

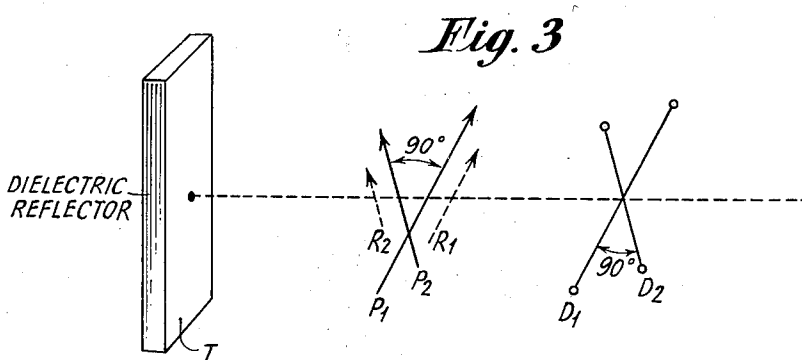
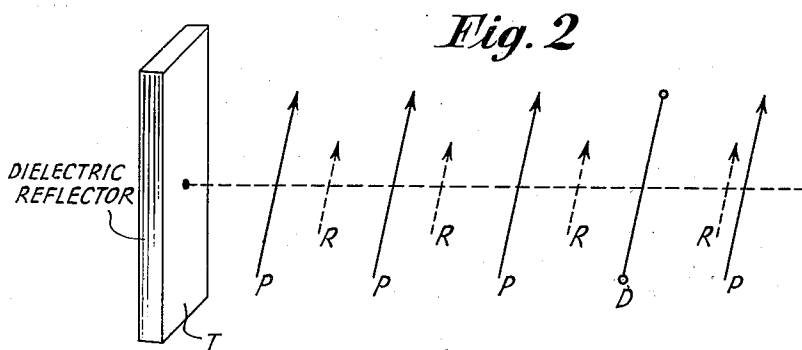
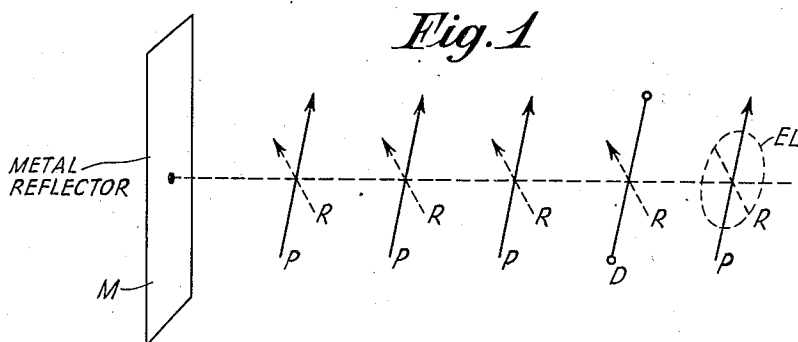
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The present invention relates to an antenna reflector for short waves, more especially ultra short waves.

In many cases it is of advantage if unequivocally polarized waves can be radiated or received. Unequivocally polarized waves are sent out, for instance, by a dipole radiator. However, in order to obtain a more favorable exploitation of power, it will be of advantage to use concentrated radiation. Concentration of electromagnetic waves is achieved by the combination of dipole radiators and reflectors. Thus, for instance, the known umbrella antennas consist of any desired number of radiators arranged at a flat reflector whereby the reflector is formed of sheet metal or wire mesh.

Reflector arrangements act in various ways according to the polarization of the waves impinging thereon. If, for instance, a wave arrives having a polarization at right angles to the reflector surface, the reflected wave has the same polarization as the impinging wave. If the impinging wave is polarized parallel to the reflector surface, the reflected wave has the reversed polarization, i. e., the polarization plane is the same, but the phase of the wave is displaced by 180° . When a wave is reflected whose polarization is inclined towards the reflector surface, a rotation is produced between the initial wave and the reflected wave, whereby the degree of rotation depends upon the relationship between the component at right angle to the reflector and the component parallel thereto.

A better understanding of the invention may be had by referring to the accompanying drawing, wherein:

Fig. 1 illustrates known practice, and

Figs. 2 and 3 illustrate two embodiments of the invention.

In Fig. 1 the radiating dipole D placed in front of the metallic reflector M is slightly inclined to the latter. The dipole sends out waves with a polarization indicated by the arrows P. Owing to the inclination relative to the reflector plane the polarization of the waves at reflection is slightly turned, the reflected wave therefore having a polarization as designated by the arrows R. Now, in adding both, there will be obtained in place of a linearly polarized wave, a wave having an elliptical polarization such as shown by the ellipse EL. Since in the practical structure of antennas difficulties are encountered in arranging the radiators exactly parallel to the reflector plane, while on the other hand, absolutely flat reflector surfaces are difficult to produce, it is

hardly possible to produce unequivocally polarized waves with linear polarization by means of the known antenna reflector arrangements.

According to the invention, antenna arrangements for waves having linear polarization are obtained, making the reflectors for the antennas from a dielectric instead of from a conductor.

It is known that at a dielectric, reversal of polarization occurs for waves polarized parallel to the reflector plane as well as for those whose polarization is at right angles to the reflector plane, i. e., the reflected wave has the same direction of polarization as the incoming wave, but its phase is rotated by 180° . Thus where a wave impinging on the dielectric reflector has its polarization turned relative to the reflector surface, the reflected wave will still reveal the same polarization.

This case is illustrated in Fig. 2. The radiating dipole D is arranged in front of the reflector T formed of a dielectric. As indicated in the drawing the polarization P of the wave radiated by the dipole is parallel to the polarization R of the reflected wave.

Through suitable spacing between radiator and reflector, one can obtain the sum of the direct and reflected wave despite the phase reversal at the place of reflection.

Where a plurality of linear radiators such as two, for instance, are to be arranged in front of the reflector surface and which are to function independently of each other, for example, one as a transmitting radiator and the other as a receiving radiator, they will ordinarily have to be disposed crosswise at a right angle to each other. If the reflector surface consists of a material which is a favorable electrical conductor such as metal, for instance, the crossed linear radiators must not have any inclination towards the reflector surface, since otherwise owing to the rotative displacement of the polarization plane at the reflector an undesirable mutual coupling (radiation coupling) occurs. However, in a dielectric reflector it is possible to arrange the linear radiators, crossed at right angles to each other, at any angle towards the reflector surface.

Fig. 3 shows such arrangement of two crossed linear radiators D₁ and D₂ in front of a dielectric reflector T. It is seen that the polarizations plane of the direct wave (P₁ and P₂) and of the reflected wave (R₁ and R₂) form respectively a right angle with each other, so that no coupling exists between the radiators.

The front surface of dielectric does not reflect the entire radiation impinging thereon but a

portion passes through and is reflected at the rear surface of the dielectric. This double reflection can be prevented simply by forming the reflector of a material having a high absorption property for electromagnetic waves, and which transforms the penetrating waves into heat. The material may, for instance, also have the property of stepped up absorption. This method however, implies the loss of the energy which enters into the material. This energy can, however, be utilized in avoiding absorption of the wave in the reflector, and by so choosing the thickness of the reflector that the waves reflected at the front and rear surface arrive in equal phase at the dipole radiator, so that in this case the sum of the direct wave and of the two reflected waves will be obtained.

The invention, it is to be distinctly understood, is not limited to the embodiments herein shown and described.

What is claimed is:

1. In combination, a plane reflector consisting of a dielectric and an antenna in front of said reflector, said antenna comprising two linear

radiators in substantially the same plane disposed at an angle of 90° with respect to each other so as to form a cross, the plane of said radiators being arranged at an angle between 0° and 90° with respect to the plane of said reflector.

2. In combination, a plane reflector consisting of a dielectric and an antenna in front of said reflector, said antenna comprising two linear radiators in substantially the same plane disposed at an angle of 90° with respect to each other so as to form a cross, the plane of said radiators being arranged at an angle of 45° with respect to the plane of said reflector.

3. In combination, an antenna and a reflector for said antenna, said reflector being made of a dielectric material having a high coefficient of absorption and having front and back reflecting surfaces, the thickness of said material and absorption coefficient thereof being so related that the reflection from said back surface is prevented from adversely affecting the reflection from said front surface.

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