Jan. 28, 1941. E. GERHARD 2,230,108

SUPERREGENERATIVE RECEIVER

Filed Aug. 10, 1939

Fig. 1

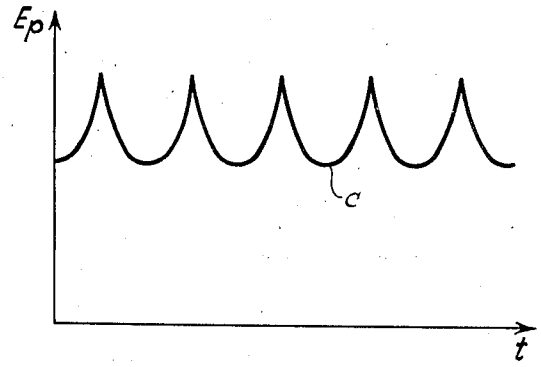
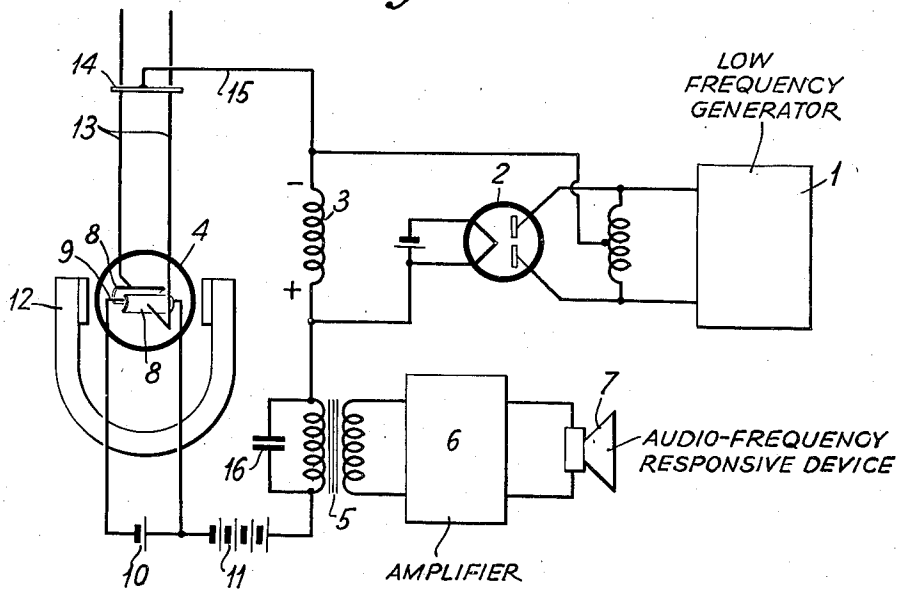



Fig. 2




INVENTOR
ERNST GERHARD
BY H. S. Sweeney
ATTORNEY

Patented Jan. 28, 1941 2,230,108

# UNITED STATES PATENT OFFICE

2,230,108

## SUPERREGENERATIVE RECEIVER

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

Application August 10, 1939, Serial No. 289,335
In Germany August 27, 1938

4 Claims. (Cl. 250—20)

This invention relates to a superregenerative receiver. The device disclosed affords a high sensitivity, through the particular choice of the potential curve of the interrupting frequency, for short wave and more particularly for ultra-short waves.

When receiving by means of a superregenerative circuit it is known that the condition of self-excitation of the receiving tube is varied periodically, an interrupting frequency being used which lies below the receiving frequency, said variation taking place in such manner that during each period of the interrupting frequency, oscillations are generated in the receiving tube and these oscillations die out again. Heretofore the voltage curve of the interrupting frequency oscillations has always revealed a sinusoidal form. The invention is based upon the theory that the potential curve of the interrupting frequency should preferably be other than sinusoidal. Experiments have shown that potential peaks of short time periods are much more favorable than sinusoidal potentials.

Figure 1 of the accompanying drawing shows graphically a plot the preferred interrupting frequency potential in relation to time, this figure being referred to in explaining the operation of my invention; and

Fig. 2 shows a circuit diagram of a preferred embodiment.

The invention resides in applying the interrupting frequency to the receiving tube in the form of periodic sharp potential peaks. The form of these potential peaks preferably corresponds with the curve *c* of Fig. 1 in which time is plotted in the abscissa while the ordinate represents the plate potential $E_p$.

The manner in which the potential peaks are produced is immaterial. However, an especially simple arrangement is represented by the circuit shown in Fig. 2. This circuit contains a magnetron tube **4** for decimeter waves.

In the embodiment herein shown the magnetron tube **4** possesses split anodes **8** and a cathode **9** centrally disposed with respect to the anodes. The cathode is heated by a direct current source **10**, while anode potential is supplied by the direct current source **11**. The discharge zone of the magnetron tube is also traversed by a magnetic field which may be produced either by an electromagnetic winding, or by a permanent magnet **12**, as shown. Each of the split anodes has connected thereto one of a pair of conductors **13** constituting a Lecher wire system or antenna. By means of the conductive bridge **14** tuning of the antenna system may be obtained. The mid-point of the bridge **14** has connected thereto a conductor **15** which leads to the choke **3** and thence through a tuned circuit consisting of the primary winding of the transformer **5** in parallel with which is a capacitor **16**. The plate potential supply source **11** is also connected to the primary of the transformer **5**. It will thus be seen that the plate potential applied to the magnetron consists of a direct potential superposed by periodic potential peaks. The interrupting frequency oscillation produced by the generator **1** is detected by a double-diode tube **2**. The detected alternating potential is applied to the choke coil **3** placed in the plate circuit of the magnetron tube **4** and in such manner that the negative pole of the detected potential lies at the anode side of the choke **3**. The curve shape of the interrupting frequency potential at the anode of the magnetron tube **4** corresponds then to the curve *c* in Fig. 1. The received signals detected by the magnetron tube are applied to the amplifier **6** across the transformer **5** and can be heard at the telephone or loudspeaker **7**.

In a specific embodiment of the invention which I have produced and operated under practical conditions I employed a direct current plate potential source of about 200 volts. The superposed alternating potential as derived from the low frequency generator **1** was of approximately 20 volts. The magnetron discharge tube oscillated to produce waves of the order of 20 centimeters in length and the frequency of the generator **1** was of the order of 6 kilocycles. However, the frequencies could be adjusted so that when the magnetron produced 50 centimeter waves it was found preferable to employ an interrupting frequency generator which gave a frequency of 3 kilocycles. It was found that the sensitivity could be increased very decidedly as compared with an equivalent receiver the interrupting frequency of which had a sinusoidal characteristic.

The invention is not limited to the example of construction herein shown, but modifications may readily be made by those skilled in the art without departing from the spirit of the invention. Furthermore, it is obviously immaterial whether the receiving tube is a magnetron tube or braking field tube.

I claim:

1. In a superregenerative system for ultra-high frequency signal reception, wherein a discharge tube having a cathode and two anodes is activated by a direct current potential in its cathode-anode circuit and wherein signal potentials are applied

through a Lecher wire system to said anodes, the method of shaping the wave of an interrupting frequency potential to be superposed on said direct current potential which comprises introducing inductive reactance in said cathode-anode circuit, and impressing a rectified component of said interrupting frequency potential across the reactive portion of said circuit, said rectified component being poled in opposition to said direct current potential and serving to produce an anode supply current having sharp peaks.

2. A superregenerative receiving system comprising an electron discharge tube having a cathode and two anodes and circuits connected thereto for producing ultra-high frequency oscillations, an antenna system for collecting control frequency energy and feeding the same into said circuits, a direct current potential source for actuating said tube, an interrupting frequency generator, means for rectifying and shaping the output waves from said generator, means for superposing said waves on the potential from said direct current source, thereby to deliver sharply peaked positive impulses to the anodes of said tube and to periodically interrupt the ultra-high frequency oscillations therein, and means responsive to an audiofrequency signal component derived from the circuits of said tube.

3. A system in accordance with claim 2 in which said tube is a split anode magnetron.

4. A superregenerative receiving system having an ultra-high frequency circuit arrangement including an oscillation generating electron discharge tube, said tube having a plurality of electrodes including at least a cathode and two anodes, a Lecher wire system connected to said anodes, a direct current source connected negatively to said cathode and positively to said anodes, a utilization device in circuit between said cathode and said Lecher wire system, and means including a low frequency generator and a full wave rectifier actuated thereby for superimposing a quenching frequency potential on the constant potential applied across said tube electrodes by said direct current source, the last said means being operative to produce an anode supply current having sharp peaks and relatively long quenching periods.

ERNST GERHARD.