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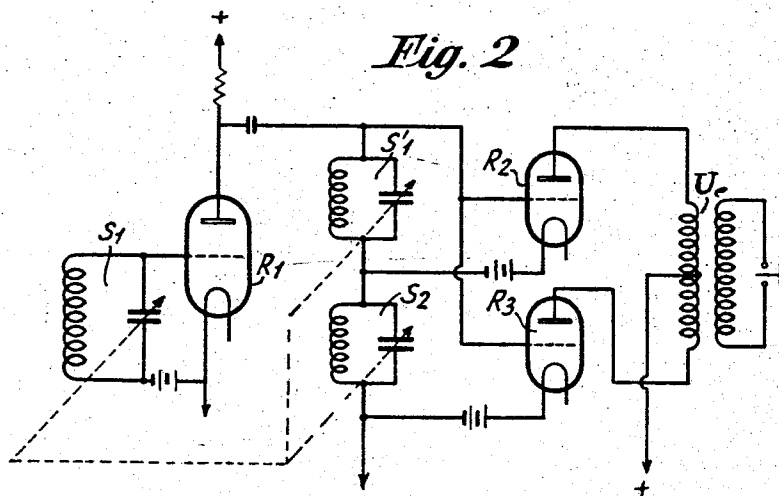
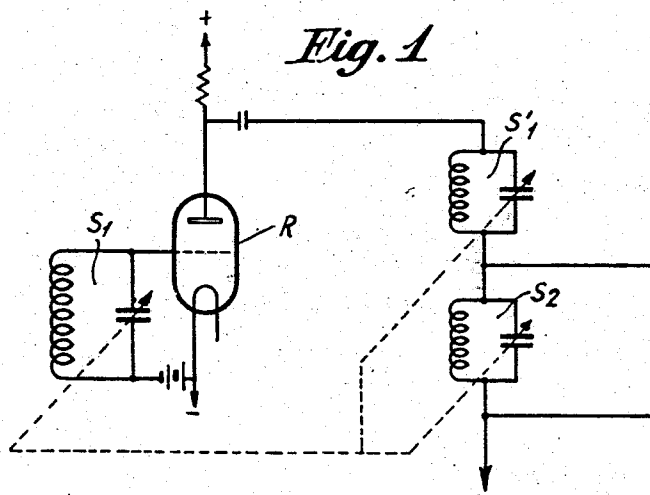
Oct. 17, 1939.

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2,176,218

ANTISTRAY ARRANGEMENT FOR RADIO COMMUNICATION

Filed March 14, 1936



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UNITED STATES PATENT OFFICE

2,176,218

ANTISTRAY ARRANGEMENT FOR RADIO COMMUNICATION

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Application March 14, 1936, Serial No. 68,787
In Germany March 14, 1935

7 Claims. (Cl. 250—20)

This invention relates to a new and novel receiving tube circuit arrangement which contains a first oscillation circuit which is detuned in reference to the incoming wave, while the plate circuit of the same tube contains a second oscillation circuit tuned to the same frequency, and in series therewith is a third oscillation circuit which is tuned to the incoming wave. This circuit organization could also be combined with a push-pull scheme in which the grid of one tube is impressed with the sum total comprising the stray or interfering wave and the incoming wave, while the grid of the second tube is impressed only with the stray wave.

It is not always an easy matter to employ the customary ways and means successfully for reducing aperiodic interference in radio frequency telegraphy and telephony. It is of some assistance to adopt methods of increasing the selectivity, also to render the antenna directional in its characteristic. The ideal of interference elimination is not, however, attained by such methods.

Accordingly, it is an object of my invention to provide a circuit arrangement which will more effectively eliminate stray interference of an aperiodic nature.

It is another object of my invention to improve the signal-to-noise ratio in a receiving circuit.

In carrying out my invention I preferably provide a first tuned circuit upon which the incoming energy is impressed. This input circuit is connected in a conventional manner between the control grid and the cathode of an electron discharge tube amplifier stage. The unconventional method which I employ, however, is to tune the input circuit of this amplifier stage to a frequency different from that of the incoming signal frequency. I also tune the output circuit of this amplifier stage by the use of two oscillatory or tank circuits which are series connected between the cathode and anode of the tube. One of these tank circuits is tuned to the same frequency as the tuned input circuit. The other tank circuit is tuned to the incoming signal wave.

Now, if aperiodic interference or stray waves happen to be impressed on such a circuit organization, they will excite the tuned grid circuit of the first tube at its natural frequency. In other words, the interference is transmitted in the form of an oscillation having the frequency to which the oscillation circuit on a certain resonant portion of the grid circuit on the input tube is tuned. If, then, the same impinges in the

plate circuit which has been tuned to the identical frequency and which represents for this frequency a very high impedance, the entire drop of voltage for the interfering wave will occur in this resonant portion. I have found it advantageous, therefore, to place a second resonant circuit in series with the first resonant circuit and to tune this second circuit to the frequency to be received. The result is that practically no drop of potential of the interfering wave will take place. If, then, the frequency to be received is taken off at the said second tank circuit, a receiving wave being practically free from stray interference will be obtained. If, on the other hand, sinuous incoming waves happen to impinge upon the first tank circuit, forced oscillations will be set up therein which are of the same frequency as the incoming currents. These forced oscillations, as well known in the art, are amplified by the tube, and they are made available across the terminals of the doubly tuned plate circuit of the tube which has been tuned to the incoming wave as above stated.

Owing to the fact that one foregoes the chance of tuning the first oscillation circuit to the incoming wave, the received amplitude, to be sure, will be lower than in a case where the said oscillatory circuit is tuned to the incoming wave. However, since the stray amplitudes are at the same time attenuated to a substantially greater degree, it will be seen that the ratio between signal amplitude and stray amplitude (signal-stray ratio)—and this is the decisive factor in the operation of modern amplifiers—will be essentially raised in the arrangement here disclosed.

This invention will best be understood by referring to the accompanying drawing, in which:

Fig. 1 is a circuit diagram of this invention, showing the three oscillatory circuits; while

Fig. 2 is a circuit diagram of a push-pull arrangement employing rectifiers.

Referring now in detail to the drawing:

Figure 1 shows a tube circuit organization according to this invention which embodies the characteristic features of the invention. The grid circuit of the tube R includes an oscillation circuit s_1 which has been set to the frequency f_1 having a value different from the incoming frequency. The plate circuit contains an oscillation circuit s'_1 which is also tuned to the frequency f_1 , and in series therewith is provided a second oscillation circuit s_2 which is tuned to the incoming frequency f_2 . Across the terminals of the said second oscillation circuit is taken off the signal frequency and the same is thence fed

to other parts of the receiver. The oscillation circuit s_2 is variable as known in the art in order that it may be adjusted to the particular frequency to be received. In order to make sure so that frequency f_2 will always be sufficiently far apart from frequency f_1 , the latter either may be chosen outside the range or wave band to be received with a given receiver apparatus, or else the oscillation circuits may be so coupled with each other that they will always be altered jointly so that the proper distance apart will be insured. For example, the tuning means may be mechanically coupled together as indicated diagrammatically in Figure 1.

According to a further object of this invention, the circuit organization illustrated in Figure 1, whenever extremely strong stray signals are dealt with, may be expanded in so far as the stray frequency alone as well as the interfering wave and the useful or signal frequency are jointly impressed each upon the grid of a tube, with the plate circuits of both tubes being connected push-pull fashion. The tubes in this scheme are used to operate as rectifiers so that in the plate circuit of one tube, as known in the prior art, either the sum or the difference of signal frequency and stray frequency is produced, while in the plate circuit of the other tube the stray alone arises. The superposition of both currents then results in the signal frequency alone. Experience has shown that such a push-pull scheme can be adjusted to any desired degree of exactness so that in this manner practically perfect elimination of interference is feasible:

Figure 2 illustrates a circuit arrangement comprising the last named feature. Associated with the oscillation circuit s_1 in the plate circuit of the input tube is the grid circuit of tube R_2 to which, as will be noted, only the stray wave is fed, while with the series scheme comprising both oscillation circuits the grid circuit of tube R_3 is connected, the latter circuit thus being impressed with the aggregate signal and interference frequencies. What will then arise in the secondary circuit of the transformer U_e is only the signal frequency.

The basic idea of this invention, as to the rest, is not confined to the exemplified embodiment hereinbefore described, in fact, it may be applied, for instance, also in cases where crystal or contact type rectifiers are employed in lieu of the two tubes R_2 and R_3 which act as rectifiers.

I claim:

1. An arrangement for eliminating interference in the reception of radio frequency signals, comprising an electron discharge tube having a tuned input circuit and an output circuit having therein two differently tuned oscillation circuits, said input circuit and one of said oscillation circuits being tuned to substantially the same frequency, and the other of said oscillation circuits being tuned to a different frequency at which it resonates with an incoming signal frequency.

2. An arrangement according to claim 1 and having means for obtaining discrimination in the output energy from said tube in respect to the signal frequency versus other frequencies, said means being constituted by a unicontrol device for the

tuned input circuit and the two said oscillation circuits in the output circuit.

3. A receiving circuit to reduce undesired stray waves of radio frequency signals comprising a first oscillation circuit which is detuned with respect to the frequency of a desired incoming wave, an electron discharge device having anode grid and cathode, the grid and cathode of said device being connected to said first oscillation circuit, a second and third oscillation circuit connected in series with each other, at least one of which is tuned to the desired frequency to be received, and the other connected to the anode of said electron discharge device.

4. A receiving circuit to reduce undesired stray waves of radio frequency signals comprising a first oscillation circuit which is detuned with respect to the frequency of a desired incoming wave, an electron discharge device having anode grid and cathode, the grid and cathode of said device being connected to said first oscillation circuit, a second and third oscillation circuit connected in series with each other, at least one of which is variable, the other being connected to the anode of said electron discharge device and detuned with respect to the frequency of a desired incoming wave.

5. An arrangement for eliminating interference in the reception of radio frequency signals comprising an electron discharge tube having a tuned input circuit and an output circuit having therein two differently tuned oscillation circuits, said input circuit and one of said oscillation circuits being tuned to substantially the same frequency and the other of said oscillation circuits being tuned to a different frequency at which it resonates with an incoming signal frequency, and means for simultaneously varying the tuning of each of said tuned circuits.

6. An arrangement for eliminating interference in the reception of radio frequency signals comprising an electron discharge tube having a tuned input circuit and an output circuit having therein two differently tuned oscillation circuits, said input circuit and one of said oscillation circuits being tuned to substantially the same frequency and the other of said oscillation circuits being tuned to a different frequency at which it resonates with an incoming signal frequency, a rectifier connected to each of said oscillation circuits and means for combining the output from each of said rectifiers in phase opposition.

7. A device for eliminating interference in the reception of radio frequency signals, an electron discharge tube amplifier stage having tuned input and output circuits, said output circuit including two differently tuned tank circuits, one of said circuits being tuned to substantially the same frequency as said input circuit, and the other of said tank circuits being tuned to the signal frequency, a rectifier connected to each of said tuned circuits, means for impressing both stray frequencies and signal frequencies on one of said rectifiers and means for impressing signal frequencies only on the other of said rectifiers, and means for combining the output from each of said rectifiers in phase opposition.

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