

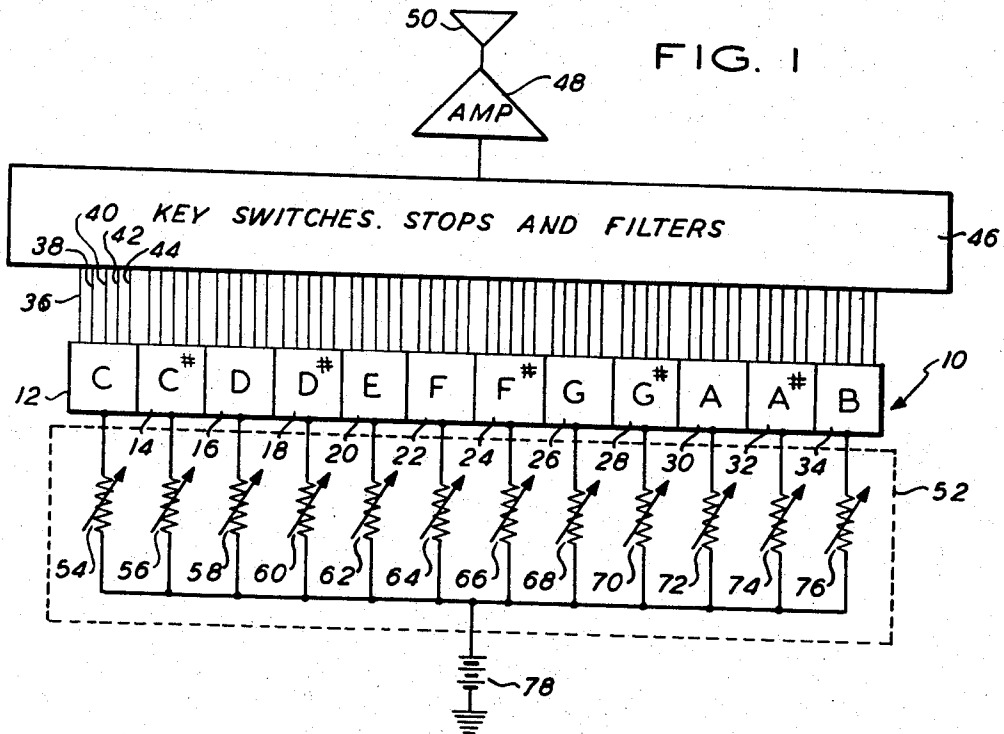
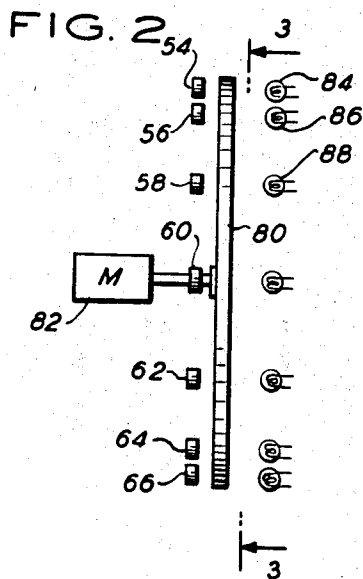
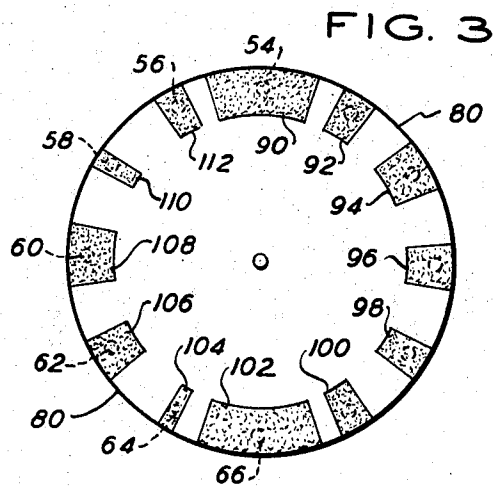
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ELECTRONIC ORGAN

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ELECTRONIC ORGAN

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In general, this invention is concerned with a new and improved electronic organ and more particularly to an electronic organ capable of producing a random sound which will more nearly duplicate the tonal qualities of a pipe organ than has been previously been possible.

In the past, there have been many attempts to duplicate the sound of an actual pipe organ. One of the qualities of the pipe organ tonality that has been more difficult to duplicate than others is the random sound caused by variations in frequency, which variations are affected by changes in wind supply, temperature, barometric pressure, and air turbulence within the pipe. This is especially true when dealing with pipe organs of the classical period where low wind pressures were used and variations in wind supply produced more significant variations than could be noted in high wind pressure organs. However, even in high wind pressure organs, there were still many variations, each differing in different pipes. Accordingly, the random variation was not uniform throughout the tonal range of the organ.

Thus, to produce a good cohesive ensemble, it is necessary to provide an electronic organ in which the variations are of a nature that will provide a different variation for different individual tones produced by the organ.

Utilizing the random sound devices of the prior art, this would have required a separate device for each of the individual tone generators, which expense would be prohibitive.

Further, prior attempts at duplicating the random motion effect with electronic tone generators forming part of an electronic organ have not yielded satisfactory results due, in large measure, to the fact that variations in the frequency and volume of the tone generators has caused them to go flat at times producing a discordant sound, inconsonant with the actual sound to be duplicated.

It should be noted that this random sound effect produces with single stops of pipe organs a warm and moving sound which develops power and majesty in full ensembles and is thus extremely desirable to duplicate.

Therefore, it is the general object of this invention to avoid and overcome the foregoing difficulties and other practices of the prior art by the provision of a new and better electronic musical instrument which more faithfully duplicates the random sound effect found in pipe organs.

A further object of this invention is the provision of a new and better device for producing a random sound effect of a pipe organ which will effect different tone generators differently without requiring separate apparatus for each tone generator.

A still further object of this invention is the provision of a new and less expensive device for producing a random sound effect in electronic organs which will not make the individual tones sound flat, but will still produce the desired variations in frequencies so as to more nearly duplicate the random sound effect found in pipe organs.

Another object of this invention is the provision of a new and better device for producing a random sound effect in electronic organs which can be simply and easily added to existing electronic organs without substantial revision in the existing apparatus.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is

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shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

In FIGURE 1 there is shown, schematically, an electronic organ built in accordance with the principles of the present invention.

FIGURE 2 is a cross-sectional view of the apparatus for producing the random motion effect utilized with the electronic organ of FIGURE 1.

FIGURE 3 is a front plan view of the disc shown in FIGURE 2 taken along lines 3—3.

In FIGURE 1, there is shown an electronic organ built in accordance with the principles of the present invention and generally designated by the numeral 10, it being understood that the parts shown are normally mounted in the usual cabinet or console (not shown).

The organ 10 includes a plurality of tone generators 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, and 34 with each tone generator being associated with a note on the chromatic scale starting with tone generator 12 which will produce the note C.

For purposes of clarity, only tone generator 12 will be discussed in detail, it being understood that the remaining tone generators are substantially similar in operation and are different only in that they will produce a different tone on the chromatic scale.

Tone generator 12 includes a master oscillator and four divider oscillators connected to and controlled by the master oscillator. As is well understood, the tone generator 12 includes a first divider or slave oscillator connected to and controlled by the master oscillator while a second slave or divider oscillator is controlled by the first slave or divider oscillator etc. Each of the oscillators forming the tone generator 12 has a separate output terminal 36, 38, 40, 42, and 44.

As will be understood there is one of the aforesaid output terminals for each note of the organ, which for purposes of example only will be considered to be 60 notes. Each of the output connections from the divider oscillators and the master oscillator are connected to key switches, organ stops, and filters all indicated quite generally in the box identified by the numeral 46. The key switches, stops, and filters are connected to an amplifier 48 of conventional design and the amplifier is connected to a loud-speaker 50. Of course, all of the foregoing parts are mounted in the usual cabinet or console.

The random motion generator of the present invention is shown in dotted line and indicated by the numeral 52. The random motion generator of the present invention includes twelve photoresistors 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, and 76 associated respectively with the grid circuit of the master oscillator of each of the respective tone generators 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, and 34. The photoresistor 54, which is taken for purposes of example only, would normally be connected to the grid circuit of a master oscillator such as is shown in U.S. Patent 3,196,200 "Electronic Musical Instrument Oscillator." However, it will be understood that the photoresistor 54 could be connected to any tone generator oscillator at the same place as a normal vibrato source is applied to the electronic oscillator.

All of the photoresistors 54—76 are connected to the positive terminal of a battery source 78 having its negative terminal at ground potential. The photoresistors 54—76 are operative, when illuminated by a light source, to be conductive and, when so conductive, will supply the positive DC voltage from battery 78 to the grids of their respective tone generators. When the positive signal is received by a tone generator such as tone generator 12, this will cause the tone generator to go sharp. When the

voltage is removed from the input to the tone generator 12, the generator will return to its neutral tuning position. This is unlike a normal vibrato oscillator which forces the generator sharp and flat at a constant rate to produce a repetitive pleasant modulation of the signal being affected.

The photoresistors 54-76 are equidistantly spaced on a circular path positioned on one side of a translucent or transparent disc 80. Disc 80 is adapted to be rotated about its axis by a motor 82.

On the side of disc 80 opposite from the photoresistors 54-76 are placed twelve incandescent lamps 84, 86, 88, etc. aligned with their respective photoresistors 54-76. The disc 80 has, on its periphery, twelve spaced opaque portions 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, and 112. These spaced opaque portions 90-112 are each different in their size, and the spacing between adjacent opaque portions is also different. In fact, the spacing and size of the opaque portions 90-112 can be considered a random selection. It will be understood that those lamps 84, 86, 88, etc. which are positioned adjacent one of the opaque portions 90-112 will not illuminate their respective photoresistors 54-76, and, accordingly, the tone generator associated with the non-illuminated photoresistor will produce its normal tone. Those incandescent lamps which are opposite from a translucent portion of the disc 80 will illuminate their respective photoresistors and, accordingly, the tone generator associated with the illuminated photoresistor will go sharp. The motor 82 drives the disc 80 at a constant rate which in one practical embodiment was found to be operative between one and eight revolutions per minute. It will be noted that each of the tone generators 12-34 will be differently affected by its individual photoresistors 54-76 as the random variation of the applied DC voltage is different at any given point in time for each of the tone generators. Accordingly, it is possible to achieve what is comparable to a chorus effect in a pipe organ because of the random motion of the frequency of each of the different master oscillators forming the electronic organ 10. The variation in resistance of the photoresistors 54-76, being somewhat gradual, rather than instantaneous, produces a natural sound not unlike that produced by variations in wind pressure, temperature, barometric pressure, and air turbulence within the pipes of a standard pipe organ.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims rather than to the foregoing specification as indicating the scope of the invention.

I claim in my invention:

1. An electronic organ comprising a plurality of electrical tone generators each operative to provide electrical signals having a different predetermined frequency, transducing means operative to change an applied electrical signal to a sound signal at the frequency of the applied electrical signal, key means for selectively connecting one or more of said tone generators to said transducing means, and random sound effect means for individually controlling each of said tone generators in a different manner whereby each tone generator will produce a different random variation in the electrical signal frequency of each tone generator at any given time.

2. The electronic organ of claim 1 wherein said random sound effect means is operative to randomly vary the sound signal output of said transducing means when said key means connects said transducing means to a tone generator, said tone generators having their predetermined frequencies arranged to produce a chromatic scale, said random variation in the frequency of each tone generator being operative to vary the transduced sound

signal from the natural tone produced by the particular tone generator to a sharp tone.

3. The electronic organ of claim 2 wherein each of said tone generators includes a master oscillator which controls at least one divider oscillator, said random sound effect means being operative to control the master oscillator of a particular tone generator to thusly control the electrical signal of its associated divider oscillator.

4. The electronic organ of claim 1 wherein said random sound effect means includes a plurality of devices to randomly vary respectively each of said plurality of tone generators, each of said devices randomly varying in the same manner as every other device with the particular random variation of any one device delayed in time with respect to the random variation of every other device whereby, at any given time, each of the tone generators is randomly varied in a different manner.

5. The electronic organ of claim 4 including a single controller for all of said devices, said controller being cyclically operative.

6. The electronic organ of claim 5 wherein each of said tone generators is operative, when connected to said transducing means to produce a different note on the chromatic scale as a sound signal, each of said devices being operative to randomly maintain its particular tone generator with an output electrical signal to produce a natural tone and, additionally, to cause said tone generator to produce a sharp tone signal in a random manner.

7. The electronic organ of claim 6 wherein each of said tone generators includes a master oscillator and a plurality of divider oscillators, each of said devices being operative to control the frequency of its associated master oscillator and, thus, to vary the frequency of the electrical signal from the associated divider oscillators.

8. The electronic organ of claim 5 wherein each of said devices is a light responsive device operative to have an electrical parameter thereof varied in a manner to cause variation in the frequency of the electrical signal from its associated tone generator, and means for randomly exposing each of said devices to a light source.

9. The electronic organ of claim 8 wherein said light sensitive devices are spaced about a circular path, said last mentioned means including a rotating shutter mounted in said path having on its opposite side a plurality of light sources arranged along a similar circular path spaced in a manner placing each of said light sources immediately opposite a light sensitive device with said shutter therebetween, said shutter being operative to expose said light sensitive devices to said light sources in a random manner.

10. An electronic organ of claim 9 wherein said light sources and said light sensitive devices are equally spaced about said circular path, said shutter having opaque and translucent areas positioned on said circular path and spaced in a random manner with the opaque and translucent areas being randomly varied in size to affect random variation in the exposure of each of said light sensitive devices.

11. The electronic organ of claim 10 wherein said shutter means includes driving means for rotating said disc at a speed between one and eight revolutions per minute.

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