Jan. 16, 1934. P. HERMANSPANN 1,943,730

RADIO FREQUENCY SHORT WAVE RECEIVER

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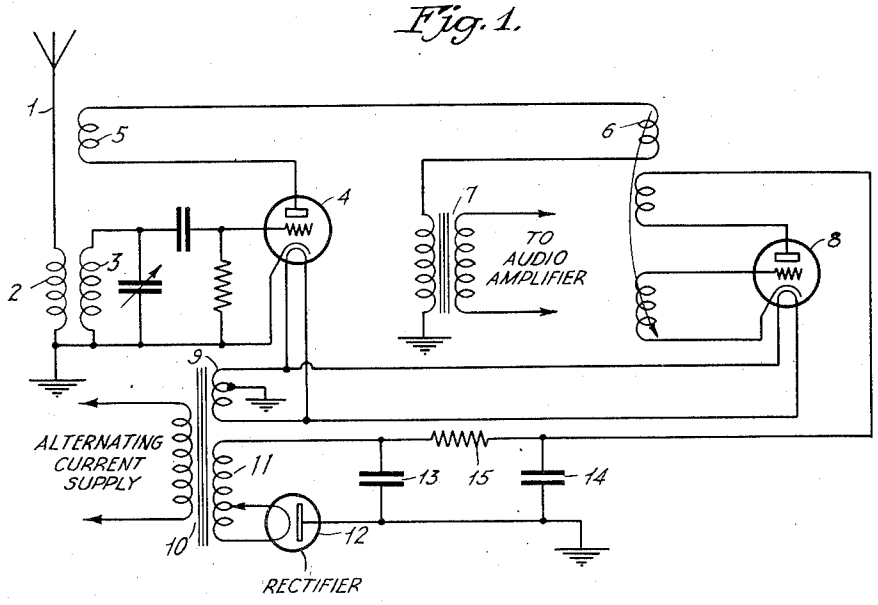
Fig. 1.



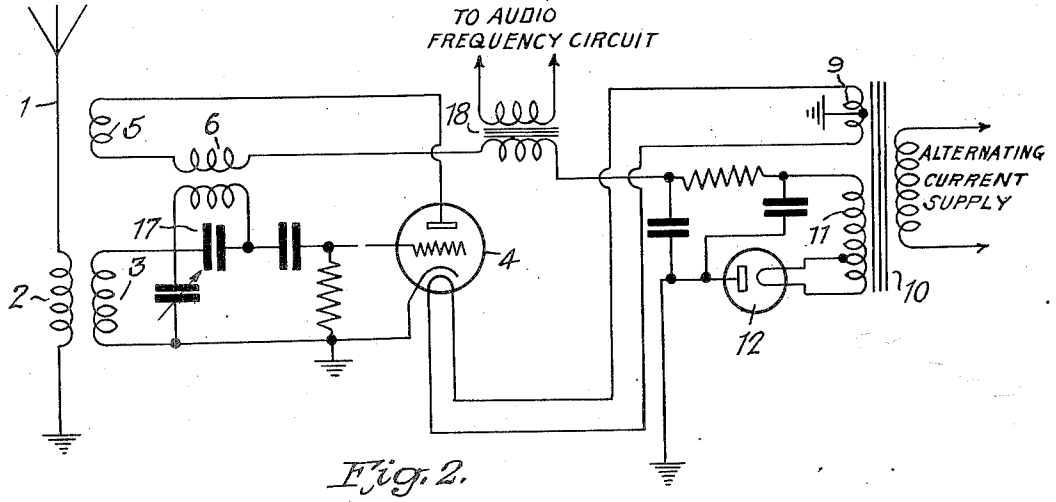


Fig. 2.

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RADIO FREQUENCY SHORT WAVE RECEIVER

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9 Claims. (Cl. 250—20)

The feeding of receiver sets for wireless telegraphy and telephony operated with waves less than 10 meters in length from a supply network is attended with serious difficulties inasmuch as the filtering of the plate direct current potential requires a disproportionately large amount of smoothing means. For instance, for a receiver set comprising a regenerative audion tube for the reception of radio telephony transmission on waves of around 7 meters length it is necessary to provide smoothing condensers of about 24 microfarads in order to filter the plate direct current potential obtained from the network connected power pack. Extensive research with receiver sets of this sort have shown that even with such large smoothing means in case of a current supply utilizing a network no satisfactory or perfect reception is feasible. On the contrary, there arises a conspicuous modulation by the line-supply frequency and the second harmonic thereof, and this becomes so much more manifest the closer the back-feed. As a matter of fact, perfect operation of the alternating current supplied set employing a network under these circumstances would only be practicable by smoothing means in the power pack that would make operations well nigh impossible from an economic viewpoint.

It is known that the sensitiveness of a telephony receiver is capable of being considerably increased by what is known as a "pendulous" back-feed or super-regeneration. It is also known in the art that such super-regeneration scheme turns out to be particularly favorable in the case of ultra-short waves, say, less than 10 meters. But what is entirely unexpected and unforeseeable is that Armstrong super-regeneration schemes very considerably simplify current supply operation of ultra-short wave receiver sets.

This fact and discovery shall be explained by means of key diagrams, Figs. 1 and 2, of an Armstrong receiver set supplied from a network and designed for ultra-short waves. Referring to Fig. 1 of the drawing, the aerial 1 is in coupling relation with a receiver circuit 3 tuned to an ultra-short wave, by means of the coil 2. The potential produced across the terminals of this receiver circuit is fed to the grid of the tube 4 connected audion-fashion. The plate circuit of this tube is formed by the tickler coil 5, the coupling coil 6 and the audio frequency transformer 7 whose secondary coil is united with an audio frequency amplifier, not shown. In the case illustrated the audion is not supplied at all with plate direct current potential from the power pack. The super-regenerative tube 8 (pendulous tube 8) is connected to act as the oscillator for the ultra-audible pendulous frequency. The audion tube is fed with the pendulous potential by way of the coupling coil 6. Both the audio tube 4, and tube 8, are of the indirectly heated type, and they receive their filament energy from the heating winding 9 of the network transformer 10. The plate potential of tube 8 is supplied from the winding 11 of the network transformer 10 by way of rectifier 12. For the filtering of the plate potential of this tube, two condensers 13 and 14 each of 4 mfd. and a high-ohmic resistance 15 have proved satisfactory. The apparatus required for the power pack therefore are considerably less compared with what is required for the power pack of a regenerative audion. However, in spite of such saving in equipment, reception with such a set in case of full alternating current supply is incomparably better, as exhaustive experiments have demonstrated.

One embodiment disclosing the chance of using the rectifier tube at the same time for the purpose of producing the pendulous frequency is shown in Figure 2. In the illustration, antenna 1 by means of the coil 2 is coupled to the receiver circuit 3 tuned to an ultra short wave. The voltage arising across the terminals of the receiving circuit is impressed upon the grid of the tube 4 connected to act as an audion. The plate circuit of this tube consists of the tickler coil 5, the coupler coil 6 and af. transformer 18. Between the grid junction point of tuned circuit 3 and the grid of the rectifier tube 4 there is inserted further a circuit 17 tuned to the pendulous frequency, said circuit 17 being excited through regeneration by way of coil 6. The denotations for the circuit elements of the power pack are the same as in Figure 1.

The probable explanation for this unexpected finding is as follows:

Regeneration in case of ultra-short wave receivers as a general rule must be very large. Hence, like percentage variations of the regeneration as in the standard regenerative receiver, therefore, must result in considerably greater effects. Minimum variations in plate potential as involved in all alternating current network supplies of plate potential occasion very appreciable variations in sensitiveness which follow each other at the rhythm of the line frequency. As a result both the voice and music sound hoarse and humming. While in super-regenerative receiver sets the sensitiveness changes with the amplitude of the pendulous potential, this occurs only

within narrow limits. The fact that the sensitiveness of the super-regenerative receiver depends indeed only relatively little upon the amplitude of the pendulous frequency follows also from that the pendulous tube may readily consist of a directly heated tube even if the filament current is an alternating current.

It may also be mentioned that contradistinct from the above example the rectifier tube 4 may, of course, be supplied also with direct current plate potential. However, network supply for the set and the operation of the latter become particularly simple when the audion tube is not supplied with a direct current plate, in line with what is shown in the drawing. If the plate of the rectifier is fed with a direct current potential then the pendulous or periodic potential may be supplied also to the grid.

Also for the circuit scheme of Figure 2 all that has been stated above holds true, namely, that the smoothing means in the power pack need to be but limited in order that reception may be freed perfectly from alternating current hum and alternating current modulation.

What shall also be mentioned is that the method here disclosed is not confined to plate rectification, but that it will be found useful also for any other regenerative rectifier scheme for the receiver tube.

I claim:

1. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an input circuit coupled to said control electrode, a feed-back connection from said anode to said input circuit, an oscillatory circuit and an output circuit both being coupled to said feed-back connection.

2. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an indirectly heated electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an antenna coupled to said control electrode, a feed-back connection from said anode to said control electrode, an oscillatory circuit coupled to one of said electrodes, and an audio frequency utilization circuit coupled to said feed-back connection.

3. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an indirectly heated electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an antenna inductively coupled to said control electrode, a feed-back connection from said anode to said control electrode and inductively coupled thereto, an oscillatory circuit coupled to one of said electrodes, and an audio frequency utilization circuit inductively coupled to said feed-back connection.

4. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an indirectly heated electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an input circuit coupled to said control electrode, a feed-back connection from said anode to said input circuit, and an oscillating audion circuit arranged to generate super-audible frequencies whose output is coupled to said feed-back connection, and a utilization circuit separately coupled to said feed-back connection.

5. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an indirectly heated electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an input circuit coupled to said control electrode, a feed-back connection from said anode to said input circuit, an oscillatory circuit comprising inductance and capacity in parallel relationship in circuit both with said feed-back connection and said control electrode, and an output circuit coupled to said feed-back connection.

6. A super-regenerative ultra short wave circuit adapted to function on waves below ten meters comprising an indirectly heated electron discharge device having an anode and a control electrode, a source of alternating current for effecting the energization of the electrodes of said device, an antenna circuit coupled to said control electrode, a feed-back connection from said anode to said input circuit, said feed-back connection being coupled to said source through an impedance network and a rectifier tube, said rectifier tube being in circuit with a transformer across said source of alternating current supply, said impedance network being arranged to smooth out the current from said rectifier tube, an oscillatory circuit comprising an inductance and a capacity in parallel relationship in circuit with said control electrode and inductively coupled to said feed-back connection, and an audio frequency utilization circuit separately coupled to said feed-back connection.

7. A super-regenerative ultra short wave circuit in accordance with claim 6 characterized in this, that the amplitude of the oscillations in said oscillatory circuit is higher than that from said rectifier tube.

8. A super-regenerative radio receiving circuit comprising an electron discharge device having a cathode, an anode and a control electrode, an input circuit coupled to said cathode and control electrode, a feed back connection from said anode to said input circuit, said feed back connection conductively extending to ground, an output circuit and an oscillatory circuit separately coupled to said feed back connection, said oscillatory circuit comprising an audion oscillator generating super-audible oscillations.

9. A super-regenerative radio receiving circuit comprising an electron discharge device having a cathode, an anode and a control electrode, an input circuit coupled to said cathode and control electrode, a feed back connection from said anode to said input circuit, said feed back connection conductively extending to ground through two inductance coils, an audio frequency output circuit coupled to one inductance coil, and a super-audible oscillatory circuit coupled to the other coil.

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