

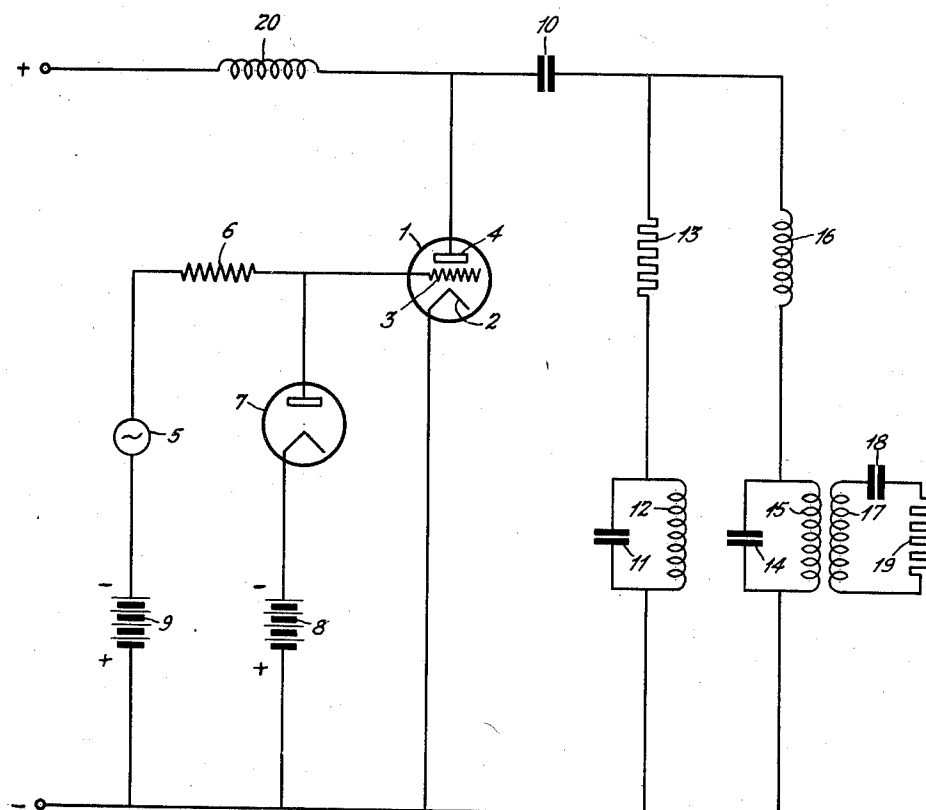
Aug. 28, 1934.

D. PRINZ

1,971,383

TRANSMITTER

Filed Feb. 15, 1933



INVENTOR
DIETRICH PRINZ
BY *J. S. Grover*
ATTORNEY

UNITED STATES PATENT OFFICE

1,971,383

TRANSMITTER

Dietrich Prinz, Berlin, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application February 15, 1933, Serial No. 656,964
In Germany March 11, 1932

5 Claims. (Cl. 250—17)

This invention relates to transmitters and in particular to transmitter circuits which include means to reduce anode loss.

More in detail, the present invention relates to circuits for producing electrical high frequency oscillation by means of electron tubes (tube transmitter) and has for its object the rendering of the anode loss transformed into heat at the anodes of these tubes as small as possible in proportion to the totally transformed energy.

It is already known to secure a decrease of the anode loss by arrangements adapted to provide a rectangular course as accurate as possible for the alternating anode potential and for the alternating anode current so that at any event either the anode current will be large and the anode potential small, or the anode potential will be high and the anode current small (see Jahrbuch der drahtlosen Telegraphie und Telefonie, volume 14, page 126, 1919). It has also been suggested that the rectangular curve of the anode current may be secured by the use of a rectangular grid alternating voltage.

However, no suggestions have hitherto been made as regards the actual provision of a resistance in the anode circuit in which, by a rectangular alternating current, also a rectangular alternating voltage is produced.

It would be required for such a resistance to have for the fundamental wave and for all harmonics of the anode current the same value, essentially determined by the anode potential and the emission of the tube, so-called limiting resistance or resistance to match the impedance between the anode and cathode of the tube. In accordance with the present invention this resistance is divided into two resistances, one having the proper value for the fundamental wave, the other one for all the harmonics, while the first one has so high a value in regard to the harmonics and the second one in regard to the fundamental wave that, when connected in parallel to an additional resistance, the value of the latter is practically not changed.

An embodiment of the invention is shown in the drawing by way of example in which, 1 represents the transmitting tube comprising the cathode 2, the grid 3 and the anode 4. The grid alternating voltage is supplied by an alternating current source 5 whose voltage may be of sinusoidal form and may be applied to the grid through a resistance 6. An auxiliary rectifier 7 is placed between grid and cathode, as, for instance, a gas rectifier connected in series to a direct current voltage 8. A direct current volt-

age 9 is also arranged in series with an alternating current voltage 5. As soon as the sum of the alternating current voltage 5, and the direct current voltage 9, is greater than the sum of the direct current voltage 8 and the breakdown potential of the rectifier 7, this rectifier becomes permeable and practically represents a short circuit so that the voltage of grid 3 can no longer increase. In this way an approximately rectangular course of the grid alternating voltage is obtained.

The anode direct potential is applied through a choke 20, in a known manner, and is kept free from oscillating currents by means of a blocking condenser 10. The anode cathode oscillating circuit contains two branches connected in parallel to each other. The first branch consists of a condenser 11 and a self inductance 12 connected in parallel thereto, and an ohmic resistance 13 is arranged in series to both. The value of this resistance is equal to that of the limiting resistance, that is, matches the impedance of the tube as determined by the anode potential and the emission of the tube. The second branch consists of a condenser 14 and a self inductance 15 connected in parallel to each other and in series with a self inductance 16. The value of the self inductance 15 is equal to that of self inductance 16. A coil 17, by which the oscillating energy is supplied to the antenna, is coupled in the known manner with the coil 15, the antenna is represented by the condenser 18 and resistance 19.

The circuits 11, 12 and 14, 15 are both tuned to the operating wave of the transmitter. In designating the alternating current resistance of the condenser 11 or of the coil 12 by X_1 and the damping thereof by d_1 , the impedance of this circuit for the fundamental wave is equal to X_1/d_1 . Since d_1 is of a very small order and n , the order of the harmonic, being at least equal to 3, due to the symmetrical course of the current curve, there is always a possibility of obtaining X_1/d_1 large and X_1/n small with respect to the limiting resistance. The entire branch, consisting of the elements 11, 12, 13, therefore, has an impedance that is practically infinite for the fundamental wave and for all harmonics in question equal to the limiting resistance.

The oscillating circuit 14, 15 may, by suitably coupling therewith the coil 17, in a known manner, obtain such damping d_2 that its impedance X_2/d_2 for the fundamental wave will be equal to the limiting resistance. As will be found by a simple calculation, this condition can also be

- complied with in regard to the entire branch consisting of elements 14, 15, 16. For high frequencies the impedance of this branch is however substantially equal to the resistance of the coil alone and therefore for the n th harmonic equal to X_{2n} . In choosing X_2 sufficiently high the impedance of the branch 14, 15, 16 can be made for the harmonics as high as desired against the limiting resistance.
- 10 As the branches 11, 12, 13 and 14, 15, 16 are connected in parallel an impedance is obtained in fact whose value for the fundamental wave, as well as for the harmonics, is equal to that of the limiting resistance and which, therefore, supplies, with the rectangular anode alternating current, a rectangular anode alternating potential of the proper value.
- 15 For modulating a transmitter constructed in accordance with the invention the customary methods are not suited, since the anode loss increases strongly as soon as the anode alternating potential decreases. According to the invention, therefore, a variation of the amplitude of the fundamental wave of the anode alternating current is obtained by a change of the intervals of the applied alternating grid voltage by preferably varying the voltages 8 and 9.
- 20 Having thus described my invention and the operation thereof, what I claim is:
1. Means for producing rectangular alternating currents comprising, a thermionic tube having a control grid electrode and an anode, a source of alternating currents of sine wave shape connected to the control grid electrode of said tube, a source of direct current and a discharge device connected in parallel with said alternating current source, and an oscillation circuit connected to the anode of said tube, said oscillation circuit comprising parallel branches, both tuned to the fundamental frequency, and each offering a different impedance to the fundamental frequency.
2. Means for amplifying oscillating currents and for producing from said oscillating currents rectangular alternating energy in which the voltage and current are alternately at maximum and minimum comprising, a thermionic relay having a control grid electrode, a cathode and an anode, a circuit including a resistance for impressing the alternating currents to be relayed between the control grid and cathode of said tube, a discharge tube and a source of direct current connected between the control grid and cathode of said tube, an oscillating circuit connected between the anode and cathode of said tube comprising two branches, one of which includes a resistance in series with a circuit which is parallel resonant to the fundamental frequency, and the other of which includes an inductance in series with a circuit which is parallel resonant to the fundamental frequency.
3. Means for producing rectangular alternating current comprising, a thermionic tube having a control grid electrode and an anode, a source of alternating current of substantially sinusoidal form connected to the control grid electrode of said tube by way of wave form distorting means, an output circuit connected to the anode of said tube, said output circuit comprising parallel branches, the first of said branches including a resistance in series with a capacity and inductance in parallel and the second of said branches including paralleled inductance and capacity in series with a third inductance, both of said parallel capacity and inductance units being tuned to the fundamental frequency, the first of said branches having an impedance approaching infinity for the fundamental wave and certain harmonics of a frequency to which the tuned circuit in said branch offers an impedance equal to the internal impedance of said tube, the impedance of said second branch approaching infinity for the harmonic frequencies and approaching the internal impedance of the tube for the fundamental frequency.
4. A device as recited in claim 3 in which the inductances in series in said second named branch are equal in value.
5. A device as recited in claim 3 in which the resistance in said first named branch is substantially equal to the internal resistance of the tube.
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