

Feb. 14, 1939.

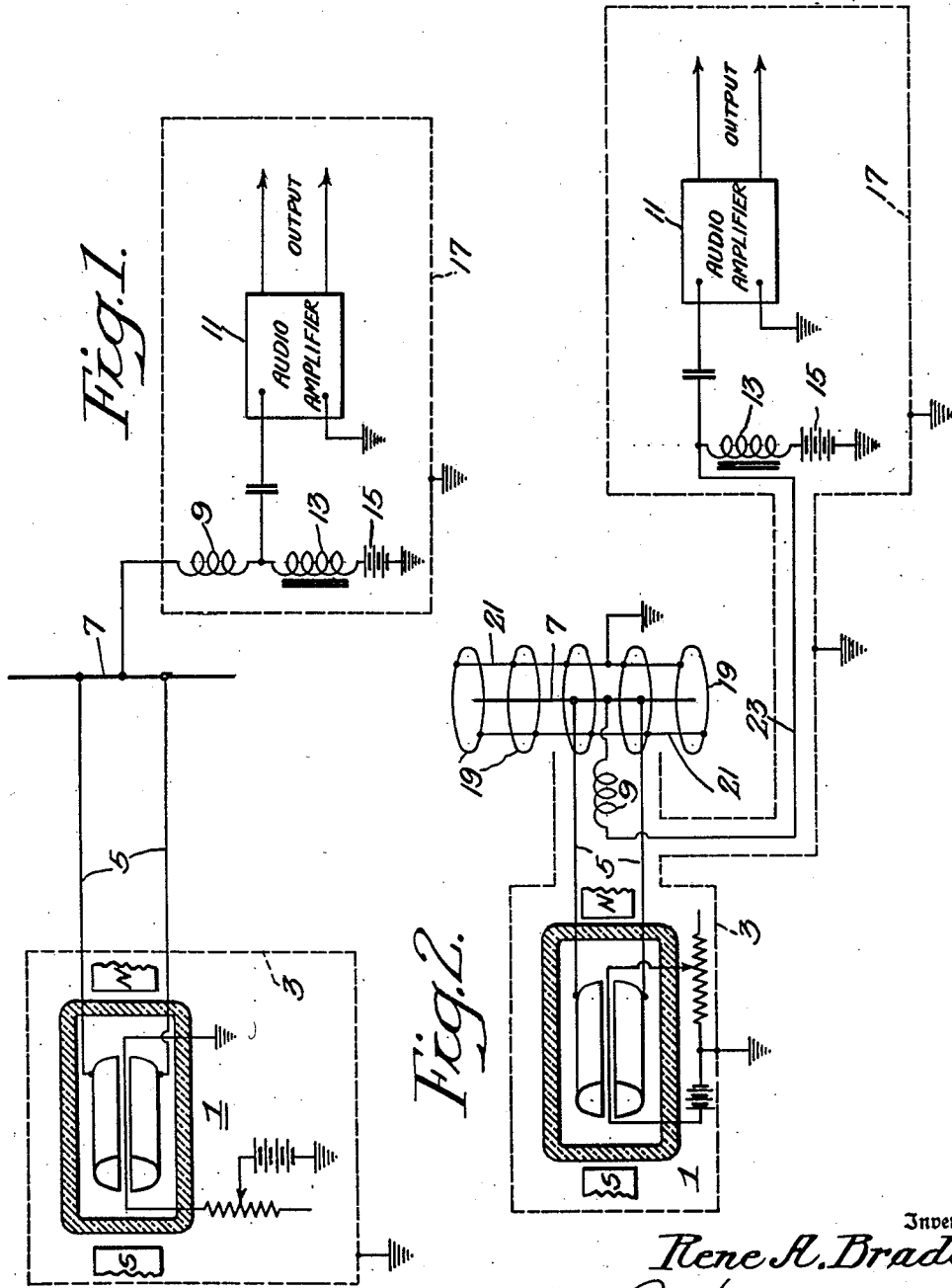
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2,147,142

RECEIVER FOR ULTRA HIGH FREQUENCY WAVES

Filed July 14, 1936

2 Sheets-Sheet 1



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Fig. 3.

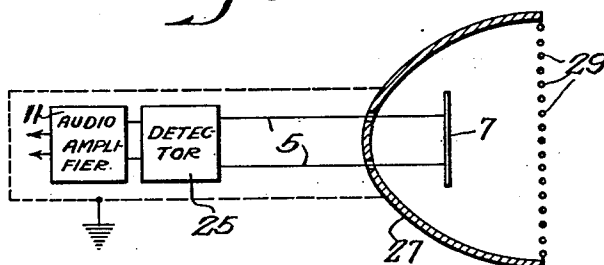


Fig. 4.

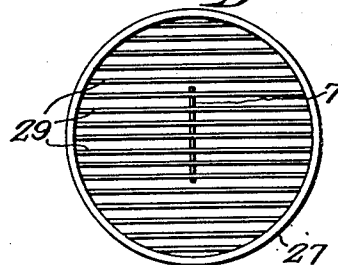


Fig. 5.

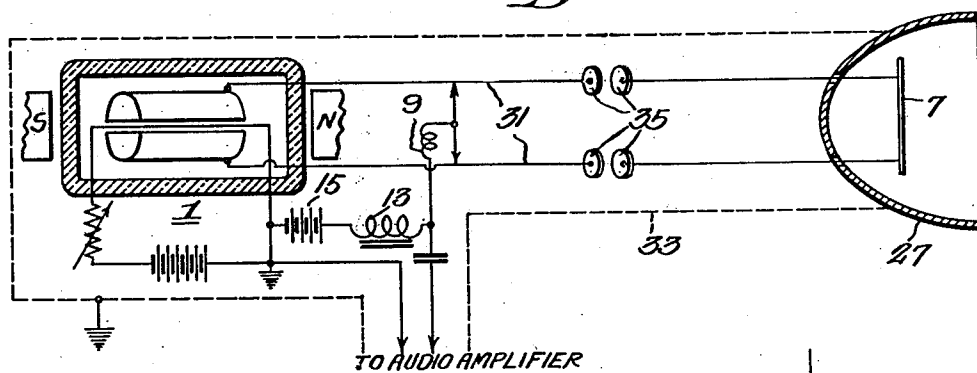
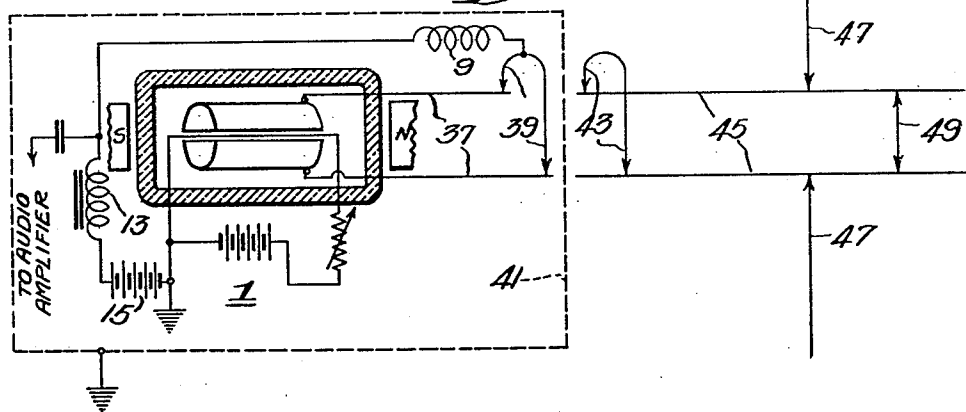


Fig. 6.



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UNITED STATES PATENT OFFICE

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RECEIVER FOR ULTRA HIGH FREQUENCY WAVES

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of Delaware

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2 Claims. (Cl. 250—20)

My invention relates to receivers for ultra short waves. More specifically, my invention provides means for receiving waves of ultra high frequency without the interfering effects caused by low frequency disturbances, such as sixty cycle induction, electrical switching, automobile ignition, and the like.

By ultra short waves is meant radio frequency currents of a wave length from several meters down to several centimeters. I have found that ordinary antenna systems which resonate at the ultra high frequencies are quite responsive to currents of relatively low frequency which may be created by sixty cycle induction, electrical switching, lightning discharges, automobile ignition, and the like. My invention contemplates means for eliminating or reducing such disturbing effects without attenuating the desired ultra short wave currents.

One of the objects of my invention is to provide means for shielding an ultra short wave antenna from low frequency disturbances. Another object is to provide an ultra high frequency antenna with shielding means which permit waves of predetermined polarization to reach the antenna. A further object is the provision of means for shielding the transmission line of an antenna system from low frequency disturbances and by providing means for attenuating low frequency disturbances in the transmission line.

My invention may be best understood by reference to the accompanying drawings, in which

Fig. 1 represents an ultra short wave receiving system with an unshielded antenna and transmission line,

Fig. 2 is a diagram of an ultra short wave receiver employing a shielded antenna and a shielded transmission line,

Figs. 3 and 4 represent an antenna system, including a reflector, which is shielded by means which admit properly polarized waves to the antenna,

Fig. 5 is a circuit diagram of an ultra high frequency receiver with a shielded antenna system which includes attenuating means for low frequency currents, and

Fig. 6 is a circuit diagram of a modification of the receiver illustrated in Fig. 5.

In a conventional ultra short wave receiving system, such as disclosed in Fig. 1, a magnetron detector 1 may be enclosed within a shield 3. The magnetron is connected to a transmission line 5 which terminates in a dipole antenna 7. The midpoint of the dipole is connected through

a radio frequency choke 9 to an audio amplifier 11. The radio frequency choke is also connected to an audio frequency inductor 13 and a power supply 15 which energizes the magnetron anode circuit. The audio amplifier 11, choke 9, inductor 13, and power supply 15 are preferably shielded by a container 17. The output of the audio amplifier may be connected to any suitable signal indicator. The magnetron detector is a high impedance device and in the system shown is particularly sensitive to low frequency disturbances which may reach the antenna or transmission line.

One arrangement for shielding the antenna system from low frequency currents without attenuating the desired ultra high frequency currents, is shown in Fig. 2. In this figure, and throughout the specification and drawings, similar reference numerals will be used to indicate similar parts. The dipole antenna 7 is located substantially at the axis of a series of conductive loops 19. The loops 19 may be supported by a pair of vertical conductors 21. The loops 19 may be spaced at intervals of substantially less than the wave length to be received by the dipole 7. The loops and vertical conductors form a shielding cage which is grounded. The lead 23 which connects the radio frequency choke 9 to the audio amplifier 11 and power source 15, is shielded. The grounded cage shields the antenna from low frequency disturbance but admits ultra high frequency currents which are polarized in the plane of the dipole antenna 7.

In Figs. 3 and 4, the detector 25 is connected by a suitable transmission line 5 to a dipole antenna 7. The detector and transmission line are suitably shielded. The dipole 7 is positioned at the focus of a reflector 27 which also acts as a shield. A series of conductors 29 are connected across the opening of the reflector. The conductors are preferably arranged substantially at right angles to the axis of the dipole and are uniformly spaced with respect to each other. In this shielded antenna arrangement, ultra high frequency waves, which are polarized in the plane of the dipole, will be admitted through the shielding wires 29, but low frequency disturbances will be excluded. The length of the transmission line 5 can be varied, by means not shown, so that it may be tuned to currents of signal frequency.

The reflector and dipole must be suitably arranged with respect to the approaching wave front in accordance with the well known directive effect of a dipole and reflector. The directive

effect is a further aid in reducing disturbances originating behind the reflector.

In Fig. 5 a magnetron 1 or any other detector, such as a positive grid triode, is connected to a transmission line 31 which terminates in a dipole antenna 7. The dipole antenna is located at the focus of a reflector 27. The magnetron and transmission line are positioned within a shield 33. A pair of capacitors 35 are serially included in the transmission line 5. These capacitors 35 may be small discs which are suitably spaced so that they offer high reactance to low frequency currents and negligible reactance to the ultra high frequency currents. The lengths of the transmission lines must be adjustable to allow tuning the lines to the wave length of the received signal, and to permit placing the capacitors 35 at or near a voltage or current node, so that the reflections from the capacitors will be in step with those from the ends of the line. In this manner, the disturbing low frequency currents are highly attenuated, while the desired high frequency currents are not appreciably attenuated. The antenna 7 and its reflector 27 may be replaced by any suitable antenna array. In Fig. 6, a magnetron detector 1 is connected to a transmission line 37. The transmission line 37 is terminated in a loop 39. The detector, transmission line, and loop are located within a shield 41. The line 37 is preferably tuned to currents of signal frequency. The portion of the shield which is near the loop 39 is arranged to permit magnetic coupling to the loop, but this portion of the shield excludes capacity coupling. A second loop 43 is inductively coupled to the first mentioned loop 39. The second loop is part of a second transmission line 45. A dipole antenna 47 is connected to the second transmission line 45 at points at which the antenna impedance is suitably related to the line impedance. The transmission line 45 is tuned by an adjustable bridge member 49 which may be a "trombone" or the like. In this arrangement, the inductive relation between the loops 39, 43 offers relatively low impedance to desired high frequency currents and very high attenuation to undesired low frequency disturbances. The magnetron and its associated transmission line is electrostatically shielded from low frequency currents, but is exposed to the desired high frequency currents through the inductive coupling between the loops of the transmission lines.

Thus I have described an ultra high frequency

detector which is connected to a transmission line. A dipole is connected or coupled to the transmission line. The transmission line, detector, and dipole may be shielded with respect to low frequency disturbances, the detector is connected to the terminating end of the transmission line. The dipole is shown as shielded by conductors which exclude low frequency disturbances but admit properly polarized ultra high frequency waves. Couplings of high impedance to the low frequency disturbances may be included in the transmission line. Although parallel wire transmission lines have been shown, it shown be understood that concentric shielded lines may be used. Likewise, equivalents may be used in place of the dipole. Various types of radio frequency detectors, such as a positive grid tube, may be used in place of the magnetron detectors. The shielded antenna system of my invention may be used on a transmitting system to prevent undesired low frequency currents from modulating the transmitter.

I claim as my invention:

1. In an ultra high frequency system, the combination of a detector, an antenna, a transmission line connecting said antenna and terminating in said detector, means shielding said detector and transmission line from disturbing low frequency currents, and reactive means between said antenna and said detector for attenuating low frequency currents without appreciably attenuating ultra high frequency currents, said last named means being placed at points in said transmission line which substantially insure that the reflections from said last named means and the reflections from the termination of said line will be in step.
2. In an ultra high frequency system, the combination of a detector, an antenna, a transmission line connecting said antenna and terminating in said detector, means shielding said detector and transmission line from disturbing low frequency currents, and capacitors connected in said transmission line whereby the reactance to low frequency currents is high with respect to the reactance to desired ultra high frequency currents, said capacitors being placed at points in said transmission line which substantially insure that the reflections from the capacitors and the reflections from the termination of the line will be in step.

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