Dec. 6, 1938. S. M. WHISK 2,139,533

ELIMINATION OF ATMOSPHERIC RADIO DISTURBANCES

Filed Aug. 25, 1937 3 Sheets-Sheet 1

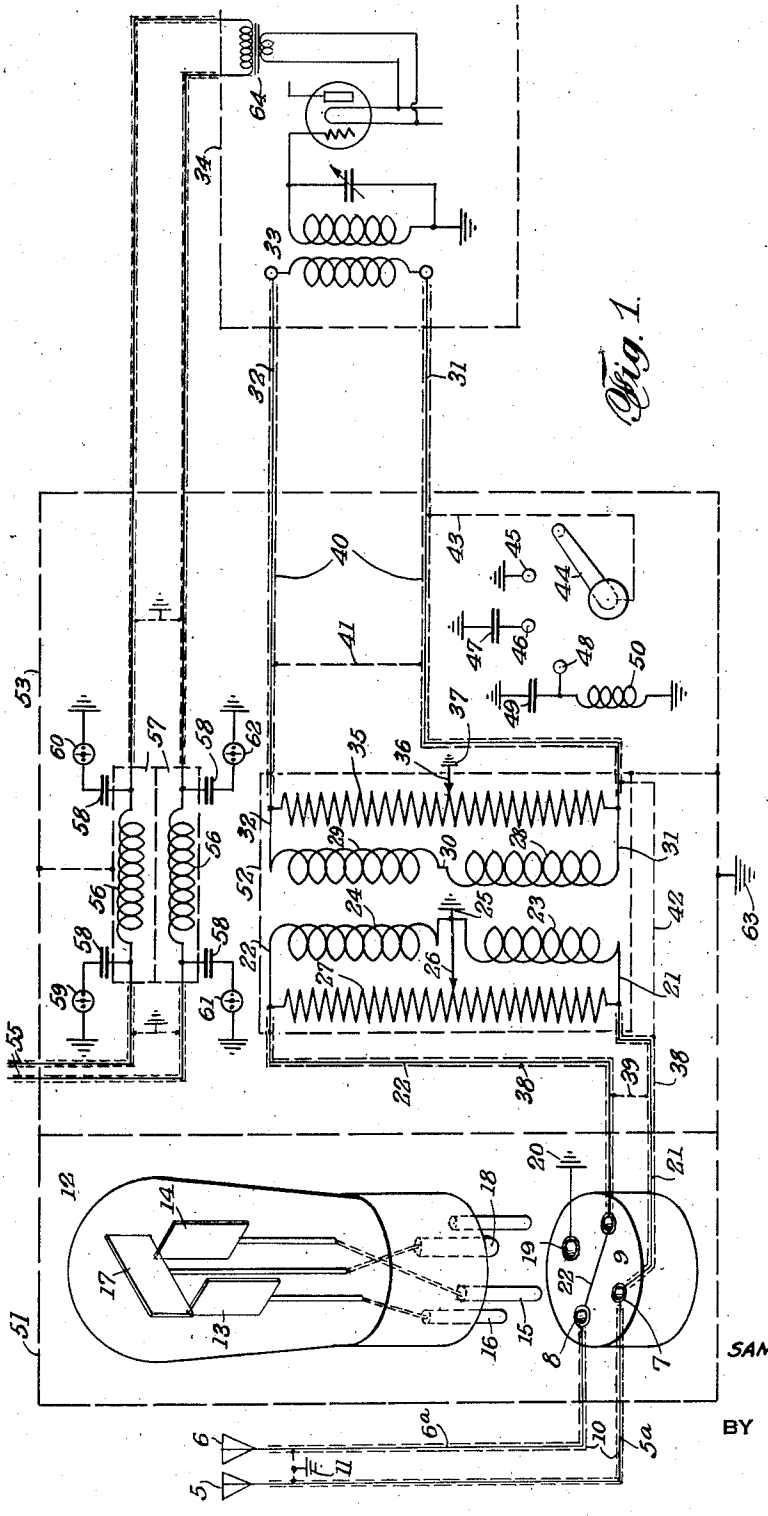


Fig. 1.

SAMUEL M. WHISK
INVENTOR

BY Philip S. McLean
ATTORNEY

Dec. 6, 1938. S. M. WHISK 2,139,533

ELIMINATION OF ATMOSPHERIC RADIO DISTURBANCES

Filed Aug. 25, 1937 3 Sheets-Sheet 2

Fig. 3.

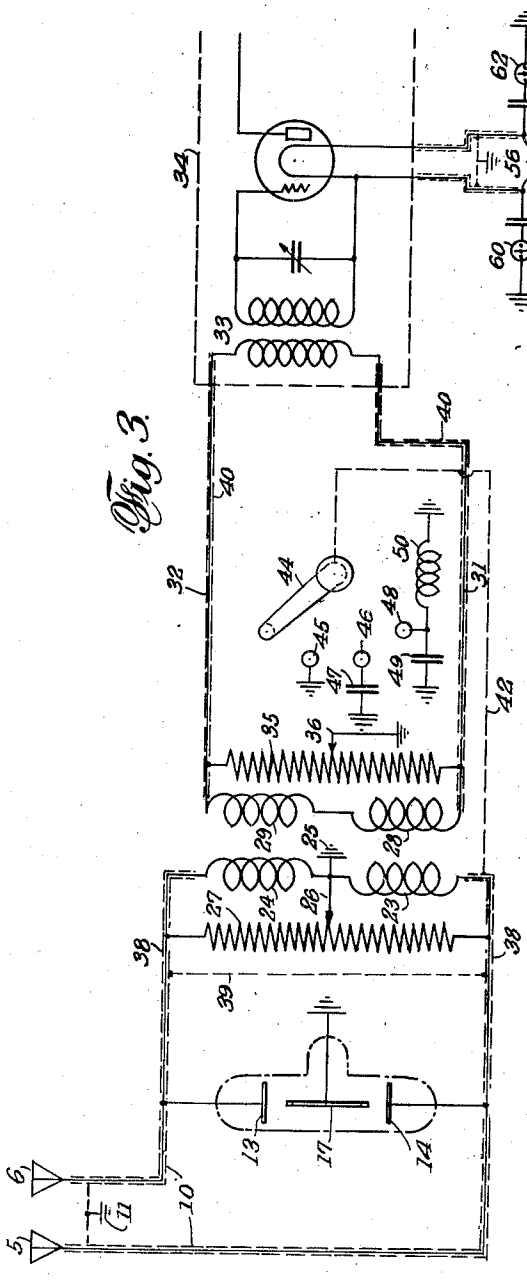
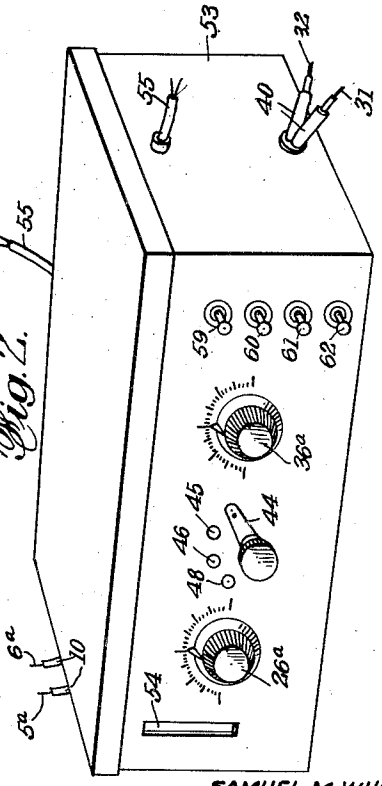


Fig. 2.



SAMUEL M. WHISK
INVENTOR

BY Philip S. McKeon
ATTORNEY

Dec. 6, 1938. S. M. WHISK 2,139,533

ELIMINATION OF ATMOSPHERIC RADIO DISTURBANCES

Filed Aug. 25, 1937 3 Sheets-Sheet 3

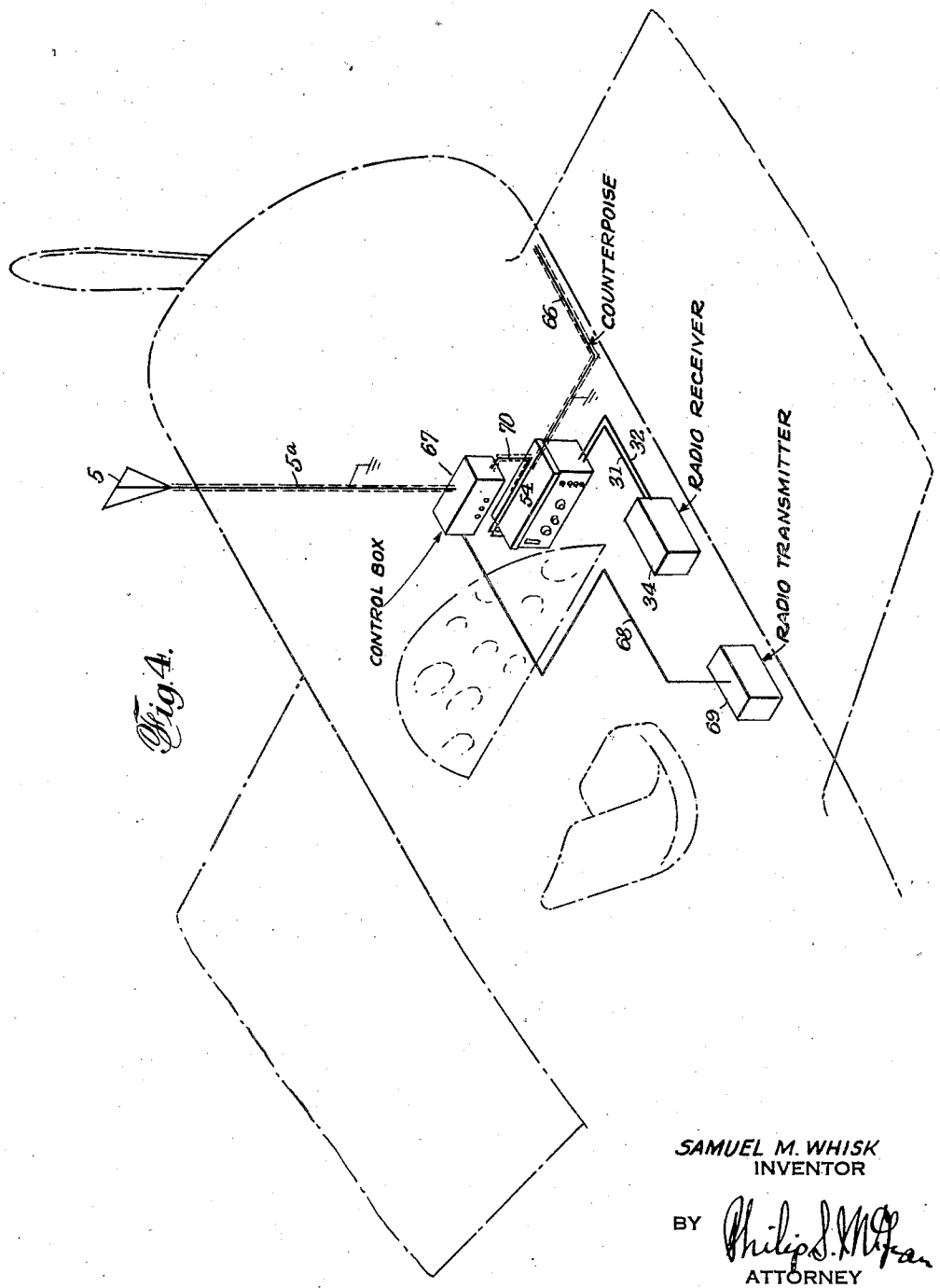


Fig. 4.

SAMUEL M. WHISK
INVENTOR

BY Philip S. McKean
ATTORNEY

Patented Dec. 6, 1938

2,139,533

UNITED STATES PATENT OFFICE

2,139,533

ELIMINATION OF ATMOSPHERIC RADIO DISTURBANCES

Samuel M. Whisk, Brooklyn, N. Y.

Application August 25, 1937, Serial No. 160,775

9 Claims. (Cl. 250—20)

The invention here disclosed relates to the elimination and avoidance of disturbing atmospheric radio frequencies, such as heretofore loosely termed as "static".

Objects of the invention are to provide simple, practical and effective apparatus which will filter or ground out objectionable frequencies, readily adjustable to eliminate the disturbing frequencies and conversely, build up the desired signal frequencies and which apparatus will be relatively inexpensive for the results accomplished and be applicable generally to existing radio receiving equipment.

The foregoing and other desirable objects are attained by novel features of construction, combinations and relations of parts as hereinafter pointed out, illustrated in the accompanying drawings and broadly covered in the claims.

The drawings accompanying and forming part of the specification illustrate different practical embodiments and applications of the invention. It is appreciated, however, that changes and modifications of the present disclosure may be made, all within the true intent and broad scope of the invention.

Figure 1 is a diagrammatic view illustrating an embodiment of the invention utilizing power line energy.

Figure 2 is a perspective view of the complete atmospheric eliminator unit.

Figure 3 is a diagrammatic illustration of an embodiment employing a battery as the current source.

Figure 4 is an illustration showing the invention applied to aircraft use.

One of the features of the invention is a double antenna pickup system with special means for balancing and grounding out the disturbing effects.

In Figure 1, two separate antennas are indicated at **5**, **6**, connected respectively to contacts **7**, **8**, on insulating base **9**.

The two antennas may be angularly related or in general parallelism, as indicated, and they may be as nearly alike as possible or have quite different values. In service one acts as a counterpoise for the other.

Both antenna leads **5***a*, **6***a*, are fully shielded as indicated at **10** and this double antenna shielding is grounded as close as practicable to the actual antennas, as indicated at **11**.

Mounted on the base **9** is a discharge tube **12** having separate insulated anodes **13**, **14**, with terminals **15**, **16**, engaging base contacts **7**, **8** and a single cathode or discharge plate **17** having a terminal **18** engageable with contact **19** which is grounded at **20**. The grounding terminal prong **18** is indicated as larger than the others and the contact socket **19** of a corresponding size so that the discharge tube can only be mounted on the base in this one relation.

From input terminals **7** and **8**, leads **21** and **22** are shown extending to opposite ends of the two reversely wound radio frequency primary coils **23**, **24**. These reversed primary windings are shown connected at the center and as having a common ground at this point at **25**. Extending from this intermediate common ground is indicated a potentiometer arm **26** adjustable over the potentiometer winding **27** bridged across the two primary windings and the antenna input leads **21**, **22**.

The secondary windings **28**, **29** of the two R. F. transformers are shown connected together at the center at **30** and as having output leads **31**, **32** extending to the input transformer **33** of the radio receiving set indicated generally at **34**.

A potentiometer winding **35** is indicated bridged across the two secondary windings and the adjustable arm **36** for this potentiometer is indicated as grounded at **37**.

The input leads **21**, **22** are indicated as shielded at **38** with the two shields connected together at **39**. Similarly, the output leads are indicated as shielded at **40** and these shields connected together at **41** and jointly connected to the input shields at **42**. All transformer lead shielding is shown as having a short connection **43** with the arm **44** of a special grounding switch adjustable to engage a straight grounding contact **45**, a contact **46** for grounding through capacity **47** or a contact **48** for grounding opposite ways through both capacity **49** and inductance **50**.

The special discharge tube **12** is indicated as shielded in a shielding compartment or container **51** and the R. F. transformers and potentiometers are indicated as shielded in a special shielding compartment or container **52**. All the several parts may be contained in a metallic shielding case illustrated particularly at **53**, Figure 2. In the latter view, the special grounding switch is shown located centrally on the front of the case with controls **26***a* and **36***a* for the two potentiometers at opposite sides of the same. This view also shows the shielding compartment for the discharge tube as having a window **54** through which any glow effect of this tube may be observed.

Where current supply for the receiver is taken from a power line, such as indicated at **55**, Fig-

ure 1, a power filter is provided embodying inductance or choke coils **56** in opposite sides of the line located in separate shielding chambers **57** and each coil adapted to be grounded at either or both ends through capacities **58** by grounding switches **59, 60, 61, 62.**

The casing **53** for the complete unit is indicated in Figure 1 as suitably grounded at **63.** The power transformer for the receiving set may be of more or less conventional design, as indicated at **64.**

Where a battery is employed as the power source, as indicated at **65** in Figure 3, the power filter may be employed as before, similar reference characters being used to denote similar features, including the choke coils and switches for grounding through capacity.

Figure 4 is an illustration of the invention as applied to a two-way communication aircraft system. In this view the equivalent of the two antennas is provided by antenna **5** and a counterpoise **66.** Antenna **5** is led into the control box **67** by which it may be switched through line **68,** or be cut back to the receiver **34,** or vise versa. From the control box another lead **70** runs to the atmospheric eliminator **54** and the counterpoise constituting in this instance the second antenna is led into this unit and connected in the same manner as the second antena **6,** Figures 1 and 3.

With the control box **67** in Figure 4 the radio system may be immediately switched over from transmitting to receiving, or vise versa, and in the receiving condition, the counterpoise is cut in as the second antenna for the atmospheric disturbance eliminator.

In all cases the receiver may be set for the desired signal and then the disturbance eliminator adjusted for rejecting or balancing out so-called static or atmospheric disturbances. Thus, there is no need to first adjust the receiver, which would involve the possibility of losing the signal. With the double antenna disturbing frequencies ordinarily will come in on one and be balanced out or grounded, leaving the other clear and free to bring in the signal frequency. The discharge tube is a low resistance tube enabling disturbances, which usually are of lower frequency, to pass to ground across the gap from one or the other plates **13, 14** to discharge plate **17.** Radio disturbances coming in on the antenna shields immediately ground out at **11** and any disturbing frequencies on the transformer shielding frequencies are grounded, through adjustment of the special grounding switch either direct or through capacity or through both capacity and inductance, by way of grounding contacts **45, 46, 48.** The R. F. transformer system is an all-wave balancing transformer combination. Those portions which are grounded by the potentiometers are neutralized through such grounding. The discharge tube and the adjustable R. F. transformer take out electrostatic and electromagnetic disturbances. The power filter takes out inductive disturbances which may come in on the power line. The antennas may be duplicates or be different, one acting as a counterpoise for the other. Both are shielded and grounded independently of the grounding of the rest of the shielding. By proper adjustment of the unit disturbances may be balanced out and grounded even though of higher value than the signal frequencies.

If energy is picked up by the antennas, as from a nearby power line or the like, the discharge tube will glow and indicate this wrong condition. This tube also may operate as a lightning arrester and may serve as a safety device when a common antenna is use both for receiving and transmitting and reception is begun when the switch is on for the transmitter.

The potentiometer adjustments serve also for volume control, particularly on short-wave reception, because of the sharp selectivity on high frequencies. To overcome fading effects, the operator ordinarily only needs to bring the radio controls up to maximum sensitivity and then adjust the potentiometer of the atmospheric filter for volume and clear signal. The coils for the radio frequency transformers may all be wound on a single tube, thus making the structure in effect a single all-wave, all-frequency transformer. The first potentiometer grounds parts of the radio frequency primary and the second potentiometer portions of the radio frequency secondary sections.

In aircraft installations the same shielding is employed such as shown in detail in Figures 1 and 3 and the elimination of disturbing frequencies is the same. The adjustment of the first potentiometer **26** grounds out portions of one side or the other, thereby neutralizing disturbing frequencies in the primary windings. Similarly any disturbing frequencies transferred to the secondary windings are grounded and balanced out by adjustment of the second potentiometer **36.** Both these potentiometers are of the non-inductive type so as not to increase or decrease the inductive effects of incoming frequencies.

The four grounding or bucking switches **59, 60, 61, 62** at opposite ends of the chokes in the power filters enable inductive or conductive disturbances coming in on the hot leg or on the neutral or grounded wire to be grounded at either the input or the output or at both ends of the choke coils, depending upon the character of such disturbances. This filter is thus in effect a "semi-tuned" filter.

What is claimed is:

1. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set and potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections.

2. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set, potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections, shielding for said transformer connections and an adjustable grounding switch for said shielding hav-

ing contacts for variously grounding said shielding.

3. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set, potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections, shielding for said transformer connections, an adjustable grounding switch for said shielding having contacts for variously grounding said shielding, including direct grounding means, capacity grounding means and a combination of capacity and inductive grounding means.

4. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection; a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set and potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections, said potentiometer for the primary sections having an intermediate grounding connection between the oppositely wound sections of said primary.

5. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system including antenna leads, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set, potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections and grounded shielding for the leads of said dual antennas.

6. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set, potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections and shielding casing for said discharge tube and transformer.

7. In apparatus for elimination of atmospheric radio disturbances, a dual antenna system, a low resistance discharge tube having electrodes in connection with the two antennas and an electrode separated by gaps from said first mentioned electrodes and having a grounding connection, a radio frequency transformer having reversely wound primary and secondary sections, input connections from said first mentioned tube electrodes to oppositely wound sections of the primary, output connections from the oppositely wound secondary sections for connection with a radio receiving set and potentiometers across the oppositely wound primary and secondary windings having adjustable grounding connections, a shielding casing for said discharge tube and transformer and an adjustable grounding switch on said casing.

8. In atmospheric radio disturbance elimination, a dual antenna system including shielded antenna leads, a low resistance discharge tube connected therewith, an all-wave radio frequency transformer having reversely wound primary and secondary sections, neutralizing and grounding connections from the reversely wound primary sections of said transformer, shielded input and output connections for said transformer and means for variously grounding said shielding.

9. In atmospheric radio disturbance elimination, a dual antenna system including shielded antenna leads, a low resistance discharge tube connected therewith, an all-wave radio frequency transformer having reversely wound primary and secondary sections, shielded input and output connections for said transformer and adjustable grounding potentiometers bridged across said reversely wound primary and secondary sections.

SAMUEL M. WHISK.