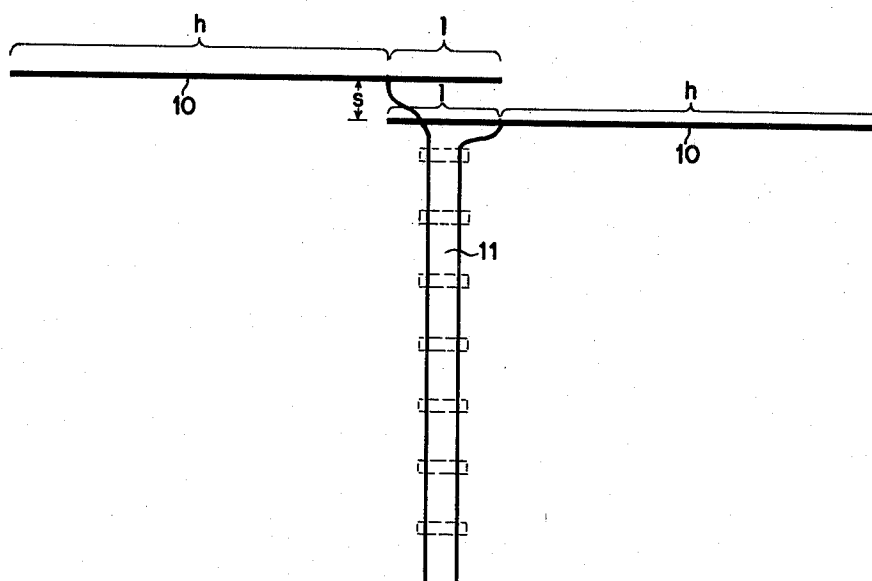


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HIGH-IMPEDANCE ANTENNA

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HIGH IMPEDANCE ANTENNA

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3 Claims. (Cl. 250—33)

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This invention is directed to antennas, and more specifically it is directed to antennas having a comparatively high radiation resistance.

The problem of providing a good impedance match between a conventional symmetrical half wave antenna, having a self-impedance, or radiation resistance, of the order of 72 ohms, and a parallel wire transmission line of reasonable dimensions, and having a characteristic impedance of the order of several hundred ohms, has been the subject of study by communications workers for many years. One of the most promising solutions to this problem is the folded dipole or "T-match" antenna which provides an input or driving-point impedance roughly equal to four times the radiation resistance of the simple dipole. The folded dipole, however, suffers the shortcoming that it is necessarily a cumbersome mechanical arrangement, and also has the limitation that its radiation resistance can not be varied over a wide range without using a structure of conductors having differing diameters.

A further shortcoming of prior art antennas of the symmetrical dipole class is that they are generally suitable for use over only a comparatively narrow band of frequencies in the vicinity of the optimum design frequency.

It is an object of this invention to provide an antenna having a comparatively high radiation resistance.

It is a further object of this invention to provide an antenna capable of being used with substantially constant efficiency over a comparatively wide band of frequencies.

It is a further object of this invention to provide an antenna, the radiation resistance of which may be continuously varied over a wide range by alteration of the lengths of its component conductors.

These objects are accomplished by the use of a pair of parallel radiating elements outwardly extending from a region of overlap between their proximate portions.

The above and further objects and advantages of this invention will more fully appear from the following detailed description when the same is read in conjunction with the accompanying drawing wherein there is illustrated schematically an antenna constituting one embodiment of the instant invention.

Referring now to the drawing there is illustrated a pair of parallel conductors 10 having outwardly extending portions h , and parallel proximate portions l . The portions l are separated by a distance indicated s . A transmission

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line 11 comprising a pair of spaced parallel conductors is connected to the conductors 10 at the points of demarcation between the portions h and l .

5 In operation, the dimension h is chosen to be slightly greater than one quarter wavelength at the mean operating frequency of the system, and the length of the overlap l and the magnitude of the spacing s is chosen to have a reactance equal and opposite to the reactance presented by the extended portions. For example, if it is desired to match a 500 ohm transmission line to the antenna, a dimension h can be found which presents a radiation resistance of 500 ohms. 10 This resistance will be accompanied by an inductive reactance which may be cancelled by proper choice of the length l and the spacing s .

Mathematical expressions for the calculation of the exact dimensions of the antenna to provide 20 the relationships set forth above are available in standard text books such as "Transmission Lines, Antennas and Waveguides," by King, Mimno and Wing, published in 1945 by McGraw-Hill Book Company, Inc., New York city.

25 A typical antenna for covering the band between 88 and 106 megacycles, and matching a 300 ohm transmission line has been found to have the following dimensions

30 $h=34\frac{1}{8}$ inches
 $a=\frac{1}{8}$ inches
 $s=1$ inch
 $l=4$ inches

While a preferred embodiment has been described, it must be understood that the invention is not limited to the precise arrangement of parts which is illustrated. For example, the conductors of the transmission line may, for mechanical convenience, be connected to any portion of the stub, as long as the stub is significantly less than a quarter wave in length, and for similar reasons the stub may take the form of a coaxial section. A deterioration in performance will, however, result from any departure of the system from 45 symmetry.

While it is recognized that antennas having an overlap portion at their center are known to the art, it must be pointed out that in their design there was no concept of dimensioning them to attain the relationships outlined herein, and that the overlap in the prior art antennas is strictly for mechanical reasons.

What is claimed is:

1. An antenna comprising a pair of radiating 55 elements each slightly greater than an electrical

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quarter wave in length; a stub matching section less than an electrical quarter wave in length interposed between and joined to the said radiating elements; and a transmission line connected to the points of junction between the said elements and the said matching section the said radiating elements being of such length as to prevent a partially reactive impedance to the said transmission line, and the said matching section being of such length as to present a reactance equal in magnitude and opposite in sign to the reactive component of the said impedance.

2. An antenna comprising a pair of radiating elements each slightly greater than an electrical quarter wave in length; a stub matching section less than an electrical quarter wave in length interposed between and joined to the said radiating elements; and a transmission line connected to the points of junction between the said elements and the said matching section the said stub being a linear extension of the radiating elements.

3. An antenna comprising a pair of radiating elements each slightly greater than an electrical quarter wave in length; a stub matching section

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less than an electrical quarter wave in length interposed between the said radiating elements; and a transmission line connected to the points of junction between the said elements and the said matching section, the said stub being a linear extension of the radiating elements, the said radiating elements being of such length as to present a partially reactive impedance to the said transmission line, and the said matching section being of such length as to present a reactance equal in magnitude and opposite in sign to the reactive component of the said impedance.

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

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Certificate of Correction

Patent No. 2,523,728

September 26, 1950

RAYMOND F. SMELTZER

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 8, for the word "prevent" read *present*;
and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.
Signed and sealed this 5th day of December, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.