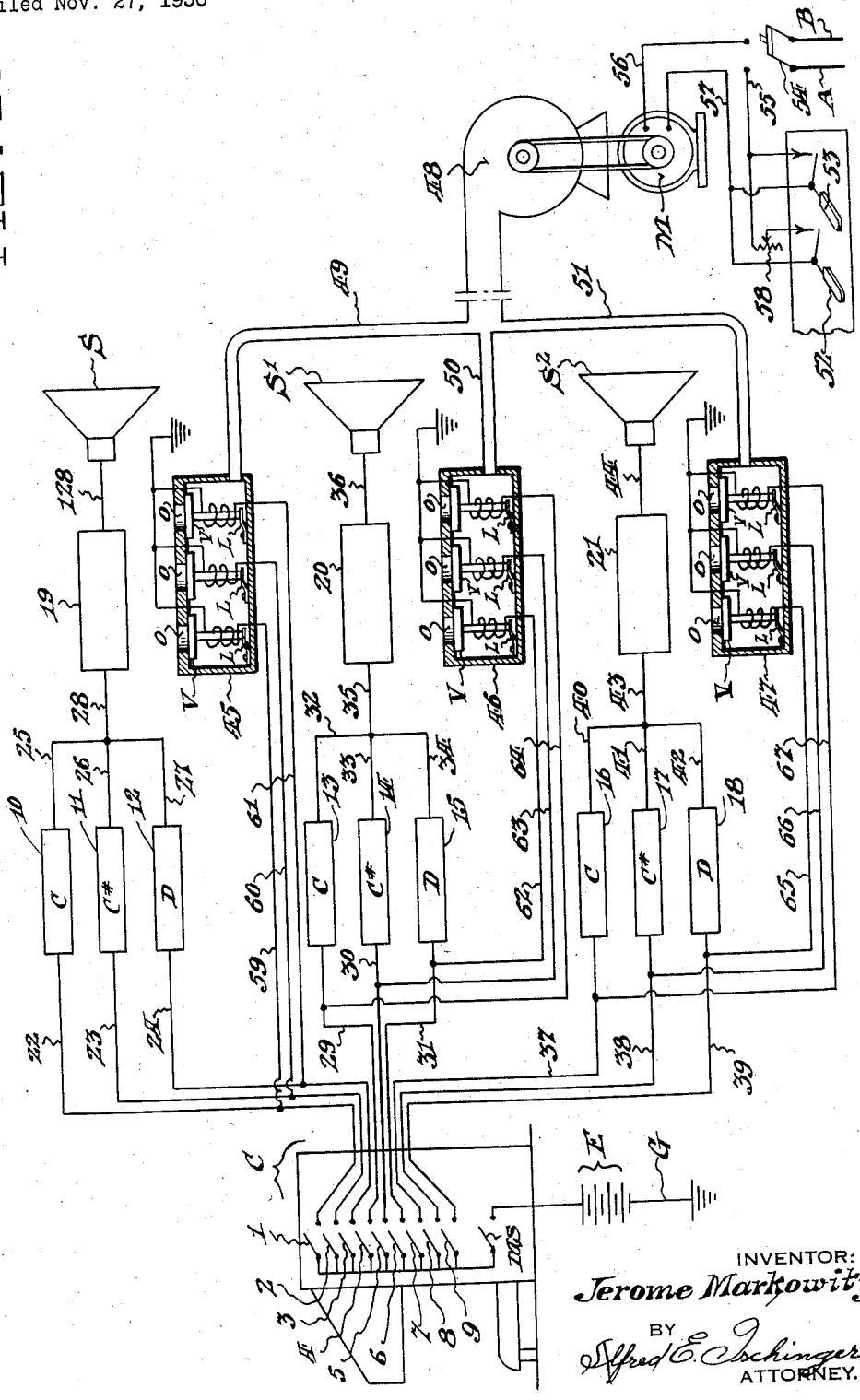
June 2, 1959 J. MARKOWITZ 2,888,850

COMBINATION ELECTRONIC ORGAN AND TRANSIENT TONE PRODUCING DEVICE

Filed Nov. 27, 1956 3 Sheets-Sheet 1

FIG. 1.



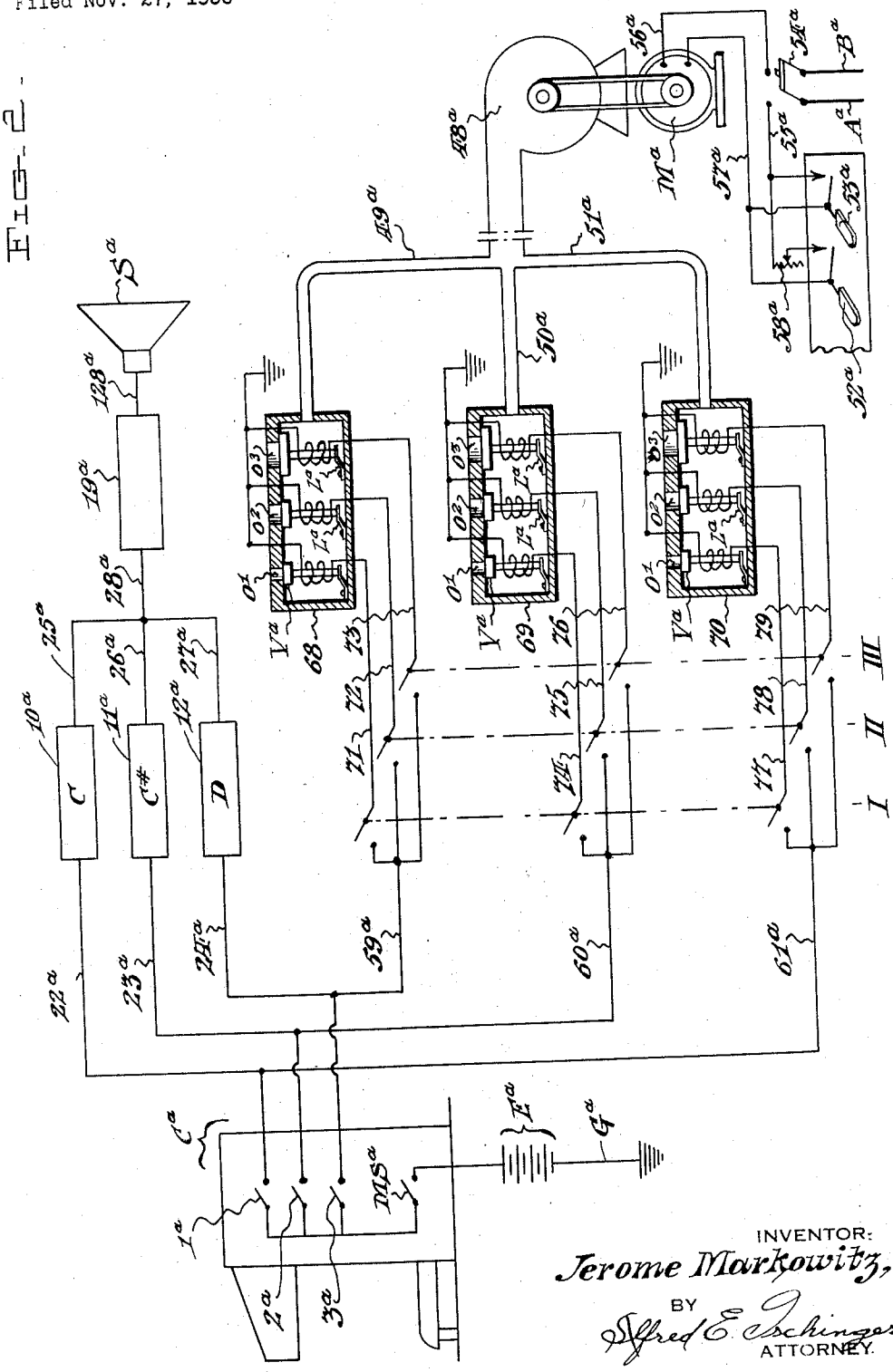
June 2, 1959 J. MARKOWITZ 2,888,850

COMBINATION ELECTRONIC ORGAN AND TRANSIENT TONE PRODUCING DEVICE

Filed Nov. 27, 1956

3 Sheets-Sheet 2

FIG. 2

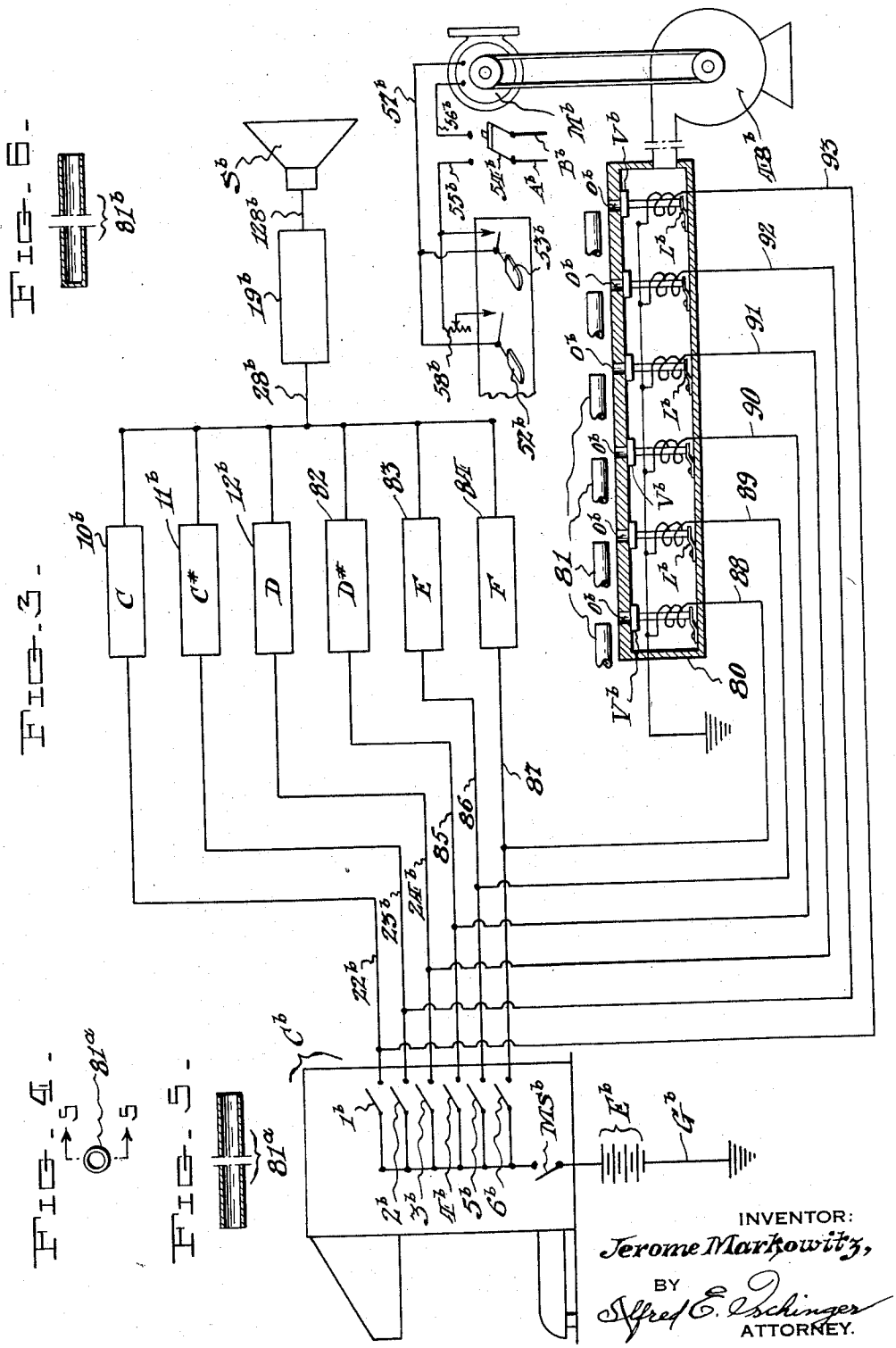


INVENTOR:
Jerome Markowitz,
BY
Alfred E. Tschinger
ATTORNEY.

June 2, 1959 J. MARKOWITZ 2,888,850

COMBINATION ELECTRONIC ORGAN AND TRANSIENT TONE PRODUCING DEVICE

Filed Nov. 27, 1956 3 Sheets-Sheet 3



INVENTOR:
Jerome Markowitz,
BY
Alfred E. Ischinger
ATTORNEY.

United States Patent Office 2,888,850 Patented June 2, 1959

2,888,850

COMBINATION ELECTRONIC ORGAN AND TRANSIENT TONE PRODUCING DEVICE

Jerome Markowitz, Allentown, Pa., assignor to Allen Organ Company, Inc., a corporation of Pennsylvania

Application November 27, 1956, Serial No. 624,696

9 Claims. (Cl. 84—1.01)

The electronic organs heretofore available are all capable of producing musical tones and effects which approach those produced by a pipe organ to a greater or lesser extent. The present invention concerns an electronic organ, or an electronic instrument, which is capable of producing musical tones and effects that are in such exact accordance with those produced by a pipe organ as to be indistinguishable therefrom.

One object of my invention is to provide a novel electronic organ, or a novel electronic instrument, of the type indicated.

Another object is to provide such an electronic organ having certain structural, functional and tonal features of advantage over the similar electronic organs of the prior art.

A further object is to provide such an electronic organ in which one or more of the electronically generated tones have combined therewith an acoustic transient, or air generated sound effect.

It is also an object to provide such an electronic organ having unique means arranged so that the electronically generated tones have combined therewith in selective manner one of a plurality of different air generated acoustic transients, or air current induced sound effects.

Another object is to provide such an electronic organ having the usual separate selectively operable electrical circuits each of which includes usual electronic means for effecting one of the various electronically generated tones of the organ tone range, and having cooperatively combined with each of said separate circuits novel means for effecting an air generated sound, so that the closing of said separate circuits will result in the simultaneous emission of the electronically generated tones of said circuits and the air generated sound produced by said means.

Another feature of the invention resides in the provision of an electronic organ having cooperatively combined with the electronic tone generating means, acoustic edge tone and pitch fringe generating means.

An additional object is to provide such novel means for effecting an air generated sound in such form that it may be initially cooperatively embodied in an electronic organ, or provided in the form of auxiliary equipment, or as a separate attachment for cooperative combination with an electronic organ.

Other objects are, to provide in combination with an electronic organ having a multiplicity of selectively operable electrical circuits each of which includes electronic means for generating a particular tone of the organ tone range, various novel items, such as, an air containing chest, or reservoir; air supply means connected with said chest and adapted to maintain the air therein at a predetermined pressure; a multiplicity of air vents arranged to extend in relatively spaced relation through the wall structure of said chest; individually movable elements arranged in cooperative relation with said air vents so as to effect opening and closing of the same; separate electrical operating means for each of said elements; means establishing an electrical connection between each of said selectively

operable circuits and one of said separate electrical operating means; and special devices that are adapted to be positioned adjacent to one or more of the air vents, on the outside of the wall structure of said air containing chest, each of which devices is adapted to be excited by the air escaping from the particular air vent adjacent to which it is positioned and adapted to function in the nature of what might be termed "a tonal catalyst device," since it acts as an agent in adding the final sound quality, characteristic, or effect, to the desired tone achieved in the manner of the invention.

With these and other objects in view, which will become more readily apparent from the following detailed description of the various practical and illustrative electronic organ improvements shown in the accompanying drawings, my invention comprises the novel electronic organ, devices, elements, features of construction and arrangement of parts in cooperative relationship, as more particularly indicated and defined by the hereto appended claims.

In the accompanying drawings:

Figure 1 is a diagrammatic, or schematic illustration, which portrays certain electronic tone producing and other parts of a standard, or conventional electronic organ arrangement, having my invention cooperatively applied thereto, or combined therewith.

Fig. 2 is an illustration, similar to Fig. 1, and shows my invention cooperatively applied to, or combined with the organ, by another form of wiring arrangement.

Fig. 3 is an illustration similar to Figs. 1 and 2, and shows a modified form of my invention cooperatively applied to, or combined with, an electronic organ.

Fig. 4 is an end elevational view of a tonal catalyst device in the form of a tubular element, which forms part of my invention.

Fig. 5 is a longitudinal cross-sectional view of the device shown in Fig. 4, taken as indicated by the arrows 5—5 on the latter, and

Fig. 6 is a longitudinal cross-sectional view, similar to Fig. 5, but of a modified tonal catalyst device in accordance with my invention.

For purposes of exemplification, or illustration, my invention is herein disclosed as embodied in, or applied to, a standard, or conventional type electronic organ. However, it is to be noted that only those parts of such an organ have been shown in the drawings as are deemed necessary to facilitate a clear understanding of the construction and operation of my invention, the performance of its intended purpose and the manner in which it achieves certain unique and desirable results and advantages. From this disclosure it will be readily apparent to those skilled in this art how my invention can be utilized, in the same or in similar manner, with electronic organs or the like, in general.

It will facilitate an understanding of my invention to first briefly consider some of the more important aspects and phases of the comparative situation surrounding electronic organs and pipe organs, as well as some of the known factors relative to the production of musical sounds as involved in this situation.

Accordingly, it is noted that in the pipe organ and electronic organ fields, the so-called "purists" and some qualified experts content that none of the electronic organs heretofore developed or avaliable have reached a state of perfection which places them on a par with pipe organs. In other words, that electronic organs have so far not attained a replacement status for pipe organs. The main reason advanced for arriving at this contention is simply that the tonal qualities and basic musical effects produced by these two musical instruments differ from each other to a greater or lesser extent. In some cases such variation is designated as

extremely different, in other cases it is pronounced as being markedly different. Therefore, in spite of the constantly increasing number of electronic organs becoming available on the market, there prevails a detrimental feeling or attitude of inadequacy against them.

There also seems to prevail among most classical organists the attitude that electronic organs are completely inadequate for use in churches, or for use where true pipe organ tones and effects are desirable or essential.

While all the phenomena involved in the production of musical sounds are presently not completely known, or understood, it is a generally accepted fact that the musical effect or quality of a given single tonality depends upon the following elements:

(1) Harmonic structure;
(2) Intensity;
(3) Frequency;
(4) Speech characteristics;
(5) The presence or absence of non-harmonically related components which may be classified as "noise."

Modern electric, or electronic organs, are capable of producing musical sounds which include elements 1, 2, 3 and 4. However, to my knowledge, no electronic organ has heretofore been developed which is capable of including with elements 1 to 4 inclusive, one or more non-harmonic components of sound which are deemed by the experts in this field to form an integral part of the tones produced by a pipe organ. That is to say, there seems to be no definite explanation for what occurs when an organ pipe is caused to "speak" and includes, along with the harmonic structure of its tone, a certain special tone, sound, or noise, comprising one or more non-harmonic components that do not come within the category of the above listed elements 1 to 4 inclusive. This tone, sound, or noise, for purposes of convenient identification and differentiation from said four elements, will hereinafter be referred to as an air current induced acoustic transient, "acoustic edge tone" or an "acoustic edge tone effect."

Since my invention includes novel means for generating, or producing, such air current induced acoustic transients, acoustic edge tones, or acoustic edge tone effects, the following explanation of my theory concerning such tones or tone effects will serve to further clarify the same. Referring, for example, to the tone of a diapason pipe speaking at "A," 220 cycles, such a tone, to the ear of a well trained listener, includes harmonics up to approximately the 20th. A wave analyzer will establish that such is the case and thereby prove that frequencies as high as 4,400 cycles are detectable by ear. However, since a portion of the speaking mechanism of an organ pipe includes one or more areas which are in contact with on-rushing air, an additional hissing edge tone, sound, or noise, is also produced. The frequency components of this hissing edge tone lie in a range somewhat higher than 4,400 cycles and up to and including the threshold of hearing. Consequently, the presence of this hissing edge tone is quite apparent to the ear, especially since the ear is very sensitive at this point of its sound detecting range. It consequently follows that the said hissing edge tone forms an integral part of the tone of an organ pipe and that exact correspondence between the tone of an organ pipe and the duplicate tone produced by an electronic tone generator can only be achieved if provision is also made to include with such electronically produced duplicate tone appropriate means for properly combining therewith the same acoustically produced hissing edge tone component of the organ pipe tone. Since the acoustically produced edge tone may be heard sooner, or later, or simultaneously with the harmonically related components of the pipe organ tone, it is also important to establish a similar time relationship between the acoustically produced edge tone and the duplicate electronically produced tone,

in order to effect exact tonal equality with the pipe organ tone.

The present invention provides an electronic organ, or musical instrument, in which electronic and acoustic edge tone and pitch fringe generator means are combined and arranged in such manner that they can be operated in unison to produce the same tones and sound effects as a pipe organ with such exactness or fidelity as to be indistinguishable therefrom. In fact, numerous tests have been held, in which trained listeners and organ experts have been exposed in side-by-side comparisons of real organ pipes and the electronic-acoustic edge tone combination. By merely adjusting the latter mechanism to produce an "overdose" of edge tone and air noise, these listeners invariably chose the electronic sounds as being the real thing over the organ pipes.

In Figure 1, certain of the well-known parts of an electronic organ are schematically indicated. These parts generally comprise an organ console C, a series of key operated electronic contacts or switches **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8** and **9**, standard or conventional electronic tone generators, or units, **10**, **11**, **12**, **13**, **14**, **15**, **16**, **17** and **18**, similar standard, or conventional electronic amplifying units **19**, **20** and **21**, and three similar and complete standard type loud speaker units S, S^1 and S^2. Such indicated parts form a portion of a standard or conventional electronic organ. For more complete and detailed information concerning such an organ, reference may be had to U.S. Patent 1,956,350 and other patents relating to such organs and to the literature pertaining to the same which is freely available from the various manufactures of such organs, for example, from the Allen Organ Company, Inc. of Macungie, Pennsylvania.

The organ console C is provided, as usual, with a full and complete set of keys, stops, pedals, etc., in correspondence with the standard and well known prior art organ console structure practice and all the operative elements of the console are arranged to control, as usual, the entire electrical, electronic and other equipment provided with such a console to form a complete electric or electronic organ system.

It will be sufficient to a complete understanding of my invention, that only the said organ portion of Fig. 1 be considered, since this illustration makes it clear how the various parts of my invention there depicted, as well as other similar parts, can be embodied throughout an entire electric organ system, in accordance with the invention.

The standard or conventional organ parts previously referred to are connected with an electrical source of energy E, as usual, for operation of the organ system, all in accordance with the prior art practice. Although the source of energy E has been symbolically indicated in Fig. 1 as being in the form of an electric battery, this has been done for convenience and simplification only. It is to be understood that such source of electric energy may also be derived from a more commonly used source, such as electric supply or feeder lines of the proper type of electric energy and voltage.

A main, or central switch MS, is provided for connecting the organ system with the source of electric energy.

For purposes of exemplification, the electronic tone generating units **10**, **11** and **12** are marked "C," and "C♯" and "D," to indicate three of the tones of the first organ octave produced thereby, the tone generating units **13**, **14** and **15** are similarly marked to indicate the same three tones of the second organ octave produced thereby and the tone generating units **16**, **17** and **18** are similarly marked to indicate the same three tones of the third octave produced thereby. The tone generator units **10**, **11** and **12** are individually connected by conductors **22**, **23** and **24** with the key operated electric contacts or switches **1**, **2** and **3** and conductors **25**, **26**, **27** and **28**;

connect said tone generator units with the tone amplifying unit **19** as shown, the latter being also connected by a conductor **128** with the loud-speaker S.

The tone generator units **13**, **14** and **15** are individually connected by conductors **29**, **30** and **31** with the key operated electric contacts or switches **4**, **5** and **6** and conductors **32**, **33**, **34** and **35** connect said tone generator units with the tone amplifying unit **20**, as shown, the latter being also connected by a conductor **36** with the loud-speaker S^1.

The tone generator units **16**, **17** and **18** are individually connected by conductors **37**, **38** and **39** with the key operated electric contacts or switches **7**, **8** and **9** and conductors **40**, **41**, **42** and **43** connect said tone generator units with the tone amplifying unit **21**, as shown, the latter being also connected by a conductor **44** with the loud-speaker S^2.

The elements, devices and parts which have been so far specifically identified constitute the usual equipment of a standard, or conventional, electric organ system and as such form no part of my invention when utilized in the manner of the prior art practice.

My invention comprises the arrangement of novel means in operational combination and cooperating relationship with said elements, devices and parts, as about to be described.

In the form of my invention shown in Fig. 1, the said novel means generally comprises, an air current generating system that includes similar air chest units **45**, **46** and **47**; an air pump or air compressor **48** which is operated by suitable power means, such as an electric motor M; individual ducts or pipes **49**, **50** and **51** arranged, as shown, so as to directly convey the air from the pump **48** to the air chest units **45**, **46** and **47**; and variable motor speed control switches **52** and **53** for effecting selective operation of the air pump driving motor M at different speeds so as to vary the air pressure existent in the air chests **45**, **46** and **47**.

The motor M receives its electric energy from two power lines A and B that are connected by a main switch **54** with conductors **55** and **56**. The variable motor speed switches **52** and **53** are connected in parallel with the conductor **55** and a conductor **57**, a variable resistance element **58** being arranged in the circuit controlled by the variable speed switch **52**. After the main switch **54** is closed, the motor M can be either directly connected with the power lines A and B by closing the selector switch **53**, thereby to effect operation of the motor M at full speed, or connected with the power lines A and B through the variable resistance element **58** by closing the selector switch **52**, thereby to effect operation of the motor M at a certain predetermined reduced speed. The switches **52** and **53** may be suitably designed so as to form part of the control arrangement of the organ console C, for convenient and selective manipulation thereof, either by hand or by foot, in connection with the playing of the organ.

The similar air chests **45**, **46** and **47** are structurally like the air chests of a pipe organ which supply the air for operating the organ pipes. That is to say, they are made of wood or some other suitable material, are preferably, but not necessarily, of a rectangular box-like configuration and are hermetically sealed so as to normally contain the compressed air which is fed thereto by the air pump or air compressor **48**. Each of the air chests is provided with a series of similar, uniformly spaced, circular air escape vents, or outlets O, which extend through the upper wall structure thereof. Individually operated electrically controlled circular valve elements V are provided to effect opening and closing of said vents. As diagrammatically indicated in Fig. 1, the valve elements V are arranged to be operated by suitable and conventional electrical actuating means, so as to be moved axially in downward direction, for example, by an electric solenoid coil acting on an iron or steel valve element stem, thereby to effect opening of the respective vents, the valve elements V being returned to their vent closing position by suitable and conventional spring means, such as indicated by the fixedly mounted leaf springs L.

The solenoid coils within the air chest **45** each have one of their terminals connected by wires **59**, **60** and **61** with the conductors **22**, **23** and **24**, the other terminal of each of said coils being connected to a grounded wire, as shown. Likewise, the solenoid coils within the air chest **46** each have one of their terminals connected by wires **62**, **63** and **64** with conductors **29**, **30** and **31**, the other terminal of each of said coils being connected to a grounded wire. In similar manner, the solenoid coils within the air chest **47** each have one of their terminals connected by wires **65**, **66** and **67** with the conductors **37**, **38** and **39**, the other terminal of each of said coils being also connected to a grounded wire, as shown.

The source of electric energy E of the organ system is also grounded by means of a conductor G. Accordingly, the closing of main switch MS will result in the establishment of nine individual open circuits each of which can be closed, or opened, by selective actuation of one of the series of key operated electrical contacts, or switches **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8** and **9**, which form part of the keyboard, or the operating means or arrangement of the organ console C. What takes place when said individual circuits are selectively closed will become apparent from a consideration of one such circuit, for example by considering what transpires when the key operated contact or switch **1** is closed. This will result in closing and energizing the circuit comprising the switch **1**, conductor **22**, unit **10**, conductors **25** and **28**, unit **19**, conductor **128**, loudspeaker S, conductor **59**, the solenoid coil in air chest **45** with which conductor **59** is connected, the main switch MS and the source of electric energy E, which latter is grounded through wire G, as is also the wire that is connected with one of the terminals of the said circuit solenoid coil in the air chest **45**. The closing of this circuit will result in simultaneous sounding of the musical tone C of the first organ octave, as effected by the electronic tone producing unit **10**, and the acoustic transient, air escape tone, air current induced sound, hissing, or noise produced when energization of the solenoid coil of the circuit causes movement of the cooperatively combined valve element V to its lower or open position relative to the directly adjoining air escape vent or outlet O. As previously pointed out, the air pressure within the air chests **45**, **46** and **47** can be selectively varied by increasing or decreasing the speed of operation of the air pump or compressor **48**, so that by selective operation of the motor speed control switches **52** and **53**, the said acoustic transient, air escape tone, air current induced sound, or hissing noise, can be determinedly tuned, changed, varied, or modified, as desired, in pitch, or otherwise, for final exact adjustment in correspondence with the edge tone effect that accompanies the same tone produced by the pipe of a pipe organ. Having thus effected such final adjustment, the setting is maintained in this order.

In this manner, there is combined with the musical tone representing the note C, as generated by the electronic tone producing unit **10**, an acustic transient, air generated tone, air current generated sound or hissing noise that is attuned to correspond with the edge tone, sound, or hissing noise which normally accompanies the musical tone C produced by an organ pipe.

The same thing takes place when the other circuits of the electronic organ system of Fig. 1 are closed by their respective key operated contacts or switches. From this it will be clear to those skilled in this art that my invention provides, in conjunction with the standard or conventional tone generating means for effecting the entire tone range of an electronic organ system, novel acoustic edge tone generating means capable of effecting, in synchronized combination with each of the electronically

produced tones of the organ system, the same characteristic acoustic transient, edge tone, air current generated sound or hissing noise, that accompanies the corresponding tones produced by the respective pipes of a pipe organ. I have found in actual practice that an electronic organ system in accordance with my invention, when arranged for tonal comparison in the same aduitorium with a high class pipe organ system, will provide musical tones, renditions and effects covering the entire tonal range of the system, that are in all respects identical and indistinguishable from the same tones, renditions and effects correspondingly produced with said pipe organ system.

The acoustic edge tone and pitch fringe generating means of my invention can also be designed so as to provide a greater selection, or variety, of air generated edge tone effects, as illustrated by Fig. 2 of the drawings. It is to be noted that the modified form of my invention shown in Fig. 2 includes certain of the previously disclosed and described parts of the electronic organ system of my invention depicted by Fig. 1. Therefore, to avoid rendundancy of the descriptive matter of such parts, the same reference characters have been applied thereto in Fig. 2, with the exponent "*a*" added in each instance for purposes of differentiation.

In Fig. 2 there are shown three air chests **68**, **69** and **70** which are structurally like the air chests **45**, **46** and **47** of Fig. 1, with the exception that the circular air vents, or outlets thereof, vary in diameter. That is to say, the diameter of these air outlets are similarly graduated in size, in each air chest, so that each of the latter includes a relatively small, medium and large size air outlet, respectively designated O^1, O^2 and O^3.

The three solenoid coils which effect opening of the valve elements V^a of the air chest **68**, each have one of their terminals connected with the wire **59**^{a} by conductors **71**, **72** and **73**, the other terminal of each of said coils being connected to a grounded wire, the same as in the arrangement shown in Fig. 1. Similarly, the three solenoid coils which effect opening of the valve elements V^a of the air chest **69**, each have one of their terminals connected with the wire **60**^{a} by conductors **74**, **75** and **76**, the other terminal of each of said coils being also connected to a grounded wire. In similar manner, the three solenoid coils which effect opening of the valve elements V^a of the air chest **70**, each have one of their terminals connected with the wire **61**^{a} by conductors **77**, **78** and **79**, the other terminal of each of said coils being connected to a grounded wire, as shown.

Each of the conductors **71** to **79** inclusive is divided, or provided in two sections, that are adapted to be relatively united for electric current flow therethrough by an interposed single pole switch, in each instance, as clearly shown. In this manner, the valve element operating solenoid coils of each of the air chests **68**, **69** and **70** can be selectively connected in circuit with the electronic tone producing units **10**^{a}, **11**^{a} and **12**^{a}, in a variety of ways, so that the tones produced by said units and identified as C, C♯ and D, will have simultaneously combined therewith an acoustic transient, air generated or air current induced edge tone effect as produced by escape of the air individually through the outlets O^1, O^2 or O^3, or any combination thereof, as desired and made possible with this modified arrangement of my invention. If desired, the three single pole switches of the conductors **71**, **74** and **77** may be simultaneously opened and closed by suitable switch connecting means diagrammatically indicated by the dot-and-dash line I in Fig. 2. Such switch connecting means may also be provided to effect simultaneous opening and closing of the switches associated with the conductors **72**, **75** and **78**, as well as to effect simultaneous opening and closing of the switches associated with the conductors **73**, **76** and **79**, as diagrammatically indicated by the dot-and-dash lines II and III in Fig. 2.

As indicated in connection with the description of the electronic organ system of Fig. 1, the motor speed control switches **52** and **53** make it possible to selectively effect air pressure variations in the air chests **45**, **46** and **47**, to thereby vary the pitch or characteristic of the edge tone effect produced by escape of the air through outlets O. Accordingly, the air current induced edge tone effects, or acoustic transients, produced by escape of air through the individual or combined air outlets O^1, O^2 and O^3 can also be further modified, as desired, by selective operation of the motor speed control switches **52**^{a} and **53**^{a}.

The acoustic edge tone and pitch fringe generating means of my invention can also be provided with special devices that are adapted to be positioned adjacent to one or more of the air vents, or outlets, on the outside of the top wall structure of the air containing chest **80**, as disclosed by Figs. 3, 4, 5 and 6 of the drawings. Such special devices are designated by the numeral **81** in Fig. 3, and may be in the form of a cylindrical tube, both ends of which are open as shown at **81**^{a} in Fig. 5, or in the form of a cylindrical tube **81**^{b}, one end of which is closed, as shown in Fig. 6. I have found that the open tubes combine most advantageously with organ tones in the category of those produced by open organ pipes, whereas the stopped tubes combine best with tones similar to those produced by stopped organ pipes. It should also be understood that the air current pressure which blows across the mouth of these tubes, is insufficient to make the tube "speak" in the manner of a normal organ flue pipe. In fact, the air pressure and the manner upon which it acts upon the tube, produces only the edge tone and the barest semblance of pitch. Consequently, it is questionable as to whether the tubes must be accurately cut to size and tuned. However, generally speaking, each tube is of such length that it will produce a sound which seems to have a pitch which is close to that of the note with which it is associated. In either case, the open end of each tube **81** is adapted for fixed positioning adjacent to an air outlet O^b, as shown in Fig. 3, or for fixed positioning so that the edge of the open ends of such tubes are in more or less overlapping, or in tilted relation with their respective air outlets O^b, as desired, or required, in order that the air excited column of the tube may function in the nature of a tonal catalyst, or agent, which imparts the final sound quality, characteristic, or effect, to the composite tone achieved by the organ system of my invention.

Fig. 3 shows my invention applied to an electronic organ system which constitutes a modified arrangement of that shown in Fig. 1, in that electronic sound producing units **82**, **83** and **84** are shown included and connected with key operated electrical contacts or switches **4**^{b}, **5**^{b} and **6**^{b} of the organ console C, by conductors **85**, **86** and **87**. As indicated in Fig. 3, the units **82**, **83** and **84** produce the notes D♯, E and F and are arranged in such electrically connected relation with the electronic tone producing units which effect the notes C, C♯ and D, as to be collectively in circuit with the single loudspeaker S. To avoid repetitive description of those parts of the electronic organ system shown in Fig. 3 which are similar to the already identified and described parts of Fig. 1, the said similar parts of Fig. 3 are designated by corresponding reference characters which have the exponent "*b*" added thereto for purposes of differentiation.

The six solenoid coils within the air chest **80**, which effect opening of the valve elements V^b, each have one of their terminals connected by conductors **88**, **89**, **90**, **91**, **92** and **93** with the condunctors **22**^{b}, **23**^{b}, **24**^{b}, **85**, **86** and **87**, the other terminal of each of said solenoid coils being connected to a grounded wire, as shown.

Of course, it will be apparent to those skilled in this art that the novel electronic organ system developments specifically shown and described, can be changed and modified in various ways, without departing from the invention herein disclosed and more particularly defined by the hereto appended claims. For example, while I

have shown different parts of the system connected to two different sources of electrical energy, it is to be understood that this has been mainly done for convenience and simplification of the wiring disclosure and that, in accordance with the standard, or conventional practice, the entire system may be connected with a single source of electric energy. Also, that the special devices **81**, **81a** or **81b**, may be of different cross-sectional shape, or configuration, for example, square, triangular, elliptical, etc., and of any suitable length found to best serve their intended purpose in accordance with my invention.

I claim:

1. In combination with an electrical organ having a multiplicity of selectively operable electrical circuits each of which includes electronic means for generating a particular tone of the organ tone range the particular tones being like pipe organ tones except that they lack a certain air current inducible sound component for completeness, of an air containing chest, air supply means connected with said chest and adapted to maintain the air therein at a predetermined pressure, a multiplicity of air vents arranged to extend in relatively spaced relation through the wall structure of said chest, means adapted to individually effect with each of said particular tones said certain air current induced sound component which means includes individually movable elements arranged in cooperative relation with said air vents so as to effect opening and closing of the same, separate electrical operating means for each of said elements, means establishing an electrical connection between each of said selectively operable circuits and one of said separate electrical operating means, and a tubular element which is open at both ends and arranged adjacent to one of said air vents at the outside of the wall structure of the chest so that the air current flowing from said vent will travel in substantially right-angular relation across one end of said tubular element.

2. In combination with an electrical organ having a multiplicity of selectively operable electrical circuits each of which includes electronic means for generating a particular tone of the organ tone range the particular tones being like pipe organ tones except that they lack a certain air current inducible sound component for completeness, of an air containing chest, air supply means connected with said chest and adapted to maintain the air therein at a predetermined pressure, a multiplicity of air vents arranged to extend in relatively spaced relation through the wall structure of said chest, means adapted to individually effect with each of said particular tones said certain air current induced sound component which means includes individually movable elements arranged in cooperative relation with said air vents so as to effect opening and closing of the same, separate electrical operating means for each of said elements, means establishing an electrical connection between each of said selectively operable circuits and one of said separate electrical operating means, and a tubular element which is open at one end and closed at the other end and arranged adjacent to one of said air vents at the outside of the wall structure of the chest so that the air current flowing from said vent will travel in substantially right-angular relation across the open end of said tubular element.

3. In combination with an electrical organ having a multiplicity of selectively operable electrical circuits each of which includes electronic means for generating a particular tone of the organ tone range the particular tones being like pipe organ tones except that they lack a certain air current inducible sound component for completeness, of an air containing chest, air supply means connected with said chest and adapted to maintain the air therein at a predetermined pressure, a multipilicity of air vents arranged to extend in relatively spaced relation through the wall structure of said chest, means adapted to individually effect with each of said particular tones said certain air current induced sound component which means includes individually movable elements arranged in cooperative relation with said air vents so as to effect opening and closing of the same, separate electrical operating means for each of said elements, means establishing an electrical connection between each of said selectively operable circuits and one of said separate electrical operating means, and a separate tubular element arranged in each instance adjacent to one of said air vents at the outside of the wall structure of said chest so that the air current flowing from one of the vents will travel in substantially right-angular relation across the end of one of said tubular elements and thereby excite a resonant air column sound effect.

4. In combination with an electronic musical instrument having a circuitry which includes individual circuits that generate tones of a musical scale; means for producing acoustic transients which enable the tones produced to resemble pipe organ tones or the like, said means comprising a chest having therein air under pressure, said chest also having a plurality of vents therein and a controlled valve for each vent which when open will produce said transients; and circuit means interconnecting each of said individual circuits and one of said controlled valves, whereby when one of said individual circuits is energized a tone and its corresponding acoustic transient will be produced.

5. The combination in accordance with claim 4, wherein at least one of said vents has arranged adjacent thereto a tonal catalyst device which is excited by the air current flow from said air vent.

6. The combination in accordance with claim 4, wherein at least one of said vents has arranged adjacent thereto tubular means in such manner that air flowing from said vent will excite said means and induce a resonant air column sound effect.

7. The combination in accordance with claim 4, wherein at least one of said vents has arranged adjacent thereto a tubular element which is open at both ends and positioned so that the air current flowing from said vent will travel in substantially right-angular relation across one end of said tubular element.

8. The combination in accordance with claim 4, wherein at least one of said vents has arranged adjacent thereto a tubular element which is open at one end and closed at the other end and positioned so that the air current flowing from said vent will travel in substantially right-angular relation across the open end of said tubular element.

9. The combination in accordance with claim 4, wherein each of said vents has arranged adjacent thereto a separate tonal catalyst device which is excited by the air current flow from its corresponding air vent.

References Cited in the file of this patent

UNITED STATES PATENTS

895,925	Whitehorne	Aug. 11, 1908
2,167,407	Marr	July 25, 1939
2,250,065	Koehl	July 22, 1941
2,562,670	Koehl	July 31, 1951