

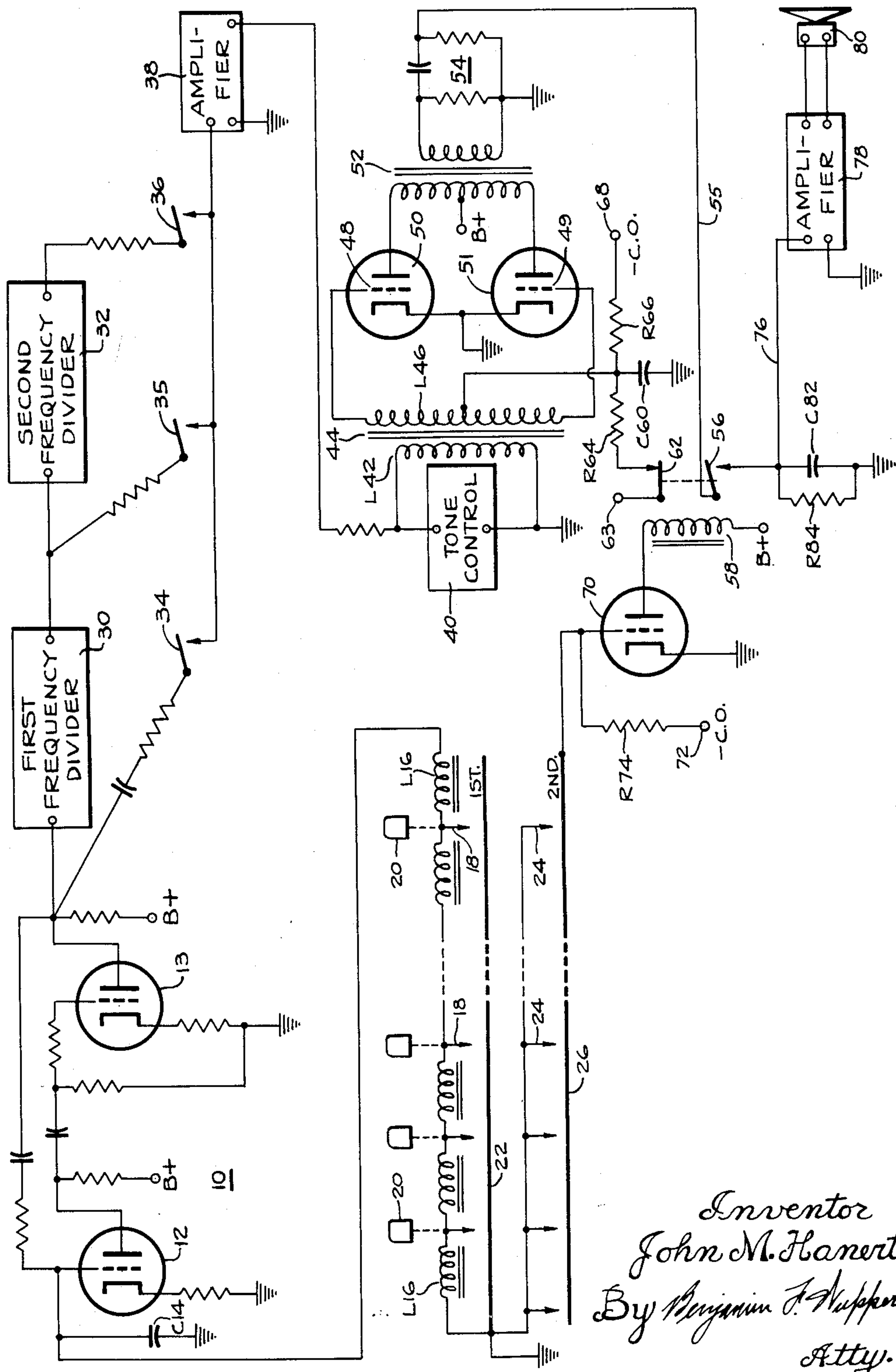
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J. M. HANERT

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PERCUSSION TONE ELECTRICAL MUSICAL INSTRUMENT

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Inventor
John M. Hanert
By Benjamin F. Kupper
Atty.

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PERCUSSION TONE ELECTRICAL MUSICAL INSTRUMENT

John M. Hanert, Des Plaines, Ill., assignor to Hammond Organ Company, Chicago, Ill., a corporation of Delaware

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My invention relates generally to electric musical instruments and more particularly to means for producing percussion tones by a monophonic or melody type instrument, or section of an instrument.

It is the primary object of the invention to provide means, for use in an electronic melody musical instrument, to cause the production of tones having percussion type intensity envelopes.

Other objects will appear from the following description, reference being had to the accompanying drawing which is a combined block and schematic circuit diagram illustrating the invention.

The instrument disclosed is a monophonic or melody instrument in which the pitch of the tone is controlled by an oscillator 10, comprising triodes 12 and 13, and tuned by a parallel resonant circuit, comprising a capacitor C14 and one or more inductance elements or coils L16 which are normally connected in series between the control grid of triode 12 and ground. The junctions between successive inductance elements L16 are connected to switch contactors 18 operable by the playing keys 20 to connect such junctions respectively to a grounded bus bar 22. In this manner the value of the inductance in the resonant circuit for the oscillator is changed to tune the oscillator to the pitch corresponding to that of a depressed key, or to the pitch of the highest of a number of keys operated at the same time.

In addition to operating the switch contactors 18, the playing keys operate switch contactors 24 respectively to connect a bus bar 26 to ground. The remaining elements of the oscillator 10 may be as shown in my prior Patent No. 2,645,968, which also discloses the details of the frequency dividers 30 and 32 which are coupled in cascade to the output of the triode 13. Octave coupler switches 34, 35, 36, are adapted to couple the output of the oscillator 10 and frequency dividers 30 and 32, respectively, to an amplifier 38. The output of the amplifier 38 is connected across suitable tone control circuits 40 and across the primary winding L42 of a transformer 44. The center-tapped secondary L46 of this transformer has its end terminals connected to the control grids 48 and 49 of a pair of control triodes 50 and 51. The outputs of these triodes are coupled by a transformer 52 to a high pass filtering mesh 54 and to a normally open contactor 56 of a relay having a coil 58.

The center tap of secondary winding L46 is connected to ground through a capacitor C60 and is connected through the normally closed contactor 62 of the relay and a relatively low value resistor R64, to a terminal 63 of the power supply, the potential of which is sufficiently high to provide normal operating bias on the control triodes 50, 51. The center tap is also connected through a relatively high value resistor R66 to a terminal 68 of the power supply which has a negative voltage sufficiently low to cut off the triodes 50, 51.

The relay coil 58 has one end connected to a B+ terminal of the power supply and its other end connected

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to the plate of a triode 70. The control grid of the triode 70 is connected to the terminal 72 of the power supply at which the voltage is sufficiently negative to maintain the triode 70 at cutoff, this connection being made through a grid resistor R74. The contactor 56 of the relay is adapted to connect the output conductor 55 to the input conductor 76 of an amplifier 78, which is coupled to a speaker 80. The conductor 76 is connected to ground through a suitable key click suppression mesh comprising a capacitor C82 and resistor R84 connected in parallel.

It should be noted that the switch contactors 18 and 24 are mechanically connected to their associated keys in such manner so that upon depression of the key the switch 18 will close before the switch 24 is closed. This sequence is very desirable so that any transients produced upon changing the frequency of the oscillator 10 by closure of a switch 18 will not be transmitted to the amplifier 78.

In operation, assuming one or more of the switches 34, 35, 36 is closed, depression of the key will first, by closure of its associated switch 18, tune the oscillator 10 to a frequency corresponding to, or octavely related to, the nominal pitch of the depressed key. The frequency dividers 30 and 32 are operable successively to divide the frequency at which the oscillator 10 operates by two and thus the tones are octavely related. The signals from the oscillator and one or both of the frequency dividers 30 and 32 may be transmitted to the amplifier 38 and thus through the transformer 44 to the input of control tubes 50 and 51. The relative values of resistors R64 and R66 is such that the normal bias voltage is applied through the center tap on transformer secondary L46 through the switch 62 and thus this bias appears on the control grids 48 and 49 of triodes 50 and 51, and these triodes are in condition to transmit the signal supplied by the oscillator and frequency dividers.

Thus, upon initial depression of a playing key its switch 18 and associated circuits tune the oscillator 10 to the required frequency. The signal output of the oscillator 10 and dividers 30, 32, is not transmitted to the amplifier 78 because the switch contactor 56 of the relay 58 is open. However, upon further depression of the playing key the switch 24 associated therewith will be closed and the triode 70, which is normally not conducting, because of the relative cutoff bias voltage present on its control grid, has its control grid connected to ground through the operated switch 24. Thus, the triode 70 conducts and the relay 58 is energized, the switch contactor 62 opened, and 56 closed. Upon closure of switch 56 the signals, as amplitude controlled by the control tubes 50, 51, is impressed upon the input circuit of the amplifier 78 and translated into sound by the speaker 80. The control grids 48 and 49 are normally held at operating potential when the switch contactor 62 is closed, but when this switch is opened the charge on the capacitor C60 is dissipated at a rate depending upon the time constant of capacitor C60 and resistor R66. This time constant is preferably made very short so that the tone intensity will decay rapidly in the manner of the tones of percussive musical instruments such as the piano (as played when the sustaining pedal is not depressed), xylophone, and similar instruments of the percussion group.

Upon release of the key the signal is first removed from the amplifier 78 by the opening of 56 due to the fact that the grid of the triode 70 is rapidly reduced to the cutoff potential, deenergizing relay 58. Such deenergization and closure of contactor 62 results in again applying a normal operating biasing voltage to the capacitor C60, recharging the capacitor C60, and conditioning the percussion control means for operation upon depression of a second key.

The keys are played in a detached or staccato manner so that capacitor C60 is quickly recharged between the playing of successive notes.

While I have shown and described a particular embodiment of my invention, it will be apparent to those skilled in the art that numerous modifications and variations may be made in the form and construction thereof, without departing from the more fundamental principles of the invention. I therefore desire, by the following claims, to include within the scope of my invention all such similar and modified forms of the apparatus disclosed, by which substantially the results of the invention may be obtained by substantially the same or equivalent means.

I claim:

1. In an electrical musical instrument, the combination of a continuously operating electrical musical tone signal generating means, a plurality of playing keys, an output system, means operated by partial depression of the playing keys to cause transmission of tone signals of pitch corresponding to the nominal pitch of the operated key from the generator to the output system, said output system including tone intensity envelope controlling means, a relay having normally closed switch contacts and normally open switch contacts, switches respectively

operable by the keys to cause completion of a circuit to energize the relay, circuit means including the normally closed relay switch to maintain the tone intensity control means in condition for transmission of the signal at high amplitude, an amplifier and speaker connected thereto, circuit means including the normally open switch of the relay operable when the relay is energized to connect the output of the tone intensity controlling means to the amplifier, and means rendered effective by the opening of the normally closed switch to cause the intensity envelope control means to transmit the signal at progressively decreasing amplitude.

2. The combination set forth in claim 1 in which the switches are operated by the keys when the keys are substantially fully depressed.

3. The combination set forth in claim 1 in which the relay energizing circuit means includes an electron discharge amplifying device.

References Cited in the file of this patent

UNITED STATES PATENTS

2,233,258	Hammond et al. -----	Feb. 25, 1941
2,301,871	Hanert -----	Nov. 10, 1942
2,310,429	Hanert -----	Feb. 3, 1943
2,357,191	Hanert -----	Aug. 29, 1944