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# SYSTEM FOR ELIMINATING STATIC

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Fig. 1.

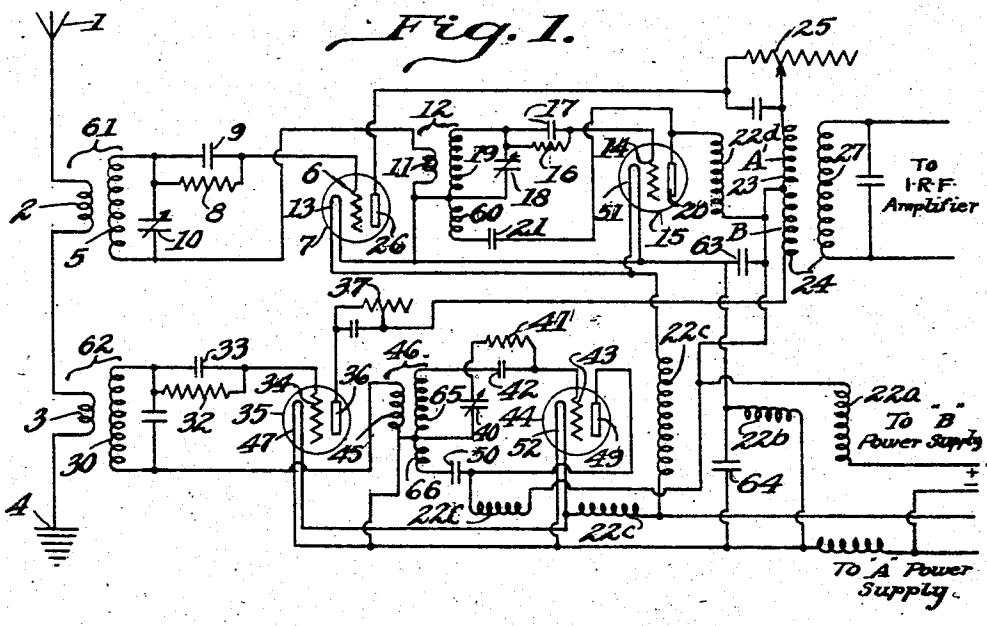
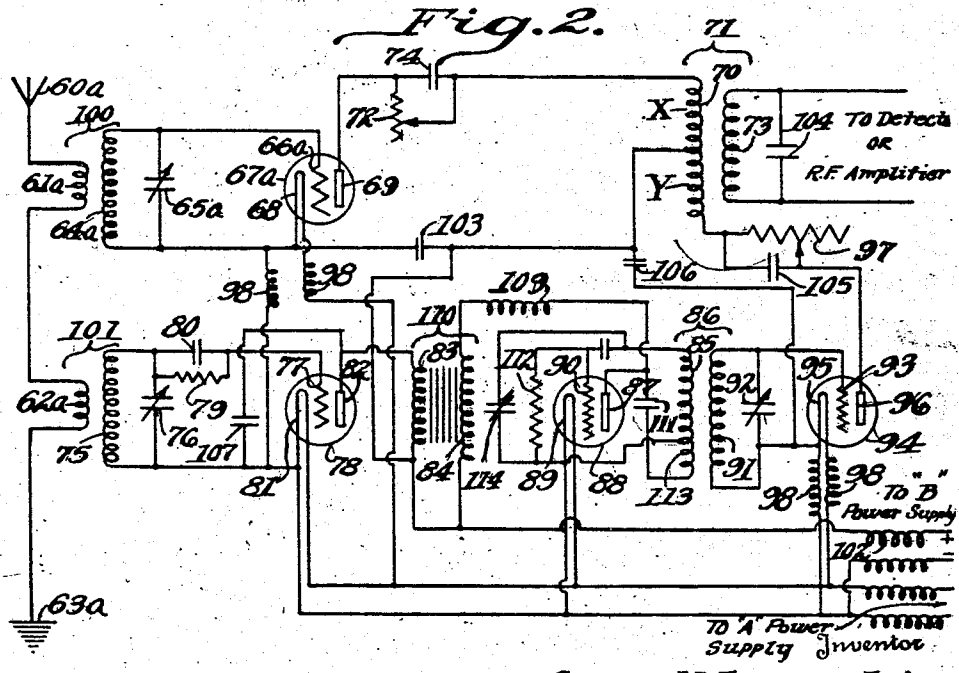



Fig. 2.




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## SYSTEM FOR ELIMINATING STATIC

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3 Claims. (Cl. 250—20)

This invention relates to an improved method of and means for eliminating static disturbances from a radio receiving system so that the reception of incoming signals will be substantially free from undesired interference, thus providing a more efficient system for the reception and audible reproduction of the signals.

An object of the invention is to provide an improved system for the elimination of static disturbances from a radio receiving system in which one circuit receives the radio signals with static disturbance and another circuit receives the static disturbance without the radio signals, and by heterodyning one of the circuits until it is of the same frequency as the other, thereby balancing out the static disturbances from the two circuits, and permitting the reception of the radio signals free from this interference.

Another object of the invention is to provide an improved system for the elimination of static disturbances from a radio receiving system in which one circuit receives the radio signals with static disturbance and another circuit receives the static disturbance without the radio signals, and wherein provision is made of a separate oscillator for each circuit.

A further object of the invention is to provide an improved system for the elimination of static disturbances from a radio receiving system in which one circuit receives the radio signals with static disturbance and another circuit receives the static disturbance without the radio signals, and in which one circuit may be straight radio frequency amplification and the other circuit tuned to a higher frequency and heterodyned.

Other objects will appear as the description proceeds.

In the accompanying drawing which forms a part of my application:

Fig. 1 is a diagrammatic view of my improved system for eliminating static disturbances from a radio receiving system;

Fig. 2 is a diagrammatic view of a modified system for eliminating static disturbances from a radio receiving system, in which the signals are not heterodyned.

Referring more particularly to the drawing and the form of the invention diagrammatically illustrated in Fig. 1, an antenna 1 is shown as connected to the primary windings 2 of a transformer 61 and also, the primary windings 3 of a second transformer 62 and thence to a suitable ground indicated at 4. The secondary winding 5 of the transformer 61 is connected to the grid 6 of an ordinary radio tube 7, the said connection extending through a grid leak 8 and a grid condenser 9. A variable condenser 10 is shunted across the secondary windings 5 of the transformer 61, as shown. Also, the secondary 5 is connected to the filament of the tube 7 through the secondary 11 of a transformer 12. The plate 26 of the tube 7 is connected to the B power supply preferably through a radio frequency choke coil 22*a* and the side A′ of the split primary 23 of a transformer 24, there being a balancing control as indicated at 25.

The radio frequency current through both sides of the split primary 23 of the transformer 24 is returned to the filaments of their respective tubes through the provision of by-pass condensers 63 and 64 which are connected from the center of the split primary 23 of the transformer 24 to the filaments 13 and 47 of the tubes 7 and 35 respectively. The filament 13 is connected to the A power supply through the radio frequency choke coils indicated at 22*b* and 22*c*. The primary 19 and 60 of the transformer 12 constitutes in effect a grid circuit and a plate circuit. The grid coil is connected to the filament 51 of the tube 15, while the other side of the grid coil is connected to the grid 14 of said tube 15 through the grid condenser 17 and grid leak 16. A variable condenser 18 is shunted across the grid coil 19 of the transformer 12. The plate 20 of the tube 15 is connected to the B power supply through the radio frequency choke coil 22*d* and to the plate coil 60 through the by-pass condenser 21. The other side of the plate coil 60 is connected to the filament 51 of the tube 15, while the secondary 30 of the transformer 62 is connected to the grid 34 of the tube 35 through the grid leak 32 and grid condenser 33. The other side of the secondary 30 of the transformer 62 is connected to the filament 47 of the tube 35 through the secondary 45 of a transformer 46. The plate 36 of the tube 35 is connected to the B power supply through the radio frequency choke coil 22*a*, and the side B of the split primary 23 of the transformer 24. The radio frequency current delivered to both sides of the split primary 23 is by-passed to the filaments of the responding tubes through condensers 63 and 64.

The balancing control indicated at 37 is connected between the plate 36 of the tube 35 and the side B of the secondary 23 of the split primary transformer 24. The primary 65 and 66 of the transformer 46 functions as a grid circuit and plate circuit. The grid coil is connected to the filament 52 of the tube 44, while the other side of the grid coil is connected to the grid 43 of the tube 44 through the grid leak 41 and grid

condenser 42. A variable condenser 40 is shunted across the grid coil 65 of the transformer 46, while the plate 49 of the tube 44 is connected to the B power supply through the radio frequency choke coil 22c. The plate coil 66 of the transformer 46 is connected to the plate 49 of the tube indicated at 44 through the by-pass condenser 50.

In the operation of the hereinbefore described system, either of the antenna circuits are tuned to the frequency of the signals with static, and the other circuit is tuned to a frequency as close as possible which has no signal. Then the oscillator using transformer 12 and tube 15, and the oscillator using transformer 46 and tube 44 are each tuned so that they both produce the same beat frequency in the respective grid circuits of the circuits using the secondary inductance 5 and tube 7, and the secondary inductance 30 and tube 35, with the impulses received from the antenna. Thus in the plate circuits of the tubes 7 and 35, there will be equal beat frequencies which are in opposition in the split primary 23 of the transformer 24, when there are static impulses. Due to the fact that both signals are originally tuned to nearly the same frequency, the same static impulse will be in both halves of the split primary 23 at the same time, but the signal impulse will be on one side only, and there will be no signal impulse in opposition, as in the case of the static impulses. This condition will eliminate static impulses in the secondary 27 of the transformer 24 which is tuned to the beat frequency, and leave only the signal impulse. The control of the balance is obtained through the variable resistors 25 and 37, because they vary the plate voltages for tubes 7 and 35.

In the diagrammatic illustration shown in Fig. 2, I do not employ a heterodyne circuit, but rather provide a straight radio frequency circuit for receiving the signals with static, and a detector circuit for receiving the static at the nearest frequency to that of the first circuit but with no signal. The second circuit is used with an audio frequency transformer which is used to modulate the oscillator circuit, which in turn is tuned to the same frequency as the first and second circuits. There is a split primary of the radio frequency transformer on one side of which there are signals with static, and on the other side static but no signals, and the frequency, power and amplitude will be the same on the opposite sides of the primary, but the static will be opposed in the two sides and will consequently balance out the static so that only the signals will pass to the secondary, and from thence to the detector or radio frequency amplification of the receiving set. It is intended that all circuits in both Figs. 1 and 2 will be properly shielded, to avoid the picking up of static impulses after the balancing out has been effected.

In the form of the invention disclosed in Fig. 2, the antenna 60a is connected to the primary 61a of transformer 100. The other side of the primary 61a is connected to the primary 62a of a transformer 101 and, likewise, the other side of the primary 62a is connected to the ground 63a. The secondary 64a of the transformer 100 is connected to the grid 66a of a radio tube 67a, while the other side of the secondary 64a is connected to the filament 68 of the tube 67a. A variable condenser 65a is shunted across the transformer secondary 64a.

The plate 69 of the tube 67a is connected to the side X of the primary 70 of a split primary radio frequency transformer 71, this being accomplished through the condenser 74 and the variable resistance indicated at 72. The center of the primary 70 of the transformer 71 is connected to the B power supply through the radio frequency choke coil 102. A by-pass condenser 103 is connected from the center tap of the primary 70 of the transformer 71 to the filament 68 of the tube 67a. A condenser 104 is shunted across the secondary 73 of the transformer 71. The circuit using the secondary 73 is adapted to be tuned to the same frequency as the circuit using the secondary 64a of the transformer 100, condenser 65a and tube 67a.

One side of the secondary 75 of the transformer 101 is connected to the grid 77 of a radio tube 78 through the grid condenser 80 and the grid leak 79. A variable condenser 76 is shunted across the secondary 75 of the transformer 101. The other side of the secondary 75 of the transformer 101 is connected to the filament 81 of the tube 78. The plate 82 of the tube 78 is connected to the B power supply through the primary 83 of an audio frequency transformer 110. One side of the radio frequency by-pass condenser 107 is connected to the filament 81 of the tube 78. The other side of the radio frequency by-pass condenser 107 is connected to the plate side of the primary of the audio frequency transformer 83. One side of the grid coil 85 of the oscillation transformer 86 is connected to the grid 90 of the tube 88. Also one side of the grid leak 112 is connected to the filament 89 of the tube 88, while the other side of the grid leak 112 is connected to the grid 90 of the tube 88.

The plate coil 113 of the transformer 86 is connected to the filament 89 of the tube 88, while the other side of the plate coil 113 of transformer 86 is connected to the plate 87 of the tube 88 through the radio frequency by-pass condenser 111.

The plate 87 of the tube 88 is connected to the B power supply through the radio frequency choke coil 109, the secondary 84 of the audio frequency transformer 110, and radio frequency choke coil 102. In this instance, the audio frequency transformer 110 acts as an amplifying transformer and also as a modulating transformer. The condenser shown at 114 is connected across the grid coil 85 of the transformer 86 and is used to tune the oscillation circuit to the same frequency as the incoming frequency in the secondary 64a of the transformer 100. One side of the secondary 91 of the transformer 86 is connected to the filament 95 of the tube 94. The other side of the secondary 91 of the transformer 86 is connected to the grid 93 of the tube 94. A condenser 92 is shunted across the secondary 91 of the transformer 86. The variable condenser 92 is used to tune the secondary 91 of the transformer 86 to the same frequency as the frequency of the oscillator. The plate 96 of the tube 94 is connected to the side Y of the split primary 70 of the transformer 71, by way of the condenser 105 and the variable resistance 97. The center tap of the split primary 70 of the transformer 71 is the point B power supply for the tubes 94 and 67a. One side of the radio frequency by-pass condenser 106 is connected to the center of the split primary 70 of the transformer 71, while the other side of the condenser 106 is connected to the filament 95 of the tube 94. Radio frequency by-pass condenser 103 is used to complete the plate radio frequency circuit of tube 67a, in the same manner that radio frequency

by-pass condenser 106 is used to complete the radio frequency plate circuit of tube 94.

The two radio frequency choke coils 98 and 98 also serve to separate circuits as much as possible. The usual A supply is connected to the filaments of the several tubes, and the B supply is connected as shown, with the proper use of the choke coils 98, to avoid the picking up of static impulses other than in the antenna circuits. All parts of the entire system must be properly shielded.

From the foregoing description, taken in conjunction with the two diagrammatic circuits, it will be apparent that I have provided two hook-ups which will positively and effectively eliminate static from the incoming signals received by a radio receiving set, the first and preferred hook-up utilizing heterodyning, and the second hook-up utilizing straight radio frequency, with audio frequency being used to modulate an oscillator which re-transmits to the receiver. Both circuits excite a single amplifier or detector circuit with the use of a split primary radio frequency transformer. In the first hook-up, I have used two oscillators, which is believed to be a decided advance over the patented art as this particular system of heterodyning will not produce useless, harmful, and annoying oscillations from being picked up in any but their intended circuits. This also prevents any radiations from being transmitted from the receiver to any other place.

Minor changes in connections and arrangement may be made without departure from the spirit of the invention.

What is claimed is:

1. A radio hook-up for the elimination of static including two detector circuits each having a detector tube, and a radio frequency transformer having a split primary, the sides of which are connected respectively with the plate elements in the said detector tubes, one detector circuit being tuned to receive a desired signal with static and the other detector circuit being tuned to as close a frequency as possible to that of the first circuit but with static and no signal, vacuum tube oscillators for each detector circuit for producing the same beat frequency in the grid circuits of the detector circuits, whereby the beat frequencies from the plate circuits of the detector tubes will be equal but opposed in the opposite sides of the said split primary of the radio frequency transformer.

2. A radio hook-up as set forth in claim 1, and separate means connected with each side of the split primary of the radio frequency transformer for varying the amplitude of the static impulses.

3. A radio hook-up as set forth in claim 1 having a single antenna for receiving said signals and including means in series for impressing said signals on said detector circuits.

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