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[54] **ELECTRONIC ORGAN WITH PLAYER CONTROLLED MUTED BRASS EFFECTS**

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[52] **U.S. Cl.** **84/1.19,** 84/1.24, 84/DIG. 9

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

[58] **Field of Search** ..... 84/1.01, 1.11, 1.19, 84/1.24, 1.12, 1.21, DIG. 9

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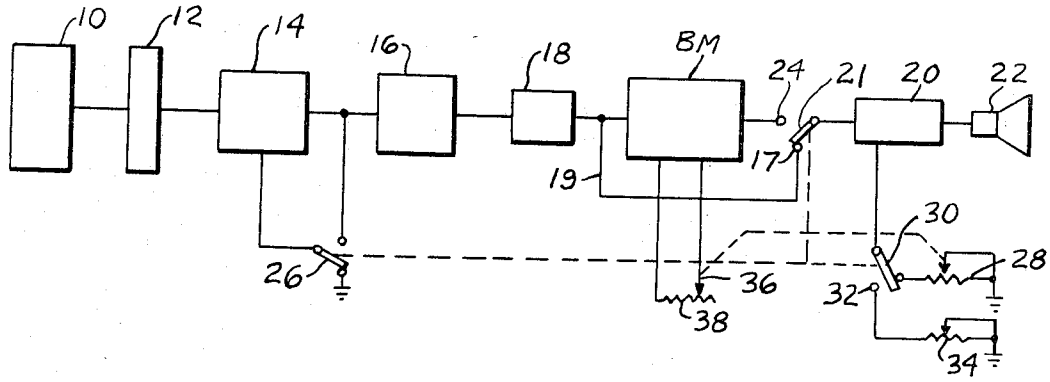
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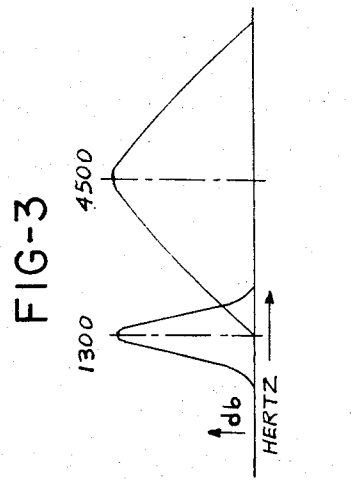
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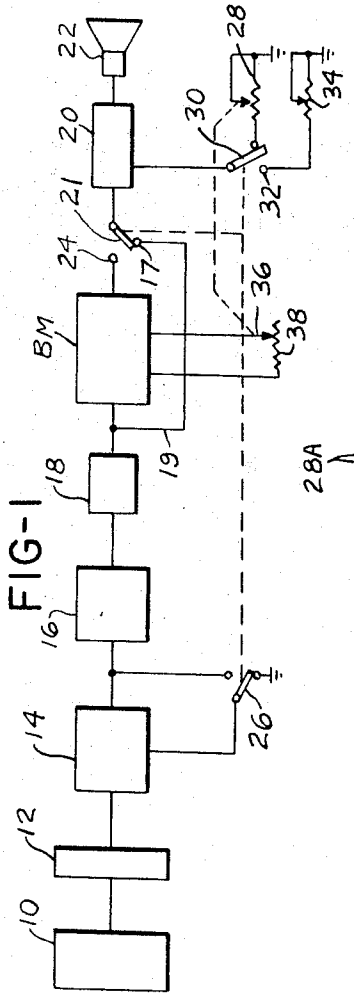
[57] **ABSTRACT**

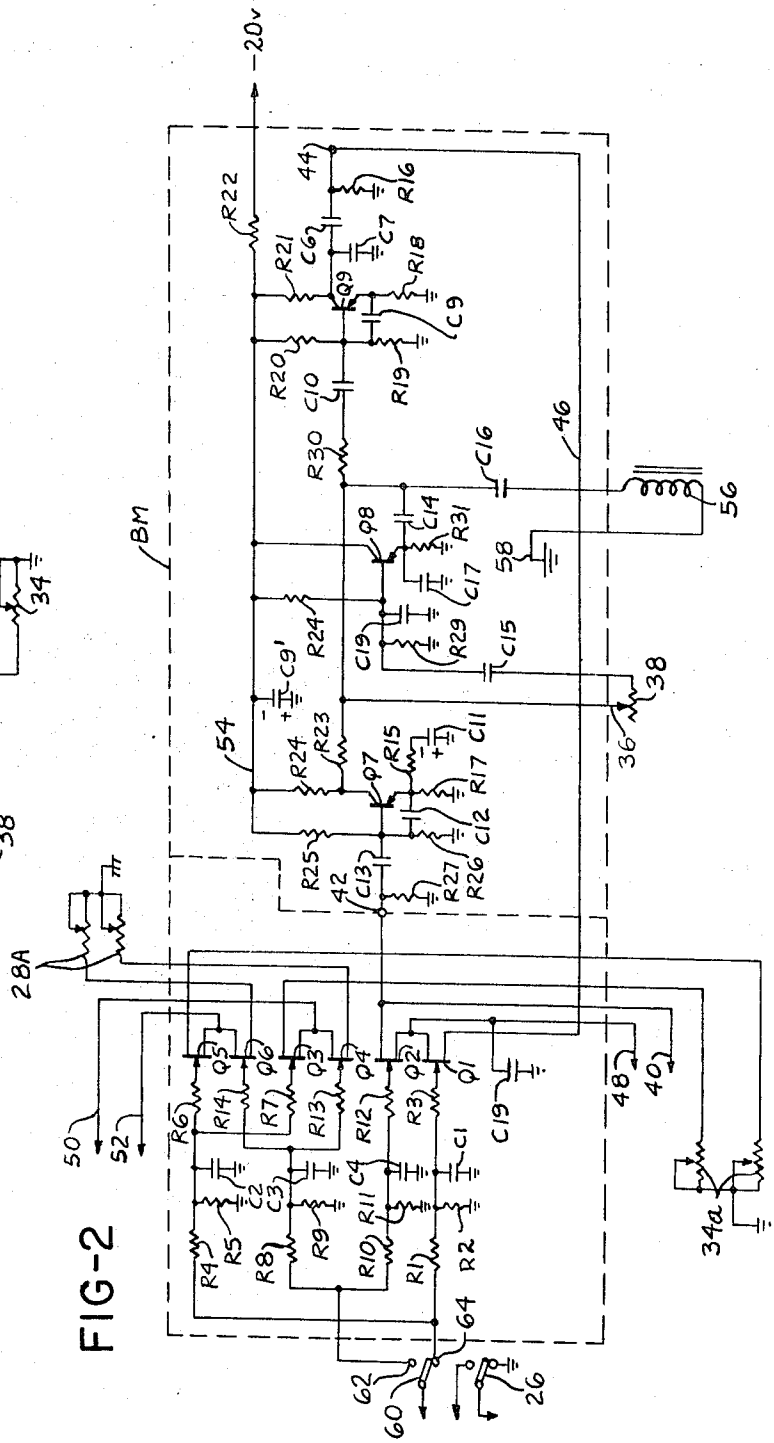
An electronic organ circuit in which an effect similar to muted brass is created by passing the organ signal through a circuit, the frequency response of which can be varied by a potentiometer connected with the swell pedal of the organ. More specifically, the circuit, when effective, provides somewhat of a muted brass sound and which varies with adjustment of aforementioned potentiometer or the swell pedal of the organ is adjusted. When the circuit is made effective, the main organ volume control is switched from a potentiometer under the control of the swell pedal to another potentiometer which can be adjusted manually. Further, a novel switching arrangement is disclosed utilizing transistors for routing signals.

11 Claims, 3 Drawing Figures









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ELECTRONIC ORGAN WITH PLAYER CONTROLLED MUTED BRASS EFFECTS

The present invention relates to electronic organs and is particularly concerned with the provision of a special circuit arrangement in electronic organs by which a novel sound effect can be obtained.

Electronic organs are well known and numerous special effects are available thereon. The particular special effect with which the present invention is concerned is that of a muted brass and which effect can be caused to vary in conformity with adjustment of the expression pedal of the organ.

A particular object of the present invention is the provision of a special effect for an electronic organ which can be selectively switched on and off.

Another object of the invention is the provision of a special effect for an electronic organ in the form of a muted brass sound which can be selectively switched on and off and which is under the control of the organ expression pedal when switched on.

A further object of the present invention is the provision of a special circuit for an electronic organ for producing the effect of muted brass which can be applied to a substantially conventional organ circuitry with the minimum of change therein.

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 simplified schematic block diagram of an organ circuit embodying a circuit according to the present invention;

FIG. 2 is a detailed showing of the special circuit components of the present invention;

FIG. 3 is a graph showing the variation in the frequency response of the circuit of FIG. 2 upon adjustment of the expression pedal when the said circuit is effective.

BRIEF SUMMARY OF THE INVENTION

The present invention shows a special brass mute circuit positioned ahead of the output amplifier of an electronic organ and which can either be switched into the circuit so as to pass the organ signal or switched out of the circuit, in which case the organ signal bypasses the brass mute circuit. The brass mute circuit modifies the organ signal to produce the effect of a muted brass instrument and is, preferably, supplied with a special signal, such as a saw tooth wave, when effective.

When the brass mute circuit is switched into the organ circuit, the regular expression pedal of the organ is switched out of the circuit and is replaced by a manually adjustable potentiometer while a resistor in the brass mute circut, which is actuated by the expression pedal, becomes effective for adjusting the frequency response of the brass mute circuit.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings somewhat more in detail, in the block diagram of FIG. 1, **10** represents a conventional tone generator, for example, a square wave generator, for supplying the various frequencies to the organ circuit. The keyboards of the organ circuitry, and which usually supply solo and accompaniment manuals and a pedal clavier, are schematically illustrated at **12.**

The tone generator **10** supplies signals to the keyboards **12** and from keyboards **12** signals corresponding to the actuated ones of the keys thereof are supplied to voice formant circuit means **14** and which incude circuits for modifying the shape and character of the waves supplied thereto together with tabs for making the various voice circuits selectively effective.

The output from voice formant means **14** is supplied to preamplifier **16** and the output from preamplifier **16** is conveyed to a reverberation unit **18.** From reverberation unit **18** the output signal can be conveyed by wire **19** to a terminal **17** engageable by a switch blade **21** which is connected to the input side of an output amplifier **20,** the output from which is supplied to speaker means **22.** It will be understood that the block diagram of FIG. **1** is extremely schematic and that the complete organ circuitry is relatively complex. Such circuitry is, however, known and is not shown in detail herein.

The output of reverberation unit **18** is also connected to the input side of a brass mute circuit marked BM, the output side of which goes to a terminal **24** adapted for engagement by switch blade **21.** At this point, it will be apparent that when switch blade **21** is in its FIG. **1** position engaging terminal **17,** the brass mute circuit BM is bypassed but when switch **21** is moved into engagement with terminal **24,** the organ signal passes through the brass mute circuit.

Switch blade **21** is connected for actuation together with another switch blade **26** which is connected to a special voice from voice formant means **14.** When switch blade **21** is in its FIG. **1** position, the special voice is grounded, but when switch blade **21** is adjusted into engagement with terminal **24,** switch blade **26** is connected to the input side of preamplifier **16** to supply the special voice thereto. By the provision of the special voice terminal, there is always a supply available for the brass mute circuit regardless of the adjustment of the tabs of the voice formant means **14.**

Pertaining to amplifier **20** is an expression pedal potentiometer **28** which is adjustable in the usual manner by adjustment of the swell pedal of the organ. When switch blade **21** is in its FIG. **1** position, a switch blade **30** leading from the amplifier connects the amplifier through potentiometer **28** to ground. However, when switch blade **21** is adjusted into engagement with terminal **24,** blade **30** closes on terminal **32** and, instead of potentiometer **28,** a second potentiometer **34** is substituted therefor and which is manually adjustable rather than being adjustable by the expression pedal. The moveable element of potentiometer **28,** which is connected to the expression pedal, is connected to the moveable element **36** of an adjustable resistor **38** which is connected in the brass mute circuit BM and serves to adjust the frequency response thereof.

The aforementioned switch blades **21, 26** and **30** are merely exemplary of several different types of switching arrangements that could be employed and, as will be seen hereinafter, switches in the form of FET transistors can also be employed for routing the signals through the organ circuitry and for switching circuit components in and out of circuit in the described manner.

Turning to FIG. **2,** for example, the brass mute circuit BM referred to is shown inside the dashed outline.

The output side of reverberation unit **18** is, in FIG. **2,** connected to a wire **40** leading to the source terminal

of an FET transistor Q2. Wire 40 also leads to the input terminal 42 of the brass mute circuit BM.

The output terminal 44 of the brass mute circuit is connected by a wire 46 with the drain terminal of a second FET transistor Q1. The source terminal transistor Q1 and the drain terminal transistor Q2 are interconnected and are connected by a wire 48 with the input side of the main output amplifier 20. At this point it will be apparent that when transistor Q1 is nonconductive and transistor Q2 is conductive, the signal from wire 40 will pass through transistor Q2 to wire 48 and thence to the main amplifier 20. However, when transistor Q1 is conductive and transistor Q2 is nonconductive, the signal from wire 40 is supplied to input terminal 42 of the brass mute circuit BM while the output terminal thereof supplies signals via wire 46 and transistor Q1 to wire 48 and thence to main output amplifier 20. Thus, by controlling the conductivity of transistors Q1 and Q2 the signal can be selectively routed through the brass mute circuit or around the brass mute circuit.

The aforementioned potentiometer 28 in FIG. 1 is represented in FIG. 2 by the double potentiometer 28*a* and which is shown double because one portion can serve to control the signal level to one speaker and the other can control the signal level to another speaker. In any case, assuming that a signal to be controlled is supplied to wire 50, the signal will be under the control of one section of potentiometer 28*a* when transistor Q4 is conductive and transistor Q3 is nonconductive. Similarly, a signal on wire 52 will be under the control of the other section of potentiometer 28*a* when transistor Q6 is conductive and transistor Q5 is nonconductive. However, when transistors Q4 and Q6 are nonconductive and transistors Q3 and Q5 are conductive, signals on wires 50 and 52 will be under the control of the sections of the potentiometer 34*a*. This last mentioned potentiometer is manually adjustable and may be mounted on the cheek block of the organ, for example, while potentiometer 28*a* is connected to the expression pedal and is adjusted thereby.

The conductivity of transistors Q1 to Q5 is under the control of a switch blade 60 connected to a source of potential and, in one position, engaging terminal 62 and, in the other position, engaging terminal 64.

Terminal 62 is connected to the gate terminals of transistors Q2, Q4 and Q6 via the illustrated network which comprises resistors R8, R9, R10, R11, R12, R13 and R14 and capacitors C3 and C4.

Terminal 64 is connected to the gate terminals of transistors Q1, Q3 and Q5 via the illustrated network which comprises resistors R1, R2, R3, R4, R5, R6 and R7 and capacitors C1 and C2.

Adjustment of switch blade 60 will, thus, selectively make transistors Q1, Q3 and Q5 conductive, while transistors Q2, Q4 and Q6 are nonconductive and vice versa. Blade 60 is mechanically connected to blade 26 whereby the special voice provided, as previously explained, becomes effective when transistors Q1, Q3 and Q5 are conductive.

Turning now to the brass mute circuit, input terminal 42 thereof is connected to ground via a resistor R27 and to the base of a transistor Q7 by a capacitor C13. The base of transistor Q7 is connected to a bias line 54 by a resistor R25 and the collector of transistor Q7 is also connected to line 54 via a resistor R24. The base of transistor Q7 is connected to ground by a resistor R26 and to the emitter by a capacitor C12. The emitter of transistor Q7 is also connected to ground by a resistor R17 and to ground by the serially arranged resistor R15 and electrolytic capacitor C11.

The collector of transistor Q7 is connected through a resistor R23 with one end of a resistor R30, the other end of which is connected through a capacitor C10 with the base of a transistor Q9. The base of transistor Q9 is also connected with line 54 by a resistor R20 and to ground by a resistor R19. The base of transistor Q9 is also connected to the emitter thereof through a capacitor C9 and the emitter of transistor Q9 is further connected to ground by a resistor R18. The collector of transistor Q9 is connected to line 54 by a resistor R21 and to ground by a capacitor C7 and to the terminal 44 by a capacitor C6 with terminal 44 also being connected to ground by a resistor R16.

A further transistor Q8 has the collector directly connected to line 54 and the base connected to line 54 by resistor R24. The base of transistor Q8 is connected to ground by capacitor C19 and by resistor R29 and is also connected by a capacitor C15 with one end of the aforementioned resistor R38. The slidable portion 36 of resistor R38 is connected back to the juncture of aforementioned resistors R23 and R30. Slider 36, as mentioned, is adjustable by the expression pedal of the organ.

The emitter of transistor Q8 is connected to ground through capacitor C17 and also through a resistor R31 and is connected through a capacitor C14 with the juncture of the aforementioned resistors R23 and R30 and also through a capacitor C16 with one end of an induction coil 56, preferably an iron core induction coil, and the other end of which is grounded at 58.

Line 54 is connected to ground via an electrolytic capacitor C9 and leads through a resistor R22 to a constant source of potential of about minus 20 volts.

The frequency response of the above described brass mute circuit and, specifically, the branch containing capacitor C16 and coil 56, is variable by adjustment of slider 36 along resistor R38. Adjustment of slider 36 along resistor 38 will change the bias on the base of transistor Q8 and vary the voltage at the juncture of C14 and R31 and thereby vary the degree of effectiveness of C14 in the aforementioned branch. Capacitors C16 and C14 are equal in size, 0.22 microfarads, for example, so that the branch containing capacitor C16 and coil 56 can be varied widely. Coil 56 may be about 350 millihenries.

A typical range of frequency change, is illustrated in FIG. 3, in which decibels are plotted against kilohertz. In this Figure, it will be seen that at one extreme of adjustment of slider 36 along resistor R38 the brass mute circuit may peak out at about 1,300 hertz whereas, at the other extreme of adjustment, the brass mute circuit may peak at about 4,500 hertz. The signal supplied to the brass mute circuit is a mixture of frequencies so that the signal passing through the brass mute circuit varies on each side of the peak point by a greater or lesser amount. The effect obtained is that of a muted brass and by adjustment of slider 36 along resistor R38 by the expression pedal of the organ, the effect can be varied a substantial amount. Further, the brass mute circuit can be selectively switched in and out as desired.

As mentioned, whenever the brass mute circuit is effective, the expression pedal is operable for controlling the frequency response of the brass mute circuit while

the adjustment of the organ volume is effected by the rheostat mounted on the cheek block of the organ. When the brass mute circuit is ineffective, the organ will play in a conventional manner with the expression pedal controlling only the organ volume.

To summarize the operation, whenever the brass mute switch is turned on the following events occur:

1. The main expression pedal potentiometer is switched out of circuit and another potentiometer on the cheek block of the organ is switched into circuit and is used to preset and adjust the organ volume.
2. A special voice that is derived from the organ voice formant means is switched on so that even though no other tab or voice is turned on when the brass mute is turned on, a voice will still sound.
3. The organ signal, immediately prior to going to the main amplifier, will now pass through the brass mute circuit.

In the brass mute circuit, transistor Q7 acts as an input amplifier and provides for circuit isolation. Adjustment of slider **36** along resistor R38 changes the supply to the base of transistor Q8 so that the coil-capacitor combination connected thereto electrically changes or tunes the circuit to a different frequency.

The signal supplied to transistor Q9 is amplified and isolated by the transistor and the output signal has a zero degree phase shift so that the signal is in phase with the input signal and is at about the same level.

A feature of the present invention is to be found in the utilization of the FET transistors as signal routing switches. These transistors are relatively inexpensive and are sensitive to voltage signals and are thereby readily controlled by simply controlling the voltage supplied to the gate terminals thereof.

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

What is claimed is:

1. In an electronic organ having tone generator means, voice formant means for supplying a signal in the form of a band of mixed frequencies and having the characteristics of a 'brass' sound and electroacoustic transducer means arranged in series in the order named, a frequency sensitive signal modifying filter circuit interposed between said voice formant means and said electroacoustic transducer means operable to modify a signal passed therethrough, said filter circuit exhibiting peak conductivity at one frequency and diminishing in conductivity in both directions from said one frequency, selectively operable switch means having a first position in which the signal from said voice formant means bypasses said signal modifying circuit and a second position in which the said signal passes through said signal modifying circuit, said electroacoustic means including amplifying means, a first potentiometer controlling the output of said amplifying means, said signal modifying circuit comprising a player controlled variable resistor operable when adjusted to vary the frequency response of said circuit, a second potentiometer manually adjustable independently of said first potentiometer, said switch means when in said first position connecting said first potentiometer in controlling relation to said amplifying means and when in said second position connecting said second potentiometer in controlling relation to said amplifying means.

2. An electronic organ according to claim **1** which includes first and second electronic gates in series with said first and second potentiometers respectively, said switch means when in said first position making said first gate conductive and said second gate nonconductive and when in said second position making said second gate conductive and said first gate nonconductive.

3. An electronic organ according to claim **2** in which said gates are FET transistors having the source to drain path in series with the respective potentiometer, said switch means controlling the connection of the gate terminals of said transistors to a source of voltage.

4. In an electronic organ having tone generator means, voice formant means for supplying a signal in the form of a band of mixed frequencies and having the characteristics of a 'brass' sound and electroacoustic transducer means arranged in series in the order named, a frequency sensitive signal modifying filter circuit interposed between said voice formant means and said electroacoustic transducer means operable to modify a signal passed therethrough, said filter circuit exhibiting peak conductivity at one frequency and diminishing in conductivity in both directions from said one frequency, selectively operable switch means having a first position in which the signal from said voice formant means bypasses said signal modifying circuit and a second position in which the said signal passes through said signal modifying circuit, said electroacoustic means including amplifying means, a first potentiometer controlling the output of said amplifying means, said signal modifying circuit comprising a player controlled variable resistor operable when adjusted to vary the frequency response of said circuit, a second potentiometer manually adjustable independently of said first potentiometer, said switch means when in said first position connecting said first potentiometer in controlling relation to said amplifying means and when in said second position connecting said second potentiometer in controlling relation to said amplifying means, said switch means including a first electronic gate between said voice formant means and said electroacoustic transducer means and a second electronic gate between said voice formant means and said signal modifying circuit, said switch means in said first position making said first gate conductive and said second gate nonconductive and in said second position making said second gate conductive and said first gate nonconductive.

5. An electronic organ according to claim **4** in which said gates are FET transistors having gate terminals and said switch means controls the connection of said gate terminals to a source of voltage.

6. In an electronic organ having tone generator means, voice formant means for supplying a signal in the form of a band of mixed frequencies and having the characteristics of a 'brass' sound and electroacoustic transducer means arranged in series in the order named, a frequency sensitive signal modifying filter circuit interposed between said voice formant means and said electroacoustic transducer means operable to modify a signal passed therethrough, said filter circuit exhibiting peak conductivity at one frequency and diminishing in conductivity in both directions from said one frequency, selectively operable switch means having a first position in which the signal from said voice formant means bypasses said signal modifying circuit and a second position in which the said signal passes

through said signal modifying circuit, said electroacoustic means including amplifying means, a first potentiometer controlling the output of said amplifying means, said signal modifying circuit comprising a player controlled variable resistor operable when adjusted to vary the frequency response of said circuit, a second potentiometer manually adjustable independently of said first potentiometer, said switch means when in said first position connecting said first potentiometer in controlling relation to said amplifying means and when in said second position connecting said second potentiometer in controlling relation to said amplifying means, said signal modifying circuit comprising an input amplifier having an input side connected to receive signals to be modified and also having an output side, an output amplifier having an output side which supplies the modified signals and also having an input side, a connection leading from the output side of said input amplifier to the input side of the output amplifier, frequency sensitive impedance means connected between said connection and ground, and control means for varying the frequency response of said impedance means.

7. An electronic organ according to claim **6** in which said impedance means comprises serially arranged capacitive and inductive impedances, and said control means comprises means for varying the effective value of at least one of said impedances.

8. An electronic organ according to claim **6** in which said impedance means comprises a first capacitor and a coil in series, a second capacitor connected on one side to said impedance means, and said control means comprises means for varying the voltage level on the other side of said second capacitor.

9. An electronic organ according to claim **8** in which said control means includes first means connected to receive a signal from the output side of said input amplifier, and second means to convert said signal into a voltage at said other side of said second capacitor.

10. An electronic organ according to claim **9** in which said second means comprises a transistor having a point on the collector-emitter path connected to said other side of said second capacitor, said first means comprising a connection leading from the output side of said input amplifier to the base of said transistor.

11. An electronic organ according to claim **10** which includes a variable resistor in the connection leading to the base of said transistor.

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