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T. H. CLARK

2,604,595

ANTENNA REFLECTOR

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Fig. 1.

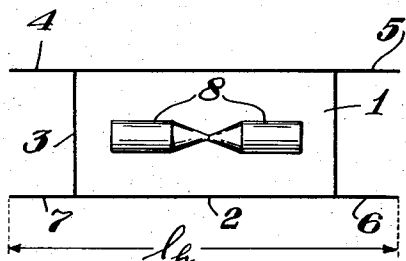


Fig. 3.

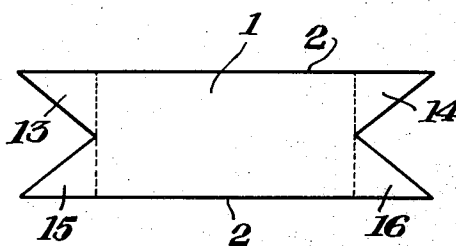


Fig. 2.

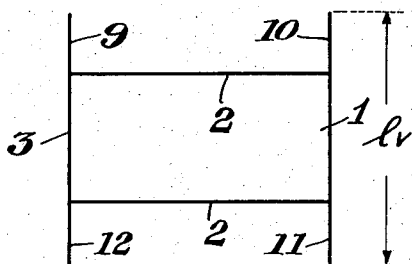


Fig. 4.

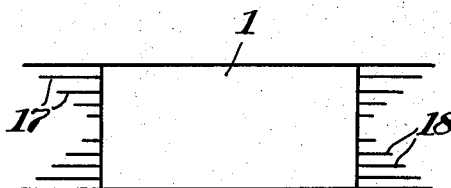
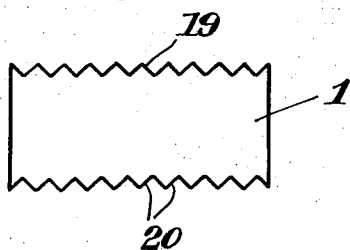


Fig. 5.



INVENTOR.
TREVOR H. CLARK

BY

Percy P. Lantry
ATTORNEY

UNITED STATES PATENT OFFICE

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ANTENNA REFLECTOR

Trevor H. Clark, Boonton, N. J., assignor to
Federal Telephone and Radio Corporation,
New York, N. Y., a corporation of Delaware

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2 Claims. (Cl. 250—33.65)

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This invention relates to radiant energy antenna reflectors and more particularly to reflectors for use with directional antenna arrangements in a certain frequency range.

When a directionally sensitive radiation characteristic is desired in an antenna system it is generally necessary to provide one or more reflectors in conjunction with a given antenna. In order for the reflector to be efficient, that is to operate with a high reflection coefficient, the reflector should be designed to possess high conductivity and for a given frequency should have dimensions such that it is resonant in the one-half wavelength mode. This characteristic is acceptable when very high frequencies are used. However, if a wide band characteristic is required of the reflector it should be of sufficient size as to be substantially non-resonant throughout the operating range. As the wavelength increases, the physical dimensions of the reflector more and more approach a length corresponding to one-half wavelength until one of the portions of the reflector corresponding to the polarization of the radiation becomes resonant with a respective wavelength. This causes the production of standing waves along these resonant portions of the reflector with a consequent increase in the back radiation of the reflector. When a radiation characteristic sensitive in only one direction is desired, an increase in back radiation, that is, sensitivity on both sides of the reflector is a cause for ambiguity of indications.

It is accordingly an object of this invention to reduce back radiation sensitivity of an antenna reflector for comparatively low frequencies in a given band.

It is another object to reduce the formation of standing waves along resonantly dimensioned portions of the reflector.

It is another object to provide a reflector which is non-resonant in any one of its portions with respect to the lowest frequency in a given band.

A still further object is to provide a reflector which may be made non-resonant for vertically polarized or for horizontally polarized radiation.

Still another object is to provide a reflector which is non-resonant in any of its portions over a wide band of frequencies.

In accordance with certain features of the invention, I provide a reflector comprised of a rectangular metallic sheet in conjunction with a given antenna the horizontal and/or vertical edges of which approach or may be less than the one-half wavelength for a given low frequency of the band dealt with. In order to avoid

the formation of standing waves I provide conductive extensions of the edges of the reflector which correspond to the respective polarization of the radiation to which the antenna is exposed.

In accordance with another feature of the invention I provide extensions for the edges as well as for intermediate portions of the reflector parallel to the edges whereby the reflector is effective in avoiding the formation of standing waves on any part of its surface which may be resonant over a broad band of frequencies. In accordance with still another feature of this invention I provide an effective extension of the respective edges of the reflector without actually having to introduce a physical extension thereof.

These and other features and objects of the invention will become more apparent upon the consideration of the following detailed description of embodiments to be read in connection with the accompanying drawings in which:

Fig. 1 represents a plan view of a reflector in accordance with my invention designed for horizontally polarized radiation;

Fig. 2 represents a reflector constructed in accordance with the invention for vertically polarized radiation;

Figs. 3 and 4 are variations of a reflector designed for a wide frequency band; and

Fig. 5 is a plan view of a reflector, certain edges of which have been lengthened in another way.

Referring to the drawings, the reflector of Fig. 1 comprises a rectangular metallic sheet 1 having a horizontal dimension given by one of the horizontal edges 2 and a vertical dimension which is given by one of its vertical edges 3. The horizontal edges have been provided with horizontal extension bars 4, 5, 6 and 7 which extend the horizontal dimensions to some value l_h . A dipole antenna 8 designed for operation over a relatively wide band of frequencies is suitably mounted in front of the reflecting surface 1. The antenna is a horizontal dipole, particularly sensitive to waves of a horizontal polarization. At the lower frequencies of the wave band the horizontal reflector dimension may be a half wavelength or less. The extensions added thereto are such that l_h is greater than a half wavelength at the operative frequencies so that resonance effects to horizontal polarized energy will be substantially eliminated.

In Fig. 2 the reflecting surface 1 has been provided with vertical extensions 9, 10, 11 and 12 of its vertical edges 3. These extensions are such that l_v is greater than a half wavelength so that vertical polarized resonance effects will

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be substantially reduced or eliminated. It should be clear that if the antenna is designed to operate at both horizontal and vertical polarization, two sets of extensions such as shown in Figs. 1 and 2, may be used on the same reflector.

The reflector of Fig. 3, which is intended to operate over a wide band, instead of having individual bar-like extensions of its edges, has been provided with wing-like extensions 13, 14, 15 and 16, which have their maximum dimension in line with the edges 2 and are reduced to zero in line with the intermediate horizontal portions of the reflector. This construction will serve further to reduce resonance effects which might occur intermediate the edges of the reflector.

In Fig. 4 a reflector is shown provided with extensions similar in effect to those of Fig. 3. However, instead of continuous extension surfaces, individual bars as at 17 and 18 are attached to oppositely disposed edges of reflector 1 parallel to the plane of polarization. The bars 17 and 18 progressively assume a smaller size from the outer portions of said edges toward the center portions of said edges of the reflector.

Another system for obtaining an effective extension of the resonant edges of a reflector has been suggested in Fig. 5 where the horizontal edges have been increased in length by being serrated as at 19 and 20.

While I have shown a few examples of how resonance may be avoided in a reflector for individual and wide band frequencies, it is to be noted that resonance may be eliminated in other ways analogous to the above.

While I have described above the principles of my invention in connection with specific apparatus, 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 defined in the objects and the accompanying claims.

I claim:

1. A reflector for use with an antenna adapted

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to operate on a given band of frequencies and with a predetermined polarization, comprising a member having a plane reflecting surface and a plurality of conductive bar-like extension elements extending from opposite edges of said member in the same plane as said reflecting surface and parallel to the plane of polarization, said elements having diverse lengths and spacedly mounted from each other along the opposite edges of said member, whereby said reflector is rendered substantially aperiodic at the operating frequencies in said band.

2. A reflector as claimed in claim 1, wherein said member comprises an element having oppositely disposed edges, each edge having a central portion and outer portions, said extension elements extending from both said edges, the longest of said extension elements attached adjacent the outer portions of said edges and the shortest of said extension elements attached adjacent the central portions of said edges, said extension elements of intermediate lengths being disposed in ascending order from the central portions of said edges in accordance with their length.

TREVOR H. CLARK.

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