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PORTABLE SUPERREGENERATIVE RECEIVER

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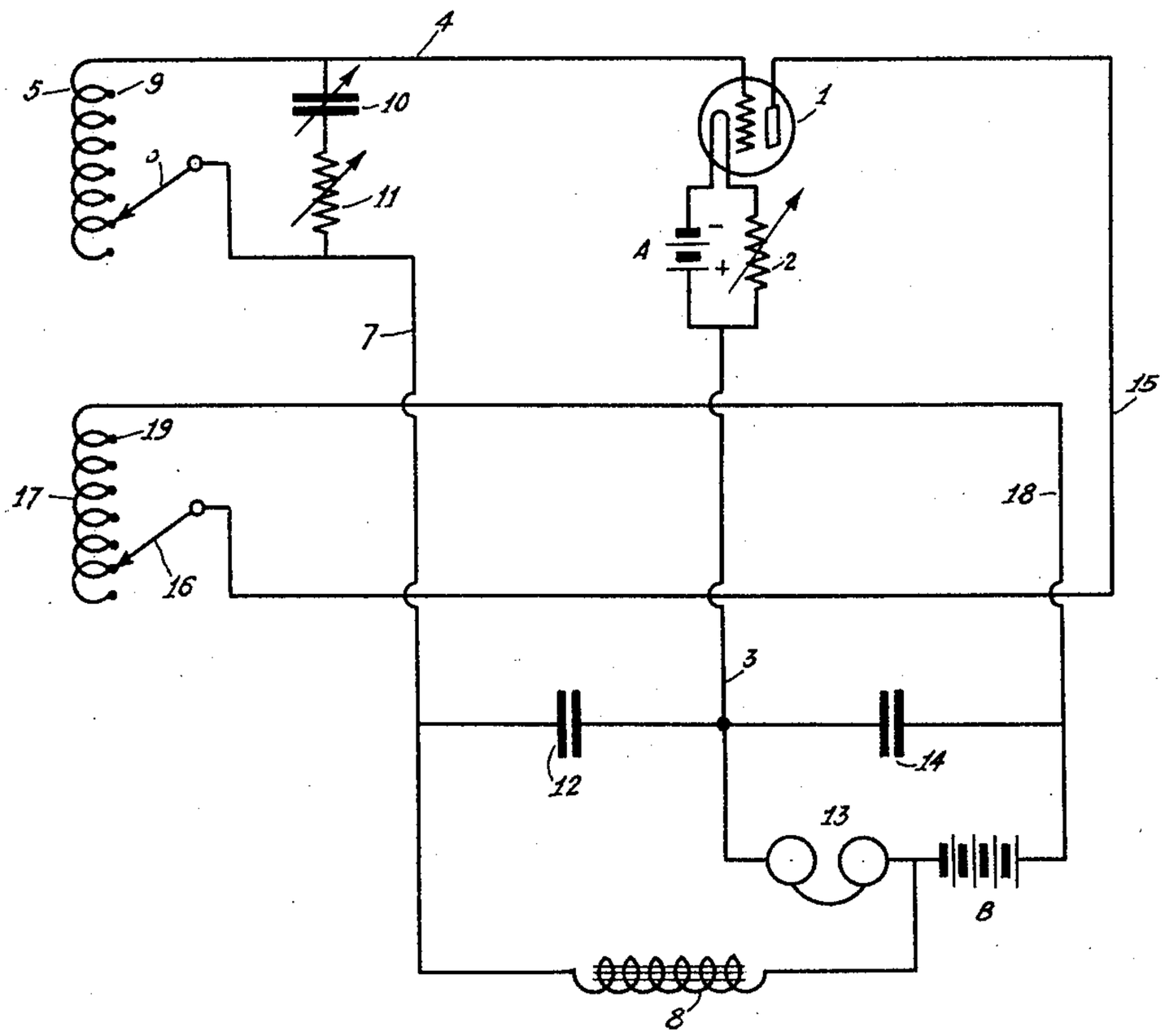

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PORTABLE SUPERREGENERATIVE RECEIVER

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My present invention relates to regenerative receivers, and more particularly to an improved type of super-regenerative radio receiver readily adapted for portability.

Super-regenerative receivers wherein the functions of amplification, variation and detection are all accomplished by the use of a single tube, are well known. For example, E. H. Armstrong in U. S. Patent No. 1,424,065, issued July 25, 1922, has shown such a receiver. However, it has been found that various improvements in such a receiver are necessary when it is desired to construct a compact, portable super-regenerative receiver of relatively small dimensions.

Accordingly, it is one of the main objects of my present invention to provide a highly simplified radio receiver utilizing the super-regenerative principle, which receiver is not only compact and portable, but utilizes only a single space discharge device adapted to be energized from extremely low voltage sources.

Another important object of the present invention is to provide a super-regenerative receiver comprising relatively fewer circuit elements than has been hitherto thought possible, and current sources of minimum dimensions, the entire circuit being capable of disposition in a minimum amount of space.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims, the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawing, in which I have indicated diagrammatically one circuit arrangement whereby my invention may be carried into effect.

Referring to the accompanying drawing there is shown diagrammatically the super-regenerative circuit comprising the present invention. This circuit includes an electron discharge tube 1 of relatively small dimensions, there preferably being employed a tube designated as "UX230" for this purpose. This tube is not only of compact size, but is capable of operation with cathode and anode current sources of relatively low potentials. For example, the cathode current source "A" need only be a three volt source. A variable resistor 2 is connected in series with the source "A" in order to regulate the heating of the cathode of the tube.

The anode of the tube is energized from a source "B", this source only having a value of four and one half volts. To illustrate the physical dimensions of the sources "A" and "B", it is pointed out that they are usually no more than three inches in length, and may be flash light batteries. A pair of head phones is connected in series between the negative terminal of the source "B" and the positive terminal of the source "A", through a conductor 3.

The grid of the tube 1 is connected to the negative terminal of the source "B" through a circuit which includes a conductor 4, an inductance coil 5, a variable conductor member 6, a conductor 7, and a choke coil 8. A plurality of taps 9 is provided along the coil 5 whereby any desired amount of inductance may be inserted in the input circuit of the tube 1 by connecting the contact member 6 with any of the taps 9. A variable condenser 10, and a variable resistor 11, both connected in series, are connected across the inductance coil 5.

The variable condenser has a capacity of 65 micro farads, while the resistor 11 has a maximum resistance of 50 ohms. It will be seen that the circuit comprising the inductance coil 5, acting as a loop aerial, and the variable condenser 10 constitutes a tunable signal energy collecting circuit. In actual practice they occupy but very little space, as the inductance may consist of a number of turns of wire on the cover of a container no larger than the conventional cigar box. A fixed capacity 12 is connected between the conductors 3 and 7. This capacity preferably has a value of 0.012 micro farads. Another condenser 14, having a value of about 0.006 micro farads is connected between conductors 3 and 18.

The regenerative path between the output circuit of tube 1 and its input circuit

comprises the conductor 15 connected at one end to the anode of the tube, and connected at its other end to a variable contact member 16, an inductance coil 17, and a conductor 18, the latter being connected to the positive terminal of the source "B". A plurality of taps 19 are provided along the inductance coil 17 whereby regeneration may be controlled by connecting the member 16 with any of the taps 19. The choke coil 8 is so designed and has such a magnitude as to produce a high pitched interrupting oscillation, which oscillation is preferably disposed near the upper limits of audibility.

It is not believed essential to the description of the present invention to explain in detail the theory of operation of a super-regenerative receiver employing only a single tube as an amplifier, a source of interrupting frequency, and a detector, since, as stated heretofore, the theory of operation of such a circuit has been clearly described by E. H. Armstrong in his aforementioned patent.

It is sufficient to state here that when the super-regenerative circuit is adjusted to its normal operating condition by means of proper setting of the contact member 16 and resistance 11, the relation between the amount of feed-back and the damping is periodically varied by the presence of the low frequency oscillations generated in the low frequency oscillation circuit 8, 12, 14, "B".

The virtue of the present arrangement comprises the following features:

1. The entire circuit, as shown in the drawing, may be disposed within a confined space no greater than a container of the size of the well known form of cigar box;

2. The present arrangement eliminates at least one fixed capacity essential for use in super-regenerative receivers of this type known to the prior art;

3. By means of the circuit arrangement shown, it is not necessary to provide a tap on the interrupting frequency inductance coil 8, as is necessary in constructions of this type in the prior art;

4. The grid and plate circuit inductances form the antenna structure, and rough adjustments of tuning and feed back are attained by means of the tap switches which may be very small. For fine tuning condenser 10 need not be large, while a small rheostat 11 takes care of fine adjustment of the relation between feed back and damping.

I have been able to construct a dependable and useful receiver by making use of the refinements described, which weighs less than two pounds complete, and which is built entirely within a cigar box.

While I have indicated and described one arrangement for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organization shown and described, but that many modifications may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim is:

1. A super-regenerative receiver comprising an electron discharge tube provided with an input and output circuit, the anode of said circuit being coupled to the said input circuit through a variable inductance path, a source of anode potential, said path being connected at one end to said anode, and at the other end to said source, a path including an inductance coil connected, between said input circuit and the negative terminal of said anode source and having a magnitude such that interruption oscillations near the upper limits of audibility are produced, a fixed capacity in shunt with said inductance coil, and means for tuning said input circuit to a desired signal frequency.

2. In a super-regenerative receiver, a low frequency oscillation circuit consisting of a single inductance coil and two condensers all arranged in series, a tube, the cathode of the tube being connected to the junction of said condensers, one terminal of said coil being connected to said junction through a reproducer, the grid return of the tube being connected to a terminal of one of said condensers, and the plate return of the tube being connected to a terminal of the other of said condensers.

3. A super-regenerative receiver comprising an electron discharge tube provided with an input and output circuit, the anode of said circuit being coupled to the said input circuit through a variable inductance path, a source of anode potential, said path being connected at one end to said anode, and at the other end to said source, a path including an inductance coil connected between said input circuit and the negative terminal of said anode source, said coil having a magnitude such that interruption oscillations near the upper limits of audibility are produced, a fixed capacity in shunt with said inductance coil, a fixed capacity in series with the shunt capacity, and means for tuning said input circuit to a desired signal frequency.

4. A super-regenerative receiver comprising an electron discharge tube provided with an input and output circuit, the anode of said circuit being coupled to the said input circuit through a variable inductance path, a source of anode potential, said path being connected at one end to said anode, and at the other end to said source, a path including a fixed choke coil connected between said input circuit and the negative terminal of

said anode source, a pair of fixed capacities in series with said coil, and means for tuning said input circuit to a desired signal frequency.

5. A super-regenerative receiver comprising a tube provided with an input and output circuit, the input circuit including a variable inductance coil, the anode of said circuit being coupled to said input circuit through a variable inductance coil, a source of anode potential, said output circuit coil being connected at one end to the anode of the tube and at the other end to said source, a path including an inductance coil connected between said input circuit and the negative terminal of said anode potential source, a fixed capacity in shunt with said last named coil, means for tuning said input circuit to a desired signal frequency, said variable inductance coils acting simultaneously as radio frequency circuit coils and as signal collecting means.

6. A super-regenerative receiver comprising a tube provided with an input and output circuit, the input circuit including a variable inductance coil, the anode of said circuit being coupled to said input circuit through a variable inductance coil, a source of anode potential, said output circuit coil being connected at one end to the anode of the tube and at the other end to said source, a path including an inductance coil connected between said input circuit and the negative terminal of said anode potential source, a fixed capacity in shunt with said last named coil, means for tuning said input circuit to a desired signal frequency, said variable inductance coils acting simultaneously as radio frequency circuit coils and as signal collecting means, and a variable resistor in said input circuit in shunt with said input coil to regulate the relation between said feed-back and damping.

7. In combination, in a portable super-regenerative receiver of relatively small dimensions, a single electron discharge tube capable of operation with cathode and anode current sources of relatively low potentials, the cathode circuit of said tube including a current source of the order of three volts, the anode circuit of said tube including a current source of the order of four and one-half volts, a pair of head-phones connected in series between the negative terminal of said anode source and the positive terminal of said cathode current source, a path between the control grid of said tube and the negative terminal of said anode current source including a variable inductance coil in series with a fixed choke coil, a path in shunt with said coil including a variable tuning condenser in series with a variable resistor, a path connected between the anode of said tube and the positive terminal of said anode current source which includes a variable inductance coil inductively coupled to said first named variable coil, both said variable coils being adapted to act as signal collecting means, a fixed condenser connected in shunt with said fixed choke coil, and a second fixed condenser connected in series with said first fixed condenser, and in shunt with said head-phones and anode current source.

8. In a super-regenerative receiver, a local frequency oscillator circuit including a single inductance coil and two condensers arranged in series with each other, a tube, the cathode of the tube being connected to the junction of said condensers, the grid return being connected to a terminal of one of said condensers, the plate return of the tube being connected to a terminal of the other of said condensers, a source of potential connected between the plate and cathode, means permitting the flow of direct current between plate and cathode, a high frequency tuned circuit regeneratively associated with said grid and plate returns and means for controlling the amount of regeneration.

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