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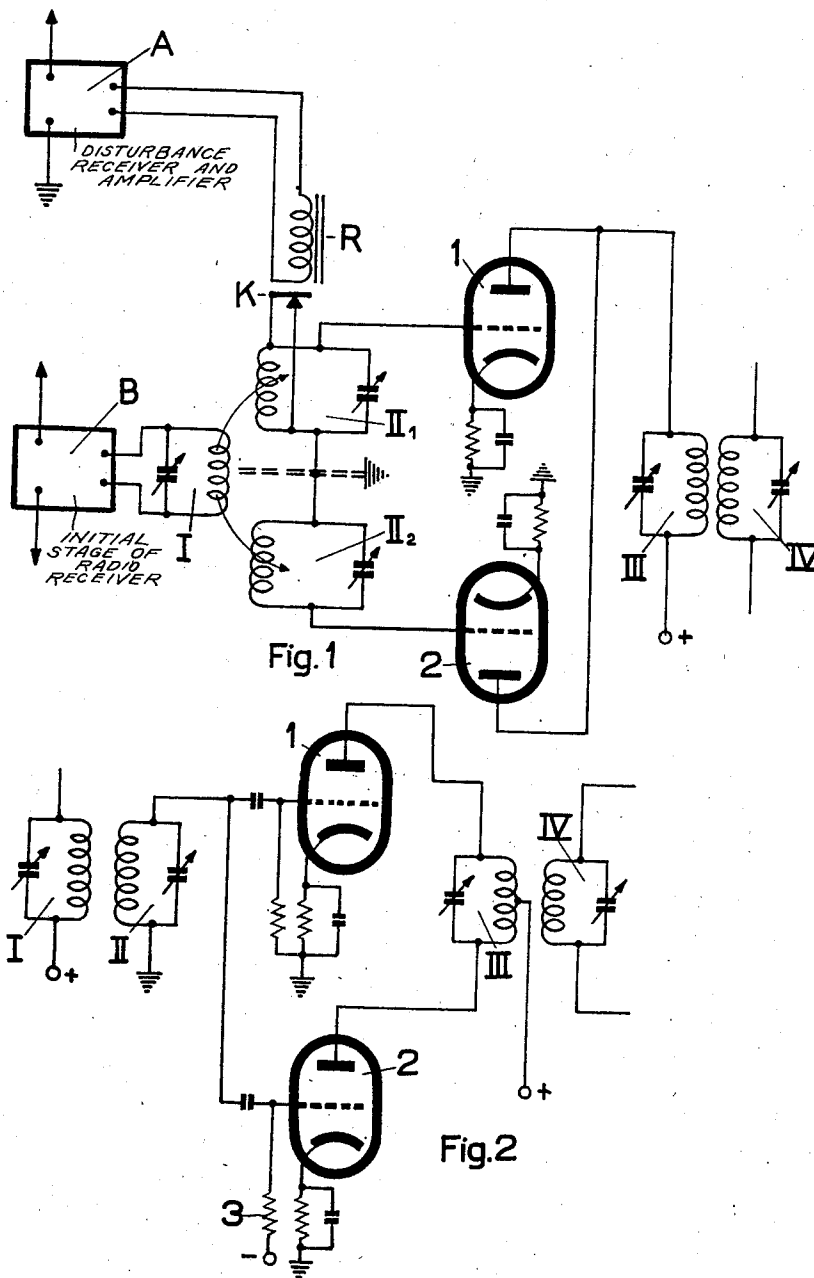
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2,265,269

MEANS FOR SUPPRESSING DISTURBANCES IN RADIO RECEIVING SETS

Filed Aug. 23, 1938

3 Sheets-Sheet 1



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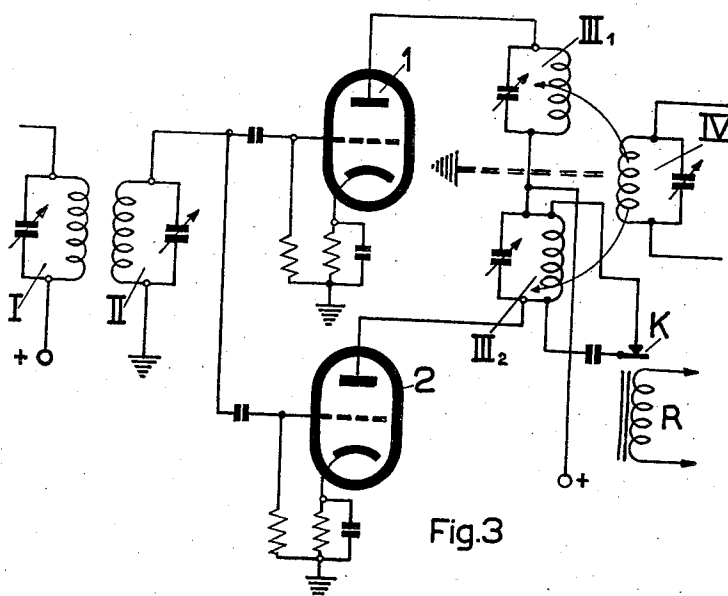


Fig.3

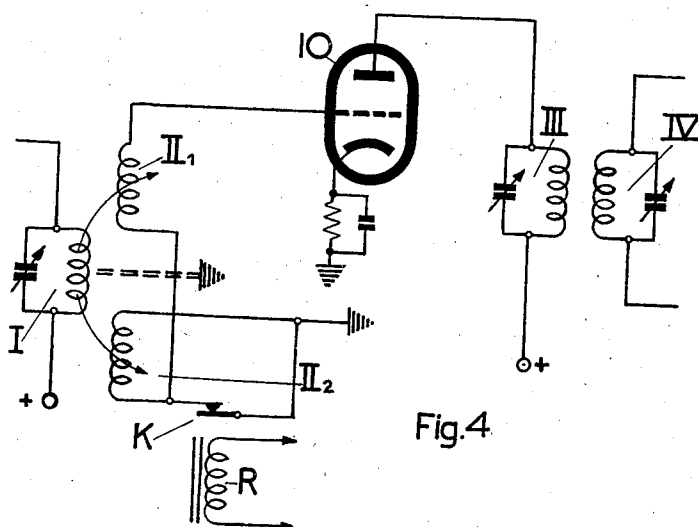


Fig.4

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3 Sheets-Sheet 3

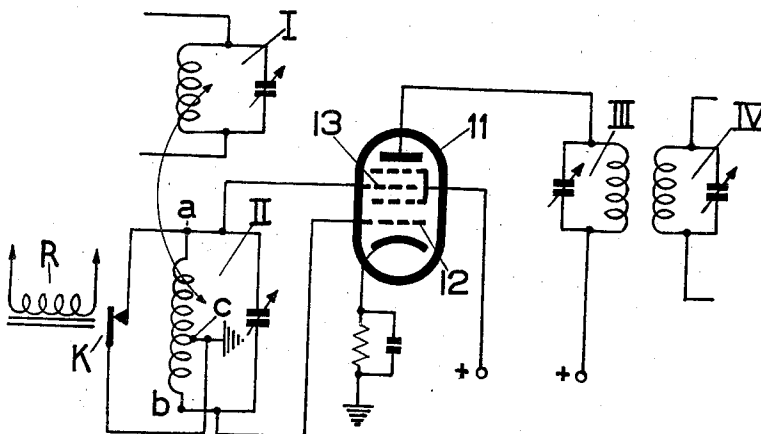


Fig. 5

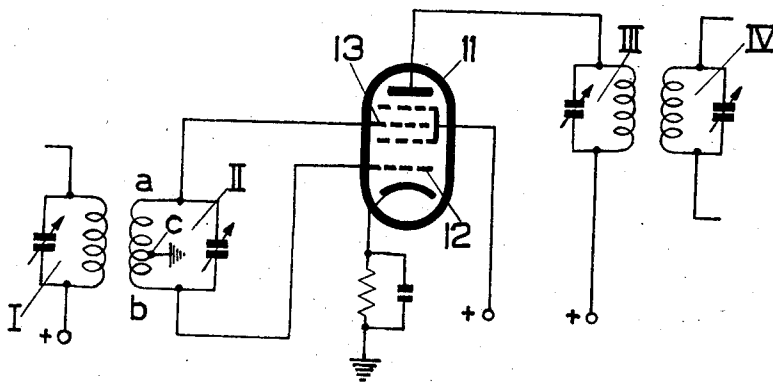


Fig. 6

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UNITED STATES PATENT OFFICE

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MEANS FOR SUPPRESSING DISTURBANCES
IN RADIO RECEIVING SETSGeorge Dallos, Ujpest, Hungary, assignor to
United Incandescent Lamp & Electrical Com-
pany, Limited, Ujpest, HungaryApplication August 23, 1938, Serial No. 226,231
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4 Claims. (Cl. 250—20)

This invention relates to means for suppressing disturbances in radio receiving sets. It has for its purpose to improve that method of suppressing disturbances according to which the receiver is rendered inoperative (blocked) for the duration of the disturbance by means of the interfering voltage.

The solutions of this problem, which are based on the above method, are mostly of a non-universal kind, i. e. they cannot be used at each stage of the receiver. As a rule they are accompanied by obnoxious phenomena, which are generated by the excitation and decay of the oscillatory circuits the moment the receiver is switched on or off. In contra-distinction thereto the arrangement for suppressing disturbances according to this invention is adapted to be used in the same manner at any stage of the receiver without creating any injurious phenomena.

The invention is based on the phenomenon that two alternating voltages of equal frequency, which are superimposed in phase opposition, cancel each other in whole or in part. According to the invention, the interfering voltage to be inactivated is used for generating in any stage of the receiver two alternating voltages of equal frequency which are superposed in phase opposition in a member such as an impedance (oscillatory circuit) or an electron discharge device or the like in such manner that owing to their cancellation in a circuit coupled to said member, for the duration of the disturbance the voltage to be inactivated is suppressed, or at least no voltage appears at the interference frequency so that the reception is interrupted.

The method according to this invention may be practised with the aid of various circuit arrangements, some of which shall be described hereinafter by way of example.

In any optional stage of the receiving set there are provided two electron valves, the control grids of which are connected in push pull fashion to an input impedance and the anodes of which are connected to an output impedance in such a way that their output voltages are in phase, one of these valves being blocked whenever the reception is free from interference, being however set operating under the action of the interfering voltage, with the result that at the two control grids a voltage of opposite phase is generated and the corresponding anode voltages compensate each other by way of the output impedance. For the purposes of this invention the two electron valves may also be connected in such manner that their control grids are con-

nected to the input impedance so that the input voltages are in phase, while the anodes are connected to the output impedance in push pull fashion, which obviously furnishes the same result as the connection described above.

A system according to this invention may also comprise a single electron valve whose control grid circuit includes two impedances connected in push pull fashion, one of which is short-circuited during undisturbed reception which short circuit is however interrupted under the influence of the interference potential, by mechanical or electrical means, so that the control grid does not receive any control potential, and consequently the valve is blocked. In the single-valve arrangement also a multigrid valve may be used, two control grids of which are connected to an input impedance in push pull fashion in such manner that, at least as long as the disturbance lasts, each of the two grids is supplied with a potential of a phase opposite to that of the other.

In the drawings affixed to this specification and forming part thereof some circuits embodying my invention are illustrated diagrammatically by way of example.

In the drawings, Figs. 1, 2 and 3 are circuit diagrams comprising two valves, while

Figs. 4, 5 and 6 illustrate circuits each containing only a single valve.

Referring to the drawings and first to Fig. 1, A is a receiver and amplifier of a known kind for receiving and amplifying disturbances only, while B is the initial stage of a radio receiving set for receiving the desired signals.

The receiver and amplifier A which, when a disturbance arises, furnishes a control voltage, operates on a wave length equal to or different from that of the receiving set B and above a certain critical peak value of the disturbing amplitude. The receiving set B comprises an output circuit I, with which are coupled the oscillatory circuits II₁ and II₂. To the oscillatory circuit II₁ is connected the control grid of the valve 1, to the oscillatory circuit II₂ the control grid of valve 2 and the two grids are connected in push pull fashion. The anodes of the valves are connected in parallel to the common output circuit III, with which the oscillatory circuit IV is coupled. During reception free from disturbances, the oscillatory circuit II₁ is short-circuited by the switch K, whereby the valve 1 is blocked, while the valve 2 is free to amplify the incoming oscillations and to pass them on to the oscillatory circuit III. If, however, a disturbing

voltage arises, the relay R connected with the receiver and amplifier A is supplied with a control voltage and will then open the switch K, whereby also the valve 1 is set operating. At the grids of each valve are now generated voltages in phase opposition, of equal frequency and amplitude, so that the anode alternating potentials of the two valves, which have opposite phases, compensate each other in the common output circuit III. Therefore, no potential is supplied to the oscillatory circuit IV, so that the reception is interrupted.

In the other figures the receiver and amplifier A, which furnishes the control voltage, is not shown.

The circuit illustrated in Fig. 2 is distinguished from that shown in Fig. 1 in that on the one hand the control grids of the valves 1 and 2 are connected parallel to the common grid circuit II, which is coupled with the circuit I, while their anodes are connected to the common anode circuit III in phase opposition, while on the other hand, if the reception is not disturbed, the valve 2 is so blocked that its working point is displaced by supplying a negative biasing potential. Should the reception be disturbed, then the control potential which now arises is impressed over a resistance 3 to the control grid of the valve 2 and thereby the biasing potential is reduced to such an extent that the valve adjusts itself to its normal working point and starts operating. In this case there pass into the oscillatory circuit III, as in the example described above, alternating anode potentials in phase opposition, which compensate each other, so that in the oscillatory circuit IV no alternating potential arises and the reception is interrupted.

The circuit according to Fig. 3 resembles the one shown in Fig. 2, however with the difference that here each valve is connected to a separate anode circuit III₁ and III₂, respectively, and, as long as the reception is free from disturbances, the valve 2 is blocked by its anode impedance, i. e. the oscillatory circuit III₂, being short-circuited by means of the switch K. In the case of a disturbing voltage being present, the switch K is opened by the relay R (similarly as in Fig. 1), so that the alternating potentials arising at the anodes in the oscillatory circuits I and III₂ cancel each other, whereby the reception is interrupted.

In Figs. 4-6 are illustrated three further embodiments of the invention, in which the suppression of disturbances is effected by means of a single valve.

In the circuit shown in Fig. 4 a valve 10 is provided, whose control grid is connected to two impedances II₁ and II₂, which are so coupled with the oscillatory circuit I that potentials in phase opposition can arise therein. During undisturbed reception the impedance II₂ is short-circuited by the switch K with regard to the alternating potential, so that the control grid of the valve 10 is fed with control potential by way of the impedance II₁. Whenever a disturbance arises, the switch K is opened by the relay R (as in the examples described above), so that also at the impedance II₂ a potential arises, which has the same frequency and amplitude as the potential at the impedance II₁, being, however, in phase opposition relative to the potential at the impedance II₂. The potentials of the two impedances thus cancel each other so that the control grid of the valve 10 does not receive any potential and the reception is interrupted.

Fig. 5 illustrates a further example of a one-valve circuit. Here a multiple-grid mixing valve 11 is used, which comprises two control grids 12 and 13 which are connected in push pull fashion to the oscillatory circuit II coupled to the oscillatory circuit I. During undisturbed reception the part a-c of the induction coil of the oscillatory circuit II is short-circuited, so that the valve is controlled merely by the alternating potential arising in the part c-b of the induction coil and supplied to the control grid 12, the valve operating in a normal manner. On a disturbance arising, the switch K is opened by the relay R, so that an alternating potential also arises in the part a-c of the oscillatory circuit and that consequently potentials are supplied to the two control grids 12 and 13 of the valves from the oscillatory circuit II, these potentials being in phase opposition.

Referring to Fig. 6, if the coil of the oscillatory circuit II is tapped in such manner that the grid 13 of valve 11 is supplied with double the potential than grid 12, the anode current of the valve will, up to a predetermined amplitude, be controlled by the difference between the two potentials in phase opposition. Above a predetermined amplitude a current limiting effect arises, which may be explained as follows: If for instance a potential of 30 volts arises at the terminals of the oscillatory circuit II, this potential will be so divided that in the part a-c the potential will be 20 volts, in the part c-d 10 volts, the point a always presenting a polarity opposite to that of point b. Therefore with high amplitudes—if the points a and b alternately show a high negative polarity—the valve will be blocked in one half period by the grid 12 of lower negative potential (for instance -10 volts), which is nearer to the cathode, and in the other half period by the grid 13 of higher negative potential (for instance -20 volts) which is more remote from the cathode, and its anode current will thus be limited. In the valve an anode current can flow only near the zero point of the valve characteristic so that only peak values appear, the number of which is the double of the original frequency, i. e. the frequency passing into the oscillatory circuit II, which anode current thus does not contain the original frequency. Accordingly as long as the disturbance lasts, i. e. at high amplitudes, no voltage arises in the oscillatory circuit IV, the frequency of which is equal to that of the voltage to be suppressed, and the reception is therefore interrupted. Fig. 6 shows that it is not absolutely necessary to short-circuit part of the input impedance during undisturbed reception nor to open it when a disturbance arises.

In the circuits above described the short-circuiting of the input or output impedances is effected mechanically by means of a switch, but obviously at might also be effected in a known manner purely electrically by means of an electron valve.

From these examples results that the suppression of disturbances according to this invention, which is based on the push pull principle, can be realised by way of many different circuits. The circuits which are represented in the drawings have only been shown by way of example, within the scope of this invention many other circuits may be designed wherein, for the duration of the disturbance, two voltages are superposed in push pull fashion and the reception is thereby interrupted in the described man-

ner. It may be useful to state that the suppression of disturbances according to this invention may be effected in a similar manner and with equal advantage at any stage of the receiver, i. e. in the high, intermediate or low frequency amplifier stages as well as in the rectifier stages.

Various changes may be made in the details disclosed in the foregoing specification without departing from the invention or sacrificing the advantages thereof.

I claim:

1. A circuit arrangement for suppressing disturbances in radio receivers, including a high frequency stage, an intermediate frequency stage, a demodulator stage and an audio frequency stage comprising in combination, two electron tubes including control grids and anodes provided in one of said stages, an input impedance, means connecting said control grids to said input impedance in push-pull fashion, an output impedance, means connecting such anodes to said output impedance so that their output voltages are in phase, means for blocking one of said tubes during undisturbed reception and means controlled by the disturbing voltage for rendering said tube operative for the duration of disturbances surpassing a predetermined value, whereby at the two control grids, potentials of opposite phase are created and the corresponding anode potentials compensate each other by way of the output impedance.

2. An arrangement according to claim 1, wherein each electron tube includes its own in-

put circuit, the means for blocking one of said tubes being means for short-circuiting one of said input circuits, and the means for rendering said tube operative being means for removing such short-circuit under the influence of the disturbing voltage.

3. A circuit arrangement for suppressing disturbances in radio receivers including a high frequency stage, an intermediate frequency stage, a demodulator stage and an audio frequency stage, comprising in combination, an electron tube including a control grid provided in one of said stages, two impedances connected in phase opposition in the control grid circuit of this tube, means for short-circuiting one of said impedances during undisturbed reception, and means for removing such short-circuit under the influence of the disturbing voltage whereby the control grid fails to receive any control potential so as to stop signal transmission.

4. The method of suppressing disturbances in radio receivers by blocking the receiver for the duration of the disturbance and where the receiver includes an auxiliary channel provided in parallel to a receiver stage and so coupled that its output voltage compensates the output voltage of the main channel in its effect on the subsequent stage, comprising controlling the amplification in the auxiliary channel in dependency upon the disturbing energy so as to interrupt reception for the duration of the disturbance.

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