

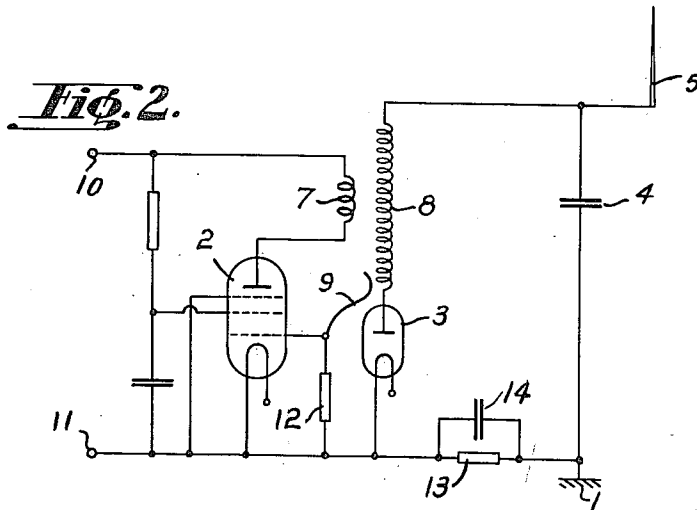
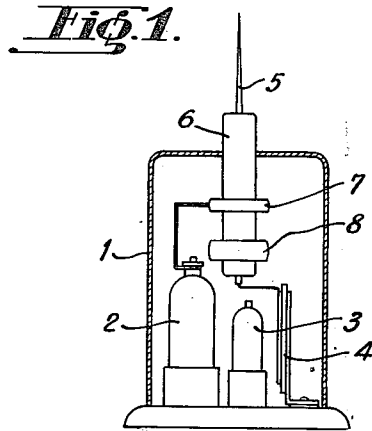
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AIR IONIZING DEVICE FOR AIR CONDITIONING PURPOSES

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AIR IONIZING DEVICE FOR AIR CONDITIONING PURPOSES

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My invention relates to a device for ionising living-rooms, consisting of an electron emitting needle-electrode, connected to one pole of a high voltage source of current, the other pole of which is grounded. Such devices are used for medical and hygienic or, generally speaking, for air-conditioning purposes.

For any air-ionisation very high voltages of say 6000 to 20,000 volts are needed and, for obtaining a pertinent ionizing effect without blowing means, the needle-electrode must be disposed in the open. However, in using such a device in living-rooms, any electric danger must be avoided, even if said needle-electrode is touched by hand.

According to my invention this effect is obtained by producing the high direct current voltage for the needle-electrode by means of a valve oscillator, for example, a pentode, operatively connected to said needle-electrode and arranged in such a manner that the amplitude of the high frequency voltage produced thereby is reduced to a non-dangerous value, if any body comes into close proximity to or touches said electrode. In this way, the supply of high voltage to the needle-electrode collapses before or when the electrode is touched, and in consequence, no danger is involved in touching this electrode.

An object of the present invention is to provide a device for ionizing air which is simple and inexpensive in construction, completely free of any danger to persons who may come in contact therewith, and provides a constant or uniform voltage and ionizing action without the need of adjustment or other servicing.

My invention will be clearly understood when considering the following description in reference to the annexed drawings, wherein:

Fig. 1 shows a schematic section of a device according to my invention, and

Fig. 2 shows a circuit arrangement for supplying the needle-electrode with high voltage, according to my invention.

Within a metallic casing 1 of Fig. 1, there is arranged an oscillator valve 2, a pentode being illustrated, a rectifier valve 3 and a high voltage condenser 4. One pole of said condenser 4 is grounded by connecting it to the casing 1, the other being connected to the needle-electrode 5, carried by a high voltage insulator 6. Within the casing 1, said insulator 6 carries coils 7 and 8 connected to the other elements of the device in a manner described hereafter.

According to Fig. 2, in a simple and desirable circuit embodying the present invention, the

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anode and cathode of pentode 2 are respectively connected to mains or power lines 10 and 11 and the anode is connected in series with the primary coil 7 having relatively few windings. Said coil 7 is magnetically coupled to the secondary coil 8, having more windings. The coil 8 is connected in series with the high voltage or storage condenser 4 and the anode of rectifier valve 3, the end of said coil remote from the rectifier valve being connected to the needle-electrode 5. The cathode of the rectifier valve 3 is grounded to the casing of the device, as is the second plate of the condenser 4. The control grid of the pentode 2 is connected to a capacitive feed-back member, consisting of a wire 9, which is disposed near to the anode of the rectifier valve 3. A grid-leak resistance 27 having as low a capacity as possible is connected between said control grid and the cathode of pentode 2, so as not to increase the static capacity of this grid and of the associated leads over its dynamic capacity. The other grids of the pentode 2 are biased in the usual manner. In order to separate the output circuit from the mains, a resistance 13, shunted by a condenser 14, is provided, the latter short-circuiting any high frequency alternating current voltage across this resistance.

The coil 8 has a considerable distributed capacity and is adapted to oscillate on its natural frequency, one of its ends being grounded as far as high frequency voltages are concerned, by means of the condenser 4, and its other end being therefore energized with high frequency voltages of some thousand volts. Said high voltage is rectified by the valve 3, and simultaneously, capacitively transmitted to the control grid of the pentode 2 by means of the member 9, in order to produce undamped oscillations.

The described feed-back circuit has the character of capacitive voltage divider, consisting of the effective input capacity of the pentode 2 in series with the capacity of the member 9 to the anode of the rectifier 3. The effective input capacity (sum of the static and of the dynamic capacities of the control grid) amounting to about $100\mu\text{f.}$, the coupling capacity of the member 9 must be lower than $10\mu\text{f.}$, preferably $0.1-0.5\mu\text{f.}$ in order to reduce the high alternating voltage of the anode of the rectifier 3 to an amplitude adapted for controlling the grid of the pentode. Such a low coupling capacity is extremely inexpensive and may be obtained in the described manner. The use of a control grid, free of any additional capacitive member, includes the advantage that the dynamic capacity of said grid

will be considerably greater than its static capacity and, therefore, that the division rate of the voltage divider described will become a function of said dynamic capacity. As it is well known, said dynamic capacity varies in accordance with the load on the oscillator valve or pentode and I have discovered that by suitably adjusting the coupling member 9 and the grid-leak resistance 12, the possible variations of the load do not impair the stability of the oscillations produced, the output voltage being an approximately linear function of the output current of the form: $V=A-B \times J$, V being the output voltage, J the output current and A and B being constants.

However, this feed-back path will be totally upset if any body, especially, if a human hand is moved into close proximity to the needle-electrode 5, the increased ground-capacity of the needle-electrode 5 detuning the coil 8. In consequence, the amplitude of oscillations is lowered to a fraction of its normal value, and the capacity of the storage condenser 4 amounting only to about 30—500 $\mu\text{mf.}$, no danger is involved in touching the electrode 5. Practically the same effect may be obtained by shunting said capacitive feed-back divider, if the needle-electrode 5 is connected to the other end of the coil 8.

In the described circuit the primary coil 7 and the pentode 2 comprise a primary circuit, while the secondary coil 8, rectifier 3, electrode 5, and condenser 4 comprise a secondary circuit, with the member 9 and the grid-leak resistance 12 comprising a capacitive coupling or feed-back between the two circuits.

While a particular circuit arrangement embodying the invention has been illustrated and described, it is to be understood that modifications and changes may be made therein without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. An air ionizing device for air-conditioning purposes, comprising in combination; a high frequency transformer having primary and secondary windings; a primary circuit including an oscillator tube having an anode, cathode and at least one control grid, a source of electrical energy, means connecting said anode and cathode of the oscillator tube to said source and to ground respectively, and means connecting said anode of the oscillator tube in series with said primary winding of the transformer; a secondary circuit including a rectifier tube having an anode and a cathode, a storage condenser and an exposed

needle-electrode, means connecting said secondary winding of the transformer to the anode of said rectifier and in series with said storage condenser, means connecting said needle-electrode into said secondary circuit between said condenser and said secondary winding, and means connecting said cathode of the rectifier and said condenser to ground; and a capacitive feed-back circuit including a capacitive feed-back member positioned to be sensitive to the ground capacity of said secondary circuit and connected to said grid of the oscillator tube and a grid-leak resistance interposed between said grid and ground; said grid having a static capacity lower than its dynamic capacity and the capacity of said feed-back member being adjusted to no more than one-tenth of the effective input capacity of said oscillator tube.

2. An air ionizing device according to claim 1; wherein said condenser has a capacity lower than 1000 $\mu\text{mf.}$

3. An air ionizing device according to claim 1; wherein said capacitive feed-back member consists of a metal strip having a portion thereof disposed in close proximity to said anode of the rectifier tube.

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