

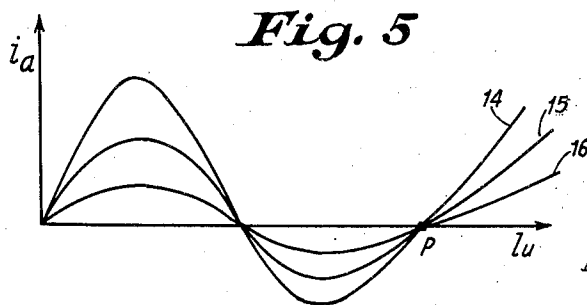
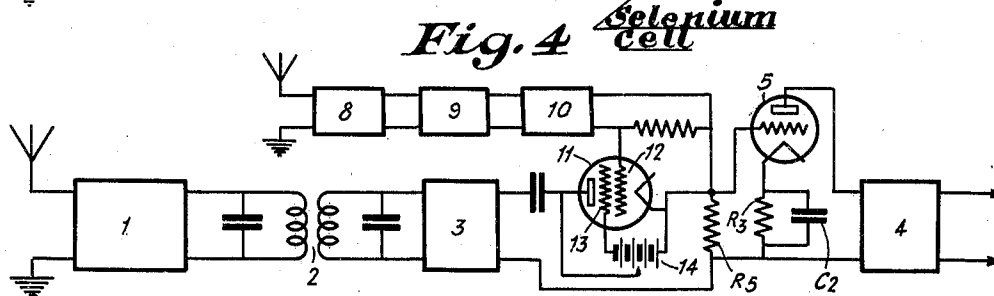
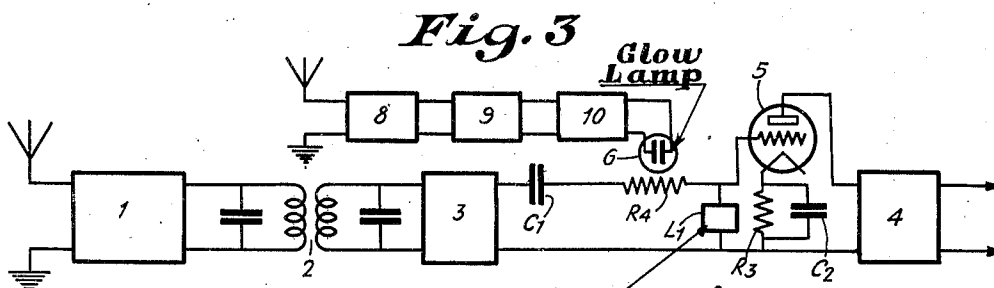
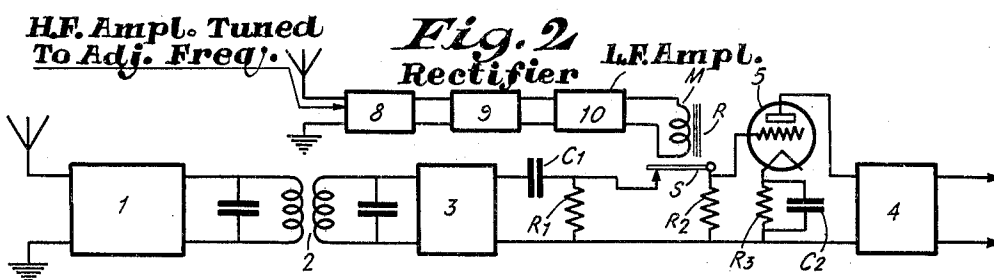
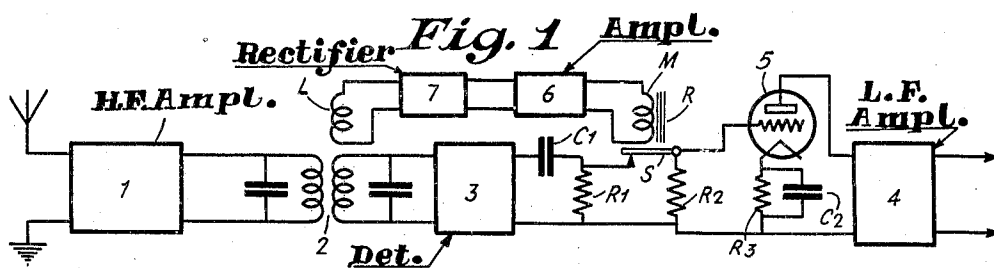
March 21, 1939.

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2,151,170

RECEIVER NOISE SUPPRESSION CIRCUIT

Filed Dec. 21, 1935



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2,151,170

RECEIVER NOISE SUPPRESSION CIRCUIT

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Application December 21, 1935, Serial No. 55,546
In Germany April 13, 1935

1 Claim. (Cl. 250—20)

This invention relates to a circuit arrangement for suppressing any disturbances in wireless receiving sets.

According to the invention, for this purpose upon the occurrence of a disturbance the low frequency amplifier is rendered inactive, for a length of time corresponding to about the duration of the disturbance, by means of an electrical or mechanical switch device controlled by the disturbance and arranged in such manner that the control of the device does not result in a harmful potential or current pulsation in the subsequent part of the circuit arrangement.

The mechanical or electrical switch device comprises, for example, a quick-acting mechanical relay, a photo-electric relay or a discharge tube. For example, with resistance-coupled low frequency amplifiers it may be connected into the conductor connecting the anode of one amplifier valve to the grid of the next amplifier valve at any point at which there is no passage of direct current. It may be connected in parallel with a resistance serving for coupling two amplifier valves and across which there is no direct current voltage. If the switch device is arranged in this manner the occurrence of a disturbance does not result in a potential pulsation at the control grid of the next amplifier valve.

In the case of transformer-coupled low frequency amplifiers the switch device may be inserted for example in the conductor connecting the secondary of a coupling transformer to the control grid of the next low frequency amplifier valve, a resistance being interconnected between the control grid and the cathode so that when the said connecting conductor is interrupted the direct current condition of the control grid of the amplifier does not vary.

The control of the switch device by the disturbance is brought about by means of a rectifier supplied from the high or intermediate frequency amplifier of the receiving set. This rectifier preferably manifests such a threshold sensitiveness that only disturbances the amplitude of which is about double the carrier wave amplitude of the signal to be received cause a current to pass through the rectifier. It is by this current that the switch device is actuated.

In order efficaciously to suppress in addition disturbances of smaller amplitude than double the carrier wave amplitude of the signal to be received, the rectifier controlling the mechanical or electrical switch device is supplied from an auxiliary receiving set tuned to a frequency band adjacent that to which the receiving set proper is tuned.

In order that the invention may be clearly understood and readily carried into effect a few circuit arrangements in accordance therewith will now be described more fully with reference to

the accompanying drawing, wherein Figs. 1 to 4 show respectively different modifications of the invention, and Fig. 5 illustrates the characteristics of the noise control tube of Fig. 4.

Fig. 1 is a diagram of a wireless receiving circuit arrangement comprising a high frequency amplifier 1; a detector 2 coupled to it by means of a tuned transformer 2; and a low frequency amplifier 4 whose first amplifier valve 5 is connected to the detector 3 through resistances R_1 and R_2 and a condenser C_1 . The cathode conductor of the valve 5 includes a resistance R_3 shunted by a condenser C_2 . The voltage drop which in this resistance is brought about by the anode direct current governs through the grid leak R_2 the grid bias of the valve 5.

The conductor connecting the resistances R_1 and R_2 includes the switch S of a relay R. The energizing coil M of this relay R is inserted in the output circuit of an amplifier 6 which is controlled by a rectifier 7 coupled, by means of a coil L, to the input circuit of the detector 3. The high frequency amplifier 1 preferably comprises an automatic volume control which controls the amplification factor in a well known manner so that upon receipt of a modulated carrier wave the alternating voltage induced in the coil L by the carrier wave is substantially constant. With 100% of modulation depth of the carrier wave, the maximum amplitude of this induced alternating voltage which is supplied to the rectifier is double the carrier wave amplitude amplified in the receiver. By giving the rectifier 7 in a well known manner a threshold sensitiveness corresponding to the said double carrier wave amplitude the coil M of the relay R is prevented from being energized when receipt is free from interference. In this case the switch S is still closed so that the low frequency amplifier valve 5 is connected to the preceding part of the set and normal receipt is consequently possible.

Upon the occurrence, however, of a disturbance which in the coil L brings about a tension whose amplitude exceeds double the carrier wave amplitude and consequently exceeds the threshold sensitiveness of the rectifier 7, a current passes through the rectifier 7. Upon amplification by the amplifier 6 this current energizes the coil M of the relay R so that the switch S is opened and the receiving set is thrown out. After the termination of the disturbance, that is to say when the disturbance voltage induced in the coil L falls below the threshold sensitiveness of the rectifier 7, the switch S is closed, whereupon the receiving set again operates normally.

During the time which elapses between the opening and the closure of the switch S, and which depends on the duration of the disturbance normal receipt is also interrupted. Experiments have revealed that this interruption is not trou-

blesome when the disturbances are not in excessively quick sequence with each other and the interval between the opening and the closure of the switch does not exceed $\frac{1}{25}$ of a second.

5 In the circuit arrangement shown in Fig. 1 the switch S is so arranged that its opening or closure does not result in the occurrence of a disturbing potential pulsation at the grid of the valve 5. Satisfactory results are also obtained when the
10 switch S is inserted in the conductor connecting the condenser C₁ to the resistance R₁; in this case the resistance R₂ can be dispensed with in the circuit arrangement. A further possibility of arranging the switch S consists in that it is connected in parallel with the resistance R₂ so that
15 this resistance is short-circuited upon the occurrence of a disturbance. In connection with the choice of the point at which the switch S is to be arranged careful watch must always be kept
20 to see that only such connecting conductors are interrupted or impedances short-circuited that a potential or current pulsation is not set up in the subsequent part of the circuit arrangement.

The circuit arrangement shown in Fig. 2 only
25 differs from the circuit arrangement of Fig. 1 in that the control of the energizing coil M in the relay R is brought about by an auxiliary receiver amplifier 2 jointly with a rectifier 9 and a low frequency amplifier 10. The auxiliary receiver
30 amplifier 8 which is connected either to a special aerial or to the same aerial as the receiving set 1 proper is tuned to a frequency band adjacent the frequency band to which the receiving set proper is tuned.

35 The advantage of this circuit arrangement is that, if the auxiliary receiver is tuned to a frequency which is not occupied by the carrier wave of a powerful emitter, for example under the actual conditions in the range comprised between
40 700 and 900 metres, the threshold value of the rectifier 9 may be materially lower than in the case of the circuit arrangement shown in Fig. 1. Even disturbances the amplitude of which is less than double the carrier wave amplitude of the
45 signal received can be satisfactorily suppressed in this case. It is self-explanatory that this circuit arrangement is based on the fact that a disturbance comprises a very wide frequency band so that the disturbance is set up simultaneously
50 in the receiver set proper and in the auxiliary receiver set.

Fig. 3 shows a circuit arrangement according to the invention in which a photo-electric relay is used for throwing out the low frequency amplifier.
55 In so far as in this figure like reference numerals are used as in Fig. 2, identical components of the circuit arrangement are designated thereby so that these components need not be more fully described. The grid circuit of the
60 valve 5 includes a photo-electric selenium cell L₁ the resistance of which, as is well known, decreases to a marked extent upon exposure. This cell constitutes jointly with a resistance R₄ a potentiometer which is so proportioned that when
65 the cell is not struck by light the low frequency alternating voltage supplied from the detector 3 brings about a maximum alternating voltage at the grid of the valve 5. The output-circuit of the disturbance amplifier 10 includes a source of
70 light, for example a glow discharge lamp G, which upon the occurrence of a disturbance lights up and exposes the selenium cell L₁ to light. Due to this resistance of the latter greatly decreases

so that the potential distribution about the resistance R₄ and the cell L₁ is varied in such manner that it is impossible for the disturbance voltage received from the detector 3 to bring about any substantial voltage at the grid of the valve 5.

Fig. 4 shows a circuit arrangement in which use is made of a potentiometer formed by a discharge tube 11 having a dynatron characteristic curve and by a resistance R₅. The tube 11 comprises two grids, the control grid 12 and a screening grid 13. The screening grid 13 and the anode have applied to them, by means of a source of current 14, voltages which are positive relatively to the cathode so that the tube operates at the point P of the characteristic curve of well known shape shown in Fig. 5. At this point P there is no passage of anode direct current so that the direct current resistance of the tube 11 is infinitely high. The alternating current resistance of the tube 11 at the point P is governed by the steepness of the characteristic curve at this point, and can be increased by raising the negative bias applied to the grid 12. Thus, for example, the characteristic curve 14 is deemed a small negative bias; the characteristic curve 15 a higher; and the characteristic curve 16 a still higher negative bias at the grid 12. If the grid bias is varied, the potential distribution about the tube 11 and the resistance R₅ is varied in such manner that on the supply of an alternating voltage to this
30 potentiometer the alternating voltage occurring at the resistance R₅ is decreased with increasing negative grid bias.

Referring to Fig. 4, the grid bias of the tube 11 is controlled by the disturbance amplifier 10.
35 Upon the occurrence of the disturbance the bias becomes more negative and due to this the alternating current resistance of the tube 11 increases so that it is impossible for interfering tensions occurring in the output circuit of the detector 3
40 to bring about any substantial voltage at the grid of the low frequency amplifier valve and disturbances are consequently suppressed.

The invention is not limited to circuit arrangements in which the detector 3 is coupled to the low frequency amplifier through resistances and condensers but, as already mentioned in the opening part, it is also applicable to transformer-coupled amplifiers.

What is claimed is:

In a modulated carrier wave receiver system of the type including a carrier wave amplifier, a detector and a modulation current amplifier, an arrangement for automatically controlling the receiver operation when undersired electrical impulses having a period of the order of $\frac{1}{25}$ second are impressed on the receiver, said arrangement comprising an alternating current rectifier having a threshold sensitivity such that solely electrical impulses having an amplitude substantially double the carrier wave amplitude at the carrier amplifier output are rectified, means responsive to the rectified output of the rectifier for rendering inefficient the modulation current transmission between the detector and modulation amplifier, said responsive means comprising an impedance coupling the detector and modulation amplifier, said impedance being a tube constructed as a dynatron.

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