

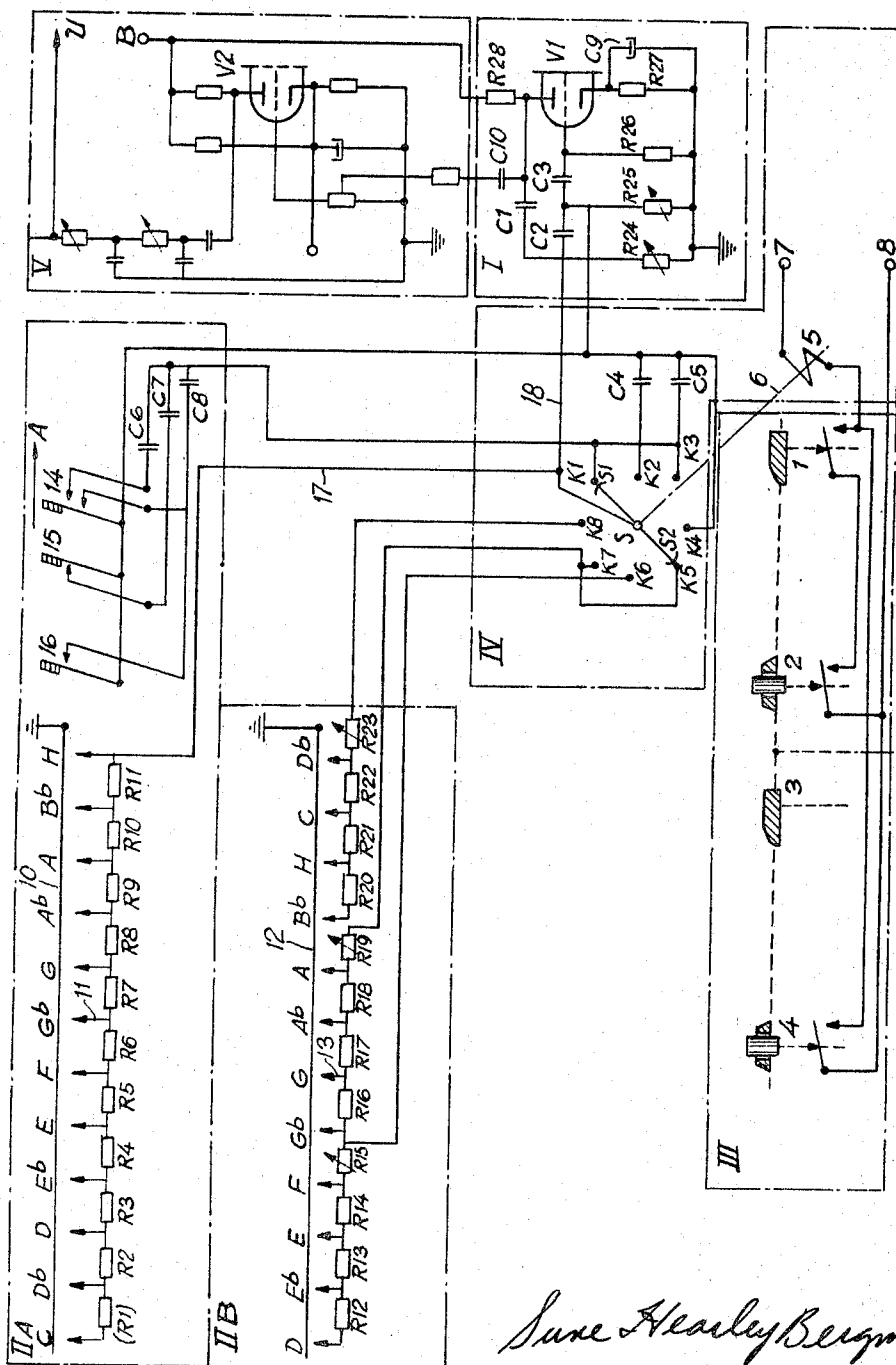
March 11, 1969

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3,432,607

BASS CONTROL OF ELECTRONIC MUSICAL INSTRUMENTS

Filed Aug. 9, 1965



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**BASS CONTROL OF ELECTRONIC  
MUSICAL INSTRUMENTS**

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Filed Aug. 9, 1965, Ser. No. 478,096

Claims priority, application Sweden, June 17, 1964,  
9,897/64

U.S. Cl. 84—1.17

5 Claims

Int. Cl. G10h 3/06, 1/02

**ABSTRACT OF THE DISCLOSURE**

The device has a source of bass tones, a key-board for the selection of bass tones from said source and a pedal device for the initiation of the selected bass tones. Means are arranged to be controlled by the pedal device and successively to bring different selected bass tones to be reproduced in a sound reproducer. Said means perform the automatic alternation between the different bass tones defined in the device for selection of bass tones so that the last mentioned device does not have to be operated for each bass tone which one desires to reproduce but only be operated for each group of bass tones between which groups there will then be obtained an automatical change by means of said means for bass notes in electronic musical instruments.

According to the present invention there is provided a device for producing bass notes in electronic musical instruments, such devices comprising an electronic oscillator for the production of bass tone signals, first frequency-determining elements for the oscillator, second frequency-determining elements controlled selectively by manually operable keys and switching means responsive to a pedal control, the arrangement being that, when a frequency of the oscillator has been determined by one or more selected second frequency-determining elements, operation of the switching means connects stepwise the first frequency-determining elements in parallel with the said selected elements, and the oscillator produces a sequence of bass notes.

In use of a device according to the present invention, the player only needs to select one frequency or note by a key or combination of keys. The first frequency determining elements can, for example, be two in number and be such as, when switched in parallel with the key-selected element or elements, to produce respectively a third and a fifth based on the said one note. When the switch is operated the third and fifth of the said one note are produced so that a three note bass sequence can be produced.

A preferred form of pedal control comprises electrical contacts which are capable of forming a circuit including a relay coil which operates the switching means.

The invention will now be described with reference to the accompanying drawing showing the circuit diagram of a particular device in accordance with the invention, the device being adapted for incorporation into an electronic musical instrument.

The device shown in the drawing comprises an oscillator I, key operated assemblies IIA and IIB, a pedal control III, means IV for progressive and automatic variation of the oscillator frequency and a circuit V. The oscillator I is based on the tube V1 and has a cathode circuit comprising a parallel coupling of the resistance R27 and the condenser C9 and further an anode resistance R28. The input circuit of the tube comprises the cascade coupling of the resistances R24, R25 and R26 as well as the condensers C2 and C3. The ends of the resistors R24, R25, and R26 remote from the condensers

C2 and C3 are connected to earth. Between the input of the grid circuit and the anode of the tube V1 there is connected the return coupling condenser C1. The signal produced by the oscillator is withdrawn via the condenser C10 and fed to the input of the circuit including the tube V2. The circuit V will not be described in detail as it may be of a known type. The circuit V, however, functions initially to pass the full output of the oscillator I and then continuously and rapidly reduces the output to zero to produce a pizzicato effect. The circuit V also serves as a filter to remove undesired harmonics. The output of the circuit V has been denoted U and passes to a sound reproducing device known per se and not shown. The tubes V1 and V2 receive their anode voltage from a battery not shown but indicated by the denomination B.

The frequency of the signal produced by the oscillator, i.e. the note produced by the device, depends on the composition of the grid circuit of the tube V1. This grid circuit comprises besides the resistances R24, R25, and R26 and the condensers C2 and C3, different combinations of resistances and condensers belonging to the assemblies IIA, IIB and IV.

The portion IIA, enclosed by a dash and dot line, is the main keyboard of the device and comprises a conductor 10 coupled to earth and a number of resistances R1-R11 in series having intermediate outputs 11, said outputs being adapted to be connected to the conductor 10 by means of a key arranged for each of the outputs. The note produced by the oscillator as a result of the depression of each key is indicated above the corresponding output 11. The keys are preferably of the automatically returning type and may be of the piano or button type. Reference numerals 14, 15 and 16 indicate manually operated contacts, preferably of the non-return type, which are adapted to modify the frequency changes produced by the assembly IV in the manner to be described subsequently.

The assembly IV comprises a rotor S having two rotor or wiper contacts S1 and S2 arranged diametrically opposite each other and cooperating with stationary contacts K1-K8. As indicated by means of the broken line 6, the rotor S is driven by means of a coil 5 which is fed with current via the terminals 7 and 8. The movable contacts S1 and S2 are interconnected and connected to the conductor 17 from the resistances R1-R11 as well as to the conductor 18 which is connected to the connection point between the condenser C2 and the resistance R24 in the oscillator I.

In order to explain the principle of operation of the illustrated device the contact S2 of the rotor S and the contacts K4-K8 will initially be disregarded. Intermittent rotation of the rotor S will thus cause successively the condenser C4, the condenser C5 and neither of these condensers to be coupled to the network of which the grid circuit of the oscillator I controlling the frequency is composed. The capacitances of the condensers C4 and C5, the grid circuit of the oscillator I and the key operated resistances R1-R11 in the unit IIA are so arranged and chosen that, when the said successive couplings are carried out a major triad on a basic note will be produced by the oscillator. The basic note of the triad is, in fact, produced when the rotor S takes the position in which the condenser C5 is connected in the grid circuit of the oscillator I and the frequency of this basic note is determined by that one of the keys corresponding to the output 11 of the bass tone selector IIA which is operated at the particular moment. Thus, intermittent and repetitive rotation of the rotor S will cause the frequency produced by the oscillator I to move from the basic note corresponding to the operated key, to the third, to the fifth and back to the basic note.

The notes of the major triad, may in the embodiment shown, be modified by means of the contact devices 14, 15 and 16 and the related condensers C6, C7, and C8. The capacitances of the condensers C6-C8 are chosen in such a way as to achieve the desired modification. Thus the third of the triad could be lowered a semitone so as to obtain a minor triad instead, this modification being achieved by operating the contact device 16 or two of the tones of the major triad could be modified so as to obtain a reduced triad chord, this being achieved by operation of the contact device 14. Of course, the number of contact devices could be chosen as desired and is not restricted to three as in the shown embodiment.

Returning now to contact S2 of the arm S and contacts K4-K8, the note selection capability is increased by the additional selector assembly IIB. The assembly IIB comprises a conductor 12 connected to earth and resistances R12-R23 arranged in three groups. There extend from the resistances in each group outputs 13 which are arranged to be connected to the conductor 12 by means of keys not shown and which may e.g. be identical with the board keys of the manual in an electronic organ. The three resistance groups are connected to the staves 14-16 has been indicated by means of the arrow A, respectively. The operative direction of the contact deflection contacts K5-K8 of assembly IV in such a way that the resistance group R12-R15 is connected to the contact K6, the resistance group R16-R19 is connected to the contacts K5 and K7 and the resistance group R20-R23 is connected to the contact K8. On depression of a key belonging to any one of said three groups and at an intermittent rotation of the rotor S in the unit IV a note will be produced in correspondence to the operated key by means of the oscillator I in a certain position of the rotor S. On depression of two or several keys corresponding to each their resistance group R12-R15, R16-R19 and R20-R23, respectively, an equal number of notes will consequently be produced in sequence by the oscillator I at the intermittent rotation of the rotor S whereas the note corresponding to the resistance group R16-R19 will be produced twice at each cycle of rotation of the rotor S. As appears from the drawing, in the coupling position corresponding to the stationary contacts K6 and K7, the rotor S will connect the condensers C4 and C5 in the grid circuit of the oscillator I controlling the frequency, and for this object these condensers and the rest of the coupling must be compatible the device IIA as well as the device IIB. Thus by means of the intermediary of the device IIB it is possible to produce note sequences with two as well as three parts if two or three keys are kept depressed during the rotation of the rotor S. It is also possible to select the notes of a sequence produced on actuation of the pedal control with a considerably greater freedom of choice than when using the unit IIA. The unit IIB offers practically all the possibilities of bass note combinations which could be required at the playing of very complicated pieces of music.

The initiation or start of the intermittent rotation of the rotor S is obtained in the shown embodiment by means of the pedal device III which comprises the toe contact 1, a first heel contact 2 as well as a second heel contact 4, the latter coordinated with a stationary toe contact 3. The contacts 1, 2 and 4 are connected in a circuit in which are connected the intermittent relay coil 5 and a battery (not shown) and the latter is connected via the terminals 7 and 8. The pedal contacts 1 and 2 are coupled in series with each other and the serial coupling is connected in series with the coil 5 and said battery. The contact 4 is in parallel therewith connected in series with the coil 5 and the battery. When the player uses the pedal contacts 1 and 2, current will consequently be fed to the coil only at the occasions when both the contacts 1 and 2 are closed. In case the player alternatively lets his foot

rest on the toe contact 1 and on the heel contact 2 the rotor S will consequently be advanced a step at each alternation of these two foot positions. However, in case the player uses the pedal elements 3 and 4, the rotor S will be fed only at every second alternation of the foot position, i.e. when the heel contact 4 is operated. These two possibilities of selection have according to the invention for practical reasons turned out to be suitable and essentially sufficient for the execution of commonly played music.

The operation of the device shown in the drawings is as follows: When playing in a certain key and when there is required only triads and modifications thereof according to the classic harmonics, the player keeps the key in the selection unit IIA pushed down which corresponds to the basic tone in the key being played. Simultaneously, the player determines the rhythm by operating, by means of his foot, either the pedal unit comprising the pedal contacts 1 and 2 or the unit comprising the elements 3 and 4. Thereby, the rotor S in the bass tone alternator IV is advanced intermittently and the oscillator I produces note sequences corresponding to a triad which notes may be modified by means of a manipulation of the contact devices 14-16 which cause the desired alternations of the notes comprised in the triad. In the event that the player wishes to obtain a two tone sequence or a three tone sequence of more arbitrary composition, the corresponding keys or buttons in the assembly IIB are kept pushed down and the pedal device III is operated in the manner described in the foregoing with the result that corresponding note sequences are produced by the oscillator I.

It is obvious that the device according to the invention considerably simplifies the playing of the lower part at the playing of musical pieces of classic type as well as of modern type. This in turn means that the player can pay greater attention to the playing of the upper parts especially in cases when a device according to the invention is incorporated in or in another way combined with an electric or electronic music instrument provided with manuals or button systems. It will be appreciated that the device shown in the drawings only produces bass notes.

The tuning of the oscillator I is in the shown embodiment performed by an adjustment of the variable resistances R24 and R25 and with regard to the selector assembly IIB a further tuning can be obtained by means of an adjustment of the variable resistances R15, R19, and R23 which for this reason preferably should be incorporated in the assembly IV, especially in the case when the rest of the resistances of the assembly IIB are incorporated in an electronic organ or another instrument having a manual or a button system.

The invention has been described in the foregoing for purposes of illustration only and is not intended to be limited to the shown and described embodiment and many modifications could be carried out within the scope of the appended claims. Thus, the device is not restricted to the production of sequences comprising two or three notes as the number of the included notes may be greater if desired which of course requires an increased number of contacts in the assembly IV.

I claim:

1. A device for producing bass notes in electronic musical instruments comprising an electronic oscillator for the production of bass tone signals, first frequency-determining elements for said oscillator, second frequency-determining elements controlled selectively by manually operable keys and switching means responsive to a pedal control so that when a frequency of the oscillator has been determined by one or more selected second frequency-determining elements, operation of said switching means connects stepwise said first frequency-determining elements in parallel with said selected elements, and said oscillator produces a sequence of bass notes.

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2. A device as claimed in claim 1 comprising further key operable frequency-determining elements connected by said switching means to said first frequency-determining elements.

3. A device as claimed in claim 1 wherein said second frequency-determining elements are connected to said oscillator and to the moving contact arm of a rotary switch, and said first frequency-determining elements are successively contacted by said contact arm.

4. A device as claimed in claim 1 wherein said pedal control comprises electric contacts capable of forming a circuit including a relay coil which operates said switching means.

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5. A device as claimed in claim 4, wherein one contact of said contacts of said pedal control is connected in parallel with a series connection of the remainder of said contacts.

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U.S. Cl. X.R.

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