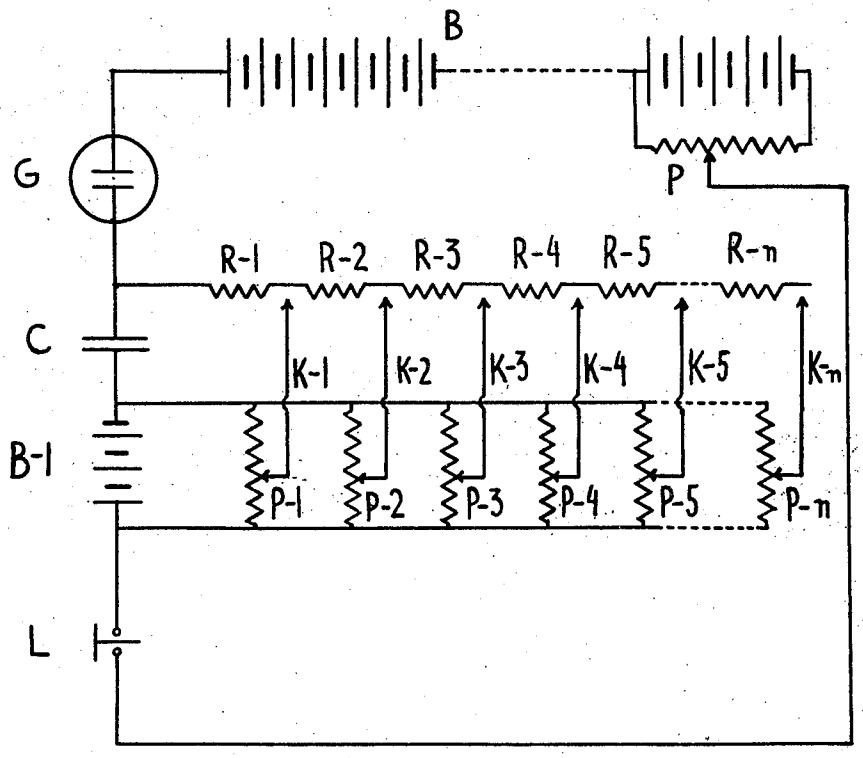
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ELECTRICAL MUSICAL INSTRUMENT

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ELECTRICAL MUSICAL INSTRUMENT

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5 Claims. (Cl. 84—1)

The present invention relates to electrical musical instruments and more particularly to electrical musical instruments of the type in which the electrical oscillations to be converted into musical sounds are produced by means of glow-discharge lamp oscillators.

The present application is a division of my copending application Ser. No. 626,456 filed July 30th, 1932, now Patent No. 1,993,890, granted March 12, 1935. The aforesaid patent broadly covers the production of musical oscillations in a glow-discharge lamp circuit having a condenser, a source of current and a sound producing means, all in series and a plurality of resistors of which a different number may be connected across the condenser by means of switching keys. In a circuit of the described character a musical sound will be produced in the sound producing means for the actuation of any of the switching keys, sound of the highest pitch when only one of the resistors is connected across the condenser, sound of the lowest pitch when all of the resistors are connected across the condenser, and sound having an intermediate pitch when a plurality of resistors is connected across the condenser. The relative proportion of the frequencies produced depends on the value of the resistors and it is fixed in case the resistances are constant.

Although instruments of this type after having been once tuned by suitable selection of the resistors will stay in tune indefinitely, there are cases in which the exactness of tuning obtainable in this manner is insufficient. This is especially the case when the instruments are to be used for orchestra work where a great accuracy of tuning is imperative due to the great number of individual instruments used. It has been already suggested to use the simplest expedient and to make the plurality of resistors used in the circuit individually variable. These resistances, however, are of the order of from 50,000 ohms up to 1,000,000 ohms and adjustable resistances of this type are not only unreliable but are at the same time also rather expensive.

I have discovered a simple, inexpensive and completely satisfactory circuit arrangement to overcome this difficulty.

It is an object of the present invention to provide an improved electrical musical instrument which is capable of producing a plurality of musical sounds of different frequency and in which the frequency of each sound is individually adjustable.

It is another object of the present invention to provide an electrical musical instrument which is easily tuned and which will stay in tune for a long time.

The invention also contemplates the provision of an improved electrical musical instrument which is simple in construction and easy and inexpensive in manufacture.

Other and further objects and advantages of the invention will appear from the present description taken in conjunction with the accompanying drawing showing the circuit of a practical embodiment of my improved electrical musical instrument.

Generally speaking according to the principles of my invention I provide an auxiliary source of current in series with the main source of current providing the direct current energy for the oscillations. Across this auxiliary source of current I connect a plurality of potentiometers, one for each of the resistors and switching keys. The sliding contact of these potentiometers is connected to the corresponding switching keys so that when depressing any of the switching keys part of the voltage of the auxiliary source of current will be added to the voltage of the main source of current according to the adjustment of the sliding contact on said potentiometer. As it is well known, the frequency of the oscillations produced by a glow-discharge lamp varies when the voltage is varied, so that in this manner the frequency of the oscillations produced may be easily and individually adjusted for each switching key. Of course, the voltage of the auxiliary source of current may be much lower than that of the main circuit source of current, generally a voltage of from 3 to 5 volts will be satisfactory.

The invention now will be more fully explained by taking reference to the drawing.

A glow-discharge lamp G, a main source of current B, a sound producing means L, and an auxiliary source of current B—1 are connected in a circuit, all in series. The voltage of the main source of current B may be adjusted by a potentiometer P connected across part of same, as it will be readily understood by those skilled in the art. A plurality of resistances R—1, R—2, R—3, . . . R—*n* are connected all in series to one side of condenser C, and a potentiometer P—1, P—2, P—3, . . . P—*n*, one for each of said resistances is connected across said auxiliary source of current B—1. A switching key K—1, K—2, K—3, . . . K—*n* is provided for each resistance and is capable of connecting the common point of any two adjoining resistances with the

sliding contact of the corresponding potentiometer.

The operation of my improved electrical musical instrument will be now readily understood by those skilled in the art. When any of the switching keys is actuated, a different number of resistances in series will be connected across the condenser C, and a sound of different pitch will be produced in the sound producing means. It will be noted, however, that a different part of the voltage of the auxiliary source of current B—1 will be operative and added to the voltage of B according to the adjustment of the potentiometer P—1, P—2, . . . P—*n* associated with the actuated switching key. From this it is clear that in addition to the capacity of C, the voltage of B and the added resistance of the operative resistances the pitch of the sound produced in the sound producing means will also depend on the adjustment of the potentiometer P—1, . . . P—*n* corresponding to the actuated switching key. In other words, the pitch of the sound obtained by actuating any of the switching keys can be easily adjusted by adjusting the corresponding potentiometer. The potentiometers P—1, P—2, . . . P—*n* may have a relatively low resistance, for example 1000 ohms.

It is to be observed that the adjustment of the main circuit potentiometer P will simultaneously control the operative voltage for the actuation of any of the switching keys. In other words the adjustment of P will change the absolute pitch of all of the sounds obtainable by actuating the different switching keys by the same amount but maintains their relative intervals. In contrast to this, the adjustment of the individual potentiometers P—1, P—2, . . . P—*n* will change the pitch of the sound obtained by actuating the corresponding switching keys but will not influence the others.

Although I have described my invention in connection with a practical embodiment thereof, many variations and modifications may be resorted to by those skilled in the art without departing from the principles of the invention, I consider all these variations and modifications as within the true spirit and scope of my invention as described in the present specification and defined by the appended claims.

I claim:—

1. An electrical musical instrument comprising a main electrical circuit containing a source of current, a glow-discharge lamp, a condenser, an auxiliary source of current, and a sound producing means, all in series with said source of current; an auxiliary circuit operatively connected with said main circuit containing a plurality of resistances in series, a potentiometer for each of said resistances connected across said auxiliary source of current, a switching key for each of the aforesaid resistances located between each common point of two adjoining resistances and the sliding contact of one of the aforesaid potentiometers, said key being normally open to disconnect the resistance from the main circuit and being capable of actuation for shunting a plurality of said series resistances across the main circuit condenser through the sliding contact of said potentiometer and said auxiliary source of current thereby completing the main circuit and causing current to flow through said lamp; said sound producing means being capable of emitting sound, the pitch of the emitted sound being the highest when one of the resistances is operating and being the lowest when all of the series resistances are operating; the pitch being capable of variation for tuning when the adjustment of the sliding contact of the potentiometer and thereby the electro-motive force of the auxiliary source of current acting in the auxiliary circuit is varied.

2. An electrical musical instrument comprising a main electrical circuit containing a source of current, a glow-discharge lamp, a condenser, an auxiliary source of current, all in series with said source of current, means for varying the voltage of said main circuit source of current; an auxiliary circuit containing a plurality of resistances in series, a potentiometer for each of said resistances connected across said auxiliary source of current, a switching key for each of the aforesaid resistances located between each common point of two adjoining resistances and the sliding contact of one of the aforesaid potentiometers, said key being normally open to disconnect the resistance from the main circuit and being capable of actuation for shunting a plurality of said resistances across the main circuit condenser through the sliding contact of said potentiometer and said auxiliary source of current thereby completing the main circuit and causing current to flow through said lamp, sound-producing means operatively associated with said main circuit being capable of emitting sound, the pitch of the emitted sound being capable of individual variation when a switching key is actuated and the sliding contact of the associated potentiometer is adjusted and the pitch of the emitted sounds being capable of collective variation when any of the switching keys is actuated and the voltage of said main source of current is varied.

3. In an electrical musical instrument, the combination comprising a circuit, a source of current, a condenser, and a glow-discharge lamp all in said circuit, a plurality of resistances in series, a switching key electrically associated with each of said resistances and adapted to selectively connect a different number thereof across said condenser to produce an oscillation of different frequency, a sound producing means associated with said circuit and adapted to produce sounds in accordance to said oscillations, an auxiliary source of current, and means for making operative in said circuit an adjustable and predetermined part of the electromotive force of said auxiliary source of current for the actuation of each of said switching keys whereby the pitch of the sound emitted by said sound producing means by actuation of said switching keys may be individually adjusted.

4. In an electrical musical instrument, the combination comprising a circuit, a glow-discharge lamp, a condenser and a source of current all in said circuit, a multiplicity of resistances in series each of said resistances having a switching key associated therewith adapted to connect a selected plurality of said resistances across said condenser and causing electrical oscillations to be set up in said circuit, a sound producing means associated with said circuit and emitting sounds in accordance to said oscillations, an auxiliary source of current, and means including a potentiometer connected across said auxiliary source of current and an adjustable contact for each of said switching keys for introducing an adjustable portion of the electromotive force of said auxiliary source of current in said circuit for the actuation of each of said switching keys whereby the pitch of the sound

produced by said sound producing means may be corrected by adjusting said contact on said potentiometer.

5. In an electrical musical instrument, the combination comprising a circuit, a main and an auxiliary source of current, a glow discharge lamp and a condenser all in said circuit, a multiplicity of resistances in series, a potentiometer having an adjustable contact for each of said resistances and connected across said auxiliary source of current, a switching key for each of said resistances and located between said resistances and said contacts being adapted to connect a selected plurality of said resistances and an adjustable portion of the electro-motive force of said auxiliary source of current across said condenser to cause current to flow through said lamp and oscillations to be set up in said circuit, and a sound producing means associated with said circuit and emitting sound in accordance to said oscillations, the pitch of said sound being capable of adjustment by varying the position of said contact on said potentiometer.

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