Dec. 27, 1927. 1,654,184

R. B. MEYER

FREQUENCY CONTROL CIRCUITS

Filed Jan. 19, 1927

FIG. 1

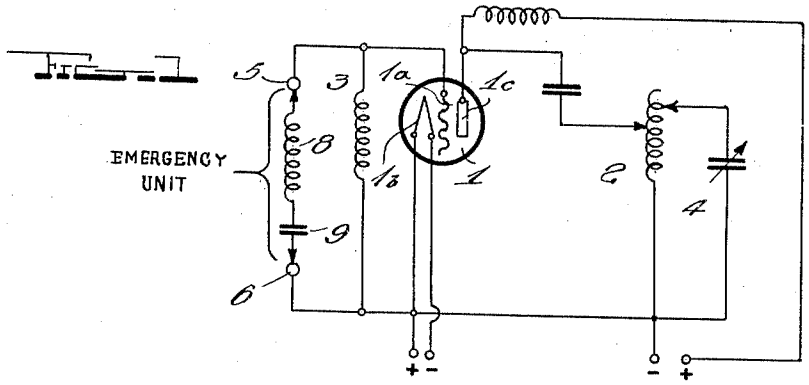


FIG. 2

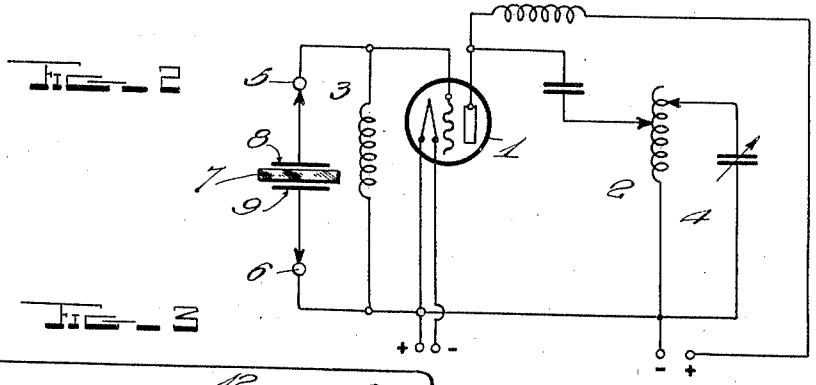


FIG. 3

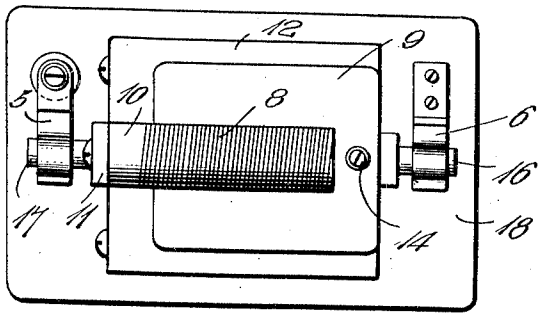


FIG. 4

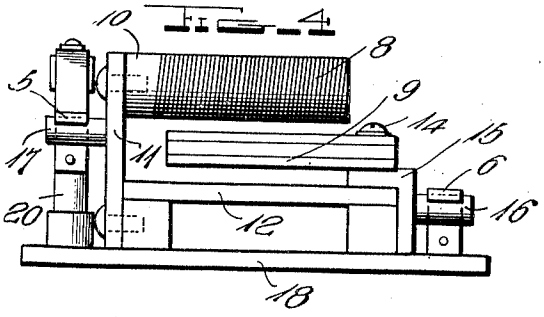
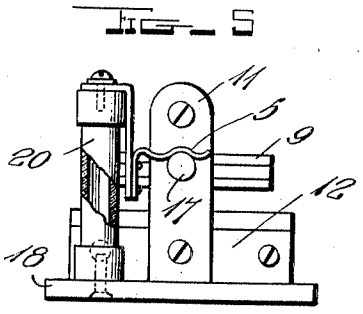


FIG. 5



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UNITED STATES PATENT OFFICE.

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FREQUENCY-CONTROL CIRCUITS.

Application filed January 19, 1927. Serial No. 162,174.

My invention relates broadly to piezo-electric controlled transmitting circuits and more particularly to an arrangement of emergency frequency control circuits for crystal controlled transmitters.

One of the objects of my invention is to provide a device that may be readily substituted in a high frequency signal transmission circuit normally employing piezo-electric crystal control, in the event of destruction or injury to the piezo-electric crystal device thereby insuring constancy of frequency in the absence of piezo-electric crystals.

Another object of my invention is to provide a construction of emergency unit that may be inserted between the terminals of a piezo-electric crystal device in a high frequency oscillator circuit for substantially duplicating the characteristics of the piezo-electric crystal circuit, in the absence of the piezo-electric element, with sufficient constancy in operation to render the transmitted signals intelligible over the emergency period until another piezo-electric crystal is available.

Still another object of my invention is to provide a construction of emergency unit for piezo-electric crystal controlled transmitters wherein an inductance and capacity are assembled as a compact unit and tuned to the frequency corresponding to the frequency of a piezo-electric crystal element normally arranged to control the operation of a signal transmitter, the inductance and capacity having such value that for emergency periods the transmitter may be operated with a reasonable degree of constancy while a substitute piezo-electric crystal element is being obtained.

My invention will be more clearly understood by reference to the following specification and the accompanying drawings in which:

Figure 1 is a diagrammatic representation of an electron tube oscillator circuit for a transmitter in which the emergency unit of my invention is shown connected in the input circuit of the electron tube; Fig. 2 is a diagrammatic illustration showing a piezo electric crystal element connected in the input circuit of the electron tube oscillator for controlling the operation of the oscillator; Fig. 3 is a plan view showing the construction of the emergency unit of my invention; Fig. 4 is a side elevation of the emergency unit of my invention; and Fig. 5 is an end view showing the emergency unit in the position normally occupied by the piezo-electric crystal element in the freqency control circuits of a transmitter.

In piezo electric crystal controlled transmitters the electron tube oscillator which delivers high frequency oscillations to the frequency multiplier or power amplifier system of the transmitter is arranged to sustain oscillations of a piezo-electric crystal element ground to a predetermined frequency. In order to transmit the predetermined frequencies piezo-electric crystal elements of particular frequencies are arranged to be connected into the oscillator circuit, one piezo-electric crystal element being readily replaceable by a different piezo-electric crystal element. In the event that a piezo-electric crystal element fails during a period of heavy traffic or signal transmission where continued operation of the transmitter is necessary I provide a construction of inductance and capacity device that may be inserted in the position normally occupied by the piezo-electric crystal element for simulating the characteristic operation of the piezo-electric crystal element and governing the operation of the transmitter with substantially the same constancy as is possible with the piezo-electric crystal element. I have termed the device an emergency unit consisting of a wound inductance and a fixed capacity so arranged as to be readily insertable between the terminals between which the piezo-electric crystal element is normally connected.

Referring to the drawings in more detail reference character 1 designates an electron tube having grid, filament and plate electrodes 1^a, 1^b and 1^c, respectively, connected in an output circuit 2 and an input circuit 3 as illustrated. Tuned oscillatory circuit 4 is connected to the output circuit of electron tube 1. Oscillations corresponding to the natural frequency of the piezo-electric crystal element are normally sustained in this oscillatory circuit. I have illustrated terminals 5 and 6 as those between which the coupled piezo-electric crystal element 7 is connected through contact plates 8 and 9. The emergency unit of my invention is connected between the contact terminals 5 and 6. The emergency unit which is more clearly

illustrated in Figs. 3, 4 and 5 consists of an inductance 8 and a capacity 9, connected in series for insertion in the grid circuit of the master oscillator tube. The frequency of the emergency unit is substantially the same as the frequency of the piezo-electric crystal element which the unit is arranged to replace. The inductance 8 is spirally wound upon an insulated core member 10 supported at one end on a standard 11 which extends vertically from a supporting frame 12. The frame 12 provides a support for the fixed condenser 9 which has one terminal thereof connected through screw 14 with angle member 15 from which protrudes the connecting member 16. The standard 11 carries a connecting member 17 protruding therefrom but at a different elevation from the elevation of the connecting member 16. The spring contact members 5 and 6 establish connection with the members 16 and 17. The spring contact member 6 is supported from a metallic base plate 18, and spring contact member 5 is insulatingly supported from the base plate 18 by means of a pedestal insulator 20. The parts of the emergency unit may be constructed of insulating materials, the terminals 16 and 17 being provided with conductive connections through the inductance 8 and condenser 9.

During emergency periods the device of my invention has been found to be extremely practical for the control of a radio transmitter enabling the transmitter to be operated during those periods where it would otherwise remain inoperative by failure of the piezo-electric crystal element.

While I have described one of the preferred embodiments of the emergency unit, I desire it to be understood that modifications in detail may be made and that no limitations upon my invention are intended other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In an electron tube piezo-electric crystal controlled oscillator circuit, an electron tube having grid, filament, and plate electrodes, input and output circuits interconnecting said electrodes, a pair of terminals in said input circuit for providing connections for a piezo-electric crystal device, and an emergency control unit comprising inductance and capacity elements and selected to form a tuned circuit corresponding to the frequency of a piezo-electric crystal element normally connected in said circuit, and means to connect said unit between the terminals of said input circuit.

2. A high frequency oscillator circuit comprising an electron tube having input and output circuits, terminals across points in said input circuit for providing connections with a piezo-electric crystal device, and an emergency control unit consisting of inductance and capacity elements connected in series and arranged to be connected across said terminals for simulating the frequency characteristics of the piezo-electric crystal element normally connected in said input circuit.

3. A high frequency oscillator system comprising an electron tube having grid, filament and plate electrodes, input and output circuits interconnecting said electrodes, terminals connected across said grid and filament electrodes for providing connections with a piezo-electric crystal element and an emergency control unit comprising series connected inductance and capacity arranged to be connected across said terminals for simulating the frequency characteristics of said piezo-electric crystal element.

4. A high frequency oscillator system comprising an electron tube having grid, filament and plate electrodes, input and output circuits interconnecting said electrodes, terminals connected to said grid and filament electrodes for the connection of a piezo-electric crystal device in said input circuit, an emergency control unit comprising series connected inductance and capacity elements, terminals on said emergency control unit for establishing connections with said aforementioned terminals for simulating the characteristics of a piezo-electric crystal normally connected between said first mentioned terminals.

5. An emergency control unit for electron tube circuits comprising a supporting member, contacts carried by said supporting member, a removable carrier arranged to be positioned on said supporting member, terminals positioned on said carrier and arranged to engage with the contacts on said supporting member, said removable carrier having condenser and inductance elements thereon and electrically connected in series, one end of the said inductance element being connected with one terminal on said carrier, and one side of said condenser being connected to the other terminal on said carrier.

6. An emergency control unit for electron tube circuits comprising a supporting base, a removable carrier arranged to be positioned upon said supporting base, condenser and inductance elements disposed one below the other on said removable carrier, terminals centrally positioned on said removable carrier and extending in opposite directions therefrom in different parallel planes, contact members disposed on said supporting base and arranged to be engaged between terminals on said emergency unit for establishing a series circuit through said inductance and condenser.

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