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AERIAL SYSTEMS

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Fig. 1

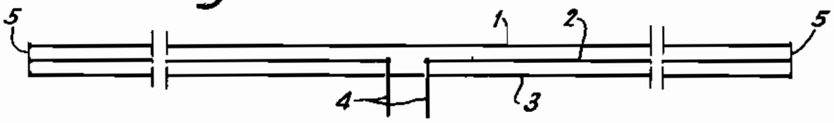


Fig. 2

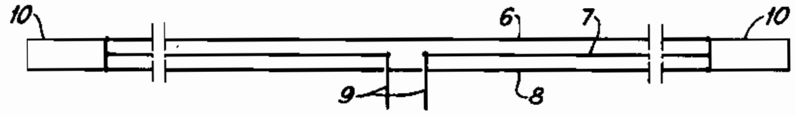
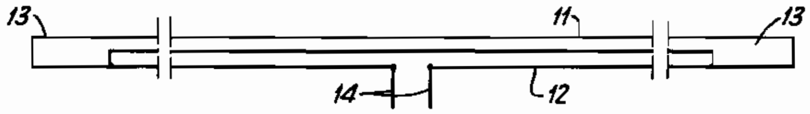


Fig. 3



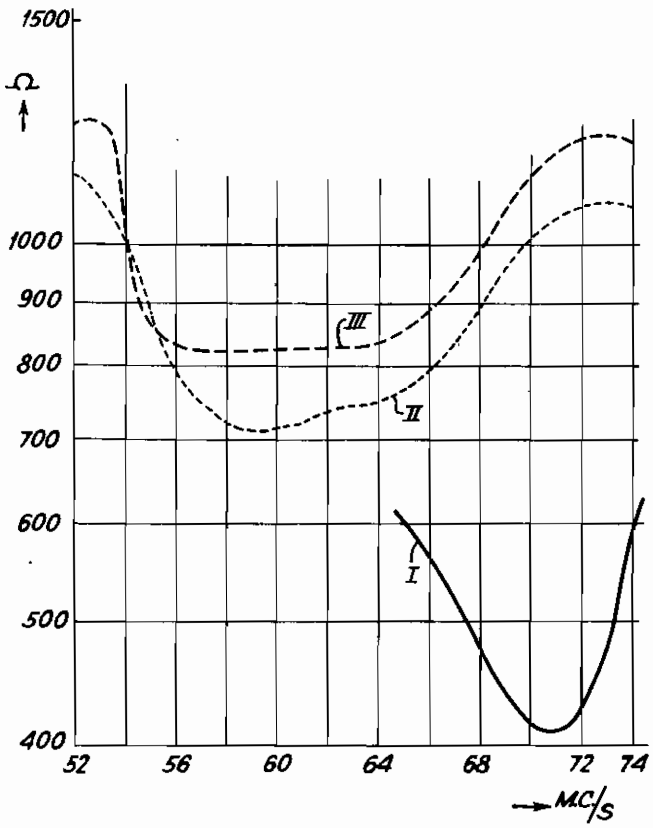


Fig. 4

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ALIEN PROPERTY CUSTODIAN

AERIAL SYSTEMS

Tjiske Douma, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed January 21, 1942

For the transmission or reception of television, as well as for definite systems of altimetry and obstacle detection in which use is made of a high carrier-wave frequency, it is necessary to utilize aerial systems which, in contradistinction to a simple dipole aerial, have an impedance of which the absolute value for a frequency range of about 10% of the carrier-wave frequency varies by 10% at most.

For such purposes it is known to utilize a dipole aerial system constituted by two conical metal bodies having their points adjacent one another.

A drawback of this cone aerial is the complicated and voluminous construction which is necessary to obtain a sufficient structural rigidity and which renders the aerial system comparatively expensive; moreover, it has a shape which is unsuitable for mounting on an airplane.

The invention has for its object an aerial system of simple and cheap construction which is suitable for the above mentioned purposes.

To this end, in an aerial system comprising at least two radiators arranged adjacent to and parallel with one another, of which the interval therebetween is small relatively to the length of the radiators, while short-circuits are provided between the corresponding extremities of the radiators. Each of the said short-circuits, according to the invention, is so made that it extends over part of the length of the radiators so that, as viewed in the longitudinal direction of the radiators, points of one of the radiators located next to one another, and in the proximity of the extremities are connected by it directly to similarly located points of the other of the radiators.

The aerial system according to the invention is preferably utilized at a wavelength which is equal to about double the length of a radiator.

It has been found that, considering the object aimed at, a very advantageous form of the impedance-frequency curve of the aerial system is obtained if each of the said short circuits, as viewed in the longitudinal direction of the radiators, extends over a distance larger than $\frac{1}{20}$ and smaller than $\frac{1}{5}$ of the length of a radiator.

Each of the short-circuits is preferably constituted by a plane metal plate located in or at least substantially in a plane surface defined by two of the radiators.

A particularly advantageous impedance-frequency curve of the aerial system according to the invention is obtained by using two radiators, one of the two radiators being constituted by a metal band whose width is preferably smaller than the interval of the two radiators, the other of the two radiators being interrupted in the center and connected to a transmission line.

In order that the invention may be more clearly understood and readily carried into effect, it will be explained more fully by reference to the accompanying drawing.

Figure 1 shows a known aerial system for comparison with the aerial system according to the invention.

Figures 2 and 3 show advantageous forms of construction of aerial systems according to the invention.

In Figure 4 the impedance-frequency curves of the aerial systems shown in Figures 1, 2 and 3 are represented for wavelengths corresponding to about double the length of a radiator.

The known aerial system shown in Figure 1 is constituted by three radiators **1**, **2** and **3** which are arranged adjacent to and parallel with one another and whose length is substantially equal to half of the wavelength utilized. The central one of the radiators (**2**) is interrupted in its center and connected to a transmission line **4** which is connected to a non-represented transmitter or receiver. Short-circuits **5** are provided between corresponding extremities of the radiators.

As may be assumed as known, the radiators of such an aerial system are excited with equal phase and consequently in the case of resonance of such a "three-fold dipole" the impedance is about 9 times as great as the resonance impedance of a simple dipole.

In Figure 4 the absolute value of the impedance of the aerial system of Figure 1, as viewed from the transmission line, is represented as a function of frequency by the curve I. It appears therefrom that it greatly varies in the vicinity of the resonance frequency of the aerial which is about 71 megacycles/sec.

The aerial system according to the invention shown in Figure 2, like the aerial system shown in Figure 1, is constituted by three radiators **6**, **7**, **8** respectively which are arranged adjacent to and parallel with one another and of which the central one is interrupted and connected to a transmission line **9**. Here again the radiators are short-circuited at their extremities, but in contradistinction to the aerial system shown in Figure 1 the short-circuits of the corresponding extremities of the radiators are brought about by plane plates **10** which are located in the plane surface common to all radiators. Each of these plates brings about a short-circuit which extends over part of the length of the radiators, thus connecting points of one of the radiators located next to one another and in the vicinity of the extremities directly to similarly located points of the other radiators.

As appears from the impedance-frequency curve II measured for the aerial system shown in Figure 2, the maximum variation of the aerial impedance, if the carrier-wave frequency of the oscillations to be transmitted or to be received is about 61 megacycles/sec., for a frequency range of about 10% of the carrier-wave frequencies (58–64 megacycles/sec.) is smaller than 8% of the average impedance of the aerial.

A still more advantageous form of the impedance curve of the aerial system according to the invention is obtained with the aid of the aerial system shown in Figure 3 which consists of two radiators. According to this form of construction, the extremities of the two radiators **11** and **12** are connected together by metal plates **13** located in the plane surface comprising the two radiators, said connection being effected over a distance which is about $\frac{1}{10}$ of the length of a radiator, or about $\frac{1}{20}$ of the wavelength utilized, as in the form of construction shown in Figure 2. However, in this form, the upper one of the two radiators (**11**) consists of a metal band whose width is less than the interval between the radiators. The other of the two radiators (**12**) is interrupted in its center and connected to the extremities of the transmission line **14**.

In Figure 4, III is the impedance-frequency curve of the aerial system shown in Figure 3. It appears therefrom that for a frequency range of more than 10% of the average frequency, viz. 8 megacycles/sec. (56–64 megacycles/sec.), the maximum variation of the aerial impedance is less than 1%, i. e., that the aerial impedance for practical purposes may be considered as constant.

It may further be remarked that the absolute value of the impedance of the aerial system shown in Figure 3, which consists of two radiators, is approximately equal to that of the aerial system shown in Figure 2 which consists of three radiators. In both cases this impedance is about 700 ohms, which value is particularly advantageous in view of the adaptation of the impedance of the aerial system to that of the transmission line.

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