

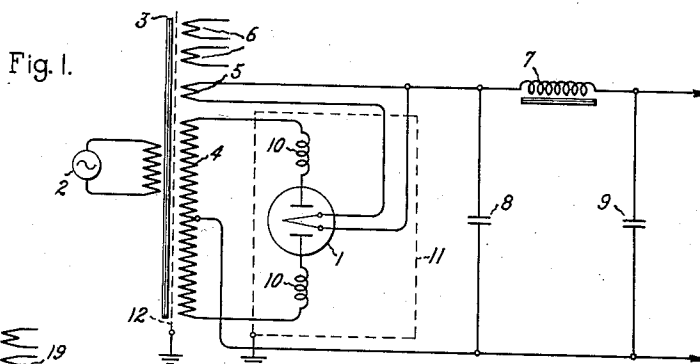
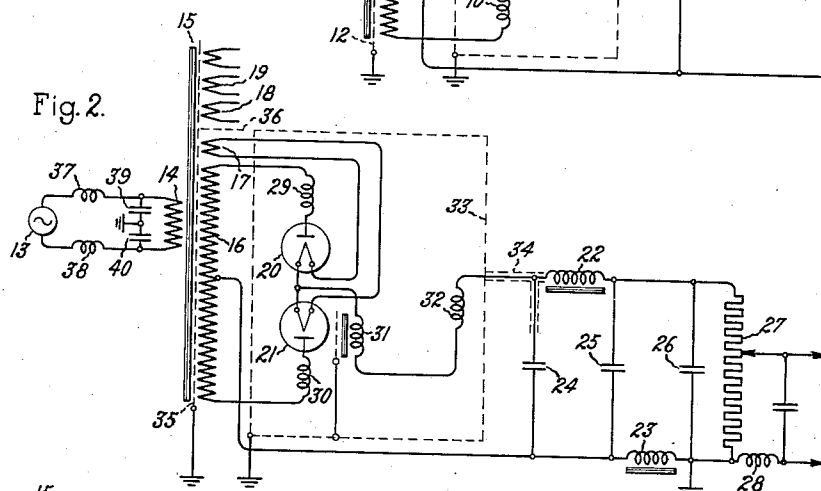
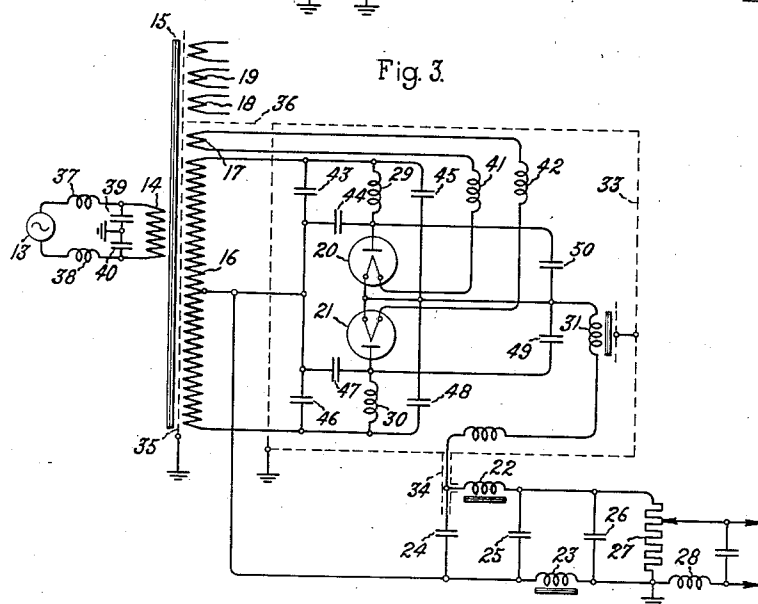
Aug. 25, 1936.

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2,052,413

POWER SUPPLY SYSTEM

Filed Nov. 16, 1933



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## UNITED STATES PATENT OFFICE

2,052,413

## POWER SUPPLY SYSTEM

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Application November 16, 1933, Serial No. 698,297

6 Claims. (Cl. 175—363)

My invention relates to power supply systems for radio apparatus and more particularly to such systems which utilize electron discharge rectifying devices which contain an ionizable medium.

5 In order to obtain high current capacity in power supply systems for radio receivers and other apparatus, it has been found that electron discharge rectifying devices containing an ionizable medium such as mercury vapor or some of  
10 the inert gases such as neon or argon may be used to advantage. Such devices, however, particularly after long periods of use, have a tendency to generate spurious oscillations of radio frequency which interfere with the proper operation  
15 of the radio apparatus.

It is therefore an object of my invention to provide a power supply system utilizing such electron discharge rectifying devices which contain  
20 an ionizable medium, with a suitable arrangement for preventing any appreciable amount of such oscillations from being radiated or transmitted to the radio apparatus which is being supplied with power from the power apparatus.

In accordance with my invention, I provide  
25 means for reducing the amplitude of such spurious oscillations and means which prevent such oscillations from being transmitted to the associated apparatus.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention  
30 itself, however, both as to its organization and method of operation together with further objects and advantages thereof, will be understood best by reference to the following description taken in connection with the accompanying  
35 drawing in which Fig. 1 discloses an embodiment of my invention, Fig. 2 discloses a preferred embodiment, and Fig. 3 discloses a further application of my invention.

Referring to Fig. 1 of the drawing, I have illustrated therein a power supply system utilizing an electron discharge device 1 which contains an  
40 ionizable medium such as gas or mercury vapor. The electron discharge device may have an anode and a cathode or as shown, two anodes and a cathode. A source of pulsating or alternating current 2 supplies energy to the primary winding  
45 of a transformer 3 which is provided with a plurality of secondary windings 4, 5, and 6. The secondary winding 4 is connected to the anodes of the discharge rectifier 1 and the midpoint thereof  
50 is connected to one side of the output circuit of the rectifier. The secondary winding 5 energizes the filamentary cathode of the discharge

rectifier and is connected to the other side of the output circuit of the discharge rectifier. The remaining secondaries 6 supply alternating current energy to other parts of the associated radio receiver or apparatus. The output of the discharge rectifier may be provided with a suitable  
5 filter network comprising a choke inductor 7 and by-pass capacitors 8 and 9.

In order to reduce the amplitude of the spurious oscillations generated by the discharge rectifier 1 and the associated circuit, a radio frequency choke inductor 10 is connected in each of the leads between the anodes and the secondary  
10 winding 4 of the transformer 3. This choke inductor 10 also serves to isolate the discharge device 1 from the transformer 3. The discharge device 1 and the choke inductors 10, 10 are surrounded by a grounded metallic screen or shield,  
15 which is indicated on the drawing by the dotted rectangle 11. This electrostatic shield prevents radiation of the oscillations through the ether. It will be apparent that it is possible for spurious oscillations which may be impressed upon  
20 the secondary winding 4 of the transformer to be transferred to the primary winding which in turn, would transfer similar currents to the secondary winding 6 of the transformer, thereby  
25 directly transmitting such oscillations to the associated radio apparatus. In order to prevent this, a grounded electrostatic screen or metallic shield 12 is arranged between the primary winding and the secondary windings of the transformer 3. The arrangement disclosed in this figure is quite satisfactory for electron discharge rectifiers of the type utilizing a gaseous discharge  
30 and those mercury vapor rectifiers having a relatively low current output.

Referring to Fig. 2, I have disclosed therein a preferred embodiment of my invention. A source of pulsating current 13 is connected to the primary winding 14 of the power transformer 15.  
40 The transformer 15 is provided with a plurality of secondary windings 16, 17, 18, 19. The secondary winding 16 supplies a potential to the anodes of a pair of electron discharge rectifiers 20 and 21 which are of the type containing an ionizable medium. It is to be understood, of course, that these two discharge devices could be replaced by a single full-wave discharge device, or that the circuit could be altered to utilize a  
50 half-wave rectifying device. The secondary winding 17 supplies current which energizes the cathodes of the rectifying devices. A multi-section filter is connected between the cathodes of the discharge devices 20 and 21 and the midpoint  
55

of the secondary winding 16 of the transformer. This filter as shown may comprise a pair of choke inductors 22 and 23 which are by-passed by suitable capacitors 24, 25, and 26. The output of the filter may be connected to the potentiometer resistor 27 from which the proper potential for the associated radio apparatus may be obtained. In order to isolate the associated apparatus from the power supply, the radio frequency choke inductor 28 may be inserted in the grounded lead of the filter. A pair of radio frequency choke inductors 29 and 30 connected between the anodes of the discharge devices 20 and 21 respectively and the secondary winding 16 serve to reduce the amplitude of the spurious oscillations and to partially shield the rectifiers from the secondary winding of the transformer. A low frequency choke inductor 31 is connected between the cathodes of the discharge rectifier and the filter network. This low frequency choke inductor is provided with an electrostatic shield which is connected to ground, or the core of the choke may be connected to ground. This inductor serves to reduce the peak current passed by the discharge rectifiers, thereby reducing the energy which may give rise to the generation of the undesired spurious oscillations. In order further to prevent or reduce the generation of spurious oscillations, a radio frequency choke inductor 32 is connected in series with the low frequency choke inductor 31 so as to prevent spurious oscillations from being impressed across the filter network. The entire arrangement comprising the discharge devices 20, 21 and the various choke inductors 29, 30, 31 and 32, is enclosed within a grounded electrostatic screen 33 or shield. It has been found that the radiation and transmission of spurious oscillations is further prevented by shielding the conductor or electrical connection extending through the side of the electrostatic shield 33 to the filter network components comprising the first inductor 22 and the by-pass capacitor 24, by a sheath 34 which may be connected to the shield 33 or grounded separately.

In order to prevent spurious oscillations from being transmitted from the secondary windings 16, 17 to the remaining secondary windings 18, 19 or by way of the primary winding 14 to the remaining secondary windings, a grounded electrostatic shield or screen 35 is arranged between the primary and secondary windings of the transformer. An electrostatic shield 36 which may be connected to the first electrostatic shield 35 is arranged between the secondary windings 16, 17 which supply energy to the rectifier circuit and the remaining secondary windings 18, 19 which supply energy to the associated radio apparatus. In order further to aid in preventing or reducing the transmission of spurious oscillations to the associated radio apparatus, the primary winding 14 of the transformer is connected through a pair of radio frequency choke inductors 37 and 38, and the winding itself is maintained at radio frequency ground potential by means of the capacitors 39 and 40. These capacitors are connected respectively between the opposite extremities of the primary winding 14 and the ground. This arrangement not only helps to prevent the primary winding from repeating spurious oscillations but it also serves to prevent extraneous disturbances arising from the alternating current source 13 from being impressed upon the power supply circuit.

Referring to Fig. 3, it will be noted that similar parts have been denoted with reference numer-

als corresponding to Fig. 2. Fig. 3 is particularly adapted to arrangements utilizing large mercury vapor discharge rectifiers which may be associated with ultra-sensitive radio receivers. Therefore, in order to allow even less of the energy due to the tendency to generate spurious oscillations to be impressed upon the ultra-sensitive radio receiver, certain additional components have been added. A pair of radio frequency choke inductors 41 and 42 is inserted in the leads between the cathodes of the discharge devices and the filament secondary 17 of the transformer. All the points of the rectifier and the associated elements such as the various choke inductors are maintained at the same radio frequency potential by means of a number of by-pass capacitors 43 to 50. Each of the choke inductors and the anodes of the discharge devices is at radio frequency potential, thereby inhibiting the tendency to generate spurious oscillations. While these various elements are generally not necessary in connection with the average radio apparatus, they are disclosed herein for the purpose of showing how my invention in its most efficient form may be utilized in connection with rectifiers having a great tendency to generate spurious oscillations or with rectifiers which supply energy to ultra-sensitive radio receivers.

While I have shown and described my invention in connection with certain specific embodiments, it will, of course, be understood that I do not wish to be limited thereto since it is apparent that the principles disclosed herein are susceptible of numerous other applications, and modifications may be made in the circuit arrangements or in the instrumentalities employed without departing from the scope and spirit of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a power supply system, the combination of an electron discharge device having a cathode and at least one anode surrounded by an ionizable medium, a transformer having a primary winding and a secondary winding, a source of pulsating current connected to said primary winding, connections from said secondary winding to said anode, an inductor choke connected between said anode and said transformer, a grounded metallic screen arranged between said primary and said secondary transformer windings, and a grounded metallic shield enclosing said inductor choke and said discharge device and separating electrostatically said discharge device from said transformer, said shield, inductor and screen cooperating to prevent radiation of spurious oscillations from said power supply system.

2. In a power supply system for radio apparatus, the combination of an electron discharge rectifier containing an ionizable medium, a source of pulsating current connected to the primary winding of a transformer, said transformer having a plurality of secondary windings, connections from certain of said secondary windings to said rectifier, a grounded metallic shield arranged between said primary and said secondary windings, a grounded metallic shield arranged between the secondary windings which are connected to said rectifier and the remaining secondary windings, said metallic shields cooperating to effectively shield said remaining secondary windings from said first-mentioned secondary windings and said primary winding, means in said connections to prevent the trans-

fer of spurious oscillations to said transformer from said rectifier through said connections, and a grounded metallic shield enclosing said rectifier and so mounted as to prevent the radiation of spurious oscillations to said transformer from said rectifier through the ether.

3. In a power supply system, the combination of an electron discharge rectifier including an anode and a cathode, a transformer for supplying current to said rectifier and to other apparatus, said transformer having a primary winding and a plurality of secondary windings, connections from certain of said secondary windings to said discharge rectifier, an inductor choke connected between said anode and said transformer, a grounded metallic screen arranged between said primary and said secondary transformer windings, a second grounded metallic screen arranged between the secondary windings which are connected to said rectifier and the remaining secondary windings, and a grounded metallic shield for enclosing said inductor choke and said discharge rectifier, said last named shield separating electrostatically said rectifier from said transformer, said shield, inductor and metallic screens cooperating to prevent spurious oscillations from being impressed upon said remaining secondary windings.

4. In a power supply system for radio apparatus, the combination of an electron discharge rectifier including an anode and a cathode, a transformer connected to a source of pulsating current, said transformer having a plurality of secondary windings, connections from certain of said secondary windings to said discharge rectifier, a load circuit for said rectifier, said load circuit being connected between said cathode and said transformer, means connected between said load circuit and said cathode for preventing substantial spurious radio frequency currents from entering said circuit, means connected between said last means and said cathode for reducing the current peaks on said rectifier and for reducing the amplitude of spurious oscillations, means connected between said anode and said transformer for preventing substantial spurious currents from being impressed upon said transformer, electrostatic shielding means for all of said means and said rectifier, said shielding means being so mounted as to prevent radiation into said transformer of spurious oscillations generated by said rectifier, a grounded metallic shield between said primary and said secondary windings, and a grounded metallic shield be-

tween said secondary windings connected to said rectifier and the remaining secondary windings.

5. In a power supply system for radio apparatus, the combination of an electron discharge rectifier having a cathode and an anode surrounded by an ionizable medium, a transformer connected to a source of pulsating current, said transformer having a plurality of secondary windings, connections from some of said secondary windings to said cathode and anode of said discharge rectifier, a load circuit for said rectifier connected between said cathode and the transformer secondary winding which is connected to said anode, a high frequency inductor connected between said anode and said transformer, a low frequency inductor and a high frequency inductor connected in series between said cathode and said load circuit, grounded electrostatic shielding means enclosing all said inductors and said discharge rectifier, said shielding means preventing radiation into said transformer of spurious oscillations from said rectifier, and a grounded electrostatic shield between said primary and said secondary windings, a portion of said shield extending between the secondary windings connected to said rectifier and the remaining secondary windings.

6. In a power supply system for radio apparatus, the combination of an electron discharge rectifier having a tendency to produce spurious oscillations of radio frequency, a transformer connected to a source of pulsating current, said transformer having a plurality of secondary windings, connections from some of said secondary windings to said rectifier, a load circuit including a multi-section filter connected to said rectifier and said transformer, a grounded metallic shield arranged between said primary and said secondary windings of said transformer, means connected between said transformer and said rectifier for substantially preventing spurious currents from being impressed through said connections upon said transformer, means connected between said rectifier and said filter for reducing the amplitude of spurious oscillations and for substantially preventing said oscillations from being impressed upon said filter, a grounded metallic shield surrounding both said means and said rectifier, said last-named shield being so arranged as to prevent radiation from said rectifier through the ether to said transformer, and a grounded metallic shield for the connection between said rectifier and the components of the first section of said filter.

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