

July 14, 1942.

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2,289,691

NOISE REDUCTION SYSTEM

Filed March 25, 1941

FIG. 1.

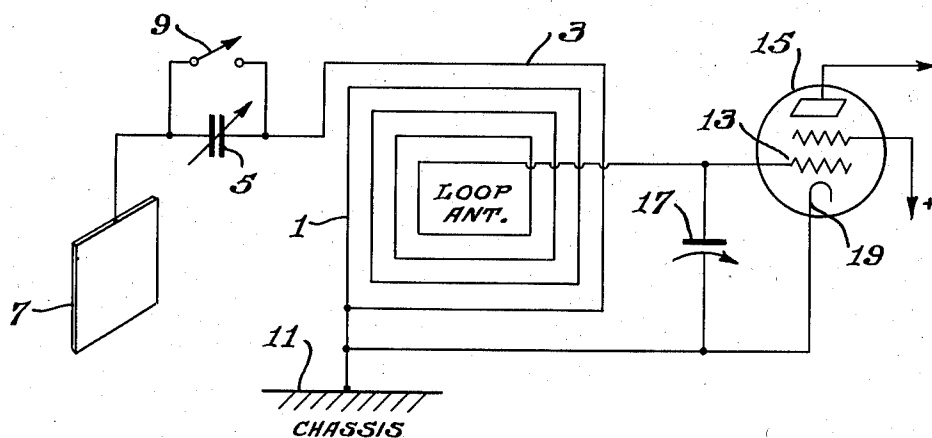
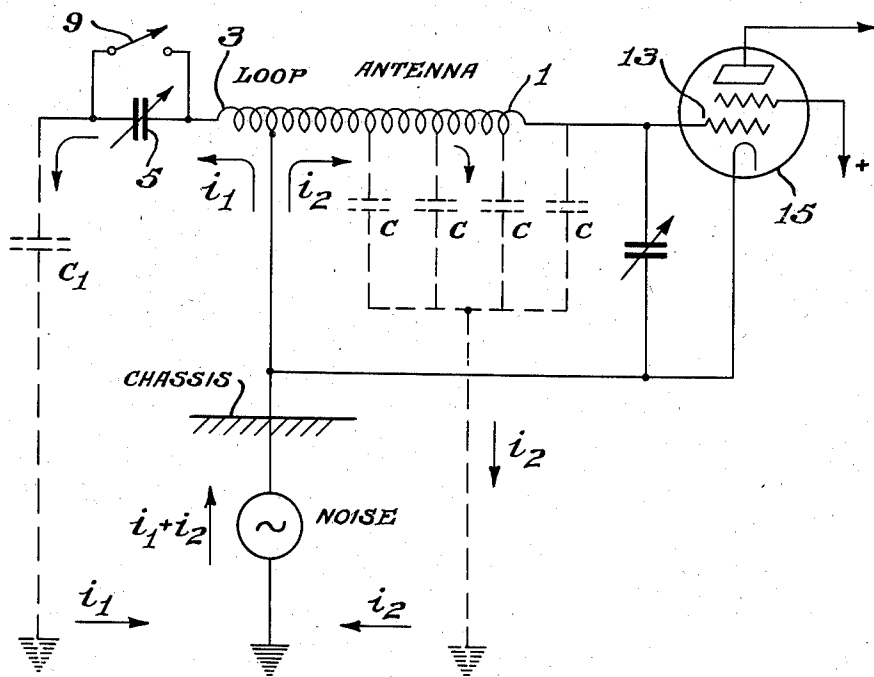


FIG. 2.



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2,289,691

NOISE REDUCTION SYSTEM

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Application March 25, 1941, Serial No. 385,062

5 Claims. (Cl. 250—20)

This invention relates to noise reduction systems such as those useful in eliminating the undesired noise picked up in radio receiving apparatus employing loop antennas and has for its principal object the provision of an improved apparatus and method of operation for eliminating the noise resulting from extraneous impulses such as those which are transmitted over the power supply line and tend to produce a noise voltage between the apparatus chassis and ground.

Heretofore it has been found that much of the noise encountered in radio reception is due to undesired electrical impulses which are transmitted to the receiver over the power supply line and produce a noise voltage between the receiver chassis and ground. While this noise voltage may be reduced by use of a short ground lead the use of a sufficiently short lead is usually impractical and furthermore in many applications the ground lead is not used. This is particularly true in radio receivers employing a loop antenna to which type of receivers this invention is particularly applicable. In connection with this problem it has been proposed to employ a shield for the loop. This, however, is not only expensive to provide, but it is bulky.

According to this invention, a loop antenna, preferably having a low capacity pickup, is provided with an outside turn which is connected through an adjustable trimmer condenser to an auxiliary plate or sheet of conducting material having a relatively high capacitive pickup. The size of the auxiliary plate or sheet, together with its series trimmer condenser and auxiliary turn on the loop, is so adjusted that the noise voltage induced in the loop antenna by the auxiliary turn is equal and opposite to the noise voltage induced in the loop antenna from the capacitive pickup of noise through the distributed capacity of the loop antenna and the turns of the loop antenna.

Other objects of this invention will become apparent to one skilled in the art from a reading of the following specification considered in connection with the accompanying drawing in which—

Figure 1 is a circuit diagram showing one form of this invention, and

Figure 2 is an explanatory diagram relating to the operation of the invention.

Fig. 1 shows a loop antenna 1 having an auxiliary turn or turns 3. This may also be less than a complete turn. A small trimmer condenser 5 is connected in series with the auxiliary turns 3 and a conductive sheet or plate 7 is con-

nected to the trimmer condenser 5. The trimmer condenser 5 is provided also with a shorting switch 9. The loop antenna 1 is connected to the chassis 11 at the point where the auxiliary turns 3 are connected to the antenna 1. The other end of the loop antenna 1 is connected to the control electrode 13 of the first amplifier tube 15. A tuning condenser 17 is utilized to tune the loop antenna 1. It will be observed that the cathode 19 of the first amplifier tube 15 and the tuning condenser 17 are connected to the chassis 11.

Fig. 2 is intended to facilitate an understanding of the operation of this invention. In Fig. 2 the loop antenna is represented by the coil having two separate sections. Section 1 is the useful loop antenna connected to the control electrode 13 and section 3 which is the auxiliary neutralizing turns. It will be noticed that the noise voltage occurs between ground and the chassis and $i_1 + i_2$ represents the noise current flowing between the chassis of the radio receiver and ground.

Because of the distributed capacity c between the turns of the useful portion of the loop antenna and ground a part of the noise current i_2 flows through the loop antenna portion 1 and ground as shown by the arrows marked i_2 . This current i_2 causes a voltage to be induced in the section 1 of the loop antenna such that this voltage is impressed upon the control electrode 13 of the amplifier tube 15 which would normally result in noise in the radio receiver.

Because of the distributed capacity c_1 between the plate 7 and ground, a portion of the noise current which is represented by i_1 flows through the auxiliary turn 3 in the loop antenna such as to induce a voltage equal and opposite to that voltage induced in the loop antenna by i_2 . This causes a neutralization of the voltage resulting from i_2 to eliminate the undesirable noise voltage impressed upon the control electrode 13 of the amplifier tube 15.

It is especially desirable to reduce the directivity of loop antennas in broadcast receivers used for entertainment. A reduction in directivity is provided when the coupling condenser 5 is shorted out by switch 9. This provides an over-neutralization of the noise voltage, but in locations where there is little or no noise the switch 9 may be closed and the directivity of the loop will be much further reduced.

While one system for carrying this invention into effect has been indicated and described, it will be apparent to one skilled in the art that

this invention is by no means limited to the particular organization shown and described, but that many modifications may be made without departing from the scope of this invention as set forth in the appended claims.

I claim as my invention:

1. In a radio receiver of the type employing a loop antenna, a connection between a point intermediate the ends of said loop antenna and a point of ground potential of said receiver, a connection between one end of said loop antenna and the input of said receiver, and the other end of said antenna coupled solely to ground through a capacitive element.

2. In a radio receiver of the type employing a loop antenna, a connection between one end of said loop antenna and the input circuit of said receiver, a capacitive element for coupling the other end of said antenna solely to ground, and a connection between a point of ground potential of said receiver and a point on said loop antenna adjacent the end of said antenna which is capacitively coupled to ground.

3. A radio receiver including a loop antenna having relatively low capacity to ground, a connection between one end of said loop antenna and the input circuit of said receiver, the other end of said loop antenna coupled only to an ele-

ment having a relatively large capacitive coupling to ground, and a connection adjacent the end opposite to that end of said loop connected to said input circuit connected to a point of ground potential of said receiver.

4. A radio receiver having a loop antenna having relatively low capacity to ground, a connection between one end of said loop antenna and the input circuit of said receiver, the other end of said loop antenna terminating solely in a capacitive element having a relatively large capacitive coupling to ground, a connection adjacent the end opposite to that end of said loop connected to said input circuit connected to a point of ground potential of said receiver.

5. In a radio receiver of the type employing a loop antenna, a connection between one end of said loop antenna and the input circuit of said receiver, the other end of said loop antenna terminating solely in a capacitive element coupled to ground comprising a sheet of conducting material displaced from said loop antenna, and a connection between a point of ground potential of said receiver and a point on said loop antenna adjacent the end of said loop antenna terminating in said capacitive element.

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