of each of said ganged switches upon operation thereof respectively interconnecting said direct current source of predetermined potential and polarity and a corresponding gas tube for selectively rendering such gas tubes and the associated diodes conductive, and a corresponding other of each of said ganged switches upon operation thereof respectively interconnecting said direct current source of opposite potential and all of said gas tubes except the one to which the source of predetermined potential is connected whereby to fire all of said gas tubes except one with opposite polarity to preclude conduction of the diodes to which they are respectively connected.

17. A switching circuit as set forth in claim 16 and further including a plurality of series resistors respectively connecting said gas tubes to said junctions, and a plurality of shunting capacitors connected respectively from the gas tubes and series resistors to ground.

18. A switching circuit for an electronic musical instrument comprising a plurality of like signal input connections, a common signal output connection, a plurality of like connecting means respectively interconnecting said plurality of signal input connections and said common signal output connection, each of said connecting means including a diode in series between the respective signal input connection and said common signal output connection and polarized in a predetermined direction, a source of positive D.C. potential, a source of negative D.C. potential, a plurality of keyswitch means, each of said switch means having a rest position and an operating position, means interconnecting said diodes, said keyswitch means and one of said sources of potential to connect one of said sources of D.C. potential to a respective diode to bias such diode to conduction upon movement of a respective keyswitch means to operating position, the keyswitch means moved to operating position further being effective to connect the other of said sources of potential to the remaining diodes to bias said remaining diodes for non-conduction in the absence of operation of the respective keyswitch means.

19. A switching circuit as set forth in claim 18 wherein the means interconnecting the diodes, the keyswitch means and said one source of potential comprises a plurality of electronic switches respectively connected in series between a keyswitch means and a respective diode, each of said electronic switches upon connection of said one source of potential thereto upon movement of the respective keyswitch means to operating position conducting to connect said one source of potential to a respective diode.

20. A switching circuit as set forth in claim 19 wherein each electronic switch comprises a gas tube which will fire upon application of a predetermined voltage irrespective of polarity, and wherein the means connecting the other source of potential to the remaining diodes comprises said keyswitch means and said gas tubes.

21. A switching circuit as set forth in claim 13 and further including a plurality of sustain capacitors equal in number to said diodes and each respectively interconnected with a diode, the sustain capacitor connected to a diode biased for conduction being charged to sustain conduction of the respective diode, a discharge path for each of said diodes to produce decaying sustain of a diode biased for conduction, the charge on a capacitor connected to a diode biased for conduction being dispelled and overcome by the other source of potential upon operation of a keyswitch means interconnected therewith and operated to bias another of said diodes for conduction.

22. A switching circuit for an electronic musical instrument comprising a plurality of signal input means, signal output means, a plurality of like connecting means respectively interconnecting said plurality of signal input means and said signal output means, each of said connecting means including a diode in series between the respective signal input means and said signal output means and polarized in a given direction, a plurality of sustain capacitors respectively connected to said diodes, a source of predetermined direct current potential effective to forward bias said diodes when connected thereto, a plurality of keys and a plurality of keyswitch means respectively

operated thereby, said keyswitch means being respectively interconnected with said source, said diodes and said sustain capacitors to charge a respective capacitor and render a respective diode conductive upon operation of one of said keys, a plurality of electronic switches respectively connected to said sustain capacitors, and means interconnecting said keyswitch means and said electronic switches to render said electronic switches conductive to overcome the charge on any charged sustain capacitor to cut off sustain.

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