

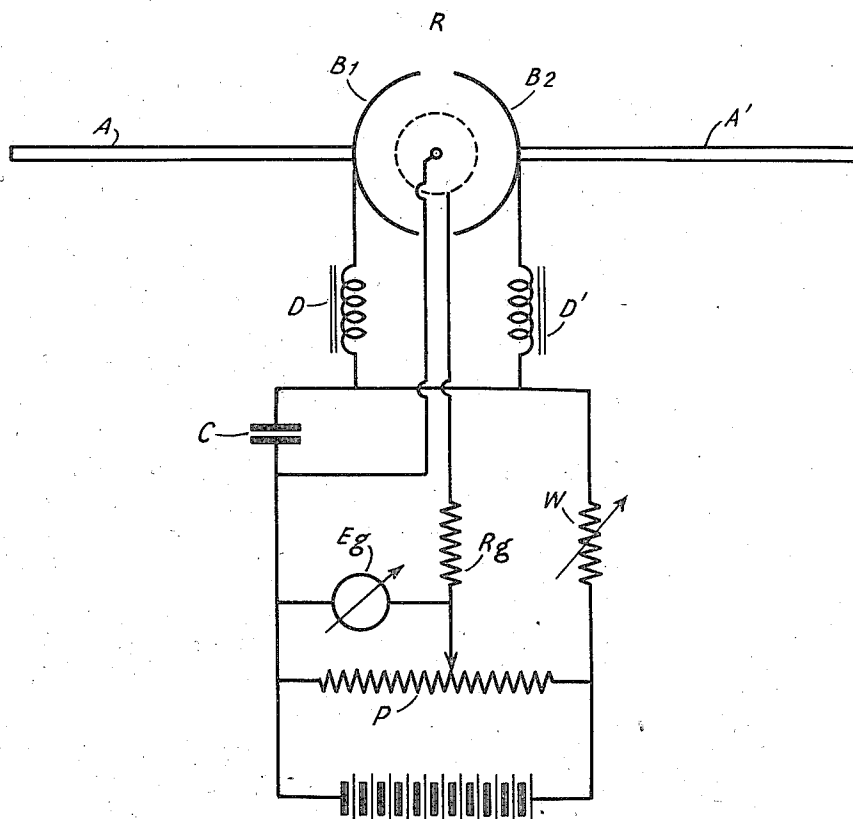
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H. E. HOLLMANN

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RECEIVER FOR ULTRA SHORT WAVES

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INVENTOR
HANS ERICH HOLLMANN
BY *H. S. Groves*
ATTORNEY

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RECEIVER FOR ULTRA SHORT WAVES

Hans Erich Hollmann, Berlin, Germany, assignor
to Telefunken Gesellschaft für Drahtlose Tele-
graphie m. b. H., Berlin, Germany, a corpora-
tion of Germany

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In my copending application Serial No. 714,651, filed March 8, 1934, entitled "Electron tube and circuit therefor", there is described an electron tube operating in a braking field circuit whose braking electrode is divided into two or more segments. By braking field circuit is meant a tube arrangement functioning on the Barkhausen-Kurz principle wherein the grid, which is maintained at a high positive potential relative to the anode and cathode, acts to retard the flow of the electrons when they have passed through the grid on their way to the anode, the grid acting as the braking or retarding electrode. For the reception of ultra short waves, for instance of the order of some decimeters in length, an arrangement is obtained in which, in accordance with the description of my copending application, the segments of the braking electrode are inserted in a parallel wire line where voltage loops may be developed. This parallel wire line then forms in connection with the antenna, the receiver circuit and must be tuned to the desired transmitter wave. Then, as is known, the braking tube acts as secondary circuit, which in this case must likewise be brought into resonance by varying the grid voltage.

My invention as hereinafter claimed is best illustrated by a particular embodiment thereof, the schematic arrangement of which may be in accordance with the accompanying drawing, the sole figure of which represents a radio receiver having an electron discharge tube of the so-called Barkhausen-Kurz type. As is well known, such a tube is usually provided with a centrally disposed cathode and a plurality of anodes of cylindrically sectioned formation. Between the cathode and the anodes a control electrode may be disposed and this electrode has applied thereto a potential which is usually high relative to that of the cylindrically sectioned anodes. In effect therefore the term "anode" is somewhat of a misnomer because the electrons are caused to seek the control electrode which is of highest potential and to be retarded in their flight exterior to the control electrode by virtue of the less positive polarity of the cylindrically sectioned electrodes.

It is among the novel features of my invention that certain new results may be obtained by a novel adjustment and control of the direct current potentials applied to the electrodes of the discharge tube which I prefer to employ. Thus my radio receiver is differently characterized from any of the hitherto known receivers of wave energy which are adapted to operate in the spec-

trum of a few decimeters of wave length. It is characteristic of my invention that although it comprises an oscillatory system of a sort, that system is not tuned in the usual way but merely by varying the operating voltages applied between the electrodes of the tube thereby to obtain an oscillatory condition in the tube only in response to the received ultra high frequency energy.

The peculiar manner of tuning my receiving system so that it shall operate to detect ultra high frequency signals may better be understood upon reference to the following detailed description. Referring to the drawing, the electron discharge tube R, which is of the Barkhausen-Kurz type, is provided with two braking electrode segments B₁ and B₂, each segment being connected to an arm of the receiving dipole A, A'. Each arm of this dipole should be preferably of at least half the length of a radio wave of the energy to be received and detected. The antenna arms may also be of greater length if desired but in any case they are of suitable length so that standing waves may be produced therein. The connection of the antenna arms with the electrodes B₁ and B₂ respectively is such that an oscillatory condition may be produced within the electron discharge tube so that the alternating current potentials applied to the respective cylindrically sectioned anodes are oppositely phased with respect to one another. These anodes operate thus in a push-pull manner.

A direct current source is shown with its positive terminal connecting through an adjustable resistor W and through inductively reactive impedances D, D' to the respective electrodes B₁ and B₂. The negative terminal of the aforementioned direct current source is connected to the cathode. A potentiometer P extends fully across the direct current source and has a tap thereon from which an impedance path R_g may be provided to the control electrode. Between the negative terminal of the battery and the potentiometer tap a voltmeter E_g may be provided if desired. A capacitor C provides a bypass for alternating currents between the retard electrodes B₁, B₂ and the cathode, thus shunting out the battery, the variable resistor W and the potentiometer P.

In the operation of my invention ultra high frequency energy may be collected on the antenna arms A, A' contra-phasally. This energy when fed to the electrodes B₁ and B₂ produces a push-pull action of the tube by virtue of an adjustment of the control grid potential to a value

such that it will be simultaneously positive with respect to a negatively charged retard electrode and negative with respect to an oppositely phased or positively charged retard electrode. The tube therefore acts as a detector and the demodulated energy may be indicated by a potential drop across the resistor R_g . The detection may otherwise be observed if the potential drop across the resistor W is utilized but the results so obtained do not usually compare favorably with those obtained according to the method first mentioned.

In considering the push-pull tube placed in a di-pole of half wave length ($\lambda/2$) as a complex resistance whose value changes with E_g only an extension of the natural wave beyond twice the length of the di-pole is suitable. Although the radiation resistance of the receiver changes thereby considerably, in a wave band beginning from an octave of the fundamental wave, the sensitivity is practically constant. Yet it will be suitable to adapt the fundamental tuning of the receiver possibly to the desired transmitter wave.

In view of the fact that a receiver for receiving waves of the order of a few decimeters should be advantageously situated in the direct field of radiation of the signals to be received, it is frequently located at places that are out of direct reach, such as at the end of a mast, for which reason the distance tuning of the described decimeter receiver by adjusting its grid potential has a particularly practical advantage.

What is claimed is:

1. In an ultra high frequency radio receiver, an electron discharge tube having a cylindrical anode divided into at least two parts, an electron emitting cathode axially disposed with respect to said anode, a control electrode disposed intermediate the cathode and anode, a direct current source for applying different potentials to each of said electrodes, an antenna system having a plurality of energy collecting arms equal in number to the number of anode sections, each arm being connected to its respective section, and means including a resistor in circuit between said direct current source and said anode sections for so adjusting the potential gradient in the zone

of electronic emission that said receiver is tuned to the frequency of an incoming wave.

2. A radio receiver in accordance with claim 1 and having means including reactive impedances in circuit with said anode sections for causing said sections to respond in a push-pull manner under control of the received radio energy.

3. A radio receiver in accordance with claim 1 and having a by-pass capacitor for shunting high frequency energy around said direct current source and toward said cathode.

4. In an ultra high frequency radio energy detector, an electron discharge tube of the Barkhausen-Kurz type, a direct current source for applying suitable potentials to the electrodes of said tube, a dipole antenna connected to the electrodes which are normally most positively biased, and means for so adjusting the potential applied to another of said electrodes that with respect to the electrodes to which the dipole antenna is connected it is simultaneously more positive to one and more negative to the other, thereby causing the tube to act as a push-pull detector.

5. In an ultra high frequency radio energy detector, an electron discharge tube having a plurality of anodes each of which comprises a cylindrical section, a cathode axially disposed with respect to said anodes, a control electrode surrounding said cathode, a radio energy collecting device different portions of which are respectively connected each to one of said cylindrical sections, a direct current source in circuit between said cathode and said anodes, a potentiometer across the terminals of said direct current source, an impedance path from a point on said potentiometer to said control electrode, a by-pass capacitor connected between said anodes and said cathode, and means including an adjustable impedance connected in circuit between said control electrode and said anodes for causing the control electrode to assume a potential intermediate between the positively peaked potential of one anode and the negatively peaked potential of the other anode, said peaked potentials being derived from the contra-phasal action of the different portions of said radio energy collecting device.

HANS ERICH HOLLMANN.