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INSTRUMENT KEYING CIRCUIT

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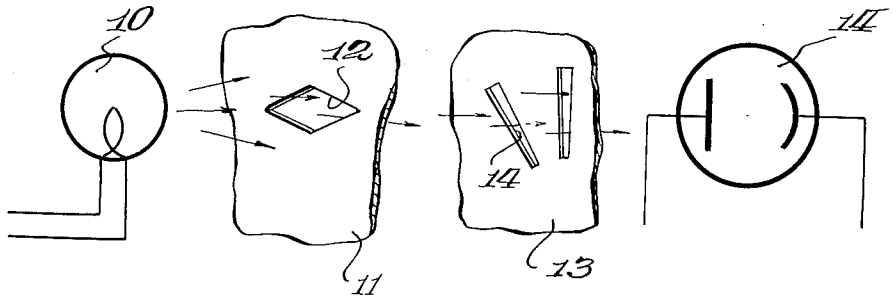
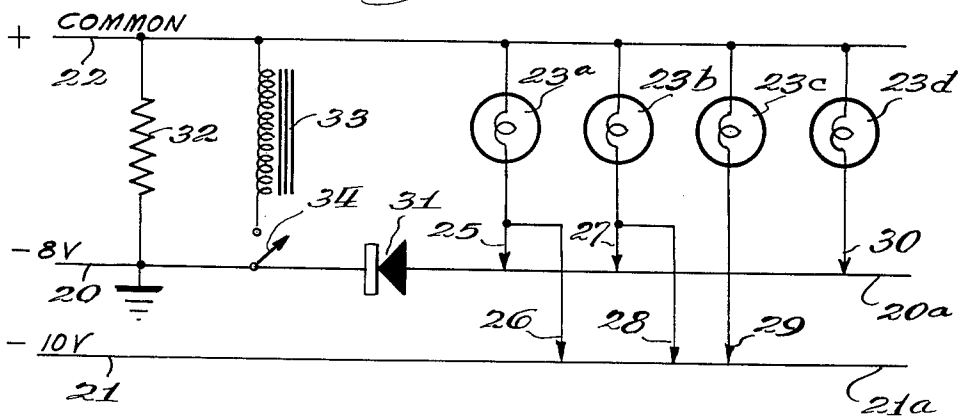


Fig. 1.

Fig. 2.



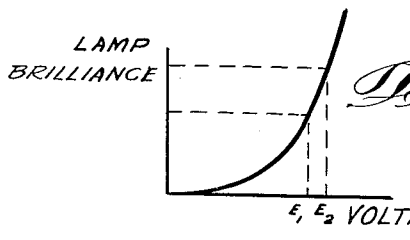


Fig. 3.

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INSTRUMENT KEYING CIRCUIT

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This invention is concerned with a keying system for an electronic musical instrument.

Certain types of electronic musical instruments utilize tone generating systems which are sensitive to the supply or actuating potential for an element of the generator, and this voltage senstivity may be utilized to control the amplitude of the generated tone representing signal. For example, in an electronic organ utilizing photoelectric scanners for tone generation, the lamps which provide illumination for the photocell tone generators may be operated at different potentials to provide a proper balance in the amplitude of various tones generated. However, with certain stop and keying combinations, the same lamp may be energized from voltage sources of different potential; and this has a tendency to reduce the potential of the higher potential source. The resultant reduction of the amplitude of the other tone signals actuated by the higher potential sources is objectionable.

It is a principal object of this invention to provide a keying circuit which prevents interaction of this nature between power sources of differing potential.

One feature of the invention is the provision, in an electronic musical instrument having voltage sensitive tone generating elements, of a first power source at one potential, a second power source at another potential, switch means for selectively actuating desired tone generating elements from said sources, and means connected between said sources, isolating one from the other. A further feature is that a diode is connected with the source of lower potential isolating the source of higher potential from it.

Further features and advantages of the invention will readily be apparent from the following specification and from the drawings, in which:

FIGURE 1 is a fragmentary exploded view of a scanner tone generating system;

FIGURE 2 is a schematic diagram of a circuit embodying the invention; and

FIGURE 3 is a curve illustrating the relation of lamp brilliance to applied voltage.

In copending but abandoned Ziehlke application Serial No. 753,771, filed August 7, 1958, now abandoned and replaced by application Serial No. 116,924, filed June 9, 1961, both assigned to the assignee of this invention, the details of a photoelectric cell tone signal generating system are disclosed. The present invention is particularly adapted for use with this type of tone generation. FIGURE 1 illustrates the basic elements of such a tone generating system including a light source or lamp **10**, and a mask plate **11** having a light transmitting area **12** with a configuration related to the tonal quality of the sound to be generated, as explained in the Ziehlke application. A scanning disc **13** is provided with scanning slots **14** which are moved past the aperture **12** of the mask plate at a predetermined rate, controlling the repetition rate of transmission of light to photocell **14** and the frequency of the generated signal. The harmonic content of the electrical signal generated in photocell **14** is established by the configuration of mask area **12** and the relative width of scanning operations **14**. Further details of the construction and operation of the tone generating system may be found in the Ziehlke application.

The amplitude of the generated signal is dependent on several variables including the height of mask opening **12**, the width of scanning slots **14** and the light output of lamp **10**. The light output, in turn, is a function of the voltage applied to the lamp (FIGURE 3). In the tone generators disclosed in the Ziehlke application there are physical considerations which limit the maximum size of the mask openings, particularly in the low frequency or pedal tones. Conversely, the mask openings for the higher frequency tones cannot be reduced in size beyond a certain point without introducing excessive noise into the generated signal. To provide the proper balance in amplitude between the lower or pedal notes and the higher or manual notes, a system is utilized in which the lamps for the pedal tones are energized from a source at a potential higher than the energizing source for the manual tones. More specifically, the pedal notes are energized from a ten volt circuit while the manual notes are energized from an eight volt circuit. However, there are certain lamps which may be energized from either of the sources, depending upon the particular stop arrangement used; and with some conditions of stop and key switch actuation, the same lamp may be connected with both sources. This is undesirable as the ten volt pedal source tends to drop toward the eight volt level, reducing the amplitude of other pedal tones which may be sounded.

Turning now to FIGURE 2, a circuit is illustrated which reduces undesirable effects. Two D.C. sources are provided, the first at **20**, with an eight volt potential and the second at **21**, with a ten volt potential; and both of the sources have a common positive return lead **22**. Connected with the source **20** is a low potential bus **20***a* and with source **21** a high potential bus **21***a*. Four lamps **23***a*, **23***b*, **23***c* and **23***d* are shown, it being understood that a complete musical instrument will have a great many more lamps. Lamps **23***a* and **23***b* may be connected with either the eight volt or ten volt bus **20***a* or **21***a*, through key switches **25** or **26** and **27** or **28**, respectively. Lamp **23***c* is connectable only with ten volt bus **21***a* through key switch **29** while lamp **23***d* is connectable only with the eight volt bus **20***a* through key switch **30**.

Ignoring for the time being the diode **31** connected between the low potential terminal **20** and bus **20***a*, it will be seen that if either key switch **26** or **28** is closed connecting lamps **23***a* or **23***b* with ten volt but **21***a*, and either key switch **25** or **27**, respectively, is also closed, the two buses are tied directly together. As pointed out above, this tends to drop the voltage of high potenial bus **21***a* reducing the brilliance of the lamps connected thereto and causing a reduction of amplitude of the generated tones.

The diode **31**, connected between potential source **20** and bus **20***a* and poled to conduct current only toward the potential source effectively isolates the higher potential source **21** from the lower potential source **20**; and when key switches are actuated as outlined above, the result is that both buses shift to the higher potential. Thus, if there is any shift in the amplitude of the generated signals it is in the direction of an increased output, rather than decreased; and this is not particularly objectionable from a practical standpoint.

The additional loads across the low potential source include a resistance **32** representing the tube filaments of the amplitfier utilized in the musical instrument and a solenoid coil **33**, controlled by a switch **34**, which is a portion of the vibrato control arrangement for the instrument.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. In an electronic musical instrument having voltage

sensitive tone generating elements, a keying circiut for selectively actuating desired tone generating elements: comprising a first direct current power source at one potential; a second direct current power source at a higher potential; a first bus conductor connected with said first source; a second bus conductor connected with said second source; said bus conductors having the same polarity; switch means for selectively actuating desired elements by connecting at least some of them optionally with the first bus, or with the second bus, or with both of said bus conductors simultaneously, such that when said switch means is actuated to connect any of said elements to both of said bus conductors simultaneously said bus conductors are connected together and have the same potential; means connected between said first power source and the first bus conductor for isolating the second power source from the first power source to energize both of said bus conductors from said second power source at the higher of said potentials whenever said bus conductors are connected together.

2. In an electronic musical instrument having voltage sensitive tone generating elements, a keying circuit for selectively actuating desired tone generating elements: comprising a first direct current power source at one potential; a second direct current power source at a higher

potential; a first bus conductor connected with said first source, a second bus conductor connected with said second source; said bus conductors having the same polarity; switch means for selectively actuating desired elements by connecting at least some of them optionally with the first bus, or with the second bus, or with both of said bus conductors simultaneously, such that when said switch means is actuated to connect any of said elements to both of said bus conductors simultaneously said bus conductors are connected together and have the same potential; a diode connected between said first power source and the first bus conductor and oriented for isolating the second power source from the first power source to energize both of said bus conductors from said second power source at the higher of said potentials whenever said bus conductors are connected together.

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