

Sept. 18, 1962

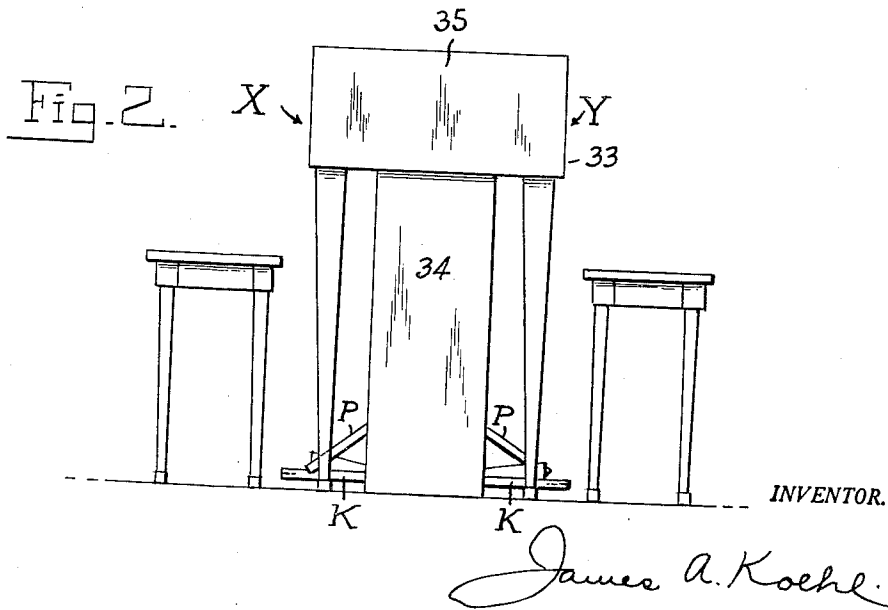
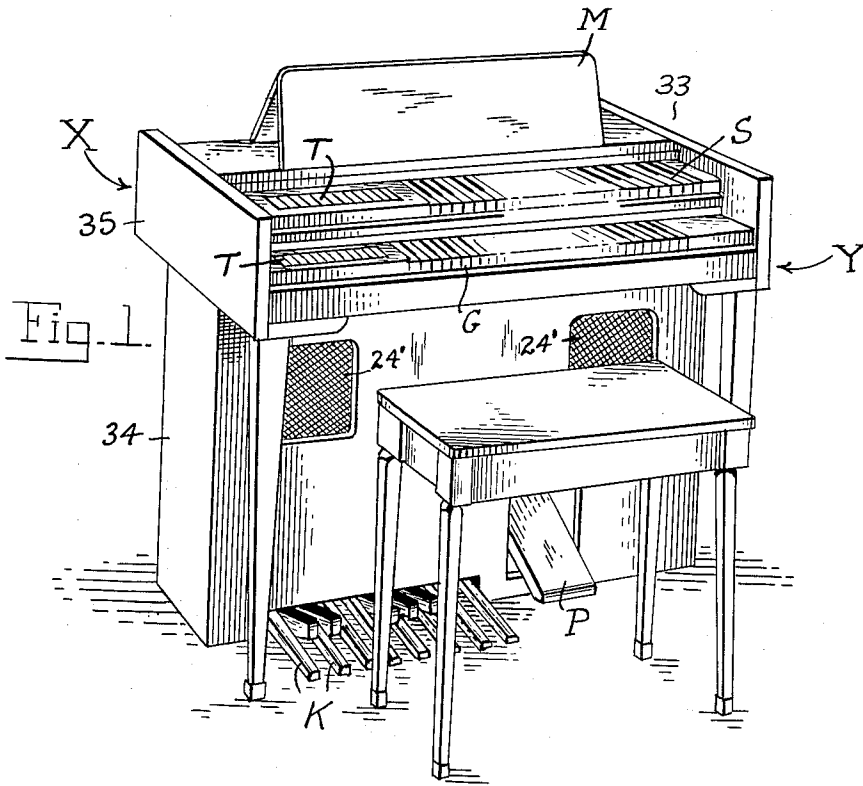
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3,054,318

ELECTRICAL MUSICAL INSTRUMENTS

Filed Oct. 10, 1960

3 Sheets-Sheet 1



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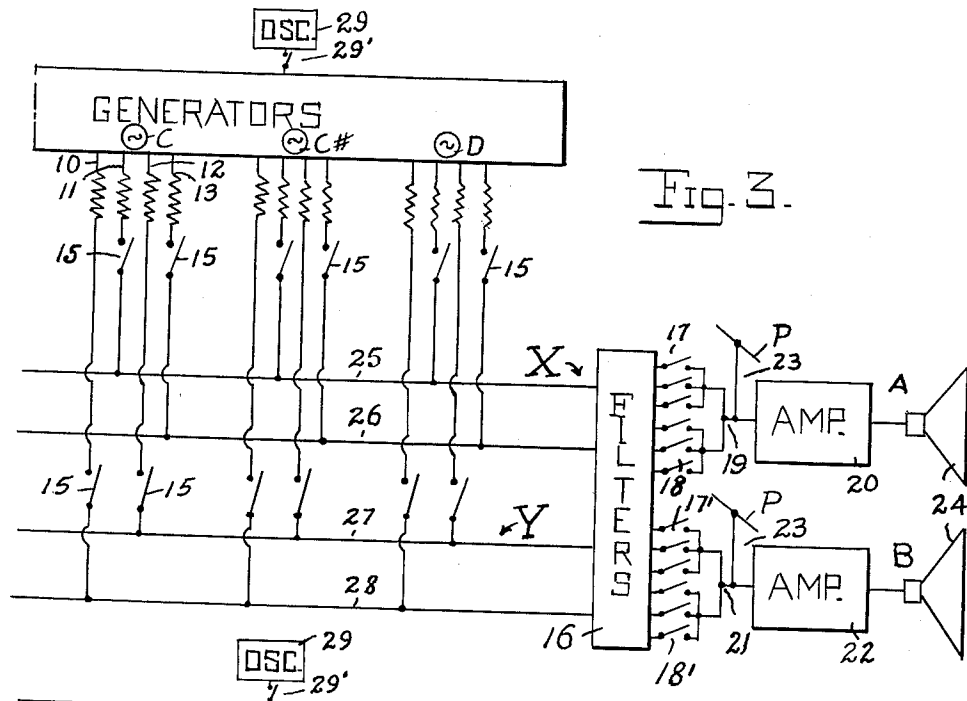


Fig. 3.

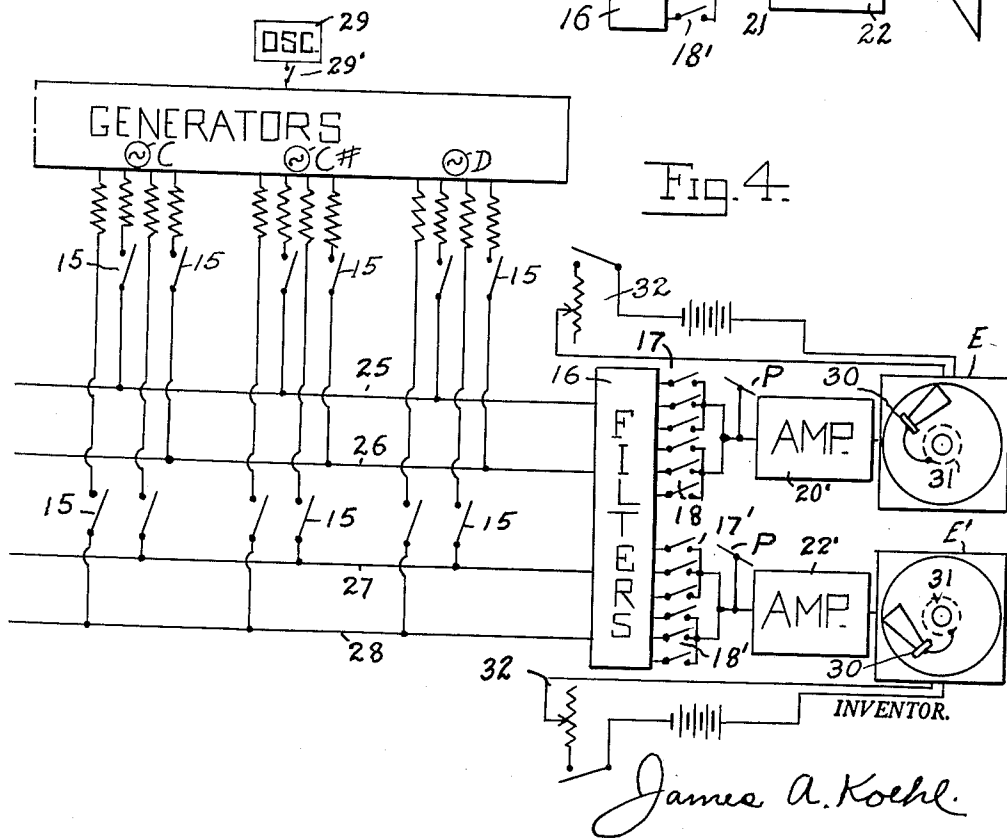


Fig. 4.

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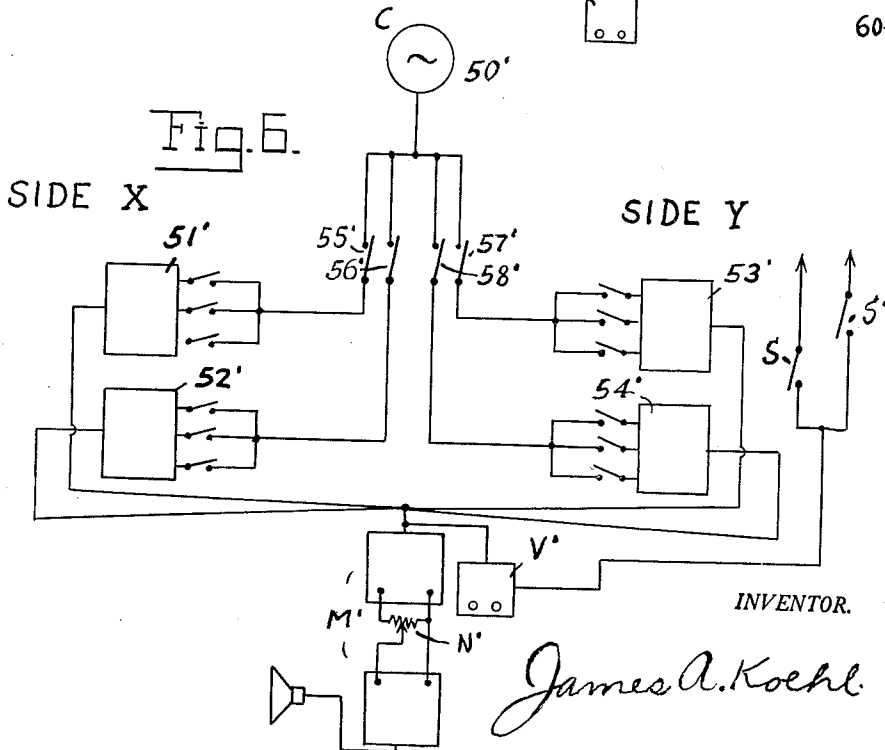
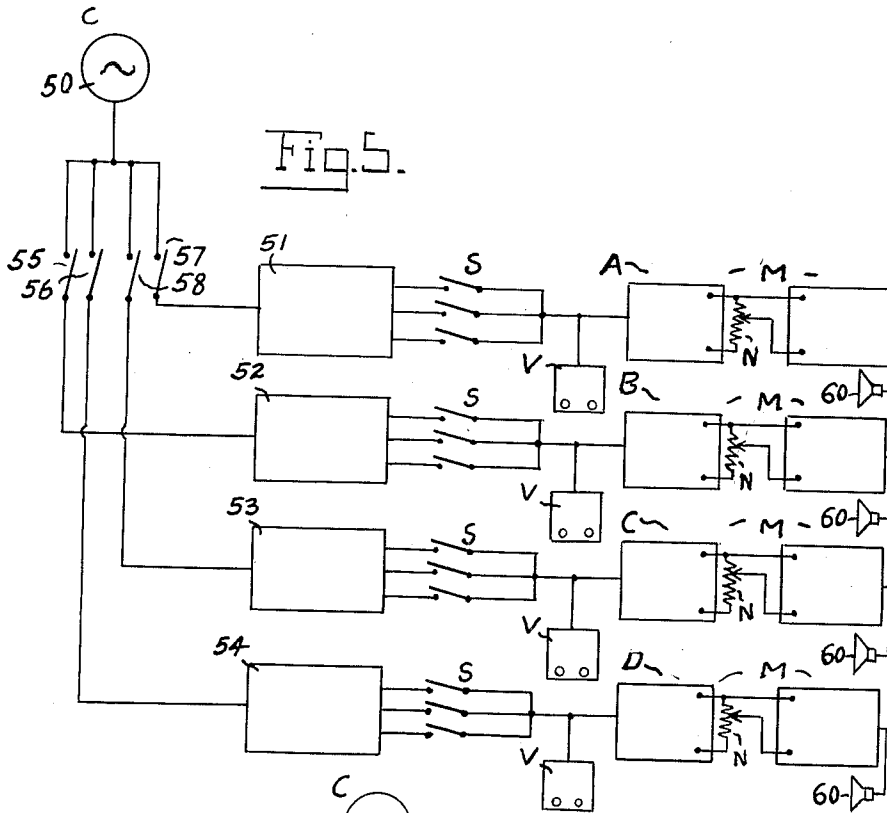
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ELECTRICAL MUSICAL INSTRUMENTS

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ELECTRICAL MUSICAL INSTRUMENTS

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8 Claims. (Cl. 84-1.17)

This invention relates to electrical musical instruments and more particularly to electrical organs employing sources of electrical signals of the note frequencies of the musical scale, and one or more electroacoustic systems for translating selected signals into audible sounds of different timbre in response to depression of the instrument's playing-keys and according as different stops are drawn. Following are certain of the more important objects of the invention:

The provision of a duo electrical organ adapted to be played conjointly by players positioned at the respective sides of the organ.

The provision of a duo electrical organ in which all tone frequencies are preferably derived from a common set of tone frequency sources.

The provision of a duo electrical organ, the combined audible effects at the ears of listeners, is comparable to hearing two similar individual organs playing the same musical composition at the same time.

The provision of a duo electrical organ for use by professional players at places of public entertainment, and in bands, orchestras and in choral singing.

The provision of a duo electrical organ for use conjointly by instructor and pupil in teaching the management of the stops and controls of the instrument and for imparting to the pupil an elementary understanding of the physical and psychological characteristics of music.

The provision of a duo electrical organ which is admirably suited for use by educators in discovering one's aptitudes and talent for music necessary to be considered for avoidance of possible misguided effort on the one hand, and to justify, on the other hand, recommending avocational or vocational guidance in music; an organ characterized by new and unique features which attract children and are a strong influence in bringing out in an impressive way hidden talent and aptitudes and serve to create in children a competitive spirit and firm determination intelligently to understand the rudiments or principles of music and to become proficient in use of playing techniques; and, an organ which is invaluable as an instrument for homes, in that, it can be played conjointly by any two members of the family and/or persons present at social gatherings, and whereby, and incident to the herein stated possibilities and advantages, the instrument makes for a wholesome environment in homes and offers and creates a strong urge in one member of a family to copy after and play as well or better than a member of the family who may be experienced in organ playing.

The provision of a duo electrical organ which is exceptionally suited for recording and reproducing high fidelity music.

The provision of a duo electrical organ, the dimensional size, form, shape and weight of which are not excessive compared with instruments of the prior art.

The provision of a duo electrical organ, which, for certain usage may be characterized by features providing, in effect, two sensibly identical organs, whereas, for other usage, the controls at the respective sides of the instrument can be different from each other; for example, those at one side may be confined to playing sustained tones only or mostly so, whereas, those at the other side may all thereof be confined to producing special sound effects including sounds typical of different percussion instruments.

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The provision of a duo electrical organ embodying features under the joint control of two players for producing greatly improved "choir," "chorus," "doppler," "celeste" and other interesting and pleasing effects which are the resultant of slight changes in frequency relationship between nominally similar tones.

The new functional and novel features of my invention, including the interconnection and interrelationship between the various instrumentalities are set forth with particularity in the herein appended claims. The invention, however, both as to the organization of said instrumentalities and their mode of operation, together with additional objects and advantages will be fully understood from the following description of the herein disclosed embodiments of the invention taken in connection with the accompanying drawings in which:

FIGURE 1 is a perspective view of the invention.

FIGURE 2 is a view in end elevation of the invention.

FIGURE 3 is a schematic illustration of the circuits embodied in the form of the invention shown at FIGURES 1 and 2.

FIGURE 4 is a view similar to FIGURE 3 showing a slightly modified form of the invention.

FIGURE 5 is a view similar to FIGURE 3 showing a still further form of the invention, and

FIGURE 6 is a schematic illustration of a still further form of the invention.

As the basic feature of the invention is the embodiment in an electrical organ of manuals disposed at the respective sides of the console of the instrument for conjoint playing by persons seated thereat and facing each other, the annexed claims shall not be construed to mean that there is any limitation upon the number of manuals that may be employed or the frequency ranges of said manuals. The term "manual" wherever used herein shall be construed to mean any suitable number of playing-keys which may be depressed and are normally resiliently biased to raised conditions.

The term "tone generator" as used herein shall mean any device of the prior art designed and adapted to produce electric pulsations of the semitone frequency of a given note of the equally tempered scale. A preferred type of such a device is one that produces a complex waveform which may be converted in any one of a number of different patterns typical of the tone quality of a given musical instrument.

At FIGURE 3, generators respectively designated C, C# and D are each provided with four high resistive keyer circuits 10, 11, 12 and 13 in each of which is a playing-key switch 15 normally biased to open circuit condition.

A wave filter system 16 is employed for converting the complex output waveforms of signals from generators C, C# and D into waveforms sensibly typical of musical sounds of different timbre. Said filter system essentially consists of sets of stop switches 17, 18, and 17' and 18'. Switches comprising the uppermost set shown at FIGURE 3 connect at common point 19 to amplifier 20 of an electroacoustic translating means A. Switches 17' and 18' of the lowermost set connect at common point 21 to amplifier 22 of an electroacoustic translating means B. The respective translating means A and B are individually operable and together, they comprise a system common to the "Swell" and "Great" manuals at the respective sides of the organ as will be more fully pointed to presently. Each means A and B has embodied therein a volume control device 23 adapted to be operated by a foot pedal P, and, as shown, each amplifier 20, 22 is provided with a loud speaker 24.

The several embodiments of the herein disclosed invention are basically the same, i.e. each is essentially characterized by a console 33, both sides of which are sensibly alike. In the instant case, each side has a "Swell" manual

S, a "Great" manual G and a suitable number of pedal keys K, all of said manuals and all of the pedal keys being coactive with a common set of tone generators.

To this point in the description of the invention and with immediate reference to FIGURE 3, it follows that when close circuiting one or more of the stop switches 17, 18 and/or 17' and 18' and when playing said manuals and/or pedal keys, waveforms of signals being conducted from the generators via selected keyer circuits 10, 11, 12 and 13 will be impressed on respective ones of the channels 25, 26 and/or 27 and 28 and then conducted to amplifiers 20 and 22.

The tone sources may be of any well known type but preferably designed and adapted to produce complex waveforms. In the disclosed embodiments the sources are vacuum tubes connected in cascade as frequency dividers and controlled by master oscillators as in the Oswald Patent No. 2,506,679 or in Larsen No. 2,403,090; Langer No. 2,533,821; Larsen No. Re. 23,376; Anderson et al. No. 2,818,762; Anderson No. 2,823,310 or Larsen et al. No. 2,568,644, either of which lends itself to satisfactorily modulating the outputs of said sources at a predetermined vibrato rate by means of a vibrato oscillator coupled to the master control circuits of the respective cascades of which there are twelve, each producing output waves at octave separation for notes of the same letter of the scale. At FIGURES 3 and 4 there is shown a vibrato oscillator 29 having a control switch 29', the oscillator adapted to function in the manner above stated. However, in lieu of an oscillator connected in circuit with the master oscillators of the respective cascades, use can be made of a vibrato oscillator in the input of the amplifier of the wave translating system according to the disclosure in the Daniels Patent No. 2,466,306 or as disclosed in other patents of the prior art, the difference in the latter vibrato means, as compared with the former arrangement being that modulation is effected at the amplifier.

The embodiment shown at FIGURE 4 is substantially the same as the embodiment shown at FIGURE 3, except with respect to the wave translating system. The amplifiers 20' and 22' are each thereof coupled to a directional loud speaker 30, the throat of the horn of which is angular to the vertical axis about which the horn is rotatable at any desired angular velocity, such as, for example, by means of a variable speed motor 31 having a rheostat 32 for changing the speed of the motor as desired with resultant changes in pitch of the reproduced sounds according to Doppler's principle. Devices of this general character are well known and reference is made to the disclosures in Patents Nos. 2,114,680 and 2,287,105.

It is an accepted fact that where several instruments of the same kind are playing in unison, the effect is not merely an increase of sound intensity, and that the slightest difference in frequency between nominally similar tones will result in changing the phase relationship, and while audible beats may not be produced between fundamental tones, beats will exist from the greater difference between their higher harmonic partials. In the case of several violins playing in unison where the vibrato rates are necessarily different and the mean frequencies and the partial frequencies are also different, the musical effect is that of a choir or chorus of voices.

Therefore, aside from the fact that the main feature of the invention is a duo electrical organ, the manuals at the respective sides of the console of which can be played conjointly by players facing each other, it is an important object of the invention to so combine the herein disclosed devices and mechanisms that there will or can be, at the discretion of the players, either no vibrato on voices, or there may be vibrato on voices produced when playing the manuals at only one side of the console or on voices produced when playing the manuals at both sides of the console, also that the vibrato rates can be varied relative to each other and that the volume of sound at the directional loud speakers can be individually controlled. When both

loud speakers are in rotation at relatively different speeds, the chorus effect is comparable to twice as many variations in pitch than when but one thereof is rotating. When both loud speakers are rotating, the difference in speed between them is preferably very slight, but sufficient to enable recognizing differences in vibratos while establishing norms which will be pleasant to all listeners. I point to the advantage of blending pitch intensity and timbre vibratos. It is also important that it be noted that by providing a volume control at each amplifier, effects are obtained that are more nearly like a number of instruments of the same kind playing in unison, during which, all thereof are not in the same pitch as would be the case with violinists when bowing where no two movements would be in synchronism.

Referring to FIGURES 1 and 2, the console 33 of the organ is of T-shape in end elevation providing a vertical section 34 which may enclose the tone sources and others of the disclosed elements, and a horizontal and transversely disposed upper section 35, the latter providing lateral extensions which are equi-distant relative to the longitudinal median line of the organ and on which the manuals and controls of the organ are mounted. The "Swell" and "Great" manuals may comprise any desired number of playing keys. The stop tablets T may be as shown or of any conventional form. At FIGURE 3, we can assume that the manuals at side X of the console are electrically coactive with signal transmission channels 25 and 26 and that the manuals at side Y are electrically coactive with channels 27 and 28. The loud speakers 24 in the embodiment shown at FIGURE 3 may be mounted in back of the grilles 24' as shown at FIGURE 1. The directional loud speakers shown at FIGURE 4 can be mounted in enclosures E and E' respectively or in any suitable manner.

While I have indicated use of pedal keys and have shown same at FIGURES 1 and 2, their connection to sources C, C# and D has not been shown in order to avoid unnecessary complication in the circuitry, it being clear to persons skilled in the art that they are adapted to be supplied with waves from the same tone sources that supply the manuals of the instrument.

Referring to the form of the invention shown in FIGURE 5, tone generator 50 is connected in common to timbre control filters 51 and 52 for the "Swell" and "Great" manuals respectively at side X of the console and filters 53 and 54 for the "Swell" and "Great" manuals respectively at side Y of the console. Filters 51, 52, 53 and 54 are each connected in a separate electroacoustic output system A, B, C and D respectively.

Playing-key switches 55, 56, 57 and 58 connect to the inputs of filters 51, 52, 53 and 54, the outputs of said filters each connected by stops S to a translator comprising an amplifier M having a volume control device N and loud speaker 60, the signal input side of the amplifier having a conventional vibrato V which may be of the form shown in the Ranger Patent No. 1,901,985 or the Miessner Patent No. 2,138,500.

In this form of the invention, it follows that each manual is virtually an organ complete in itself to and inclusive of the timbre control means, translator and vibrato, thereby enabling producing chorus effects in a vastly improved manner as compared with instruments of the prior art, the vibrato rate being controlled in any well known manner.

At FIGURE 6, tone generator 50' connects by key switches 55'—56' to filters 51', 52' for the "Swell" and "Great" manuals at side Y of the console of the organ, switches 57' and 58', connecting to filters 53', 54' for the "Swell" and "Great" manuals at side X of said console. The output signals from all filters 51'—54' connect to translator M' having a volume control N' and a vibrato V', the latter adapted to be connected to a source of operating energy by switches S and S' for control thereof from sides X and Y of the console.

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The wave filters shown schematically in the several forms of the invention may be of any well known construction, reference being made to FIGURE 2 in Patent No. 2,403,664; FIGURE 9 in Patent No. 2,332,948 or FIGURE 10, in Patent No. 2,568,644.

What I claim is:

1. An electric organ comprising a console the opposite sides of which are each provided with at least one keyboard, a set of tone signal generators in said console, an electroacoustic output system, timbre control means providing for each keyboard a series of stops, circuitry having switches operated by the keys of said keyboards for conducting to the timbre control means signals from said generators, and stop switches connecting said timbre control means to said output system.
2. An electric organ as set forth in claim 1 wherein the output system includes an amplifier and associated loud speaker for each keyboard and the amplifier is operatively coupled to preassigned ones of said stop switches.
3. An electric organ as set forth in claim 1 wherein the output system includes an amplifier and associated loud speaker for each keyboard and the amplifier is operatively coupled to preassigned ones of said stop switches, and wherein devices are controllable from the respective keyboards for producing a tremulant on sound being emitted from a respective loud speaker.
4. An electric organ as set forth in claim 1 wherein the output system includes an amplifier and associated directional loud speaker for each manual and the amplifier is operatively coupled to preassigned ones of said stop switches.
5. An electric organ as set forth in claim 1 wherein the output system includes an amplifier and associated directional loud speaker for each manual and the amplifier is operatively coupled to preassigned ones of said stop switches, and wherein means are provided for varying the operating speed of said loud speaker.
6. An electric organ comprising a console the opposite sides of which each has at least an upper manual

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- keyboard and a lower manual keyboard, timbre control means providing a set of stops for each of said keyboards, a set of tone signal generators in said console, each keyboard having key operated switches connecting the generators to said timbre control means, an electroacoustic tone signal translating system, and stop switches connecting the timbre control means to said translating system.
7. An electric organ comprising a console of substantially T-shape in a transverse plane and providing a vertical enclosure section and a substantially horizontally disposed upper section having similar portions extending beyond the respective sides of the enclosure section, a set of tone signal generators in said enclosure section, each extended portion of said upper section having at least one manual keyboard, timbre control means, an electroacoustic output system, key switches operatively connecting the generators to said timbre control means for activation of said means from either of said keyboards, and stop switches actuatable from the respective keyboards and operatively connecting the timbre control means to said output system.
 8. An electric organ as set forth in claim 7 wherein said output system comprises an amplifier and associated loud speaker individual to the stop switches of a respective keyboard.

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