

X5482W
X5496W
X5494H

ASD

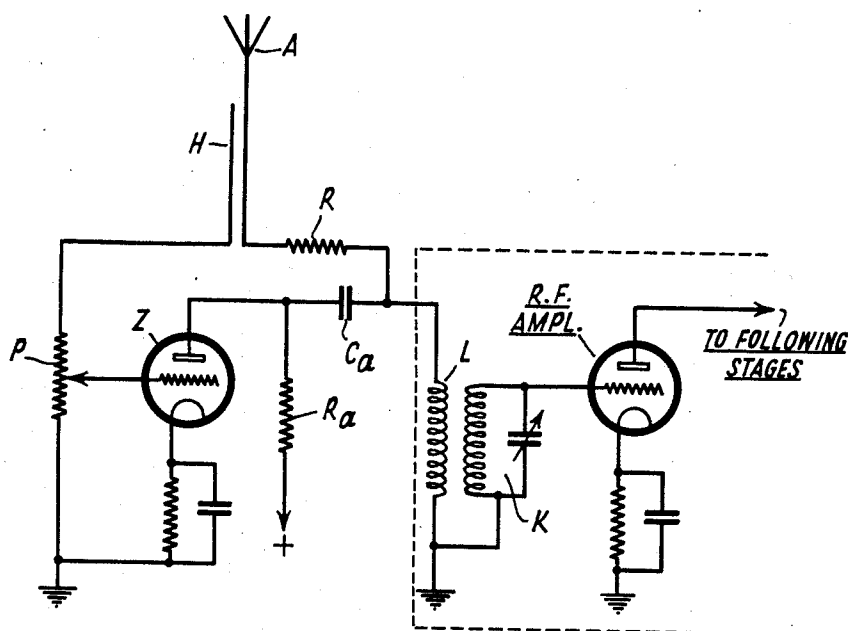
July 16, 1940.

B. JOHANNESSON

2,207,886

NOISE REDUCTION CIRCUIT

Filed June 8, 1938



INVENTOR
BENNO JOHANNESSON
BY *H.S. Grover*
ATTORNEY

Patented July 16, 1940

2,207,886

UNITED STATES PATENT OFFICE

2,207,886

NOISE REDUCTION CIRCUIT

Benno Johannesson, Berlin-Lichterfelde, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application June 8, 1938, Serial No. 212,426
In Germany June 24, 1937

5 Claims. (Cl. 250—20)

It is already known to compensate by means of an auxiliary antenna disturbances produced nearby, and received by, the antenna of a receiver whereby said auxiliary antenna is arranged preferably in parallel to the lead-in of the main antenna. In a known arrangement of this type the main antenna is placed at one end of the primary winding of a push-pull transformer which winding is grounded in the center thereof, and there is placed the auxiliary antenna serving for compensation to the other end of said winding, while the secondary potential is applied to the receiver. The disadvantage of this arrangement is that it is practically impossible to provide a completely symmetrical high frequency push-pull transformer. In fact, in order to obtain a favorable coupling within a wide frequency range, the degree of coupling must be very high, for instance it must lie near 90%. However, it is inevitable in this case that aside from the inductive coupling, also a capacitive coupling appears between the primary side and the secondary side, and which, owing to the non-symmetrical conditions of grounding of the secondary side, is different as regards the two halves of the primary winding and furthermore said capacitive coupling is greatly dependent on the frequency. At any rate, with such push-pull transformers it was hitherto impossible to obtain within a wider frequency range a compensation which is independent of the frequency.

It has been already proposed to carry out the compensation by placing the main antenna directly at the control grid of the first amplifier tube and the auxiliary antenna at the cathode of the same tube whereby the cathode was grounded across a high ohmic resistor. The disadvantage of this arrangement resides in the cross-modulation of the first tube owing to the aperiodic input.

In accordance with the present invention the oscillations received by the auxiliary antenna are applied to the control grid of an additional amplifier tube whose output electrode is connected in common with the main antenna to the input of the receiver.

The advantage of the present invention resides in the fact that the oscillations of the antenna and the compensation oscillations, whose phase is reversed by the additional tube, act at the same time upon the same load, namely upon the input impedance of the receiver, for instance upon the antenna coil, so that a compensation is possible which is independent of the frequency. There is no danger of cross-modulation by the first tube of the actual receiver since this tube can

be coupled, as is customary, to the antenna coil across a tuned circuit. The arrangement can be employed in a receiver of customary construction without changes in the receiver proper.

The accompanying figure shows an example of construction according to the invention. In this figure A represents the main antenna of the receiver which is connected to the antenna coil L through an ohmic resistor R, the other end of said coil being grounded. The antenna coil is coupled in the usual manner with the tuned oscillatory circuit K which is placed at the grid of the first tube of the receiver. The auxiliary antenna H, disposed in parallel to the lead-in wire, is grounded through the resistor of a high ohmic voltage divider P. The voltage derived at the sliding contact of this voltage divider is applied to the control grid of the additional tube Z, the anode of which is connected to the receiver input by the condenser C_a. The direct current plate potential is supplied through the high ohmic load resistor R_a.

If V_H is the E. M. F. induced in the auxiliary antenna due to a nearby disturbance whereby the said E. M. F. is assumed also to act essentially at the resistor of the voltage divider P, and if *a* is the proportion of the division of the voltage divider P, while D is the through-grip (reciprocal of amplification factor) of the tube Z, then a substitution scheme can be set up for the present arrangement in which a voltage source having the voltage

$$\frac{-V_H(a)}{D}$$

acts upon the antenna coil across the inner resistance R_i of the tube Z and across the condenser C_a. This antenna coil has applied thereto at the same time across the resistor R the disturbance potential received in the lead-in of the main antenna, and which likewise is presupposed to be equal to V_H. From this conception it can be seen that there will be possible a complete compensation of the two disturbance oscillations in the antenna coil A provided that (*a=D*) and that the loads acting in both branches are approximately the same. Since the antenna coil is situated in both circuits, it will then only be necessary to choose the resistor R approximately equal to the inner resistance R_i of the tube Z. In this case, the condenser C_a will preferably be chosen as large as possible. But, if in the connection of the main antenna with the receiver input a shortening condenser is placed, then C_a will suitably be chosen approximately equal to said shortening condenser.

If, in order to attain a higher efficiency, R is chosen lower, then it is obviously necessary to tap at the resistor P a correspondingly higher voltage. However, in order to attain considerable independence of frequency, it is advisable that both branches are rendered completely symmetrical. Eventually, additional impedances, by which the symmetry and thus also the independence of frequency is still further improved, can be inserted into the connection between the main antenna and the receiver input, and/or between the anode of the tube Z and the receiver input. Since the input potential of the tube Z consists essentially only of the disturbances produced nearby and, in fact, only of a fraction of the voltage induced in the auxiliary antenna, the danger of cross-modulation for the additional tube can hardly be expected. It is advisable to employ as the additional tube a tube having a low inner resistance and a possibly straight characteristic, in particular a triode.

What is claimed is:

1. In combination with a radio receiver having a resonant input circuit tuned to a desired signal carrier frequency, a signal collector, a connection including a resistor between said collector and said input circuit, means for substantially reducing the effect of undesired noise impulses existing in the vicinity of said collector upon said input circuit, said means comprising an auxiliary signal collector located in close proximity to said first collector, an electron discharge tube provided with input and output electrodes, an aperiodic coupling means including an adjustable resistor connecting the input electrodes of said tube to said auxiliary collector, and an untuned capacity coupling element connecting the output electrodes of said tube to said resonant input circuit.

2. In combination with a radio receiver having a resonant input circuit tuned to a desired signal carrier frequency, a signal collector, a lead-in connection including a resistor between said collector and said input circuit, means for substantially reducing the effect of undesired noise impulses existing in the vicinity of said collector upon said input circuit, said means comprising an auxiliary signal collector located in close proximity to, and in parallel with, the lead-in connection to said first collector, an electron discharge tube provided with input and output electrodes, an aperiodic coupling means including a resistive potentiometer connecting the input electrodes of said tube to said auxiliary collector, and an untuned capacity coupling element con-

necting the output electrodes of said tube to said resonant input circuit.

3. In combination with a radio receiver having a resonant input circuit tuned to a desired signal carrier frequency, a signal collector, a connection between said collector and said input circuit, means for substantially reducing the effect of undesired noise impulses existing in the vicinity of said collector upon said input circuit, said means comprising an auxiliary signal collector located in close proximity to said first collector, an electron discharge tube provided with input and output electrodes, an aperiodic coupling means connecting the input electrodes of said tube to said auxiliary collector, and an untuned capacity coupling element connecting the output electrodes of said tube to said resonant input circuit, said connection to said input circuit comprising in series a resistor and a coil, said coil being magnetically coupled to said input circuit.

4. In combination with a radio receiver having a resonant input circuit tuned to a desired signal carrier frequency, a signal collector, a connection including a resistive impedance between said collector and said input circuit, means for substantially reducing the effect of undesired noise impulses existing in the vicinity of said collector upon said input circuit, said means comprising an auxiliary signal collector located in close proximity to said first collector, an electron discharge tube provided with input and output electrodes, an aperiodic coupling means connecting the input electrodes of said tube to said auxiliary collector, an untuned capacity coupling element connecting the output electrodes of said tube to said resonant input circuit, said aperiodic coupling means consisting of a resistor connected to the auxiliary collector, and means for adjustably connecting said input electrodes to said resistor.

5. In a radio signal receiving system of the type having an input tube provided with a tunable signal input circuit, a main antenna, a connection from the antenna to the input circuit comprising the series arrangement of a lead-in, a resistor and a coil, the coil being coupled to the input circuit, an auxiliary antenna located in parallel to said lead-in, a second tube having at least a cathode, a grid and plate, a second resistor connecting said auxiliary antenna to said cathode, means adjustably connecting the grid to said second resistor, and solely a condenser coupling the plate of said second tube to the said coil.

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