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OSCILLATOR

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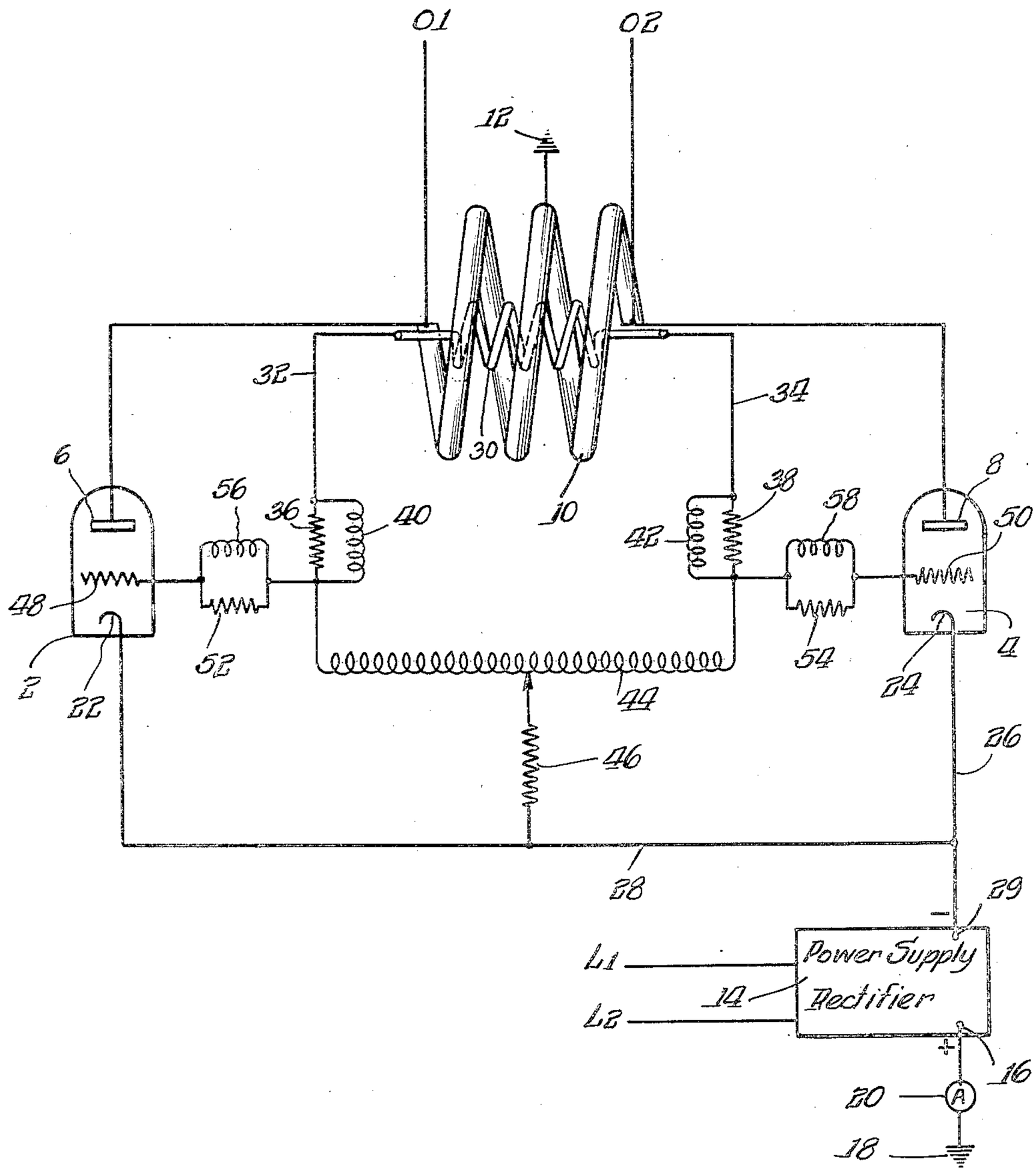

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OSCILLATOR

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4 Claims. (Cl. 250—36)

1

This invention relates to an electronic oscillator, and more particularly to an oscillator for high frequency heating equipment.

The object of the invention is to provide a satisfactory feed-back connection or circuit by means of which energy may be transferred from a tank coil of relatively few turns to the grid circuit of a relatively high power oscillator.

The invention consists generally of a feed-back coil coaxially disposed within the tank coil of relatively few turns and having its ends brought out axially of the tank coil and connected through a parasitic suppressor or suppressors to a choke coil or inductance of a relatively large number of turns and connected in the grid circuit of the oscillator.

Other objects and advantages of the invention and the preferred embodiment thereof will be evident from the following description when taken in connection with the accompanying drawing, in which the single figure thereof is a schematic diagram of an oscillator embodying the invention.

The drawing shows a push-pull oscillator comprising vacuum tube triodes 2 and 4, the plates 6 and 8 of which are connected to opposite ends of the high voltage tank coil 10 of relatively few turns. The electrical center of the tank coil is grounded as at 12 and connected through such ground connection to the usual power supply rectifier 14, which has its positive terminal 16 grounded as at 18 through the plate current meter 20. The rectifier is energized from the usual alternating current supply lines L1 and L2. The cathodes 22 and 24 of the tubes 2 and 4 are interconnected through wires 26 and 28 and the negative terminal 29 of the power supply rectifier 14.

The tank coil 10 has applied to it the high tension, direct current supply voltage, and the high, radio frequency voltage generated across the coil is applied through the output leads O1 and O2 to the load circuit. The desired operating frequency, determined by the reactance of the plate-to-cathode tube capacities and the reactance of the tank coil, limits the tank coil to one of few turns, e. g. three turns. The voltage gradient along the tank coil conductor is, therefore, very steep and high voltages exist between adjacent turns of the tank coil. It is, therefore, extremely difficult, if not impossible, to tap off accurately the required feed-back voltage, for the slightest change in the tapping point effects a large change in the feed-back voltage; to insulate properly the tapping leads;

2

to prevent the introduction of capacities which create parasitic oscillations, and, in the case of a push-pull oscillator, to maintain the two tube circuits in balance.

I have discovered that these difficulties may be avoided and expensive insulation devices eliminated by coaxially disposing within the tank coil a feed-back coil 30 of relatively few turns, e. g. three and one-half turns, the two ends of this feed-back coil being brought out axially or substantially axially of the tank coil and connected through leads 32 and 34 to parasitic suppressors comprising resistances 36 and 38 respectively shunted by inductances 40 and 42.

The suppressors are of such resistance and inductance values that at the frequency at which parasitic oscillations are likely to occur, maximum power absorption takes place in the resistances.

These suppressors are in series with the feed-back coil 30 and a choke coil or inductance 44 having a relatively large number of turns, e. g. thirty-four turns, and having its electrical center connected through an adjustable center tap connection, and through grid resistor 46 and leads 28 and 26 to the cathodes 22 and 24. The grids 48 and 50 of the tubes 2 and 4 are connected to the opposite ends of the center-tapped choke coil 44 through additional parasitic suppressors comprising resistors 52 and 54 shunted respectively by inductances 56 and 58 which may be designed to suppress the same or a different parasitic frequency from that suppressed by the parasitic suppressors in series with the choke coil 44.

The feed-back coil, being in the center of the tank coil and only two ends being brought out, can be readily dimensioned in such a manner that the air spacing between it and the tank coil provides sufficient insulation for the high tension direct and radio frequency voltages of the tank coil and the high frequency voltage between the tank coil and the feed-back coil. The center-tapped choke coil 44 eliminates the need for tapping the feed-back coil and consequently eliminates the need for splitting the tank coil in order to permit insulation of such tapping leads from the split center turn of the tank coil. The choke coil 44 having an adjustable center tap also makes it possible to eliminate, by a simple adjustment, asymmetries which are created by uneven distribution of capacity and inductance along the coil and in the feed-back connections.

While certain specific structural details have been disclosed and described here for the pur-

poses of illustration, it will be apparent that modifications and changes may be made without departing from the spirit and scope of the appended claims.

What I claim is:

1. A high power, high frequency oscillator for high frequency heating apparatus, said oscillator comprising a pair of vacuum tubes, a tank coil having its electrical center directly grounded and opposite potential points connected to the plates of said tubes, a high voltage direct current supply source having its positive terminal grounded and its negative terminal connected to the cathodes of said tubes, a feed-back coil mounted in the tank coil and concentric therewith, the ends of said feed-back coil extending oppositely out of the tank coil substantially along the common axis, parasitic suppressors connected to the ends of said feed-back coil and the grids of said tubes, and a choke coil having opposite potential points connected to the grids and its electrical center connected to the cathodes of said tubes.

2. A high power, high frequency oscillator for high frequency heating apparatus, said oscillator comprising a pair of vacuum tubes, a tank coil having its electrical center directly grounded and opposite potential points connected to the plates of said tubes, a high voltage direct current supply source having its positive terminal grounded and its negative terminal connected to the cathodes of said tubes, a feed-back coil mounted in the tank coil and concentric therewith, the ends of said feed-back coil extending oppositely out of the tank coil substantially along the common axis, parasitic suppressors connected to the ends of said feed-back coil and the grids of said tubes, a choke coil having opposite potential points connected to the grids and its electrical center connected to the cathodes of said tubes, and other parasitic suppressors in the connections from the first parasitic suppressors to the grids of the tubes.

3. In an oscillator adapted to be powered by a source of direct current having high-potential and low-potential terminals, a vacuum tube having plate, grid and cathode elements, said cathode being connected to said low-potential terminal, means including a tank coil connecting said plate to said high-potential terminal, a feed-back coil having a relatively small number of turns disposed in a relatively high-strength portion of the magnetic field of said tank coil,

a choke coil having a relatively large number of turns connected in a closed circuit with said feed-back coil, said choke coil being arranged to have negligible magnetic coupling with said tank coil and said feed-back coil, means connecting a point of said circuit between said feed-back coil and said choke coil to said grid, and adjustable means connecting said choke coil to said cathode whereby the feed-back voltage applied to said grid may be varied.

4. In an oscillator adapted to be powered by a source of direct current having high-potential and low-potential terminals, a vacuum tube having plate, grid and cathode elements, said cathode being connected to said low-potential terminal, means including a tank coil connecting said plate to said high-potential terminal, a feed-back coil having a relatively small number of turns mounted in said tank coil and disposed in substantially coaxial relation therewith, a high-impedance element connected in a closed circuit with said feed-back coil means connecting a point of said circuit between said feed-back coil and said high impedance element to said grid, and means including an adjustable tap connecting said high-impedance elements to said cathode whereby the feed-back voltage applied to said grid may be varied.

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