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ELECTRONIC ORGAN KEYING DEVICE

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Fig. 1

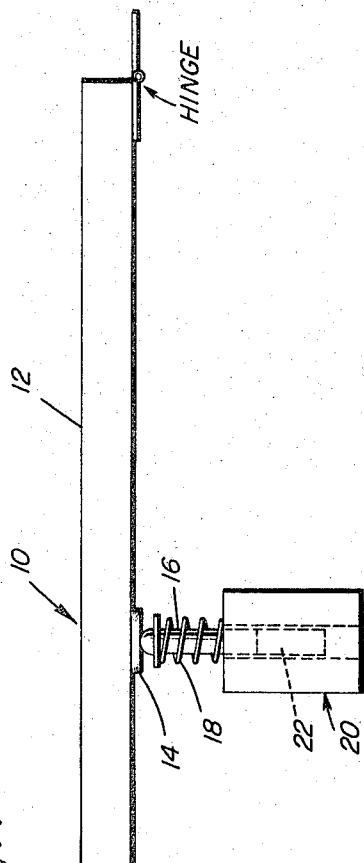
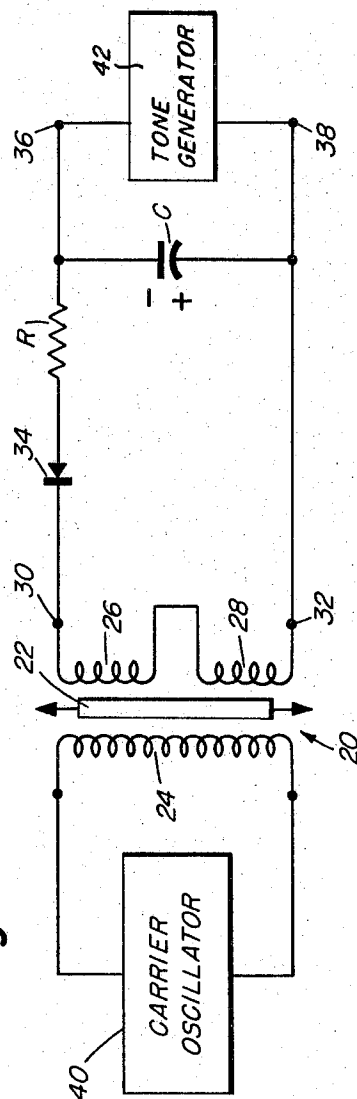


Fig. 2



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ELECTRONIC ORGAN KEYING DEVICE

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8 Claims. (Cl. 84-1.01)

This invention relates generally to music instruments, and more particularly it pertains to a keying arrangement for switching on the tone generators of an electronic organ.

All electronic organs use some kind of electrical contact in the keying circuits to turn on and off the tone generators at the will of the operator by means of the manual finger keys.

The usual method is to supply a more or less step variable D.C. voltage to a control circuit which utilizes a tube or transistor as the actual switching device. Typically in the case of a transistor, the absence of a D.C. voltage on the base and hence the absence of base current would result in no tone generator output, the presence of D.C. voltage resulting in some degree of output.

At present the D.C. control voltage is removed or applied by means of a switch controlled by depressing keys on the manual of the organ, control voltage being maximum when the key is fully depressed. However, depending on the tone generator type of circuit, an opposite effect is sometimes required, i.e., the control voltage being minimum when the key is fully depressed. Some circuits may require different polarity of keying voltage than others.

Spring wire contacts, sometimes with associated carbon rods are now used. In the latter case, the output voltage is a minimum when contact is first made and this increases to a maximum at full key depression. In this manner, the "plop" of an initial contact make is reduced considerably. Other schemes involve sliding or rolling contacts on a resistance element such as carbon to soften the impact of the keying voltage as the key is depressed.

In spite of such features, all the methods have shortcomings because a definite starting point of contact making is unavoidable and also because of short life of the contacts.

It is an object of this invention, therefore, to provide a key for an electronic musical instrument which makes no physical contact when actuated.

Another object of this invention is to provide a key which will actuate a musical instrument tone generator in a smooth manner without the customary transients in starting or stopping.

To provide a keying device for electronic organs which can provide a keying voltage of either polarity, is yet another object of this invention.

Still another feature of this invention is to provide a keying arrangement for the manual of electronic organs which can be smoothed electrically to furnish keying voltage with any degree of abruptness.

And another object of this invention is to provide a simple, frictionless, inexpensive key for electronic musical instruments which is not subject to contact corrosion or dust; has indefinite life and is easily and permanently adjusted.

Other objects and attendant advantages of this invention will become more readily apparent and understood from the accompanying specification and drawings in which:

FIG. 1 is a schematic of an electronic organ keying device incorporating features of this invention; and

FIG. 2 is a schematic of an electrical system for use with the keying device of FIG. 1.

Referring now to the details of the drawings, an elec-

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tronic musical instrument key assembly embodying principles of this invention is shown depicted in FIG. 1 by reference numeral 10. The key assembly 10 comprises the usual hinged key 12 of a keyboard or manual of an organ, for example. A nylon pad 14 is secured to the underside of the key 12 so as to contact a non-metallic coupling rod 16 which is biased upwardly by a compression coiled spring 18.

A differential transformer 20 is located so as to receive the rod 16 and be secured to some immovable portion of the organ. The ferrite core 22 of the differential transformer is movable therewithin and is attached to the rod 16 for actuation thereby as the key 12 is depressed. The spring 18 returns the key, rod, and ferrite core 15 when pressure is released.

As shown schematically in FIG. 2, the differential transformer 20 has three windings 24, 26 and 28. The excitation winding 24 receives an A.C. sine wave potential from a carrier oscillator 40.

The other two or output windings 26 and 28 are identical to each other and coupled tightly together electromagnetically. They also are connected in series opposition as shown by the instantaneous polarity dots.

Consequently, when the ferrite core 22 is centered in the windings 24, 26, and 28, there are equal voltages induced in the output windings from the excitation winding and they buck out to a resultant-zero output. However, should the core 22 be moved, this equality is upset and a voltage appears at terminals 30 and 32.

A rectifier 34, which may be a single diode as shown, is connected to the output from the terminals 30 and 32 and converts the sine wave voltage output from transformer 30 to a pulsating D.C. The filter RC smooths this output so that it is a pure D.C.

It will be noted that the movement of the ferrite core 22 starts a linear current flow from terminals 30 and 32 from zero to a maximum without any abruptness. Consequently, if the rectifier 34 is linear the D.C. control voltage at keying terminals 36, 38 will be without transients. This is the desirable keying voltage for electronic keying of a tone generator 42, connected thereto. By reversing the rectifier 34, the other polarity is available where required.

Usually, the position of transformer core 22 is so adjusted with key up that a small initial output voltage is obtained, not sufficient to key the tone generator "on." This setting can be thus chosen to accept a wide variation in the keying characteristics of the usual tone generators.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A keying arrangement for actuating an electrical element, comprising transformer means including a pair of output windings connected in series opposition and in circuit with said electrical element and an input winding, said transformer means having a movable core element for inducing voltage from said input winding to said pair of output windings in accordance with the position of said core element relative to said pair of output windings, and means for moving said core element to the position desired including a hinged key element and a rod element attached to said core element, with said rod element being in operative engagement with said hinged key for actuation thereby.

2. The keying arrangement as recited in claim 1 wherein said rod element is biased against said key element.

3. The keying arrangement as recited in claim 1 wherein a nylon pad is secured to the underside of said key

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element and said rod element is maintained in contact with said nylon pad.

4. A keying arrangement for actuating the tone generator of an electric organ, comprising transformer means including a pair of output windings connected in series opposition and in circuit with said tone generator and an input winding, said transformer means having a movable core element for inducing, voltage from said input winding to said pair of output windings in accordance with the position of said core element relative to said pair of output windings, and means including a key for moving said core element to the position desired.

5. The keying arrangement as recited in claim 4 wherein when said core element is centered between said pair of output windings, the voltages induced therein are equal.

6. In an electric organ having a tone generator and a key for the actuation thereof, means for gradually supplying voltage to said tone generator, said means including a transformer having a pair of output windings connected in series opposition and in circuit with said tone generator, an input winding, said transformer having a movable core element for inducing voltage from said input winding to said pair of output windings in accordance with the position of said core element relative to said

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pair of output windings, and means coupling movement of said key with movement of said core element.

7. In the electric organ as recited in claim 6 wherein said means includes electrical circuitry for supplying direct current to said tone generator from the voltage induced in said pair of output windings.

8. In the electric organ as recited in claim 7 wherein said pair of output windings are substantially balanced so that when core element is centered therebetween, the induced voltage supplied to said tone generator is substantially zero and when said core element is moved, the change in said induced voltage is substantially linear.

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