Sept. 27, 1960 T. J. GEORGE 2,953,958

ELECTRONIC MUSICAL INSTRUMENT CONTROL SYSTEM

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FIG. 1.

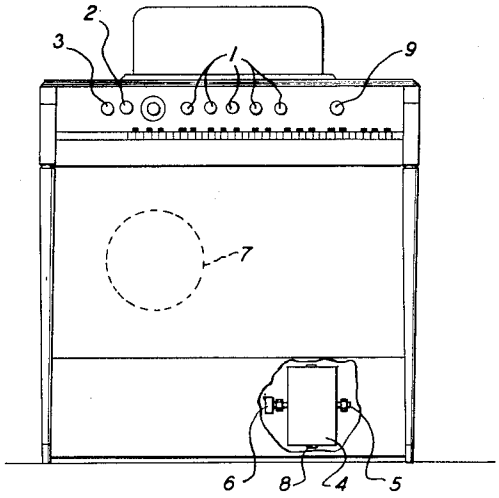


FIG. 2.

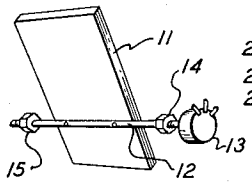


FIG. 3.

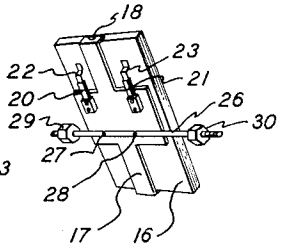


FIG. 4.

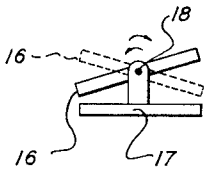


FIG. 5.

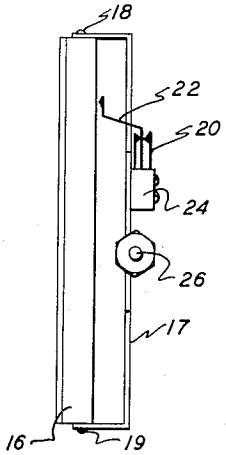
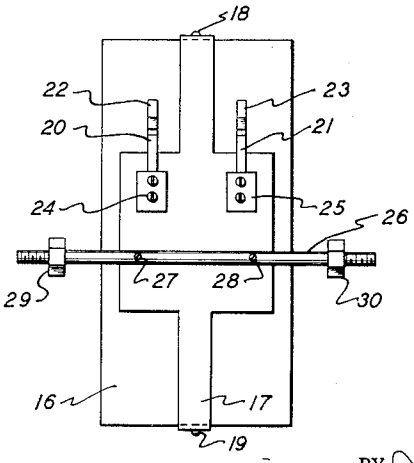


FIG. 6.



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ELECTRONIC MUSICAL INSTRUMENT CONTROL SYSTEM

Filed Nov. 25, 1958 2 Sheets-Sheet 2

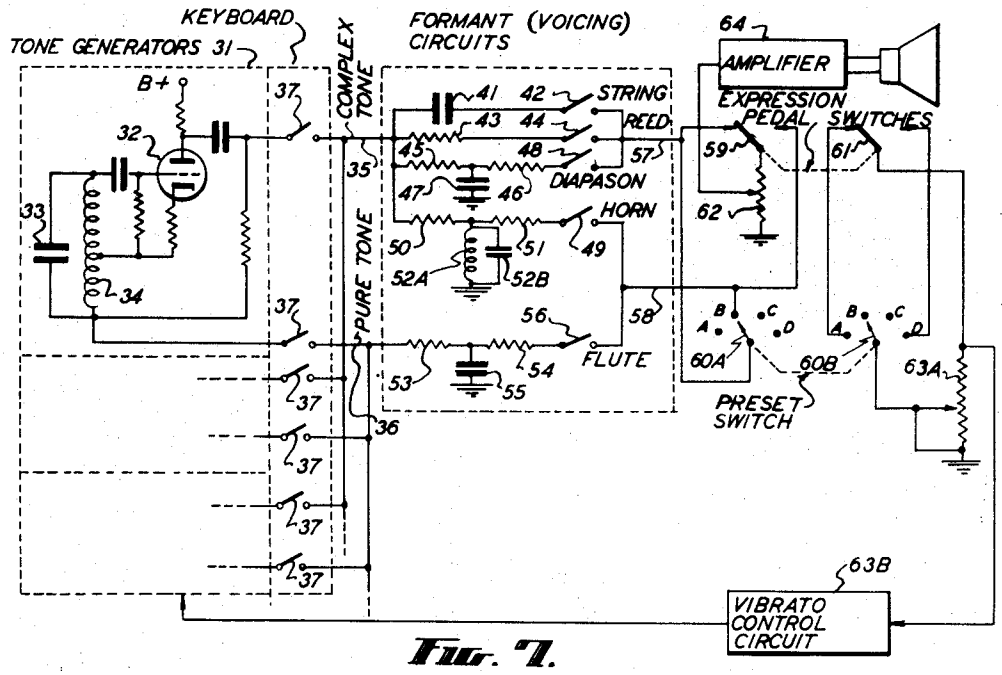
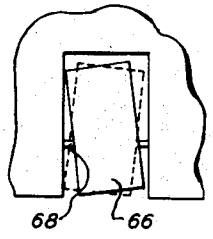
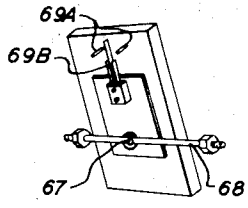
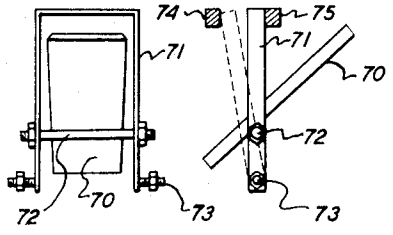


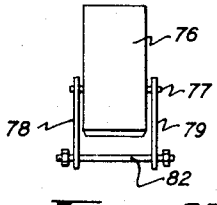
FIG. 7.

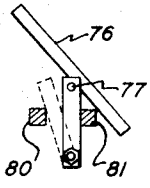
FIG. 8. FIG. 9. FIG. 10. FIG. 11.











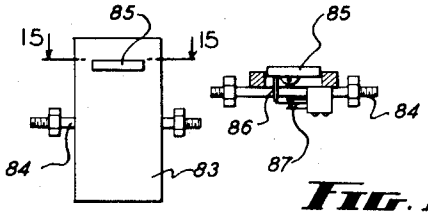


FIG. 12. FIG. 13. FIG. 14. FIG. 15.

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ELECTRONIC MUSICAL INSTRUMENT CONTROL SYSTEM

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8 Claims. (Cl. 84—229)

This invention relates to musical instruments and more particularly to a new and improved arrangement for controlling the amplitude and selection of musical characteristics of tones produced by an electronic musical instrument.

In practically all types of orchestral and organ music, variety of tone color, vibrato, percussion and other characteristics enhance the musical effect upon a listener. Thus, one of the principal reasons for incorporating two or more separate manuals, i.e. keyboards, in an organ is so that an organist may have readily available contrasting musical characteristics.

In an effort to increase the versatility of organ-type musical instruments, it is well known to employ a number of separate preset combinations of musical tones, vibrato and percussive effects which may be selected when desired through manipulation of a selection mechanism. However, most known types of preset selection arrangements suffer from the disadvantage that it is necessary to remove one or both hands from playing position to actuate the preset selection mechanism. In addition, preset arrangements tend to increase the complexity of the musical instrument so that in relatively small electronic organs satisfactory systems for presetting musical characteristics are seldom found. For example, in one well known variety of single manual electronic organ, no facility is included for presetting combinations of musical characteristics so that it is necessary to reposition each of the individual voicing, vibrato and percussive controls to switch from one musical effect to another.

Accordingly, it is a principal object of the present invention to provide a new and improved preset selection arrangement for use in a musical instrument in which a variety of musical effects may be achieved.

It is another object of the present invention to provide a dual purpose pedal arrangement for use in conjunction with a musical instrument by means of which both the amplitude and characteristics of musical tones produced by the instrument may be independently varied.

It is yet another object of the present invention to provide a new and improved expression control for use in conjunction with a musical instrument in which a movement of the expression control in a given direction provides a selection of various musical characteristics.

It is still another object of the present invention to provide a combined expression and switching arrangement for a musical instrument in which a foot-operated pedal may be moved in two mutually exclusive directions to vary independently the amplitude and musical characteristics of tones produced by the instrument.

Briefly, in accordance with one aspect of the invention, a plurality of musical tone generators are coupled to an output circuit via means for controlling the amplitude of the signals and voicing control circuits so that signals possessing differing characteristics may be selectively passed to the output circuit. A foot-operated pedal is suspended for motion in two mutually independent directions and mechanical linkages are provided between the foot pedal and the amplitude and voicing control means so that both the volume of musical tones produced by the musical instrument as well as the musical characteristics of the tones may be varied through positioning the pedal in each of the two mutually exclusive directions.

In a particular arrangement of the invention, electrical switching circuits are associated with the expression pedal of an electronic organ in such a way that the expression pedal serves the dual purpose of controlling the volume of the musical tones as well as actuating the switching circuits which may be connected to voicing, vibrato or percussion arrangements preset to produce at least two differing musical effects. As a result, a single manual organ may be adapted to provide the facility of a multiple manual organ in which varieties of musical effects are achieved. In addition, a selection of voicing of the instrument or other musical characteristics is readily available practically instantaneously without removing either hands or feet from normal playing position.

A better understanding of the invention may be had from a reading of the following detailed description and an inspection of the drawings, in which:

Fig. 1 is an elevational view of a single manual electronic organ equipped with a dual purpose expression control pedal and preset selection arrangement in accordance with the invention;

Fig. 2 is a perspective view illustrating the manner in which a conventional expression pedal may be suspended in a musical instrument;

Fig. 3 is a perspective view of a dual purpose expression control pedal in accordance with the invention;

Fig. 4 is a simple diagrammatic illustration of the manner in which the expression pedal of Fig. 3 may be suspended for motion in a direction independent of the direction normally employed for expression control;

Fig. 5 is an enlarged side view of the dual purpose expression control pedal of Fig. 3;

Fig. 6 is an enlarged rear view of the expression control pedal of Fig. 3;

Fig. 7 is a combined block and schematic circuit diagram of an electronic musical instrument in accordance with the invention;

Fig. 8 is an elevational view of an alternative arrangement of a dual purpose expression pedal in accordance with the invention;

Fig. 9 is a rear perspective view of the expression control pedal of Fig. 8;

Fig. 10 is an elevational view of another alternative arrangement of a dual purpose expression control pedal in accordance with the invention;

Fig. 11 is a side elevational view of the arrangement of Fig. 10;

Fig. 12 is a front elevational view of a dual purpose expression pedal similar in operation to the arrangement of Fig. 10 but differing in structure;

Fig. 13 is a side elevational view of the arrangement of Fig. 12;

Fig. 14 is an elevational view of a dual purpose expression control pedal in accordance with the invention utilizing a rocker arm switching arrangement; and

Fig. 15 is a sectional view of the arrangement of Fig. 14 taken along line 15—15.

In Fig. 1 there is illustrated a single manual organ having a number of different controls for altering the characteristics of the musical tones produced including a plurality of voicing controls 1, a vibrato control 2 and a percussion control 3. In the particular type of organ illustrated there is generally included no means for presetting more than one combination of musical characteristics. However, in accordance with the present invention, the organ of Fig. 1 includes a dual purpose expression pedal 4 which is suspended on a shaft 5 to which there is at-

tached a transducer such as a conventional volume control 6 so that as the pedal 4 is rocked back and forth about the axis of the shaft 5, a variation in the volume of musical tones produced by a speaker 7 is achieved. In addition, the pedal 4 is supported for rotational movement around an axis normal to the axis of the shaft 5 by means of a bracket 8.

As described in detail below, switching devices may be associated with the pedal 4 so that upon a sidewise rotational movement various combinations of preset characteristics may be selected to modify readily the musical effect of the tones being produced. In this connection, a special preset control knob 9 is included in the organ of Fig. 1 by means of which preset combinations of musical characteristics may be established for selection through the sidewise movement of the pedal 4. It has been found that the sidewise rocking motion of an organist's foot on the pedal 4 may be quickly mastered so that an independent control of expression and other musical characteristics may be achieved through manipulation of the pedal 4 in each of two mutually exclusive directions.

For the sake of comparison, Fig. 2 illustrates in simplified form a conventional organ expression pedal 11 supported on a shaft 12 to which is attached a potentiometer 13 for controlling the amplitude of electrical signals within an electronic organ. The shaft 12 is supported in bearings 14 and 15 for rotational movement with the position of the pedal 11 controlling the position of the potentiometer 13 and hence the volume of the musical tones being generated.

Figs. 3–6 illustrate a preferred arrangement of a dual purpose expression and control pedal in accordance with the invention for use in a musical instrument such as the organ of Fig. 1 in which a pedal 16 is suspended for rotational movement about two separate and mutually exclusive axes of rotation.

One axis of rotation is established by the bracket 17 within the end portions of which the pedal 16 is supported by means of suitable pivots illustrated in Figs. 3–6 as comprising conventional screws 18 and 19. The pedal 16 may be rotated around the axis of the screws 18 and 19 to actuate a pair of single-pole double-throw switches 20 and 21. The center leaf of each of the switches 20 and 21 is attached to an extension 22 and 23, respectively, so that when the pedal 16 is turned in one direction on the axis of the screws 18 and 19, the bottom surface engages the extension 23 to actuate the switch 21 and, when the pedal 16 is turned in the opposite direction, the bottom surface engages the extension 22 to actuate the switch 20. The rotational movement of the expression pedal about the axis of the pivot screws 18 and 19 is illustrated diagrammatically in Fig. 4.

The switches 20 and 21 are supported by means of insulating blocks 24 and 25, respectively, on the bottom surface of the bracket 17. The bracket 17 may be fastened to a rotatable shaft 26 by means of the screws 27 and 28 for rotational movement within the bearings 29 and 30. Accordingly, the pedal 16 may be rotated about the axis of the shaft 26 independently of motion around the axis of the pivot screws 18 and 19. By connecting a suitable transducer to the shaft 26, as illustrated in Figs. 1 and 2, the dual purpose expression control pedal of Figs. 3–6 may be employed to position a volume control transducer as well as to actuate selectively either of the switches 20 and 21.

With the above description of a dual purpose expression control pedal in mind, reference is made to Fig. 7 which comprises a simplified block and schematic circuit diagram of an electronic musical instrument in which a dual purpose pedal may be employed to select preset musical characteristics as well to control the volume of reproduced musical tones.

In Fig. 7 a plurality of tone generators 31 are arranged to generate the tones in a conventional musical scale. In some types of organs, separate tone generators are employed for each note of the musical scale. However, in a small organ of the type illustrated in Fig. 1, it is preferable to utilize a shared oscillator system in which each of the tone generators is arranged to generate two or more adjacent notes in a chromatic musical scale. For the sake of simplicty, a circuit diagram for only one of the tone generators 31 is illustrated in Fig. 7 and comprises a conventional oscillator circuit incorporating an electron tube 32 whose frequency of oscillation is determined by the values of a capacitor 33 and an inductance 34 connected to form a parallel resonant tank circuit.

As is well known, the waveform of an electrical signal bears a direct relationship to the voicing or musical characteristics of a musical tone produced where the electrical signal is applied to a sound producing transducer such as a speaker. In general, electrical signals which follow sine wave patterns may be referred to as pure tone signals which correspond to the well known flute stops in organ music. In contrast, electrical signals having a relatively high harmonic content may be referred to as complex tone signals and are suitable for producing musical sounds resembling string, reed, diapason and horn. Accordingly, in the arrangement of Fig. 7, an electrical signal of high harmonic content for complex tones may be derived from the tone generator 31 on a lead 35 while substantially sine wave signals for pure tones may be derived on a lead 36. Both the complex tone signals and the pure tone signals from each of the plurality of oscillators 31 may be fed to a plurality of keyboard switches 37 which are arranged to be actuated by the playing keys of an electronic musical instrument. In general, it is common practice for each of the keys in the musical instrument to be arranged to actuate two or more individual electrical switches, each of which is connected to pass either complex tones or pure tones to common leads, such as the leads 35 and 36, connected to a voicing circuit in which the final selection of the musical characteristic desired to achieved. Accordingly, in Fig. 7 complex tones from each of the plurality of oscillators 31 are passed to the lead 35 whenever the associated keyboard switches 37 are actuated. In a similar fashion, pure tones from each of the plurality of oscillators 31 are passed to the lead 36 whenever corresponding ones of the keyboard switches 37 are closed.

Although the voicing circuits employed in most conventional electronic organs are relatively complex, there is illustrated in Fig. 7 a number of simplified circuits for purposes of illustration. The complex tone on the lead 35 may be passed via a capacitor 41 when a switch 42 is closed so that lower frequency components of the complex tone are attenuated and an electrical signal is formed which when reproduced has the characteristic of a string instrument. Similarly, the complex tone on the lead 35 may be passed via a resistor 43 by closing a switch 44 so that substantially all of the frequency components in the complex tone are present in the output to form an electrical signal having characteristics similar to read instruments. By means of a filter, including the resistors 45 and 46 and the capacitor 47, selected frequency components of the complex tone appearing on the lead 35 may be passed when a switch 48 is closed corresponding to the well known diapason organ stop. Electrical signals having the characteristics of the horn type musical instruments may be formed in the voicing circuits by closing a switch 49 to pass the complex tone from lead 35 through a network including the resistors 50 and 51, an inductance 52A and a capacitor 52B. Flutelike tones may be derived from the substantially sine wave signals appearing on the lead 36 by means of a smoothing filter including the resistors 53 and 54 and the capacitor 55 when a switch 56 is closed.

Although any combination of musical characteristics may be preset within the voicing circuit, a very pleasing combination of characteristics occurs where one or all of the string, reed, and diapason electrical signals are combined on one voicing circuit output lead 57 and elec-

trical signals corresponding to one or both of the horn and flute signals are combined on another voicing circuit output lead **58**. Thus, the voicing circuits may be preset by actuation of the switches **42**, **44** and **48** and by actuating of the switches **49** and **56** to produce on the leads **57** and **58** two distinctly different electrical signals having characteristics corresponding to separate and contrasting musical effects.

In accordance with the invention, the signals appearing on the leads **57** and **58** are applied to opposite fixed contacts on a single-pole double-throw switch **59**. When a four-position panel selection switch having two separate ganged decks **60A** and **60B** is in position A, B, C or D, the position of the single-pole double-throw switch **59** determines which of the electrical signals appearing on the leads **57** and **58** are to be passed to an output amplifier **64**.

The switches **60A** and **60B** may be mounted on the control panel of a musical instrument in the manner illustrated by the preset control knob **9** of Fig. 1. The single-pole double-throw switch **59** may comprise one of the switching devices associated with the dual purpose expression control pedal of Figs. 3–6 so that as the expression control pedal is rotated from side to side, the input circuit of the amplifier **64** is switched to receive electrical signals from either the string-reed-diapason lead **57** or from the horn-flute lead **58**. A potentiometer **62** is connected between the movable contact of the switch **59** and the amplifier **64** for the purpose of varying the amplitude of the electrical signals. Thus, by linking the potentiometer **62** to the shaft **26** of the dual purpose expression control pedal of Figs. 3–6, a combined expression control and voicing selection may be achieved.

When the preset control switch **60A** is in position B, electrical signals appearing on both the leads **57** and **58** are passed to the amplifier **64** irrespective of the position of the switch **59**. Accordingly, position B may be termed a normal position in which the preset arrangement of the invention is rendered inoperative and the musical instrument functions in conventional fashion.

Although the preselection arrangement described above and illustrated in Fig. 7 provides a means by which any electronic musical instrument may be adapted for preset musical effects to advantage, there is also illustrated in Fig. 7 an additional arrangement by means of which another musical characteristic, such as, for example, the vibrato, may be controlled along with the preset voicing or independent of the preset voicing by means of a dual purpose expression pedal. For this purpose, a switch **60B** may be ganged with the switch **60A** for selection of the characteristic desired and a second expression pedal switch **61** is arranged to be actuated by a dual purpose expression pedal as shown in Figs. 3–6. A vibrato control potentiometer **63A** may be connected to the movable contact of the switch **61** so that when the selection switch **60B** is in position A, the connection is completed to the left-hand fixed contact of the switch **61** via the potentiometer **63A** to a vibrato control circuit **63B**. As noted above, when the preset selection switch **60A** is in position A, the expression pedal switch **59** functions to select either the signals appearing on the lead **57** or the signals appearing on the lead **58**. Therefore, in position A where the switches **60A** and **60B** are ganged, there is provided an arrangement in which vibrato effects are provided along with the string-reed-diapason sounds, while in the opposite position of the expression pedal switches **59** and **61**, horn-type and flute sounds without vibrato are provided. Positions B and C of the switch **60B** render the vibrato system inoperative so that in position B a normal operation of the musical instrument unaffected by the expression pedal switches **59** and **61** is provided, and in position C the switch **59** enables a selection of either the signals of a lead **57** or lead **58**, both without vibrato.

By positioning the switches **60A** and **60B** in position D, a circuit is completed to the right-hand fixed contact of the expression pedal switch **61** to the vibrato control circuit **63B** so that vibrato along with a selection of voices is provided in which the vibrato appears when the signals from the horn-type and flute signals from the lead **58** are passed to the amplifier **64** with the string-reed-diapason signals from the lead **57** being passed to the amplifier **64** without vibrato. The vibrato control circuit **63B** may be connected to the tone generators **31** in conventional fashion for modifying the frequency of oscillation of each of the tone generators within a small range at an amplitude and speed of variation determined in part by the position of the potentiometer **63A**.

Although only two expression pedal switches **59** and **61** have been illustrated in Fig. 7 in a circuit arrangement for controlling the voicing and vibrato of a musical instrument in accordance with the position of two ganged four-position preset selector switches **60A** and **60B**, it will be appreciated that additional or substitute musical effects may be achieved through the use of additional expression pedal switches for controlling any desired combination of characteristics such as, for example, percussion. In addition, the expression pedal switches need not necessarily be limited to single-pole double-throw switches. For example, the expression pedal switches may comprise multiple position switches or variable transducers linked to the expression pedal so that various musical effects may be achieved through positioning of the expression pedal in a direction mutually exclusive of the direction in which the expression pedal is positioned for control of the amplitude of the sounds produced.

Although the arrangement of a dual purpose expression pedal in accordance with the invention illustrated in Figs. 3–6 is preferable due to its simplicity of construction and ease of operation, it will be appreciated that other arrangements of an expression pedal for movement in two mutually exclusive directions may be employed as well. Accordingly, there is illustrated in Figs. 8–15 several different arrangements in which an expression pedal may be supported for movement independently in two directions for control of both the amplitude and musical characteristics of sounds produced in an electronic organ in accordance with the invention.

For example, Figs. 8 and 9 illustrate one such arrangement in which a pedal **66** is mounted on a central bearing **67** for pivotal movement about an axis determined by the position of the bearing with respect to a rotatable shaft **68**. As before, an amplitude control transducer (not shown) may be linked to the shaft **68** so that as the pedal **66** is moved back and forth about the rotational axis of the shaft **68**, a volume control may be achieved. By means of the pins **69A**, one or more suitable expression pedal switches **69B** mounted beneath the pedal **66** may be actuated, so that the rotational movement about the pivot point **67** may be emloyed for the control of the voicing, vibrato, percussion or other musical effects as described above in connection with Fig. 7.

Another alternative arrangement is illustrated in Figs. 10 and 11 in which a pedal **70** is supported in a cradle **71** on a shaft **72**. By rotation of the pedal **70** about the shaft **72** to which may be attached an amplitude control transducer, normal expression may be achieved. By pressing the expression pedal forward and back, the cradle **71** rocks on the pivot point **73** between a pair of stops **74** and **75** (Fig. 11). Suitable switches (not shown) may be arranged to be actuated by the rocking movement of the pedal **70** and cradle **71** between the stops **74** and **75** to control any desired musical effect. An arrangement similar in operation to the expression pedal of Figs. 10 and 11 is illustrated in Figs. 12 and 13 in which the pedal **76** is supported on a shaft **77** within a cradle formed by the brackets **78** and **79** which may be moved back and forth between the stops **80** and **81** (Fig. 13) about the shaft **82** by moving the pedal **76** in a longitudinal direction to actuate selection switches (not shown).

Figs. 14 and 15 illustrate another alternative arrangement of a dual purpose expression control pedal in ac-

cordance with the invention in which an expression pedal 83 is mounted in a conventional fashion for rotation of a shaft 84 to which may be attached a volume control transducer as before. Control of musical effects such as voicing, percussion or vibrato is achieved in the arrangement of Figs. 14 and 15 by means of a toe rocker 85 which is arranged to actuate the plunger 86 linked to a switch 87. Thus, in the arrangement of Figs. 14 and 15 the toe rocker 85 may be depressed on one side or the other by the organist's foot to actuate one or more switches 87 for the purpose of controlling preset musical effects as described above in connection with Fig. 7.

Throughout the above description and in the appended claims, the terms "voicing" and "voicing circuits" are intended to include each of the various combinations of musical effects such as tone color, vibrato and percussion, and the circuits by which such effects are achieved. Accordingly, wherever the above mentioned terms are used, they should be taken to include any arrangement for producing the desired musical effects.

The specific arrangements of a dual purpose expression and preset selection control systems illustrated in the drawings and described in detail above are intended to be by way of example only. Accordingly, any and all modifications, variations or equivalent arrangements falling within the scope of the annexed claims should be considered to be a part of the invention.

What is claimed is:

1. In a musical instrument in which a foot-operated pedal is employed to control the intensity of musical sounds produced by the instrument, the combination of a musical tone generator, a plurality of voicing control devices coupled to the tone generator from which may be derived selected variations in the characteristics of a musical sound having distinctly different musical effects, a selection device coupled to the voicing control devices for switching from at least one musical effect to at least one other musical effect, and means linking the selection device to the foot-operated pedal so that the foot-operated pedal may be employed to vary the musical characteristics as well as the intensity of sounds produced by the instrument.

2. In a musical instrument including a sound generating device capable of producing sounds having selectable characteristics and variable intensity the combination of means for generating musical tones having various selectable characteristics producing distinctly different musical effects, a foot-operated pedal independently movable in two mutually exclusive directions, a voicing selection means coupled between the tone generating means and the sound generating device for passing musical tones of selected characteristics, means linking the foot-operated pedal to the voicing selection means for varying the characteristics of the musical tone applied to the sound generating device as a function of movement of the foot-operated pedal in one of said two mutually exclusive directions, intensity control means coupled between the tone generating means and the sound generating device for controlling the intensity of musical tones, and means linking the foot-operated pedal to the intensity control means for varying the intensity of the sounds produced by the sound generating device as a function of movement of the foot-operated pedal in the other of said two mutually exclusive directions whereby a single foot pedal may be employed for a dual purpose to control the voicing of the instrument as well as the intensity of sound produced thereby.

3. In a musical instrument capable of producing musical sounds having selectable characteristics and variable intensity the combination of a foot-operated pedal independently movable in two mutually exclusive directions, a source of electrical signals corresponding to musical tones having various selectable characteristics, an output circuit, expression control means coupled between the source of electrical signals and the output circuit for varying the amplitude of signals passed to the output circuit, a first mechanical linkage between the foot-operated pedal and the expression control means for varying the amplitude of the signals applied to the output circuit as a function of movement of the foot-operated pedal in one of said two mutually exclusive directions, a voicing selection circuit connected between the source of electrical signals and the output circuit, and a second mechanical linkage between the foot-operated pedal and the voicing selection circuit for varying the characteristics of the electrical signals applied to the output circuit as a function of movement of the foot-operated pedal in the other of said two mutually exclusive directions whereby a single foot-operated pedal may be employed for a dual purpose to control the voicing of the instrument as well as the intensity of sounds produced thereby.

4. In a musical instrument capable of producing sounds having selectable characteristics and variable intensity the combination of a source of electrical signals representing musical tones, a foot-operated pedal suspended for rotational movement about two independent axes, an output circuit, expression control means coupled between the electrical signal source and the output circuit, a first mechanical linkage between the foot-operated pedal and the expression control means for varying the amplitude of the signals passed from the electrical signal source to the output circuit as a function of rotational movement of the foot-operated pedal about the first one of said two independent axes, a voicing circuit coupled between the electrical signal source and the output circuit, a second mechanical linkage between the foot-operated pedal and the voicing circuit for varying the characteristics of the electrical signal source to the output circuit as a function of rotational movement of the pedal about the other of said independent axes whereby a single foot-operated pedal may be employed for a dual purpose to control the voicing of the instrument as well as the intensity of sounds produced thereby.

5. In a musical instrument capable of producing sounds and having selectable characteristics and variable intensity the combination of a source of electrical signals representing musical tones, a foot-operated pedal independently movable in two mutually exclusive directions, an output circuit, expression control means coupled between the electrical signal source and the output circuit, electrical switching means mechanically linked to the foot-operated pedal for actuation in response to movement in one of said two mutually exclusive directions, at least two preset voicing circuits coupled to the electrical signal source, and means coupling the electrical switching means between the preset voicing circuits and the output circuit so that electrical signals from either one of the voicing circuits may be passed to the output circuit as a function of the position of the foot-operated pedal in one mutually exclusive direction and the intensity of electrical signals passed to the output circuit is a function of the position of the foot-operated pedal in the other of the two mutually exclusive directions.

6. In a musical instrument capable of producing musical sounds having selectable characteristics and variable intensity the combination of a foot-operated pedal, a first mechanical suspension system within which the foot pedal is supported for rotational movement about a first axis, a second mechanical suspension system within which the pedal is supported for rotational movement about a second axis, an expression control device, means linking the expression control device to the foot pedal for translating rotational movement of the pedal about the first axis into a variation in intensity of the sounds produced by the musical instrument, a voicing control circuit, and means linking the pedal to the voicing control circuit for translating rotational movement of the pedal about a second axis into variations in the characteristics of musical tones produced by the musical instrument.

7. In a musical instrument capable of producing musical sounds having selectable characteristics and vari-

able intensity the combination of a source of electrical signals representing musical tones, a first voicing circuit associated with the source of electrical signals, a second voicing circuit associated with the source of electrical signals, a foot-operated expression pedal, an output circuit, and switching means coupled between the voicing circuits and the output circuit and linked to the foot-operated pedal whereby electrical signals derived from either of the voicing circuits may be selectively passed to the output circuit as a function of the position of the expression pedal.

8. In a musical instrument the combination of a foot-operated pedal independently movable in two mutually exclusive directions, including the combination of means linked to the foot-operated pedal for producing musical tones of variable intensity in accordance with the position of the foot-operated pedal in one of said two mutually exclusive directions, and means coupled to the foot-operated pedal for providing musical tones having variable characteristics producing distinctly different musical effects as a function of the position of the foot-operated pedal in the other of said two mutually exclusive directions.

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