July 1, 1947. E. DAUBARAS 2,423,083

LOOP ANTENNA SYSTEM

Filed March 5, 1943

Fig: 1.

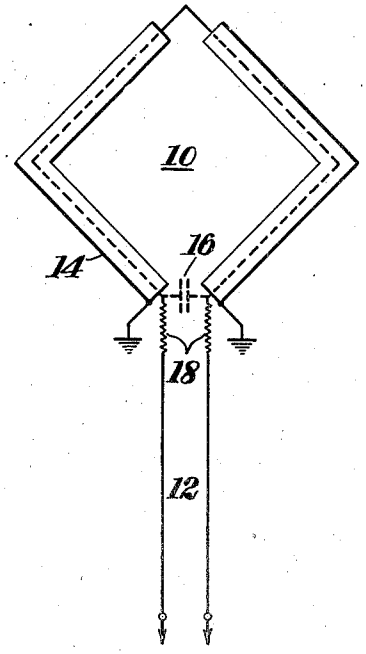
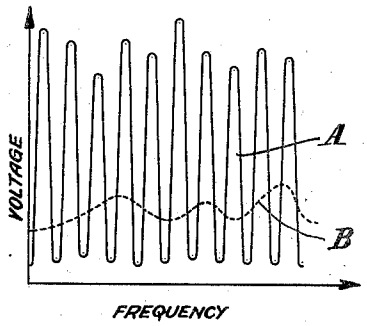


Fig: 2.



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LOOP ANTENNA SYSTEM

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5 Claims. (Cl. 250—33)

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This invention relates to improvements in loop antenna systems, and more particularly to an arrangement for interconnecting a loop receiving antenna with a transmission line.

An object of this invention relates to providing a novel arrangement for interconnecting a loop antenna with a transmission line.

Another object of this invention is directed to an arrangement for preventing wide fluctuations of voltage amplitude with frequency without appreciable loss in power, in a loop-transmission line system.

A specific object of the present invention is to effectively prevent large voltage fluctuations with frequency on the end of a transmission line whose other end is connected to a shielded receiving loop.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, described for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a diagrammatical illustration of a loop antenna and transmission line interconnected in accordance with the present invention;

Fig. 2 is a diagram illustrating by means of curves a comparison between applicant's novel system and comparable systems of the prior art.

In Fig. 1, I have indicated at 10 a loop antenna which is to be connected to radio apparatus such as a receiver or transmitter (not shown) through a transmission line 12 which may be a relatively long line, as 20 feet or more. The loop 10 may be shielded as indicated at 14 but, in any event, shielded or not, some capacitance indicated at 16 will exist between the ends of the loop to form a circuit which will be resonant at some predetermined frequency. The loop 10 and the transmission line 12 are preferably matched in impedance in accordance with the usual practice in this art.

In ordinary systems of the kind just described the interconnection between the loop 10 and the transmission line 12 will, over a frequency band, produce wide voltage fluctuations as indicated, for example, in curve A of Fig. 2. For example, if the antenna 10 is a receiving antenna, and the transmission line 12 is directly connected to the ends thereof the voltage at the other ends of the transmission line may change in value in the ratio of

$$\frac{100}{1}$$

over a wide frequency band. Various arrangements have heretofore been proposed for reducing this undesirable fluctuation but, in all cases such arrangements have also introduced an undesirable reduction in voltage amplitude. In accordance with the present invention, however, I introduce immediately between the loop antenna and the transmission line, resistors indicated in Fig. 1 at 18. These resistors are of equal value and their sum should be at least equal to the surge impedance of the transmission line 12. By the introduction of these resistors I have effectively isolated the loop 10 from the transmission line 12 so that the large voltage changes over a wide frequency band will no longer occur. At the same time these resistors, if of proper value will not appreciably reduce the voltage at the output end of the line 12. The results of introducing such resistors are graphically indicated in Fig. 2 by curve B, drawn to the same scale as curve A, previously mentioned. It will be seen at once that while some voltage fluctuation over a frequency band does occur, this voltage fluctuation is extremely small compared to systems which do not utilize such resistors, while at the same time the voltage amplitude is still appreciable.

While the value of each resistor 18 should preferably be approximately equal to one half the surge impedance of the line 12, the value is not critical. It will be obvious however, that if the value of resistor 18 is too low it will eventually result in a condition in which the transmission line is effectively directly connected to the loop and the system will then be substantially equivalent to other systems which produce the large voltage fluctuations indicated by curve A. On the other hand if the value of resistors 18 is too high, voltage fluctuation will be prevented but the voltage amplitude will be more greatly reduced as the value of such resistors increases. The best results appear to be obtained if as previously stated, the value of each resistor is equal one-half the surge impedance of line 12.

While the present invention was developed primarily for use with shielded loop antennas used for receiving purposes in direction finding equipment, it will be obvious to those skilled in this art that the principles of the present invention of applicant for use in connection with any loop antenna whether shielded or unshielded, whether for receiving or transmitting, which must be connected to the radio equipment into a transmission line.

Accordingly, while I have described above the principles of my invention with some particularity, it is to be clearly understood that this description is made only by way of example and

not as a limitation on the scope of my invention as set forth in the objects and the accompanying claims.

I claim:

1. An antenna system including, in combination, a loop antenna, a two conductor transmission line, and resistors respectively serially interconnecting the ends of said conductors with the ends of said loop, each of said resistors having the same value and being at least equal to approximately one half the surge impedance of said transmission line.

2. A receiving antenna system, including in combination, a loop antenna, a transmission line adapted to be connected at one end to the ends of the loop, and means damping voltage fluctuations of the energy received at the other end of the transmission line without appreciably reducing the voltage amplitude, comprising a resistor connected immediately adjacent each end of the loop and serially with the conductors of the transmission line.

3. The combination according to claim 2, in which said resistors are of equal value.

4. The combination according to claim 2, in which said resistors are of equal value and the sum of the value of said resistors is at least appreciably equal to the surge impedance of the transmission line.

5. The combination according to claim 2, in combination with means shielding the loop antenna.

EDWARD DAUBARAS.

REFERENCES CITED

The following references are of record in the file of this patent:

Wireless Direction Finding, by Keene, 3d ed., pp. 128 and 129, copy in Division 51.