March 10, 1953 J. W. SHERIFF 2,631,235

ANTENNA

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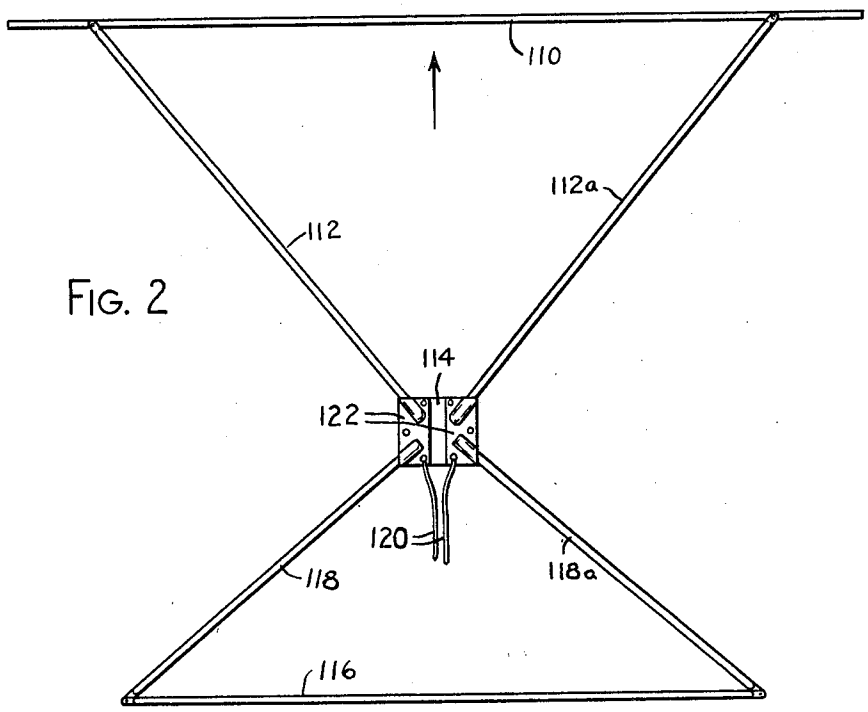


FIG. 2

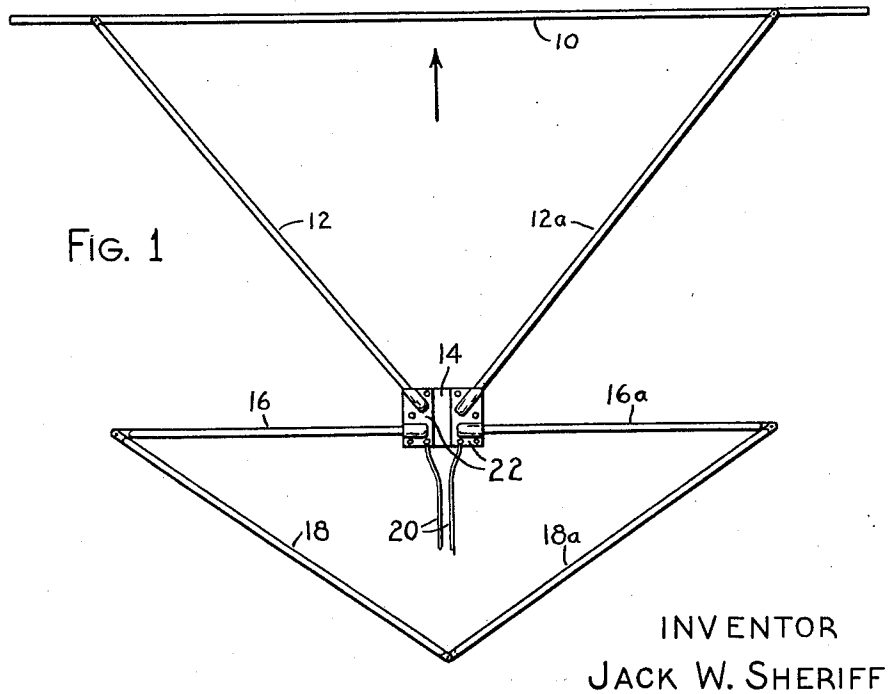


FIG. 1

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6 Claims. (Cl. 250—33)

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My invention relates to antennas, as used in radio and television and related fields. An object of my invention is to provide a structure for the radiation or reception of radio frequency energy which will have high gain, highly directional characteristics including high front-to-back ratio, and which will exhibit these characteristics in marked degree over an extended range of frequencies.

An antenna having these features is particularly useful for reception in the bands presently assigned for television, where the ratio of frequencies at the extremes of the range is about 4 to 1. Antennas now commercially available at reasonable cost do not have satisfactory characteristics over such a wide frequency range. My invention provides, in a structure which can be manufactured at moderate cost, a highly desirable efficiency over all the television bands, 55 megacycles to 216 megacycles. The principle of my invention, of course, can be applied in other circumstances where it is desirable to have an antenna with high gain over a wide frequency range.

In the accompanying drawings,

Fig. 1 represents a plan view of one embodiment of my invention, and

Fig. 2 represents a plan view of another form of my invention.

The structure shown in my drawings can be readily fabricated from aluminum or other light weight metal tubing, as is presently common in the art. The elements may, however, be made of any form of material having satisfactory conductivity at the frequencies involved, together with the necessary mechanical qualities of strength and rigidity.

In the drawings I have used the reference numeral 10 to indicate the longest element of the structure. It is connected to, and in the usual case supported by, a pair of elements designated as 12 and 12*a*. These three elements are arranged in triangular configuration, as the drawing shows. The converging ends of the elements 12 and 12*a* are mounted on and electrically insulated from each other by an insulating block 14.

A pair of elements 16 and 16*a* are connected respectively to the adjacent ends of the elements 12 and 12*a*, and extend outwardly in axial alignment, substantially parallel to element 10. Another pair of elements, 18 and 18*a*, are connected respectively to the outer ends of elements 16 and 16*a*, in triangular configuration as shown.

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Energy is fed to or from the antenna by a feeder or transmission line of conventional two-conductor type, indicated at 20. Connection for this purpose is made at the junctions of elements 12 and 16, and of elements 12*a* and 16*a*. The junction may be formed by clamp plates 22 which support the elements mechanically on the block 14.

In the application of my invention to the problem of operating over a specified range of frequencies, the elements 12 and 12*a* are each made of such length as to be ¼ wave length for a frequency A near the low frequency end of the desired range, but within that range. Element 10 is made to be ½ wave length for a slightly higher frequency B. Elements 18 and 18*a* are each ½ wave length for a still higher frequency C, and elements 16 and 16*a* are each ½ wave length for a frequency D near the high frequency end of the desired range.

The elements 12 and 12*a* may be connected to element 10 at the ends of the latter, or at points spaced inwardly somewhat from the ends, as shown in the drawing. In the television bands, I find that the latter arrangement gives an increase in gain.

The direction indicated by the arrow in the figures is the one in which the antenna radiates the maximum signal, when used for transmitting, or from which it has the greatest gain, when used for receiving. The side of the system on which the arrow appears is usually referred to as the "front" of the antenna, and I refer to the large triangle consisting of the elements 10, 12 and 12*a* as the front structure, and the balance of the system as the rear or back structure. Normally the two triangles lie in the same plane, and the block 14 is mounted on a vertical mast (not shown) about which the system can be rotated to give the desired directional orientation.

My invention can be embodied in another form which I have illustrated in Fig. 2. In this form the front structure is substantially the same as that in Fig. 1, and I have used corresponding reference numerals, 110 referring to the longest element, 112 and 112*a* referring to the side members of the triangle. In the rear structure, the element 116 is arranged parallel to 110, and is connected to and supported by the diverging ends of elements 118 and 118*a*. The apex or converging ends of 118 and 118*a* are connected respectively to the corresponding ends of 112 and 112*a*, and the transmission line 120 is connected to the system at these junction points.

In either embodiment of my invention, the frequencies A, B, C and D can be selected so that they will be spaced across the desired range of operation at intervals to give relatively high gain throughout the range, and/or they may be chosen to place the resonances at points in the range where particularly effective functioning is required. The corresponding lengths of the various elements of the antenna, as previously indicated, will thus be determined.

In the claims, for simplicity, I use the term "fed," or similar terminology, to indicate the connection of a line by which energy is brought to or taken from the antenna system, but it will be understood that this is not intended to limit the application of the structure defined to either receiving or transmitting use.

It will be understood that some changes may be made in the construction and arrangement of the various parts of my structure, without departing from the true spirit and purpose of my invention, and it is my intention to cover any and all such modifications as come within the full and proper scope of my claims.

I claim as my invention:

1. In an antenna system, a plurality of electrically conducting elements arranged to form substantially an isosceles triangle, the electrical continuity of the triangular configuration being interrupted by a gap in the base element of said triangle on the line of symmetry of the configuration, three additional elements in the configuration of an isosceles triangle, the isosceles sides being separated at their converging ends and said converging ends being connected respectively to elements of said plurality on opposite sides of said gap, said system being fed at said gap.

2. An antenna system comprising a set of rectilinear conductive elements in triangular configuration, arranged to be connected to a transmission line at one corner of the triangle, and a second set of rectilinear conductive elements in triangular configuration, arranged to form an electrically discontinuous gap at the midpoint of one side of the configuration, and to be connected to the same transmission line at said gap.

3. An antenna system comprising a set of rectilinear conductive elements in triangular configuration, arranged to be connected to a transmission line at one corner of the triangle, and a second set of rectilinear conductive elements arranged to form a triangle substantially smaller in size than said first mentioned triangle, but lying in the same plane therewith, and connected to the same transmission line at the midpoint of one of the elements of said second set.

4. An antenna system comprising a group of elements in triangular configuration, joined by a transmission line at one corner, and a second group of elements arranged in triangular configuration having one side parallel to the side of said first triangular group opposite the line corner thereof, the element forming said one side being joined at its midpoint to said transmission line.

5. An antenna system comprising a front and a back structure, said front structure comprising an isosceles triangle fed from the apex of the isosceles sides, and said back structure comprising a triangle fed from the center of one side, said one side being substantially parallel to the side of said front structure opposite the apex thereof.

6. An antenna system comprising a front structure and a rear structure, said front structure consisting of two elements arranged in V relation and a third element connected across the tops of the V, said two elements being insulated from each other at the apex of the V, said rear structure consisting of four elements, two of said four elements being supported in axial alignment with each other and substantially parallel to the third element of said front structure, the other two of said four elements being joined together to form a V, having its tops connected respectively to the first two of said four elements, and having its apex pointing in the same direction as the V formed by the first two elements of said front structure, said first two of said four elements being connected respectively at their inner ends to the apex ends of said first two elements of said front structure, said system being fed at said last mentioned points of connection.

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