

- [54] **CHORD PLAYING ORGAN**
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[58] Field of Search: **84/1.01, 1.03, 1.17, 1.24, 84/DIG. 22, DIG. 23**

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[57] **ABSTRACT**

An electronic organ which can be adjusted from playing in a conventional manner to playing in such a manner that at least selected playing keys of the lower manual of the organ will each cause a sounding of a respective chord when actuated. The tone signals from the tone generator of the organ are controlled by keyers and, in one condition of adjustment of the organ, each playing keys controls a single keyer, while in another condition of adjustment thereof, each of a selected group of the playing keys of the lower manual of the organ controls a group of keyers with the keyers pertaining to tones that make up a musical chord. The switching employed in the organ for adjustment thereof from one playing condition to another is by way of d.c. logic and the control of the keyers is also affected by d.c. logic.

6 Claims, 2 Drawing Figures

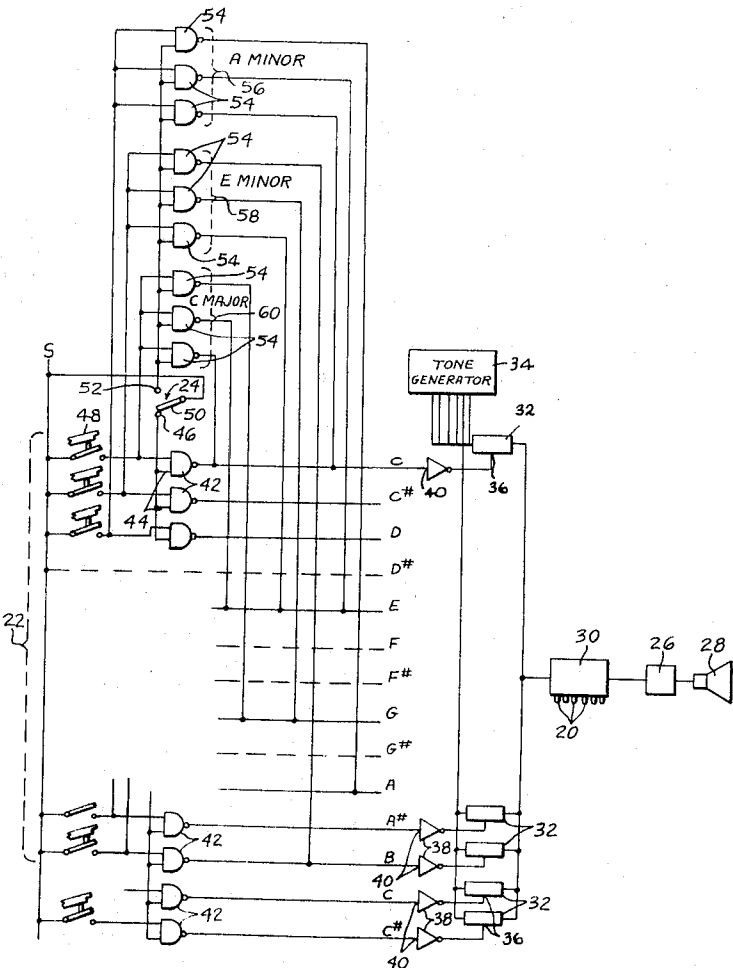


FIG-2

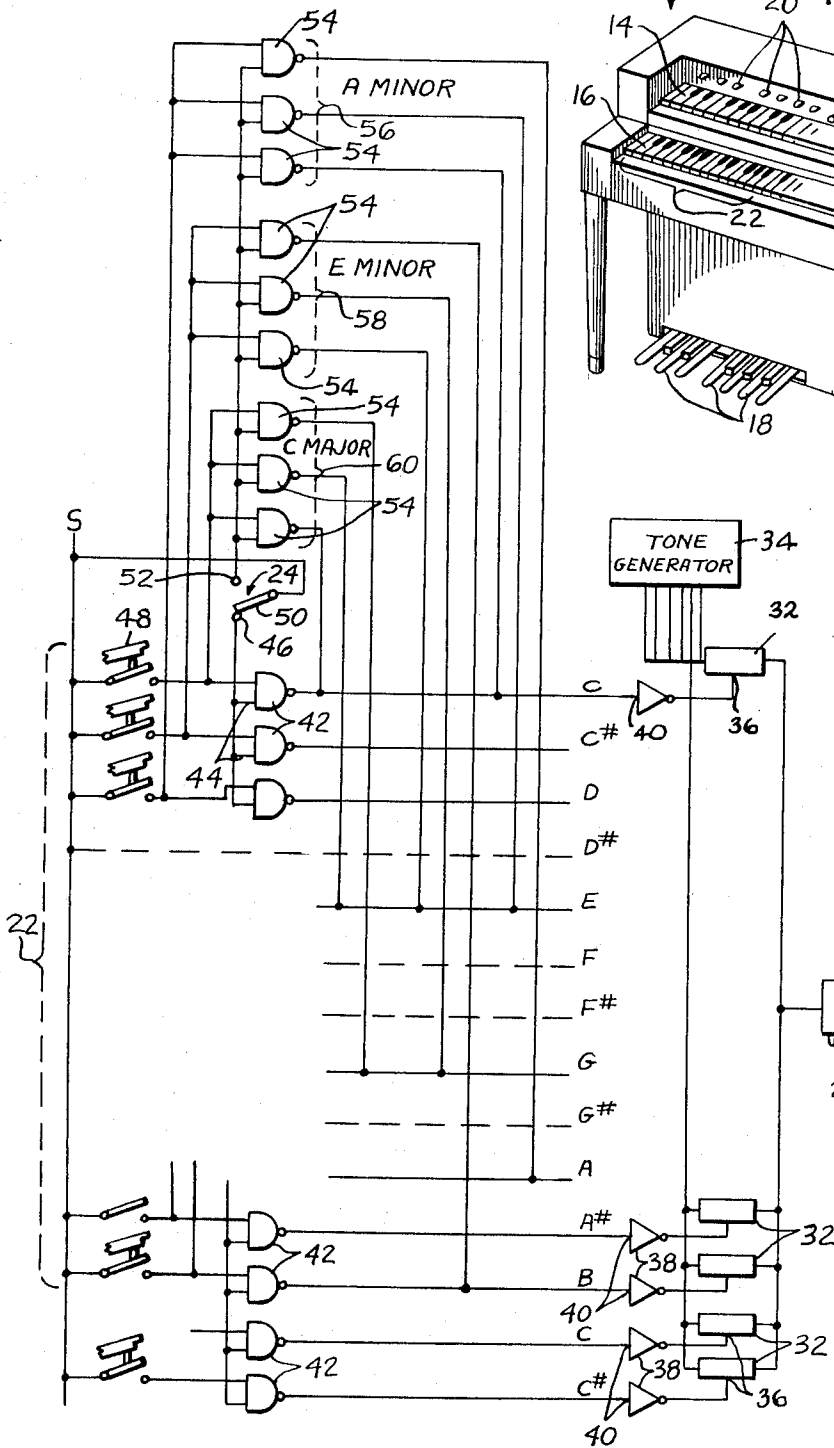
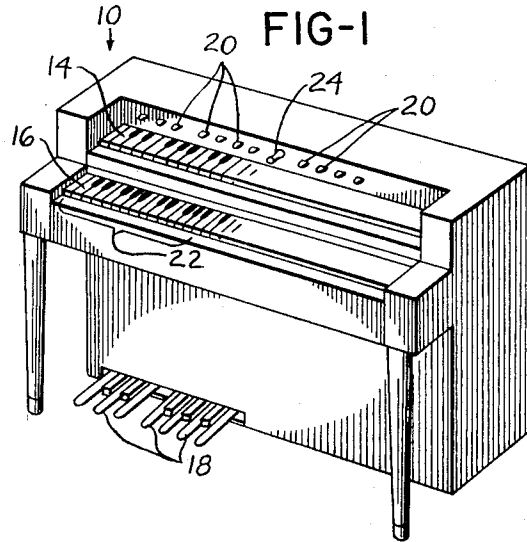


FIG-1



CHORD PLAYING ORGAN

The present invention relates to electronic organs and is particularly concerned with an electronic organ which can be adjusted to cause the individual keys of a selected group thereof in the lower manual to sound chords when actuated.

Electronic organs having circuit arrangements wherein single notes can sound chords are known but, heretofore, such organ arrangements have been relatively complex and expensive and have not been of flexible design.

The primary objective of the present invention is the provision of an electronic organ which can readily be adjusted from conventional playing mode to chord playing mode and vice versa.

A particular object of the present invention is the provision of a d.c. logic control system in an electronic organ permitting ready switching of the organ from conventional playing to chord playing, or vice versa.

Still another object of this invention is the provision of a circuit arrangement in an electronic organ which will selectively permit the playing of chords by certain ones of the keys of the lower manual and which is quite inexpensive to incorporate in an organ structure.

Another object of the invention is the provision of an arrangement wherein a single switch blade can be adjusted to change the organ between conventional and chord playing mode.

Still another object is the provision of circuitry which will permit keys of any keyboard of the organ to sound notes pertaining to any other keyboard of the organ.

The foregoing objects as well as still other objects and advantages of the present invention will become more apparent upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

FIG. 1 is a somewhat schematic perspective view of an electronic organ.

FIG. 2 is a simplified showing of that portion of the organ circuitry to which the present invention pertains.

BRIEF SUMMARY OF THE INVENTION

According to the present invention, an electronic organ having a tone generator with a plurality of terminals at respective pitches and an electroacoustic transducer for converting the tone signals to sound is provided with keyers connecting the generator terminals to the transducer and each keyer having a control terminal to which a signal is supplied for actuating the keyer. Playing keys are provided for the organ in the form of upper manual playing keys, lower manual playing keys, and pedals for actuating switches pertaining to the pedal keyboard.

The upper and lower manual playing keys each operate a respective switch and the switches are interposed between a source of signal voltage and the control terminals of respective keyers so that, normally, the actuation of a single key of one of the upper and lower manuals produces a single tone sound from the electroacoustic transducer.

According to the present invention it is desired for certain ones of the keys of the lower manual, for example, a selected group toward the left end of the lower manual, to play chords and the present invention is particularly concerned with a circuit arrangement which enables the organ to operate in this manner.

In the organ circuit according to the present invention, the signals from the switches operated by the playing keys are routed to gates and the signals from the gates are then routed through invertors to the control terminals of the keyers. In conventional playing mode, the signal from each playing key actuated switch is routed through a gate to a single invertor and, when the organ is adjusted to play chords, the signal from each of the chord playing keys of the lower manual is routed to a group of gates with the signals from the group of gates being connected to a group of the aforementioned invertors to supply actuating signals to a plurality of the keyers, thereby making up a musical chord.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings somewhat more in detail, the organ generally indicated at 10 in FIG. 1 has an upper manual 14, a lower manual 16, and a pedal keyboard 18.

Each of the keys of the upper and lower manuals and the pedal keyboard operates a respective switch that controls the supply of a respective tone signal from a tone generator to the electroacoustic transducer system in the organ. As is conventional, the tone signals supplied from the tone generator to the electroacoustic transducer pass through voice circuits which shape and modify the signals to produce the desired character in the sound produced by the electroacoustic transducer. The voice circuits are under the control of stops or tabs indicated at 20 in FIG. 1. The organ arrangement above described is substantially conventional in the art.

According to the present invention, a selected group of the keys of the lower manual 16, as indicated at 22, for example, are operable upon the adjustment of a selector switch 24 to play chords.

The circuitry pertaining to the keys of group 22 is schematically disclosed in FIG. 2.

In FIG. 2, the electroacoustic transducer means will be seen to be made up of amplifier 26 and speaker 28 with the voice circuits previously referred to indicated at 30. The keyers are under the control of the playing key switches and are indicated at 32, and the output sides thereof are connected to the input side of voice circuits 30. The input sides of the keyers 32 are connected to respective terminals of tone generator 34 and which supplies respective pitches to the terminals thereof over a range of, say, four or five octaves.

Each keyer 32 has a control terminal 36 which actuates the respective keyer when a signal is supplied thereto. Each terminal 36 is connected to the output side of a respective signal invertor 38. Each signal invertor 38 has an input terminal 40 connected to the output side of a respective two input NAND gate 42. Each NAND gate 42 has one input terminal 44 connected to a contact 46 pertaining to selector switch 24 and a second input terminal connected to one side of a respective playing key operated switch 48, the other side of which is connected with a source S of voltage.

Selector switch 24 comprises a blade 50 also connected to source S and which is adapted to be closed on contact 46 when the organ is adjusted for playing in a conventional manner.

Considering the playing of the organ in a conventional manner, with switch blade 50 adjusted into engagement with contact 46, a "one" signal is supplied to one input terminal of each of the NAND gates 42.

When a "one" signal is supplied to only one input terminal of each of the NAND gates 42, the output from each will be at "one" and each thereof will be supplying a "one" signal to the input side of a respective inverter so that the invertors each put out a "zero" signal and none of the keyers 32 are actuated.

However, upon closing a key operated switch 48, the other input terminal of the respective NAND gate will receive a "one" signal so that the output from the respective NAND gate will go to "zero" and this will supply a "zero" signal to the input side of the respective inverter, and the said inverter will thus supply a "one" signal to the control terminal of the respective keyer and actuate the keyer so that a tone signal will pass to the voice circuit arrangement of 30 and therefrom through amplifier 26 to speaker 28. The playing keys shown in FIG. 2 are a part of those pertaining to lower manual 16 and those falling within the range indicated at 22 of FIG. 1 are bracketed and designated with the same reference number in FIG. 1.

From the foregoing description, it will be evident that when switch blade 50 is resting on contact 46, each and every key of the lower manual will cause a single tone to sound when the key is actuated. However, if, now, blade 50 of selector switch 24 is adjusted into engagement with terminal 52, one input terminal of each of the gates 42 will go to "zero" so that each of the gates 42 will have its output at the "one" level and each thereof will be supplying a "one" signal to the input side of a respective inverter so that the output sides of the invertors are held at "zero" and do not actuate the respective keyers.

Furthermore, closing of any of the playing switches to supply a "one" signal to the other input terminal of any of the NAND gates 42 will not change the situation because the one input terminal will remain at "zero" and there will continue to be a "one" signal at the output side thereof.

Returning now to the contact 52, this contact is connected to one input terminal of each of a plurality of other two input NAND gates 54. The NAND gates 54 are arranged in groups such as the group 56, 58 and 60 which are bracketed and indicated with the said reference numerals, and the other input terminals of each group are interconnected and connected to the output side of a respective one of the key switches falling within the group indicated by bracket 22.

The output sides of the NAND gates 54 are each connected to a respective one of the output sides of the NAND gate 42.

If, now, switch blade 50 is adjusted to rest on contact 52, one terminal of each of the NAND gates 54 will be supplied with a "one" signal from source S and, upon the depressing of one of the playing keys falling within the group 22 to close the pertaining switch, a "one" signal will be supplied to the other input terminal of each of the NAND gates 54 falling within a respective group. Each of the NAND gates thus supplied with signals to both input terminals will have the output go to "zero" and this will pull the outputs of the NAND gates 42 connected thereto down to "zero" so that the input terminal of the respective invertors will go to "zero" and "one" signals will pass from the outputs of the respective invertors to the respective keyers.

Each group of the NAND gates 54 can consist of two or more gates, three being shown in each group, and since the output side of each one is connected to the output side of a respective one of gates 42, it will be apparent that the closing of each of the keys which is within the range 22 will result in the sounding of a chord.

FIG. 2 represents only a portion of the lower manual, for the reason of simplicity and it will be understood that there are more playing keys and more switches and more of the gates 42 and more groups of the gates 54 than are illustrated. As identified in FIG. 2, the gates 42 control the range of one octave and two further half steps and the groups 56, 58 and 60 of the gates 54 are effective for controlling the keyers falling within the first octave illustrated in FIG. 2.

By way of example, the group of NAND gates 54 falling within group 60 controls keyers pertaining to notes C, E and G and, thus, the group 60 is operable for causing the C major chord to sound.

The group at 58 controls the keyers pertaining to the tones E, G and B and thus causes the E minor chord to sound.

Finally, the group at 56 controls the keyers pertaining to the notes C, E and A, and thus causes the A minor chord to sound.

The range of chords that can be played in the described manner, and the number of notes pertaining to each chord, can be varied at will and the selected chords have been illustrated to show each chord is independently controlled even though the chords might have one or more of the same notes therein. In the illustrated chords, for example, the note E common to all thereof, and the note G is common to two thereof. The sounding of one chord, however, does not influence the sound of any other chord and each group of the NAND gates 54 operate entirely independently of the others thereof.

The arrangement of the invention can readily be arranged to permit a key of any keyboard to control keyers of the same or others of the keyboards, as may be desired.

From the foregoing, it will be apparent that the circuit arrangement of the present invention is quite flexible and is relatively inexpensive because the individual components are quite inexpensive. The components can be carded up in any suitably convenient manner and easily connected into the organ circuit to obtain the desired results.

Modifications may be made within the scope of the appended claims.

What is claimed is:

1. In a chord playing organ having keyboards in the form of upper and lower manuals and a pedal keyboard; tone generator means having a plurality of terminals for supplying tone signals at respective pitches, electroacoustic transducer means for converting said tone signals to sound, key switches operated by the keys of said keyboards, an electrically operated keyer interposed between each said terminal and said transducer means and each having a control terminal, first two input gates each having an output side connected to respective ones of said control terminals groups of second two input gates each having an output side connected to a selected group of said control ter-

minals, each of a selected group of key switches being connected to one input of a respective said first gate and to one input of each gate of a selected said group of second gates, and selector switch means having one output terminal connected to the other input of said first gates and another output connected to the other inputs of said second gates whereby in one position of said selector switch means actuation of each of a selected group of key switches will cause the supply of a single tone signal from said tone generator to said transducer means while in another position of said selector switch means, actuation of each of a selected group of key switches will cause the supply of a group of tones from said tone generator to said transducer means.

2. A chord playing organ according to claim 1 in which each keyer includes a control terminal to which signals are supplied to actuate the keyer, each said gate being a NAND gate, and a signal inverter connected to each control terminal and through which the respective keyer is actuated by signals from said gates.

3. A chord playing organ according to claim 2 in which the side of each key switch opposite the connection thereof to the said gate inputs and the side of said selector switch means opposite the said output terminals thereof are connected to a source of signal voltage for said gates.

4. A chord playing organ according to claim 1 in which each said selected group of control terminals pertains to a group of tones making up a chord.

5. A chord playing electronic organ according to claim 2 in which said second NAND gates are in groups and the said one input of each of the gates of a said group is connected to one side of a respective playing key operated switch, the output of each of said group of gates being connected to the input side of a respective

inverter of a group of invertors pertaining to keyers making up a musical chord.

6. In a chord playing electronic organ: a tone generator having a plurality of terminals supplying tone signals at respective pitches, electroacoustic transducer means for converting said tone signals to sound, a plurality of keyers having inputs connected to said terminals and outputs connected to said transducer means and each having a control terminal operable to actuate the keyer in response to a voltage signal, an inverter for each keyer having an output side connected to the control terminal of the respective keyer, and also having an input side, a plurality of playing keys, a playing key switch for each playing key and each having one side connected to a source of voltage and the other side in circuit with the input side of a respective inverter and actuated by actuation of the respective playing key, a plurality of first two input NAND gates each having one input connected to the said other side of a respective one of a selected group of said playing key switches and the output connected to the input side of the inverter pertaining to the respective playing key switch, a plurality second of two input NAND gates each having one input connected to the said other side of a respective one of said selected group of playing key switches and the output connected to the input side of a selected inverter, a selector switch blade connected to a source of voltage, a first contact connected to the other inputs of said first NAND gates and a second contact connected to the other inputs of said second NAND gates, said selector switch blade being selectively moveable into engagement with either of said contacts whereby said selected group of playing keys will play single notes or chords depending on the position of said selector switch blade.

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