

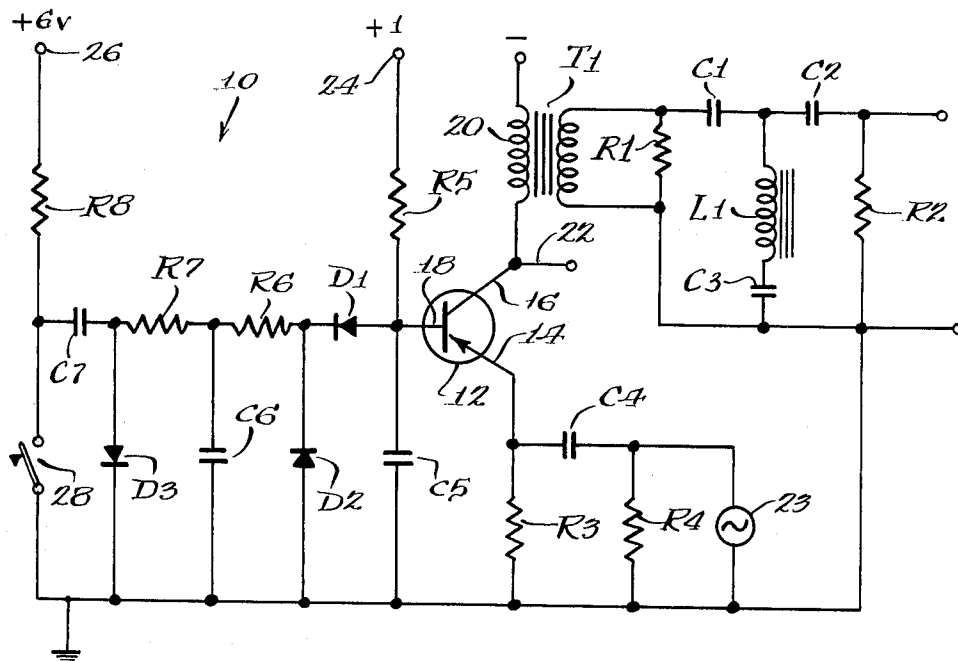
April 19, 1966

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3,247,306

KEYER CIRCUIT

Filed Dec. 3, 1962



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3,247,306

KEYER CIRCUIT

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Filed Dec. 3, 1962, Ser. No. 241,999

4 Claims. (Cl. 84-1.13)

The present invention relates in general to a percussion sustain keyer for use in electrical musical instruments. More particularly, it relates to keyer circuits for organs of the type having free-running oscillators as opposed to systems which turn the individual oscillators on and off by operation of key contacts. The keyers provide the keyed signal with a full percussive envelope which is independent for each keyed tone signal source and automatic in its operation and in which the percussion sustain effect is achieved by a single key contact for each playing key.

Usual percussion circuits for electrical musical instruments are of several different types. In one type, operation of a playing key permits the note to sound percussively and thereafter it decays during a sustain period while the key is held operated. If the key is released before the percussion envelope is complete, the tone generator is cut off and the signal immediately ceases, furthermore release of the key during the sustain period may have other deleterious effects upon the tone signal. In another type of percussion circuit, the tone is sounded at a constant level while the key is held operated and after the key is released, the tone is sustained on a declining basis for a short period of time. Both types of percussion therefore have disadvantages which have heretofore been difficult to remedy since in one case the time of key operation is variable and therefore the percussion effect is interrupted, while in the other the tone is given a sustain period only on release of the key.

In addition, many percussion circuits employ complex contact arrangements for each organ key due to the need to place differing potentials across the key contacts at the various organ keys. The present invention simplifies the percussion key contact structure by enabling the use of a common bus configuration in the keyboard.

One object of the invention is to provide a novel keyer circuit for providing sustained type percussion in which the percussive envelope is never suddenly interrupted by release of a key.

The above and other objects of the present invention will become apparent on examination of the following specification and claims together with the drawing.

In the drawing a percussion keyer circuit for use in an electrical organ is indicated generally by the reference character 10. It comprises a transistor 12 of the PNP type having an emitter circuit 14, a collector circuit 16 and a base circuit 18.

The collector circuit 16 is connected through the primary 20 of an output transformer T1 to a source of negative potential. A lead 22 connects the primary 20 to a similar collector circuit of each of a plurality of other keyers which feed the transformer T1. The output of the transformer T1 is applied through a suitable output system to a loud speaker or similar transducer.

A resistor R1 is connected across the secondary of transformer T1 which acts as a mixer and provides a voltage gain, while a low frequency transient filter comprising capacitors C1, C2 and C3 and inductance L1 serves to filter the output of transformer T1. A resistor R2 is also connected across the output of transformer T1.

The emitter circuit 14 of transistor 12 is also con-

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nected through a low frequency transient filter comprising resistors R3 and R4 and a capacitor C4 to a tone signal source 22 to ground. A similar signal source is provided for the other keyers feeding transformer T1 over lead 22.

The base circuit 18 of the transistor 12 is connected through a resistor R5 to a source 24 of approximately one volt positive potential. The base circuit is also connected to a large capacitor C5 and to one terminal of a diode D1 poled to pass current when the base circuit is positive with respect to the other terminal of diode D1.

The other terminal of diode D1 is connected to a diode D2 poled in the reverse direction and connected in shunt with capacitor C5. Diode D1 is also connected through series connected resistors R6 and R7 and through a diode D3 poled in the same direction as diode D1 to ground. The junction of resistors R6 and R7 is connected to ground through a capacitor C6 and the junction of resistor R7 and diode D3 is connected to one terminal of a keying capacitor C7.

The other terminal of capacitor C7 is connected through a resistor R8 to a source 26 of about six volts positive potential so that capacitor C7 is normally charged to this value. One playing key 28 of the organ is adapted, when operated, to connect the junction of resistor R8 and capacitor C7 to ground.

Normally then, with the key 28 open as shown, the capacitor C7 is charged to a value of +6 volts through the resistor R8. The base circuit 18 of the transistor has a potential established by the voltage drop across resistor R5 as current flows from the +1 volt battery source 24 through the diode D1 and the resistors R6 and R7 through the diode D3 to ground. This potential is such that the transistor is normally nonconductive and no signal from the source 22 appears across the output transformer T1.

In response to the closure of the key 28 as the organ is played, capacitor C7 has one side connected to ground potential so that a negative pulse appears across resistors R7 and R6 and the capacitor C5. The diode D3 blocks the negative pulse and the capacitor C5 partially discharges through resistors R6 and R7 to render the base circuit 18 of the transistor 12 slightly negative. The transistor 12 therefore becomes conductive to immediately pass the signal provided from the tone source 22 to the output transformer T1 and the output system. The capacitor C6 and resistors R6 and R7 filter any transient resulting contact bounce at key 28.

After the initial negative pulse from capacitor C7, capacitor C5 potential returns toward the normal base potential at a desired rate dependent on the circuit time constants and cuts off the transistor 12 irrespective of the length of time key 28 is held operated.

When the key 28 is opened, of course, the capacitor C7 charges positive. The diode D3 blocks this charge from the base circuit of the transistor and the keyer circuit 10 assumes its normal condition. Thus, irrespective of whether the key 28 is operated momentarily or for an extended duration the percussive effect provided to the tone from source 22 is completed, since release of the key does not open a set of contacts in the tone generator output circuit as is customary of percussion circuits of the type which supply a percussive envelope even though a key is continuously held. The other keyers connected to transformer T1 may of course be arranged to provide similar or different percussive effects, as desired, but they too are arranged to percussively key the signal without the need for key contacts in the generator output circuits.

Although the foregoing describes one embodiment of the invention, it is believed capable of numerous adaptations, wherefore the limitations of the invention are be-

lieved more adequately set forth in the accompanying claims.

I claim:

1. In an individual percussion keyer circuit for a musical instrument for use with a respective individual musical tone signal source representative of a single musical note to connect the respective source to an output system common to a plurality of independent such sources upon the actuation of a respective playing key, an electronic variable impedance device the impedance of which is dependent upon the potential applied to a terminal thereof, circuit means including said variable impedance device for connecting said source to said output system, means normally applying a bias potential to said terminal to render said circuit means ineffective to conduct said signal to said output system, means including the playing key for applying a pulse to said variable impedance device terminal in response to actuation of said key to change the potential at said terminal substantially instantaneously to render said circuit means effective to conduct said signal to said output system, and automatic means operative with the application of said pulse to reestablish said normal bias potential to said terminal at a slow rate following the application of said pulse to said terminal for progressively rendering said circuit means ineffective to conduct said signal to said output system.

2. In an individual percussion keyer circuit for a musical instrument for use with a respective individual musical tone signal source representative of a single musical note to connect the respective source to an output system common to a plurality of independent such sources upon the actuation of a respective playing key, an electronic variable impedance device the impedance of which is dependent upon the potential applied to a terminal thereof, circuit means including said variable impedance device for connecting said source to said output system, means including the playing key for applying a pulse to said variable impedance device terminal in response to actuation of said key to change the potential at said terminal substantially instantaneously to render said circuit means effective to conduct said signal to said output system, automatic means operative with the application of said pulse to reestablish said normal bias potential to said terminal at a slow rate following the application of said pulse to said terminal for progressively rendering said circuit means ineffective to conduct said signal to said output system, said pulse applying means comprising a capacitor, means including a potential source and an impedance element for applying a potential to one side of said capacitor, means including said playing key for suddenly removing the last said potential from said one side of said capacitor when said playing key is actuated, circuit means for connecting the other side of said capacitor to said terminal, the last said circuit means including an impedance element and a unidirectional element polarized to conduct when said other side of said capacitor has a potential that will cause said circuit means including said variable impedance device to conduct when the last said potential is applied to said terminal, a charge removing circuit including a unidirectional element connected to

said other side of said capacitor, and the last said unidirectional element being polarized to be nonconductive when the potential on said other side of said capacitor is such as to cause conduction through said circuit means including said variable impedance device when the last said potential is applied to said terminal.

3. In an individual percussion keyer circuit for a musical instrument for use with a respective individual musical tone signal source representative of a single musical note to connect the respective source to an output system common to a plurality of independent such sources upon the actuation of a respective playing key, an electronic variable impedance device the impedance of which is dependent upon the potential applied to a terminal thereof, circuit means including said variable impedance device for connecting said source to said output system, means normally applying a positive bias potential to said terminal to render said circuit means ineffective to conduct said signal to said output system, means including a playing key for applying a negative pulse to said variable impedance device terminal in response to actuation of said key to lower the potential at said terminal substantially instantaneously to render said circuit means effective to conduct said signal to said output system, automatic means operative with the application of said pulse to reestablish said normal bias potential to said terminal at a slow rate following the application of said pulse to said terminal for progressively rendering said circuit means ineffective to conduct said signal to said output system, said means for supplying said pulse to said variable impedance device terminal comprising a capacitor, circuit means including a source of positive potential and an impedance element connected for applying a positive potential to one side of said capacitor, a circuit including said playing key for suddenly removing said potential from said one side of said capacitor when said playing key is actuated, circuit means for connecting the other side of said capacitor to said terminal, the last said circuit means including an impedance element and a unidirectional element polarized to conduct when said other side of said capacitor is negative relative to said terminal, and a circuit connected between the other side of said capacitor and ground for removing a positive charge from said other side of said capacitor, the last said circuit including a unidirectional element polarized to conduct when said other side of said capacitor tends to become positive relative to ground.

4. The combination called for in claim 3 including means including a unidirectional circuit element for preventing the potential at said terminal from becoming negative relative to ground.

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