June 29, 1937. T. E. PONSOT ET AL 2,085,448

WIRELESS RECEIVING SET

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Fig. 1.

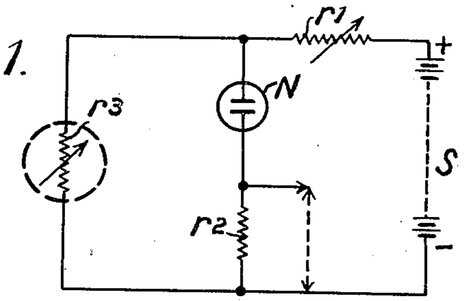


Fig. 2.

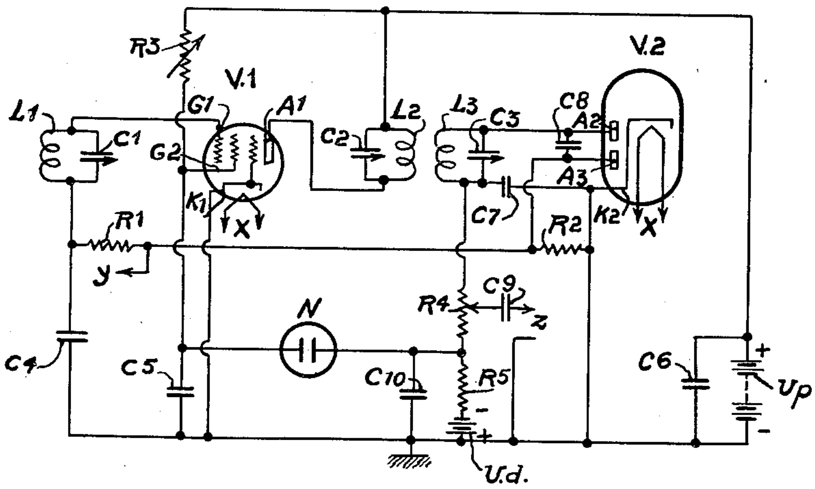
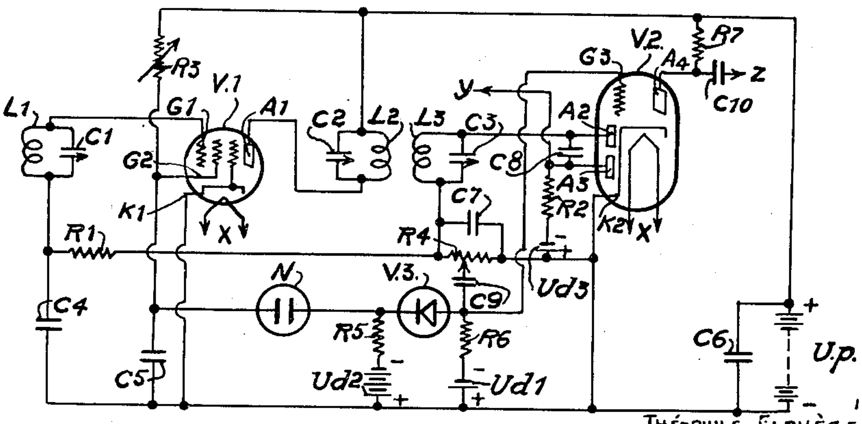


Fig. 3.



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WIRELESS RECEIVING SET

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1 Claim. (Cl. 250—20)

It is known that each broadcasting station is separated from immediately adjacent stations by a band reckoned in wave lengths. When the user adjusts his wireless receiving set, the passage of these bands produces, in the loudspeaker, various noises resulting from "parasites", atmospheric perturbations, from emitting stations of low power or located far away. The sounds thus produced are disagreeable for the auditors.

The present invention avoids, in particular, this inconvenience. It allows a noiseless adjustment of the receiving set, free from any mains hum or crackling. When the bands separating the broadcasting stations pass, the loudspeaker remains silent; it only operates when it can emit a sound, speech or music, sufficiently clear and powerful for interesting the auditory.

The invention consists in automatically starting the operation of an essential part of the wireless receiving set only above a given value of the high frequency energy received by the set.

Below this value, which can be chosen at will, the receiving set does not completely operate, so that the loudspeaker remains silent. This value being exceeded, the wireless set is automatically put in condition for reception and then operates as usual.

In the accompanying drawing, like characters of reference indicate like parts in the several views, and:—

Figure 1 is a wiring diagram typically illustrating the general idea of this invention.

Figure 2 is a wiring diagram illustrating one practical embodiment of the inventoin.

Figure 3 is a wiring diagram illustrating a second practical embodiment of the invention.

The invention is based on the following typical circuit, utilizing a property of neon tubes.

In a circuit connecting both poles of a source of electric supply S are interposed a resistance r^1 and a resistance r^3 (Fig. 1).

A neon tube N, followed by a resistance r^2, is connected in parallel with the resistance r^3.

The resistance r^3 is variable; in practice, it is the internal resistance of a vacuum tube. Its variation is then obtained by varying the grid potential.

As is well known, a neon tube has the property of lighting only above a certain and definite value of the voltage applied to its terminal. This neon tube can moreover be replaced, in the circuit, by any device preventing the passage of the current below a certain value of the voltage of the latter at the terminals of the device and allowing the passage for higher values.

If, from a value of the resistance r^3 insufficient for causing the neon tube N to light, this value is caused to increase, the difference of potential at the terminals of the neon tube N increases and, at a certain moment, the tube is lighted. This lighting causes a current to pass through the resistance r^2 at the terminals of which can be collected a difference of potential the presence of which conditions the operation of the wireless set to which the present circuit is added.

It is to be noted that, in order that the lighting of the neon tube should be stable, it is necessary that the drop of potential caused by the passage of the current, upon lighting, through the resistances r^1 and r^2 should be smaller than the difference of the voltages used for lighting and extinguishing the neon tube. In fact, in the reverse case, this neon tube would twinkle and the operation would be unsatisfactory. This mode of connection is applicable every time it is necessary to control, postively, without progression or gradual diminution, the closing of a circuit. It allows to obtain this result without interposition of mechanical members.

In the application of this coupling to wireless receiving sets, the variation of the resistance of r^3 is under the influence of the rectified high frequency current, as will be explained later on. When the high frequency energy received becomes too small to be suitably heard, the operation of the low frequency stages is automatically stopped.

In practice, the lighting of the neon tube can be rendered visible from the exterior of the receiving set, so that the user will be informed that the receiving set, in which the coupling above described is used, is in condition for operation.

An example of the automatic starting device according to the invention as applied to a coupling for wireless receiving set will now be given, the circuit comprising a high or mean frequency amplifying stage acting on a rectification valve.

The amplifying stage (Fig. 2) utilizes a tube V^1 of the pentode type. It acts, through the medium of the circuits—self-induction coil L^2—condenser C^2, self-induction coil L^3—condenser C^3 on a rectification valve V^2 of the double diode type.

For greater simplicity of the diagram, the heating circuits X of the tubes V^1 and V^2, of the indirect heating type, have not been shown.

A difference of high frequency potential appearing at the terminals of the oscillatory circuit: self-induction coil L^1—condenser C^1, is applied between the control grid G^1 and the cathode

K^1 of the tube V^1, through the medium of the connecting condenser C^4. The continuous potential relating to the said tube is defined, relatively to the potential of the cathode, through the resistances R^1 and R^2 in series.

The screen-grid, or accelerating grid G^2 is usually supplied with one half the plate current, by lowering the plate current *Up* by interposition of the resistance R^3. This supply voltage is so chosen as to be lower, by choosing the value of R^3, than the voltage necessary for lighting a neon tube N.

A fixed condenser C^5 is connected between the screen-grid G^2 and the cathode K^1.

The amplified high frequency energy, collected between the anode A^1 and the cathode K^1 of the tube V^1, is applied to the circuit L^2—C^2 through the fixed condenser C^6. This energy, transmitted to the circuit L^3—C^3, is applied between an anode A^2 and the cathode K^2 of the tube V^2 through the fixed condenser C^7. A source of current supply *Ud* negatively polarizes the anode A^2, resistances R^4 and R^5 being interposed between the anode A^2 and the negative pole of the source of current supply *Ud*. It will be understood that, as long as the anode A^2 is negatively polarized, no rectification of the high frequency energy takes place.

The amplified high frequency energy is also applied between the anode A^3 and the cathode K^2 of the tube V^2, through the condensers C^7 and C^8.

The potential of this anode A^3 being fixed, at rest, relatively to that of the cathode K^2, through the interposed resistance R^2, the lowering of the potential of this anode proportionally to the amplitude of the carrier wave is obtained, as is well known. A corresponding lowering of potential (a resistance R^1 and the self-induction coil L^1 taken into consideration) is thus obtained for the control grid G^1 of the tube V^1.

This lowering of potential can also be used, in the known manner, for obtaining automatic regulation of the amplification, by applying it at Y towards the preceding amplifying tubes V^1.

The following circuit: positive pole of the B battery *Up*, resistance R^3, grid G^2, cathode K^1, negative pole of the B battery *Up*; connected in parallel: neon tube N, resistance R^5, is assimilable to the automatic starting which has been described above.

The resistance R^3 fulfills the function of r^1 of Fig. 1, the internal resistance: grid G^2—cathode K^1 of the tube V^1, fulfills the function of the resistance r^3, and the resistance R^5 that of r^2.

When the internal resistance: grid G^2—cathode K^1 of the tube V^1, increases, in relation to the lowering of the potential of the grid G^1 indicated above, the intensity of the current passing through the grid G^2 diminishes, as well as the drop of voltage at the terminals of the resistance R^3; the potential of the grid G^2 increases and the lighting of the neon tube N takes place when this potential equals the starting voltage of this tube less the difference of potential at the terminals of the battery *Ud*.

The value of the resistance R^5 is so chosen that the current passing through it causes, for the minimum intensity of the current passing through the neon tube N, a drop of potential equal to the difference of potential existing at the terminals of the battery *Ud*.

It will then be understood that, at the time a current can pass through the neon tube N, the influence of the battery *Ud* is annulled and, from this fact, the anode A^2 of the tube V^2 is brought to a potential equivalent to that of the cathode K^2.

The detection of the carrier wave takes place in these conditions and the variations of musical frequency modulation of the carrier wave are collected at the terminals of the resistance R^4; these variations are applied at Z to the low frequency stages through the medium of the condensers C^9 and C^{10}.

If the amplitude of the carrier wave diminishes, the voltage at the terminals of the neon tube N correspondingly diminishes until the latter extinguishes. The anode A^2 is again negatively polarized by the battery *Ud*; rectification no longer takes place and no difference of low frequency potential is applied at Z to the low frequency stages.

By regulation of the resistance r^3, the neon tube can be lighted for definite values of the high frequency energy received by the wireless set; this wireless set can therefore be given a sensitiveness varying from the maximum sensitiveness determined by the general circuit to zero sensitiveness.

A second application of the automatic starting device will now be described with reference to Fig. 3 of the accompanying drawing.

The wireless receiving set comprises, in particular, a high frequency or mean frequency amplifying stage utilizing a tube V^1 of the pentode type which acts, through the medium of the coupled oscillatory circuits: self-induction coil L^2—condenser C^2, and self-induction coil L^3—condenser C^3, on a detector tube V^2 of the double diode type. The latter is combined with a low frequency amplifying triode comprised, in the example described, in the same enclosure.

In the following circuit: cathode K^2, condenser C^7, self-induction coil L^3—condenser C^3, anode A^2, the rectification of the high frequency half-wave normally takes place, the anode A^2 being at a rest potential equal to the potential of the cathode K^2.

The potential of the end of the resistance R^4 opposed to the cathode K^2 lowers proportionally to the amplitude of the high frequency wave. It is applied to the control grid G^1 of the tube V^1 through the medium of the resistance R^1 and of the self-induction coil L^1.

An increase of the internal resistance—space cathode K^1, screen-grid G^2—of the tube V^1, is therefore obtained, as previously, as well as a corresponding increase of the difference of potential at the terminals of the neon tube N in proportion to an increase of the amplitude of the high frequency wave received.

The musical frequency component existing at the terminals of the resistance R^4 is applied, through the medium of the capacity C^9, to the control grid G^3 of the low frequency amplifier contained in the tube V^2.

The mean potential of this grid which, normally, that is to say for a satisfactory operation, must be, relatively to the cathode, slightly negative owing to the action of a battery Ud^1, is rendered, the neon tube not being lighted, very negative by the influence of a battery Ud^2 connected in opposition to the battery Ud^1.

In the opposition circuit of the batteries Ud^1 and Ud^2, is to be successively found, from the negative pole of Ud^1: a resistance R^6, a device allowing the current to pass only in the direction Ud^1 towards Ud^2, for instance a valve V^3, a resistance R^5.

The relative values of the resistances R^5 and R^6 are such that the difference of the negative potentials of the batteries Ud^2 and Ud^1 is again found, nearly integrally, at the terminals of the resistance R^6. In this way, the point of operation of the control grid G^3 of the low frequency amplifying tube is displaced outside the working characteristics, this preventing the low frequency amplification.

This low frequency amplification is, moreover, prevented in an absolutely complete manner by the fact that the difference of low frequency potential at the terminals of the resistance R^6 is shunted by the resistance R^5 and the valve V_3, this in fact, being the equivalent of a short circuit.

The high frequency energy existing at the terminals of the circuit: self-induction coil L^3—condenser C^3, is also applied to the anode A^3 of the tube V^2 through the condenser C^8.

This anode is negatively polarized by the battery Ud^3, so that the rectification takes place only from a definite high frequency amplitude, corresponding to the minimum energy necessary for the normal low frequency volume.

The drop of voltage, obtained owing to the amplification of a high frequency wave, which is collected at the terminals of the resistance R^2, allows the application, to the preceding amplifying tubes V^1, at Y, of a negative voltage regularly increasing with the amplitude of the carrier wave.

This mode of carrying out the invention therefore also allows of preserving the automatic control of the amplification.

When the circuit according to the invention is regulated for corresponding to maximum sensitiveness, the low frequency amplification is obtained by allowing the high frequency amplifying tubes preceding V^1 to operate in conditions of maximum efficiency.

When, owing to a sufficient value of the high frequency energy amplified by the tube V^1, a difference of potential equal to the lighting voltage is obtained at the terminals of the neon tube N, the latter lights.

A current circulates in the following circuit: positive pole of the B battery *Up*, resistance R_3, neon tube N, resistance R^5, battery Ud^2 in opposition to the B battery *Up*, negative pole of the B battery *Up*.

The resistance R^5 is so chosen that the difference of potential which then appears at its terminals is sufficient for equalizing the potentials of both terminals of the valve V^3.

The depolarization of the low frequency control grid G^3 is then determined solely by the battery Ud^1, and, the shunt at the terminals of the resistance R^6 becoming practically infinite, the operation of the low frequency stage normally takes place.

It is to be noted that if the difference of potential at the terminals of R^5 increases, for any reason whatever, for instance under the influence of the conditions of operation of the neon tube N, no current circulates however towards the resistance R^6, owing to the blocking action due to the valve V^3.

In reverse direction, if the high frequency energy amplified by the tube V^1 falls below a certain value, the neon tube extinguishes and low frequency amplification is no longer possible.

It is to be understood that it is possible, as in the form of construction previously described, to cause full operation of the wireless receiving set for any definite value of the high frequency energy by suitably choosing the resistance R^3.

What we claim as our invention and desire to secure by Letters Patent is:—

In a wireless receiving set, a B battery, a circuit connecting both poles of the B battery, means interposed in this circuit, allowing the operation of the low frequency stages to start only when the energy received exceeds a certain value, comprising: a resistance in series in the circuit, the internal resistance of a tube adapted to function under wireless impulses of not less than mean frequency in series in the circuit,—in parallel with the internal resistance: a neon tube, a battery connected, by its negative pole, to the grid of a low frequency tube and capable, by its action alone, of putting this grid outside the normal working conditions, a resistance interposed between the neon tube and this battery, annulling, upon lighting of the tube, the influence of the said battery,—another battery connected in opposition to the preceding one for the normal polarization, upon lighting of the neon tube, of the said low frequency grid, a device between these two batteries, allowing the current to pass only in the direction from the usual polarization battery towards the other battery,—a detecting anode being reserved for regulating the high frequency stages with the exclusion of the regulation of the automatically started circuit.

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