United States Patent

Bunger

[15] **3,696,200**

[45] ***Oct. 3, 1972**

[54] **AUTOMATIC SEQUENTIAL VOICING**

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[*] Notice: The portion of the term of this patent subsequent to Dec. 22, 1987, has been disclaimed.

[22] Filed: **Oct. 27, 1970**

[21] Appl. No.: **84,301**

Related U.S. Application Data

[62] Division of Ser. No. 664,745, Aug. 31, 1967, Pat. No. 3,549,777.

[52] **U.S. Cl.** **84/1.03,** 84/1.19, 84/1.24

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

[58] **Field of Search**.....84/1.01, 1.03, 1.17, 1.24, 84/DIG. 22, DIG. 23

[56] **References Cited**

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[57] **ABSTRACT**

System for sounding two organ voices and/or footages reiteratively in alternation. Several embodiments are provided as follows:

1. Tone is applied via a key switch to two tone color filters in parallel and outputs of the filters are applied in alternation to a loudspeaker or to separate loudspeakers.

2. Two footages are applied to distinct tone color filters and the outputs of these applied reiteratively in alternation to a loudspeaker or to separate loudspeakers.

3. Two footages of the same tone color are applied reiteratively in alternation to a loudspeaker or to separate loudspeakers.

4. Three or more tones are applied in sequence via different tone color filters to a loudspeaker.

5. Solo tones proceed via one tone filter so long as pedal notes are not called for. When pedal note is played solo tone proceeds via a different tone filter.

8 Claims, 8 Drawing Figures

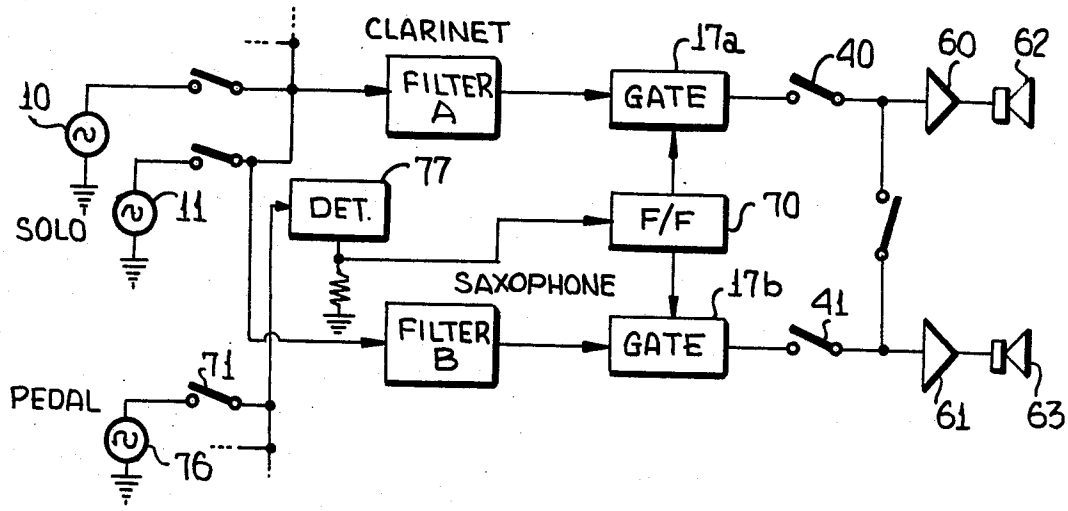


FIG.1

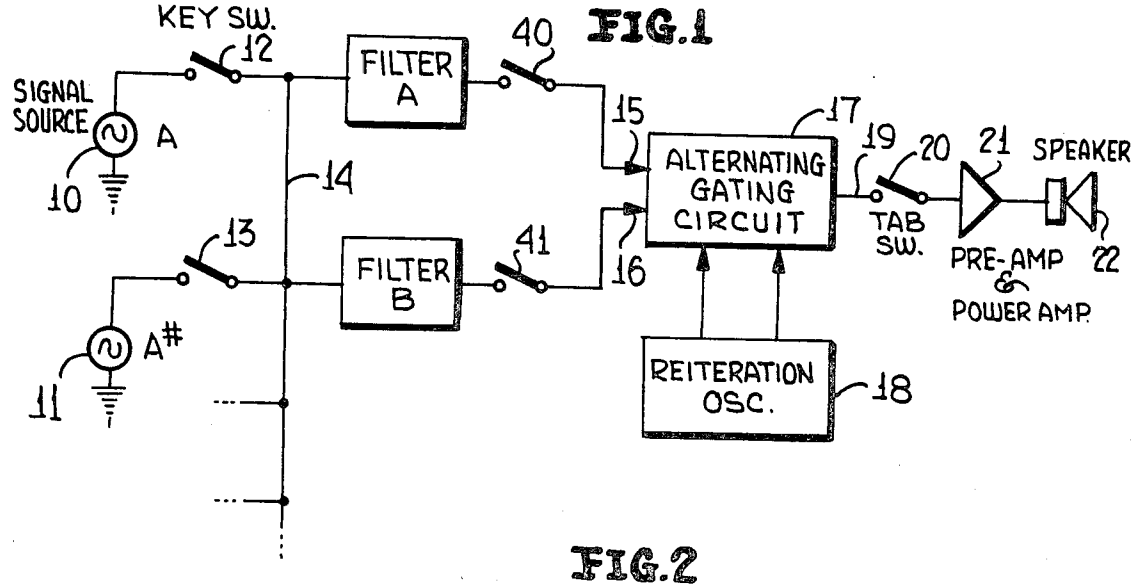


FIG.2

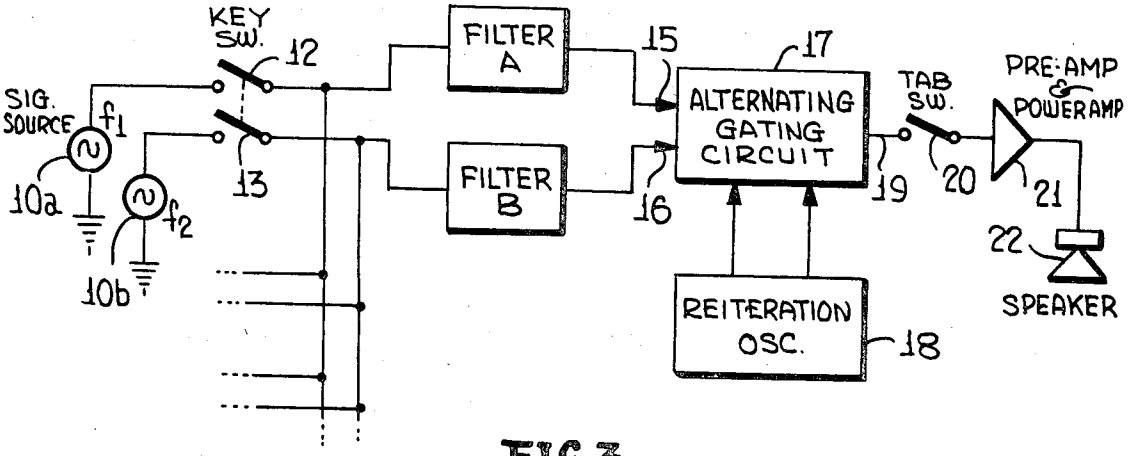
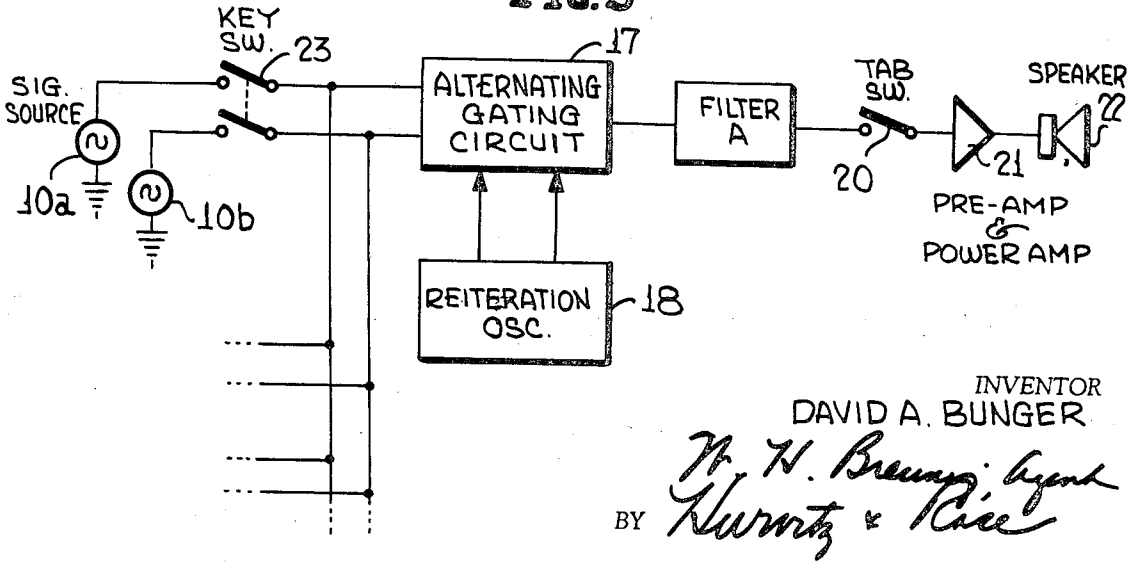


FIG.3



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FIG.4

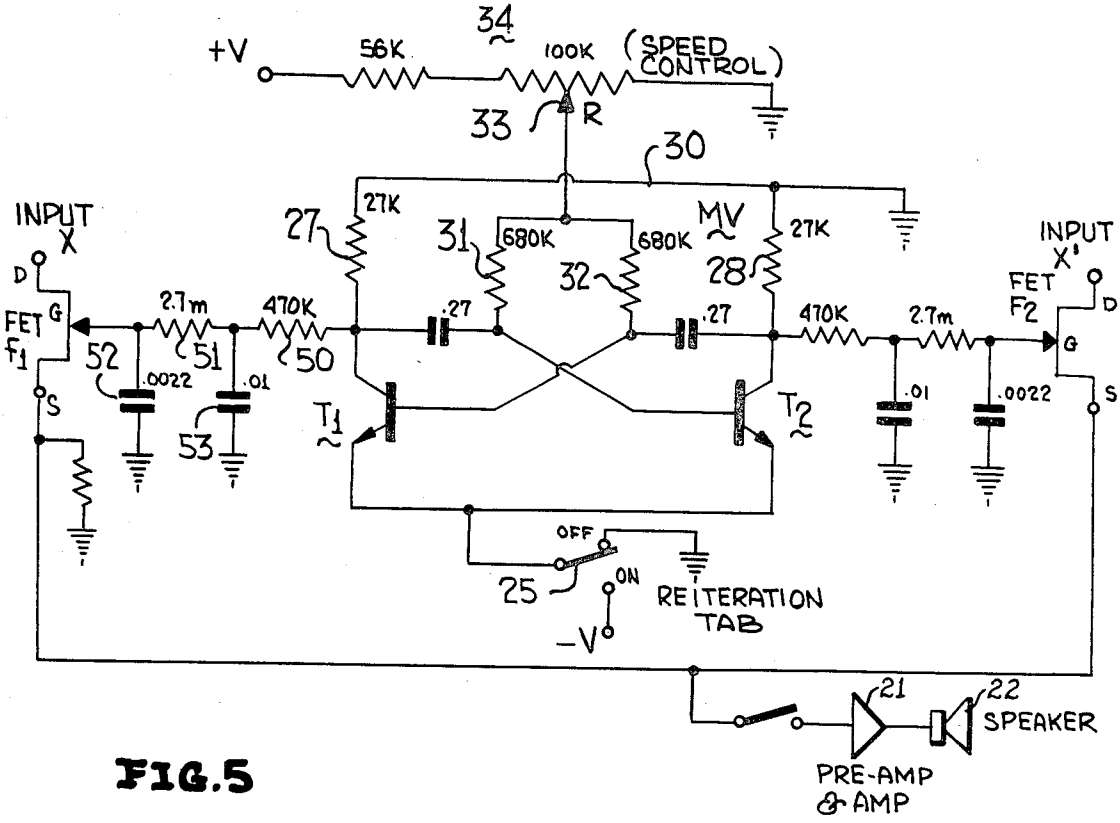
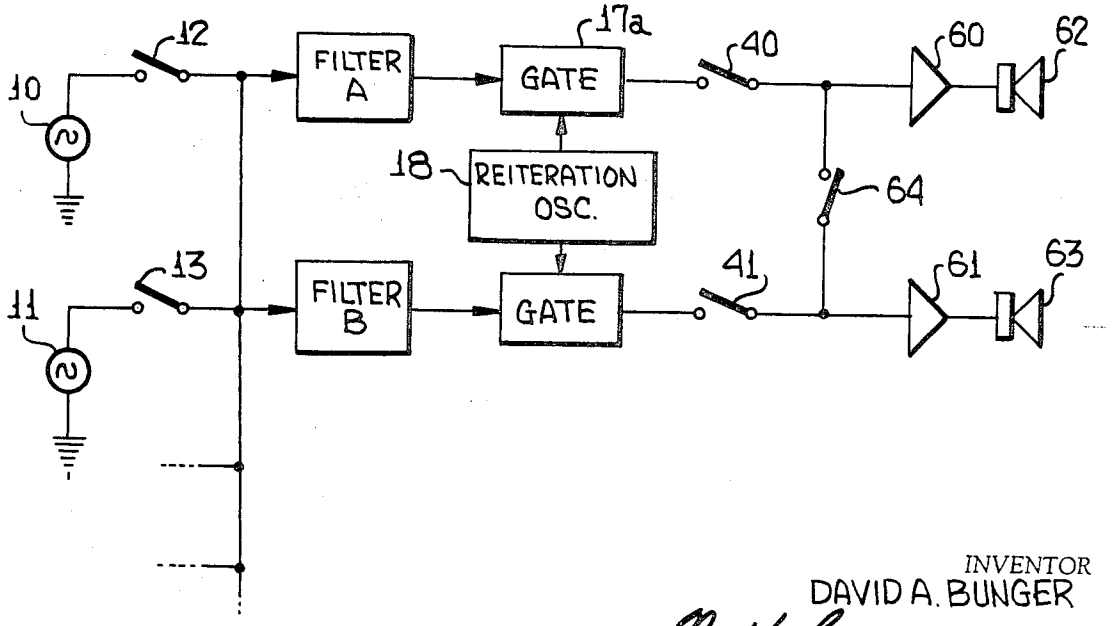


FIG.5



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FIG.6

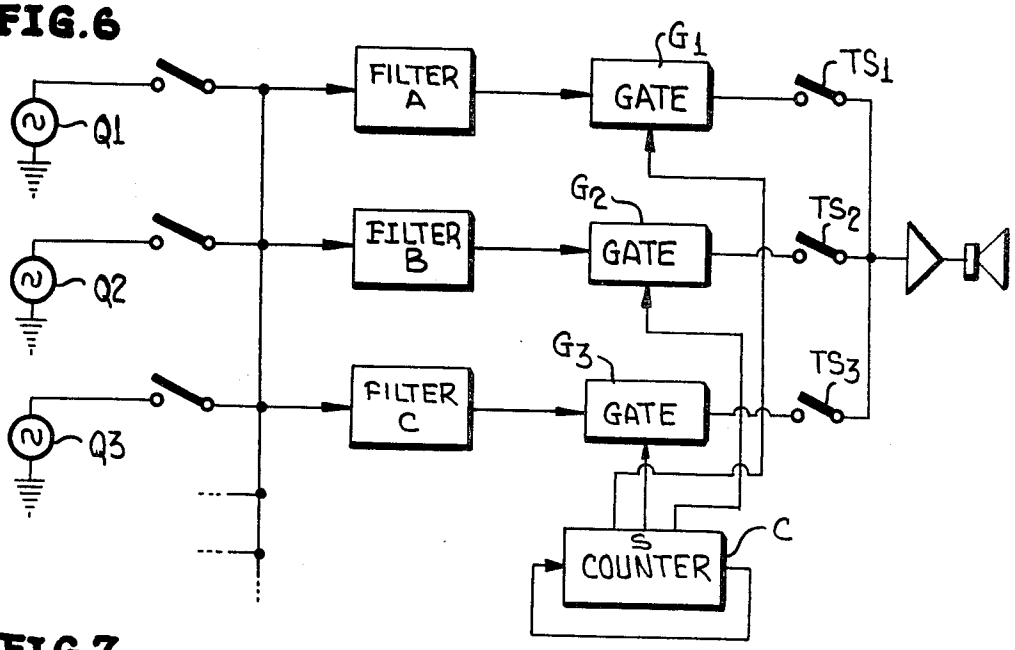


FIG.7

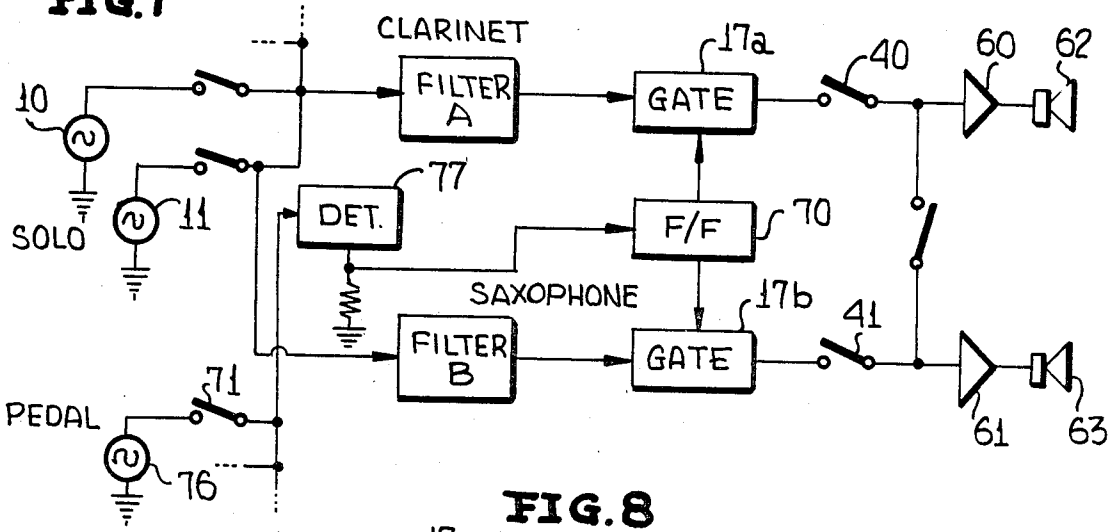
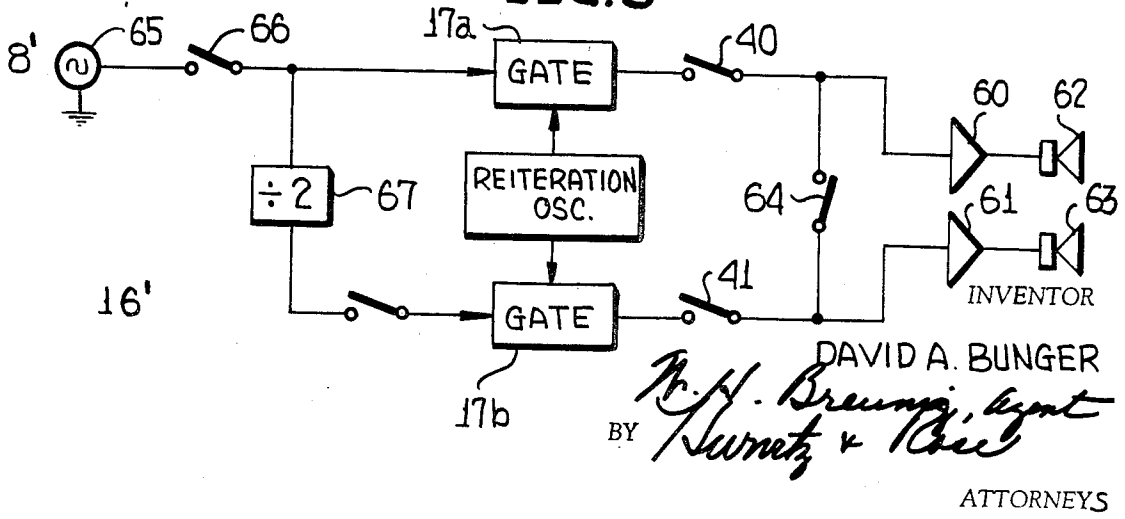


FIG.8



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AUTOMATIC SEQUENTIAL VOICING

CROSS-REFERENCE

This application is a division of parent application Ser. No. 664,745, entitled "ELECTRONIC MUSICAL INSTRUMENT SYSTEM FOR SOUNDING VOICES REITERATIVELY IN ALTERNATION", filed Aug. 31, 1967 now U.S. Pat. No. 3,549,777 granted Dec. 22, 1970.

BACKGROUND OF THE INVENTION

It is well known to provide iterative sounding of notes played by electronic organs. Systems for iteratively processing tones have not heretofore involved modification of tone color iteratively, nor the iterative transfer of notes from one speaker to another, either concurrently with tone color transfer or without, as is accomplished by the present invention.

SUMMARY OF THE INVENTION

The present invention employs alternating reiteration in reiteration with different tone color voices, or to alternate different footages of the same or different voices. Speed of alternation is preferably adjustable, and certain tone colors may speak continuously while others are alternately speaking. The alternate tones may proceed via the same loudspeaker or via different loudspeakers, at the will of the musician. Novel circuitry is provided for alternate gating of tones.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a system according to the invention providing alternating voices of the same footage;

FIG. 2 is a block diagram of a modification of the system of FIG. 1, providing alternating voices of different footages;

FIG. 3 is a block diagram of a modification of the system of FIGS. 1 and 2, providing alternate footages of the same voicing;

FIG. 4 is a schematic circuit diagram of a bistable gate used in the iteration systems of FIGS. 1–3;

FIG. 5 is a block diagram of a modification of the system of FIG. 1, having provision for stereophonic effects;

FIG. 6 is a block diagram of a system for providing a cyclic succession of three voices;

FIG. 7 is a block diagram of a system for providing and for transferring voicing whenever a pedal is depressed;

FIG. 8 is a block diagram of a system for providing alternating voices of different footage, with or without stereophonic effects.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Identical parts in the several figures are identified by the same reference numerals, to obviate repetitious description.

In FIG. 1, **10** is a tone oscillator and **11** is another tone oscillator, these being of the same footage. Key switches **12** and **13** connect oscillators **10** and **11** to a common bus **14**, which is connected jointly to tone color filters A and B. For example, filter A may provide a tibia voice and filter B a saxophone voice. Or, filter A may provide a clarinet voice and filter B an oboe voice. Filters A and B are connected to alternate inputs **15, 16** of an alternating gating circuit **17**, which is controlled by a reiteration oscillator **18**, which provides gating signals to cause tones from filters A and B to appear in alternation at output bus **19**. That bus is connected by tab switch **20** to amplifiers **21** and loudspeakers **22**.

On actuating key switch **12**, for example, and assuming oscillator **10** to generate an A tone, this tone might sound reiteratively as a tibia and as a saxophone, in alternation.

The system of FIG. **2** is similar to the system of FIG. **1** except in that generators **10***a* and **10***b* are of the same nomenclature, but different footages.

In the system of FIG. **3**, tones of the same nomenclature but different footages are applied by ganged key switches **23**, to alternating gating circuit **17**, the output of which proceeds to a single filter A and thence eventually to loud speaker **22**. Accordingly, actuation of key switch **23** causes iterative alternative sounding of the same voice in two different footages.

FIG. **4** illustrates schematically a reiterative oscillator and associated gates, for use in the several systems of the invention.

Two transistors T1 and T2 are employed in the multivibrator MV and two FET's, F1 and F2, as gates. The multivibrator MV employs NPN transistors having emitters which can be selectively connected, via ON-OFF switch **25**, to ground or to −V. The collectors are connected by equal resistances **27, 28** to ground, via lead **30**.

Accordingly, when switch **25** is in OFF position the multivibrator MV is inoperative, and when connected in the ON condition to −V, it oscillates.

The bases of transistors T1 and T2 are connected via resistances **31** and **32** to the slider **33** of a voltage divider **34**. Position of the slider establishes dc bias of T1 and T2 and therefore frequency of oscillation, which may be variable in the range 3. to 3. cps, for example only. The collector of T1 is capacitively coupled to the base of T2, and the collector of T2 to the base of T1, in conventional fashion, to provide oscillations. The collectors of T1 and T2 then provide control points which proceed in alternation from ground to negative potential as MV oscillates. The FETs F1 and F2 are conductive when their gates are referenced to ground. When switch **25** is in OFF condition both gates are referenced to ground, both FETs are conductive, and tone from both filters A and B can be heard. If desired the individual filters may be provided with stop tabs, as **40, 41** in FIG. **1**, to enable selection, and also to enable single tone reiteration, i.e. sounding of one tone followed by a silent period, for each cycle of oscillator **18**. This expedient is applicable to all Figures of the drawings.

The collectors of T1 and T2 are connected to ground via resistances **27, 50, 51**, and filter capacitors **52, 53** are provided for smoothing purposes and to remove high frequency noise. The drain terminal D of FET F1 is connected to filter A, in FIG. **1** for example, and the drain terminal D of FET F2 to filter B. The source terminals S are jointly connected to amplifiers **21**.

FIG. **5** parallels FIG. **1**, except in that the outputs of gates A and B proceed, respectively, to separate amplifiers **60, 61** and loudspeakers **62, 63**. Accordingly, tones of diverse color sound via different loudspeakers,

providing a stereophonic effect. Single filters may be disabled to stop tabs **40, 41** at will, and the gating circuit **17** is illustrated as two distinct gates, for purposes of clarity.

By providing a coupling between the input of amplifiers **60** and **61**, via switch **64**, the speakers are employed together for both tones, and the system of FIG. **5** is then operatively that of FIG. **1**.

In the system of FIG. **8**, as distinct from that of FIG. **5**, a single tone oscillator **65** and a single key switch **66**, provide alternate reiteration of tones of different footages, by interposing a frequency divider stage **67** between oscillator **65** and gate **17***a*. Tone filtering may be interposed following gates **17***a* and **17***b*, which may provide the same or different tone colors for the two gate conditions.

In the system of FIG. **7**, a flip flop **70** may be employed, which retains one of the gates **17***a*, **17***b* normally conductive and the other non-conductive. On closure of a pedal key switch **71**, pedal tone from oscillator **76** is detected in detector **77** and changes the state of flip flop **70**, which reverses the status of the gates **17***a*, **17***b*. Thereby, for example, clarinet tone may be heard as long as a pedal is not depressed, but saxophone when it is. In the alternative, the flip-flop **70** may be a free running oscillator, as **18** in FIG. **5**, which is cut off when a pedal switch is operated, to sound both tones simultaneously at that time, but the tones only in alternation while the pedal key switch is not closed. The alternate tones, in FIG. **7**, can sound via different speakers, or both tones can sound via both speakers.

In the system of FIG. **6**, three tone oscillators Q1, Q2, and Q3 are provided. These proceed jointly to three different tone color filters A, B and C., and thence via three gates G1, G2, G3 to tab switches TS1, TS2 and TS3, and thence to amplifiers **21** and loudspeaker **22**. The gates may be FET gates, as in FIG. **4** of the drawings. These gates are turned on sequentially by counter C. A modification is to employ filter A twice, once where shown and once in place of filter C. If the filters A and B were saxophone and clarinet tone color filters, for example, one would then hear sequences of three tones, each consisting of saxophone, clarinet, saxophone. If the filters were all different, the sequence might be clarinet, saxophone, oboe, for example.

The system of FIG. **5** may be modified to use only one filter, or two identical filters, so that the reiteration is not one of tone but only that of directivity, as the separate speakers sound in alternation. Various additional modifications of the present system will suggest themselves to one skilled in the art, within the basic concept of providing alternate tones reiteratively, or with different directivities, or both, or of providing the same tone with different directities, reiteratively.

While the present invention has been shown and described with reference to certain preferred embodiments thereof, it will be clear that various changes and modifications may be resorted to without departing from the true spirit and scope of the invention as defined by the appended claims.

I claim:

1. In an electronic organ system,

means for generating at least three different tone signals on three separate buses,

a separate normally non-conductive gate connected to each of said buses for transferring signal on said bus,

means generating reiterative sequences of at least three gating pulses per sequence,

means applying the separate pulses of each sequence to render conductive separate ones of said gates, and

a loudspeaker system responsive via separate paths to all tone signals passed by said gates.

2. The combination according to claim **1**, wherein said means for generating gating pulses is a re-entrant counter.

3. The combination according to claim **1**, wherein is included means for selectively opening said paths.

4. In an electronic organ system,

a source of tone signal,

a first key switch,

gate means,

a second key switch,

a loudspeaker,

means connected to said first key switch and responsive to actuation of only said first key switch for transferring tone signal controlled by said source to said loudspeaker via said gate means, and

means connected to said second key switch and responsive to operation of said second key switch for disabling said gate means.

5. An electronic organ having key switches for the notes of the organ, a tone signal source operatively associated with each of said key switches, a common bus, means responsive to closure of any of said key switches for connecting the operatively associated signal source to said common bus, at least two diverse tone color filters connected in parallel to said common bus, means for electroacoustically transducing the outputs of said tone color filters, and means including a ring counter commutator for reiteratively connecting the tone color filters to said means for transducing (in time alteration with respect to each other.

6. In an electronic organ, a plurality of tone signal sources, output means, a first tone color filter, a second tone color filter, a first normally non-conductive gate in series with one of said tone signal sources and said first tone color filter, a second normally non-conductive gate in series with another of said tone signal sources and said second tone color filter, key switches for individually selectively connecting said tone signal sources in cascade with said tone color filters, a flip-flop connected to said gates for rendering said gates conductive in alternation according to the state of said flip-flop, pedal key switches, and means responsive to closure of any of said pedal key switches for transferring the state of said flip-flop from one state to another.

7. In an electronic organ, a tone signal source, a tone signal bus, a key switch for at will connecting said tone signal source to said bus, at least three diverse tone color filters connected in parallel to said bus, loudspeaker means, and ring counter commutator means including a gate in series with each of said tone color filters for transferring signal from said filters in time sequence to said loudspeaker means.

8. In an electronic organ, a source of tone signal, a bus, a key switch for connecting said source of tone signal to said bus, parallel paths extending from said

bus, a divide by two circuit connected in one only of said paths to provide a frequency divided output, loudspeaker means, and means for reiteratively commutating the signals in said paths including said frequency divided output to said loudspeaker means in time sequence.

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