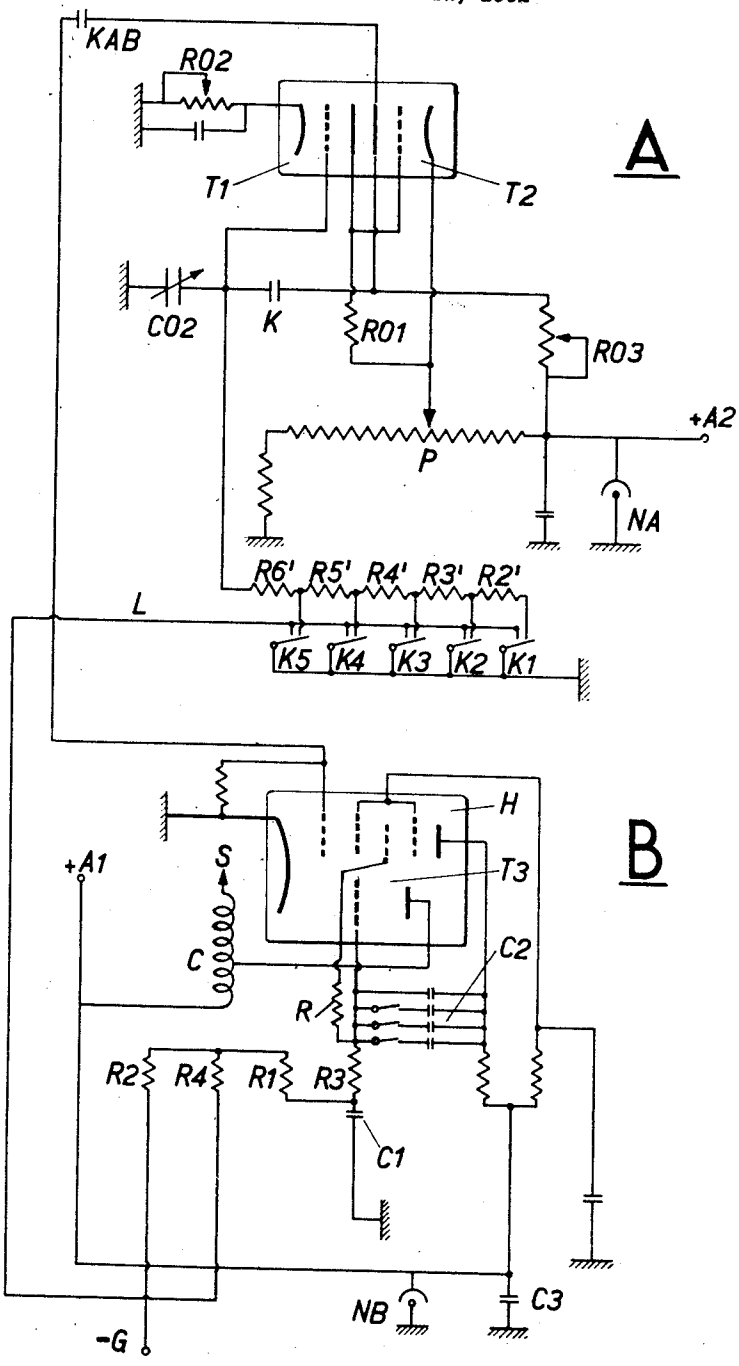
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ELECTRONICALLY-OPERATED MUSIC INSTRUMENT

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ELECTRONICALLY-OPERATED MUSIC INSTRUMENT

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The present invention relates to electronically operated music instruments.

It is one object of the present invention to provide improvements in electronically operated music instruments of the type wherein the electric oscillations corresponding to the different notes are transmitted through amplifiers to a sound reproducer such as a loud speaker.

It is a further object of the present invention to remove the difficulties encountered in the tuning of instruments of this type and also to cut out the parasitical noises arising at the beginning and at the end of each note. Such creaking noises are cut out in accordance with the present invention by means of a hexode-triode inserted in the circuit so as to flatten the steep front and rear edges of the waves; to this end, the grid bias applied to the hexode-triode when inoperative is such that it blocks completely the entrance of the oscillations into the tubes; the arrival of a pulse shifts then gradually the grid bias to operative value so as to gradually release correspondingly the originally blocked tube and consequently, after a delay of a predetermined duration, the current may flow at full intensity. Similarly, at the end of the pulse, the opposite phenomenon appears inasmuch as the grid bias is shifted back gradually from its operative value to its blocking value. By reason of this smooth switching in and out of the pulses, the unpleasant creaking noises appearing in the known arrangements of this type at the beginning and at the end of each note disappear completely in the present, improved instrument. It is of advantage to provide for the blocking of the tube through the application of a high negative grid bias so that the pulse corresponding to each note may reduce said bias gradually to a small negative value.

Such arrangements of vacuum tubes, the conductivity of which varies through a modification in the grid bias between a range of blocking values and an operative value and reversely, are well known per se and have been used for various purposes, chiefly for cutting out the echoes in long distance transmissions and in fact certain details developed previously in such technical fields may also be resorted to in the case of the present, improved instrument. It is also possible through a modification of the voltage of the cathode of a variable-mu tube inserted between the frequency generator and the amplifier as provided by a system of resistances and condensers to release the tube operating as an amplifier with a suitable delay. It is also known that it is possible to produce a lasting note by a corresponding frequency generator through depression of a key and to transmit it in a manner such that the depression and release of said key produces, through a modification in the negative voltage of the control grid of a variable-mu tube, a gradual increase and decrease of the second volume.

It is still another object of the present invention to provide an electronically operated music instrument in which the depression of the key allows the production of the desired note only after a predetermined period of gradual development while the release of the key provides for the gradual dying out of the sound which is being no longer produced.

It is of particular interest, for the application to be considered, to resort to a network of condensers and ohmic resistances that is connected with the grid biasing means. To this end, the condenser is loaded when inoperative through the source of negative potential which may be of say —20 volts. When a pulse at the note frequency is fed into the circuit, the key or the like means produces simultaneously a switching of the condenser and resistance network in a manner such that the condenser discharges across a resistance while on the other hand, the current produced by the source of biasing potential is submitted, on its way, to such a drop in potential that the bias of the grid assumes the value required for operation of the tube. The time required for shifting the grid potential from its blocking value to its operative value is thus equal to the delay required for discharging the condenser across the resistance. A suitable selection of the value of these elements allows thus adjusting, within a large range and as desired, the time of this modification in grid bias and consequently the duration of the development of the sound. Thus it is possible to adjust the duration of this development as desired within a range between one thousandth of a second and several seconds.

The same procedure is obtained in the opposite direction at the end of the impulse inasmuch as the discharge circuit of the condenser is broken and the source of grid bias loads again the condenser gradually and consequently the bias of the grid assumes gradually a value blocking the tube.

The possibility of adjusting according to circumstances the duration of the development and of the dying out of each note allows adapting these durations to the requirements of the music. Thus it is possible for instance to make this duration substantially longer for low notes than for high notes, in which latter case the periods considered may be comparatively short and yet cut out the parasitical noises at the beginning and end of each note. Consequently, the switching means for the condenser and resistance network should be preferably coupled mechanically with the note producing key, in a manner such that, in the case of high notes, low capacity and resistance values are inserted while large capacity and resistance values are inserted for lower notes. Thus the duration of the development and dying out of a note is defined automatically in accordance with the note that is being produced through the mere depression of the corresponding key.

In many known electric music instruments, there are provided octave switching means that allow upon actuation of a predetermined key to produce, instead of the note corresponding normally to said key, a note that is higher or lower than the latter by one or more octaves. Such octave switches are coupled with the condenser and resistance network referred to hereinabove in a manner such as to provide the execution of these conditions. It is of advantage to couple also these switching means controlling the condensers and the resistances with the registers that define timbre of the instrument.

With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawing, in which:

The figure is a diagrammatic showing of the invention.

Referring now to the drawing, the present arrangement includes two main sections. The section A forms the frequency generator provided in the case illustrated with a simple coupling. The section B forms the preliminary amplifier that serves also for the control of the

above-disclosed gradual development and dying out of the notes. These two sections are coupled through the condenser KAB.

The frequency generator A includes two triodes T1 and T2 that are drawn as incorporated into a common tube. The note provided through this arrangement is defined by the magnitude of the operative portion of the resistance $R2'+R3'+R4'+R5'+R6'$, the values of these well-defined elementary resistances being such that they produce the notes of the chromatic scale. The insertion of these resistances is provided through switches of which only five are illustrated for sake of simplicity by way of exemplifications, to wit the switches K1 to K5. These switches first ground the corresponding tapping points on the resistance system and consequently the wire L which operates as deblocking of the preliminary amplifier section B.

The anode of the triode T1 is connected directly with the grid of the triode T2, this connection between said anode and said grid being furthermore connected through a resistance R01 with a potentiometer P of which one terminal is fed by the supply of energy A2 feeding the anode of T2, said supply being stabilized by a neon tube NA while the other potentiometer end is grounded. The anode resistance R03 of the triode T2 is adjustable. The resistance R01 inserted between the anode of T1 and the potentiometer P is designed in such manner that the drop in potential across it may produce the desired bias for the grid of the triode T2. A shifting of the rider providing for the tapping on the potentiometer P produces a modification in the biasing voltage which leads in its turn to an adjustment of the slope of the characteristic curves in the triodes T1 and T2 inasmuch as an increase in the slope of the triode T2 produces a reduction in the slope of the triode T1 and vice versa. The grid of the triode T1 is grounded through an adjustable condenser C02.

The condenser K that connects the anode of the triode T2 with the control grid of the triode T1 is designed so that the concert pitch be such that the A of the scale may vibrate at a frequency of 880 cycles.

In the instrument when complete and wherein consequently the magnitude of the different resistances and condensers are well-defined, the adjustment to the characteristics of the different tubes, which always vary somewhat for tubes of the same type, may be provided with a view to obtaining accurate tuning. This tuning may be achieved in three different ways. Supposing that the resistances, which define the pitch, produce a range of notes extending over three octaves between C1 and C4, it is possible through action on the potentiometer P and on the adjustable resistances R02 and R03 to obtain an accurate tuning for a basic note A1 to 870 or 880 cycles. In order to allow playing with other instruments and to make up consequently for possible differences in pitch, the adjustable resistance R02 which connects the cathode of the triode T1 with ground is provided. The player may, through a suitable rotary adjustment of the resistance R02 raise or lower the whole pitch of the instrument so as to prevent any interference when playing with other instruments. Furthermore if the magnitudes of the condensers K and CO2 are adjusted for a predetermined type of vacuum tubes, it is possible to provide for a transposition of the scale by one or more octaves by increasing or reducing the frequency twice, four times and the like.

The frequency generator A is coupled with the preliminary amplifier B through the above-mentioned coupling condenser KAB and it is thus possible to feed the first control grid 1 of the hexode H through the current at audio frequency produced by the frequency generator A. This hexode is illustrated in the drawing as combined in a single vacuum tube with a triode T3, although this is not essential.

The wire L fed through the switches K1 to K5 feeds two resistances R4 and R2 in series and therethrough it

is connected with a supply G biasing the grids of the combined hexode-triode, the potential of said supply lying at say —20 volts. The point of connection between the two resistances R4 and R2 arranged in series is connected through the two resistances R1 and R3 also arranged in series with the control grid of the triode T3 and the mixer grid of the hexode H. There may be inserted, if required, in the connection between the two grids a resistance R5. The connecting point between the two resistances R1 and R3 is grounded through the condenser C1. The wire feeding triode grid is connected through a condenser C2 with the anode of the hexode.

No sound is produced when the switches K1 to K5 lie in the open position as illustrated in the drawing. The negative grid bias of —20 volts is transferred through the resistances R2, R1 and R3 to the control grid of the triode T3 and to the mixer grid of the hexode H and as a consequence of this high negative bias, the two tubes are blocked against the passage of oscillatory current.

Now if the switch K1 is closed, its movable contact blade connects the wire L with ground. The current, fed by the grid bias supply G to the ground through the resistances R2 and R4, produces at the connection between the two last mentioned resistances a potential that is different from that previously prevailing at said point and in fact it assumes no longer a high negative value. This potential, the value of which is defined by the resistances R2 and R4 and that is fed through the resistances R1 and R3 to the control grid of the triode T3 and of the mixer grid of the hexode H, is therefore substantially lower than —20 volts in absolute value and, in fact, the grid bias is now of a value which permits of passage of oscillatory current through the two tubes and the note defined by the resistance R' may develop.

The same procedure is true in case of the closing of any of the other switches K2 to K5 or of the further switches that are not illustrated.

The value of the grid bias defined by the value given to the resistances is however not applied to the grids in perfect synchronism with the closing of any of the switches K, such as the switch K1; as a matter of fact, the condenser C1 is already loaded by the negative voltage of the grid bias supply and it keeps at first this high negative potential still applied for a short time to the two grids. It discharges then gradually across the resistances R1 and R4 into the wire L and towards ground. It is only when this discharge is at an end that the value of grid potential corresponds to the desired operativeness. It is therefore apparent that the operative potential of the grid is defined chiefly by the value of the resistances R2 and R4 and also of course by the value of the resistances R1 and R3 while the time of discharge of the condenser C1 depends on its own capacity and on the magnitude of the resistances R1 and R4. Similarly, the capacity of the condenser C2 connecting the wire feeding the grids of the combined tubes with the anode of the hexode has an action on the length of the transient period. It should be remarked that this condenser may be adjustable so as to provide for the higher range of notes about one quarter of the capacity of the condenser C1.

When the switch K1 is opened, the opposite succession of steps is provided; the short-circuiting of the condenser C1 across the resistances R1 and R4 is first switched off at K1. Consequently, the condenser C1 is loaded again through the resistances R2 and R1 and it shifts through the resistance R3 the grid bias back into its blocking value.

In order to act selectively on the duration of the intermediate stages during which the grid bias is modified, it is possible to adjust the condenser C2. This possibility is illustrated in the drawing by showing the condenser constituted by a plurality of separate condensers inserted in parallel and the connection with each of which may be opened and closed through corresponding switches. Through action on these switches and through a selective

combination of the different condensers, for instance by means of a continuous control, there are provided various possibilities of adjustment, the number of which may be as high as desired.

As illustrated by the wiring diagram, the resistance R1 and the condenser C2 act on the grid of the triode T3 and also on a grid of the hexode H, the phases of said grids being shifted by 180°. By reason of this phase-shifting between the two elementary tubes and of the direct or indirect interconnection between the two grids, there is provided a counter-coupling which makes up completely for the undesirable parasitical noises appearing otherwise at the beginning and end of the production of a note. It is also an advantage with a view to cutting out any creaking noises that the current flowing through the switches is extremelly weak and consequently this allows using for such currents very small contact areas in the said switches. The cuts out also the burning of the contact-pieces which leads to a longer life for the music instruments without any risk of any disturbances arising.

The frequency generator A received its anode voltage from the supply of anode voltage A2 while the preliminary amplifier B is fed by another anode voltage supply A1. It is essential for these supplies of anode voltage to be quite independent of each other so that the two sections A and B may be quite distinct. It is possible, in fact, to use completely separate supplies of anode voltages, but it is also possible to resort to a common supply, as obviously apparent from comparison with the instruments fed from the mains, the two voltages A1 and A2 being stabilized independently of each other, for instance through corresponding neon tubes NA and NB so that these voltages may be adjusted permanently to the values required for the two sections A and B. The insertion of these two neon tubes for stabilizing independently of each other the voltages A1 and A2 cuts out any action of the frequency generator A on the preliminary amplifier B and reversely, this being extremely important for the obtention of a perfect reproduction of music.

The amplified oscillatory voltages appearing at the anode of the triode T3 are finally fed through the output transformer C and the wire S fed by the latter to the associated tone and volume control and thence to the amplifier and to the loud speaker.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connecting to the control grid of said triode, and, thereby, over the said condenser to the anode of the hexode, means for blocking the passage of said audio current pulses to said control grid of the hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, and means whereby the said audio current pulses gradually modify grid bias fed by the said grid bias supply in order to arrive at a value allowing operation of the hexode-triode a short time after the initiation of each of said pulses and gradually returning said bias to its original blocking value at the end of the pulse.

2. The instrument, as set forth in claim 1, which the said mixer grid of said hexode is connected directly to the control grid of said triode.

3. The instrument, as set forth in claim 1, in which the said mixer grid is connected to the control grid of said triode by means of a resistance.

4. In an electronically-operated music instrument, the

combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a network including a capacity and resistances inserted between said grid bias supply and the control grid of the triode and the mixer grid of the hexode and means whereby the said incoming audio current pulses provide a drop in the voltage fed by grid bias supply and the discharge of the network condenser across the network resistance to produce a gradual modification in the grid bias and, thereby, a gradually increasing development of the audio pulses through the hexode-triode and conversely the end of a note produces a reloading of said network condenser and returns the grid bias to its normal value to produce a gradual throttling of the audio pulses passing through the hexode-triode.

5. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode, and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a network including a capacity and resistances inserted between said grid bias supply and the control grid of said triode and the mixer grid of said hexode and mounted in parallel with the first condenser, at least one of which capacity and resistance elements is adjustable, and means whereby the said incoming audio current pulses provide a drop in the voltage fed by the grid bias supply and the discharge of the network condenser across the network resistance to produce a gradual modification in the grid bias and thereby, a gradually increasing development of said audio pulses through the said hexode-triode and conversely the end of a pulse produces a reloading of said network condenser and returns the grid bias to its normal value to produce a gradual throttling of said audio pulses passing through said hexode-triode.

6. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the said control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a network including a capacity and resistances inserted between said grid bias supply and the control grid of said triode and the mixer grid of said hexode and mounted in parallel with the first condenser, at least one of which capacity and resistance elements is adjustable, and means whereby said incoming audio current pulses provide a drop in the voltage fed by said grid bias supply and the discharge of the network condenser across the network resistance to produce a gradual modification in said grid bias and, thereby, a gradually increasing development of said audio pulses through said

hexode-triode and conversely the end of a pulse produces a reloading of said network condenser and returns said grid bias to its normal value to produce a gradual throttling of said audio pulses passing through said hexode-triode and means for coupling the adjustable element of the network with said pulse generating means in a manner such that the durations of development of said audio currents through the hexode-triode and of the throttling thereof are smaller for high frequencies than for low frequencies.

7. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a network including a capacity and resistances inserted between said grid bias supply and the control grid of said triode and the mixer grid of said hexode and mounted in parallel with the first condenser, at least one of which capacity and resistance elements is adjustable, and means whereby said incoming audio current pulses provide a drop in the voltage fed by said grid bias supply and the discharge of the network condenser across the network resistance to produce a gradual modification in said grid bias and thereby, a gradually increasing development of said audio pulses passing through said hexode-triode and conversely the end of a pulse produces a reloading of said network condenser and returns said grid bias to its normal value to produce a gradual throttling of said audio pulses passing through said hexode-triode, means for coupling the adjustable element of the network with said pulse feeding means in a manner such that the durations of development of said audio currents through said hexode-triode and of the throttling thereof are smaller for high frequencies than for low frequencies and an octave transposition switch coupled with the adjustable element of the network.

8. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for the triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to said control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a first resistance inserted between the control grid of said triode and the mixer grid of said hexode and said grid bias supply, a plurality of switches controlling the feeding of said pulses corresponding to different notes, a second resistance disposed in series with the said first resistance and adapted to be grounded upon operation of any switch and a third resistance inserted between the point connecting the said first and second resistances and the hexode-triode grids and including a tapping, and a condenser grounding said tapping.

9. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode, including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a first resistance inserted between the control grid of said triode and the mixer grid of said hexode and said grid bias supply, a plurality of switches controlling the feeding of such pulses corresponding to different notes, a second resistance mounted in series with the said first resistance and adapted to be grounded upon operation of any of said switches, and a third resistance inserted between the point connecting the said first and second resistances and said hexode-triode grids and including a tapping, a condenser grounding said tapping, and means for adjusting the said last mentioned condenser to modify the duration of the variation in bias of said hexode-triode grids under the action of the grounding of the said second resistance.

10. In an electronically-operated music instrument, the combination of means for generating audio current pulses with an amplifier connected with said pulse generating means and comprising a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of said audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, means for adjusting the capacity of said condenser, a first resistance inserted between the control grid of said triode and the mixer grid of said hexode and said grid bias supply, a plurality of switches controlling the feeding of said pulses corresponding to different notes, a second resistance mounted in series with the said first resistance and adapted to be grounded upon operation of any of said switches and a third resistance inserted between the point connecting the said first and second resistances and said hexode-triode grids and including a tapping, a condenser grounding said tapping, and means for adjusting the said last mentioned condenser to modify the duration of the variation in bias of said hexode-triode grids under the action of the said second resistance.

11. In an electronically-operated music instrument, the combination of a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a double triode frequency generator comprising a first triode and a second triode feeding the control grid in the hexode with audio current pulses corresponding to different notes, each triode including a cathode, a control grid and an anode, a grounded potentiometer provided with an adjustable tapping, a resistance connecting said tapping with the anode of said first triode and the grid of said second triode, a source of anode supply feeding the anode of the second triode and connected with the non-grounded end of said potentiometer, an adjustable resistance inserted between said anode voltage supply and said anode of the said second triode and an adjustable resistance grounding the cathode of the said first triode and means whereby the said audio current pulses gradually modify grid bias fed by the grid bias supply in order to arrive at a value allowing operation of the hexode-triode a short time after the initiation of each of said pulses and gradually returning said bias to its original blocking value at the end of the pulse.

12. In an electronically-operated music instrument, the combination of a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a double triode frequency generator comprising a first triode and a second triode feeding the control grid of said hexode with audio current pulses corresponding to different notes, each triode including a cathode, a control grid and an anode, an adjustable condenser grounding the grid of said first triode, a grounded potentiometer provided with an adjustable tapping, a resistance connecting said tapping with the anode of said first triode and the grid of said second triode, a source of anode supply feeding the anode of the second triode and connected with the non-grounded end of said potentiometer, an adjustable resistance inserted between said anode voltage supply and said anode of the said second triode and an adjustable resistance grounding the cathode of the said first triode and means whereby the said audio current pulses gradually modify grid bias fed by the grid bias supply in order to arrive at a value allowing operation of said hexode-triode a short time after the initiation of each of said pulses and gradually returning said bias to its original blocking value at the end of the pulse.

13. In an electronically-operated music instrument, the combination of a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, an anode voltage supply for the anode of said hexode-triode, a double triode frequency generator comprising a first triode and a second triode feeding the control grid in said hexode with audio current pulses corresponding to different notes, each triode including a cathode, a control grid and an anode, a grounded potentiometer provided with an adjustable tapping, a resistance connecting said tapping with the anode of the said first triode and the grid of the said second triode, independent of the hexode-triode anode voltage supply, a source of anode supply feeding the anode of the said second triode and connected with the non-grounded end of said potentiometer, an adjustable resistance inserted between said anode voltage supply and said anode of the second triode and an adjustable resistance grounding the cathode of the said first triode and means whereby the said audio current pulses gradually modify the grid bias fed by the grid bias supply in order to arrive at a value allowing operation of the hexode-triode a short time after the initiation of each of said pulses and gradually returning said bias to its original blocking value at the end of the pulse.

14. In an electronically-operated music instrument, the combination of a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, an anode voltage supply for the anode of said hexode-triode, a double triode frequency generator comprising a first triode and a second triode feeding the control grid in said hexode with audio current pulses corresponding to different notes, each triode including a cathode, a control grid and an anode, a grounded potentiometer provided with an adjustable tapping, a resistance connecting said tapping with the anode of the said first triode and the grid of said second triode, a source of anode supply feeding the anode of the said second triode and connected with the non-grounded end of said potentiometer, an adjustable resistance inserted between said anode voltage supply and said anode of the said second triode and an adjustable resistance grounding the cathode of the said first triode and means whereby the said audio current pulses gradually modify the grid bias fed by the grid bias supply in order to arrive at a value allowing operation of said hexode-triode a short time after the initiation of each of said pulses and gradually returning said bias to its original blocking value at the end of the pulse.

15. In an electronically-operated music instrument, the combination of a hexode-triode including a control grid and a mixer grid for the hexode, an anode for said hexode, a control grid for said triode and a condenser, the said mixer grid of said hexode being connected to the control grid of said triode, and, thereby, over the said condenser to the anode of said hexode, means for blocking the passage of audio current pulses to the control grid of said hexode, a grid bias supply feeding the control grid of said triode and the mixer grid of said hexode, a double triode frequency generator comprising a first triode and a second triode feeding the control grid in said hexode with audio current pulses corresponding to different notes, each triode including a cathode, a control grid and an anode, a system of resistances adapted to feed selectively the control grid of the said first triode, means controlling the selective connection of said resistances with the control grid of the said first triode to produce the different desired notes, a grounded potentiometer provided with an adjustable tapping, a resistance connecting said tapping with the anode of the said first triode and the grid of the said second triode, a source of anode supply feeding the anode of the said second triode and connected with the non-grounded end of said potentiometer, a first resistance inserted between said hexode-triode grids and said bias supply with the said condenser, a plurality of switches controlling the means controlling the selective connection of the resistances feeding the control grid of the said second triode, a second resistance mounted in series with the bias-fed first resistance and adapted to be grounded upon operation of any of said switches and a third resistance inserted between the point connecting said two last mentioned resistances and said hexode-triode grids and including a tapping, and a further condenser grounding said tapping.

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