Aug. 31, 1948. H. G. BUSIGNIES ET AL 2,448,017

ANTENNA SYSTEM

Filed April 17, 1945

Fig. 1.

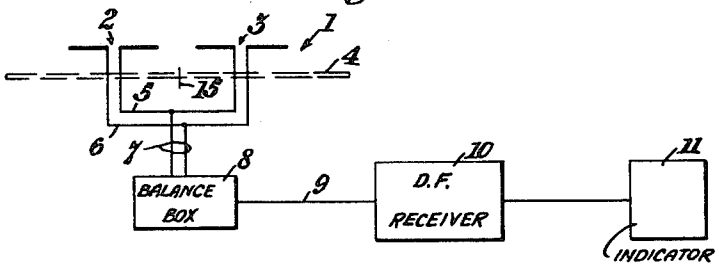


Fig. 2.

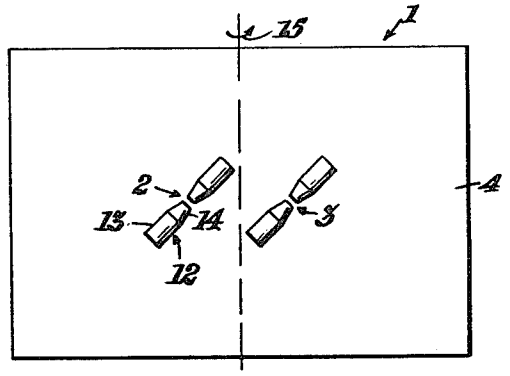


Fig. 3.

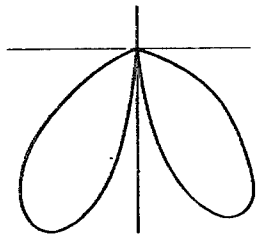
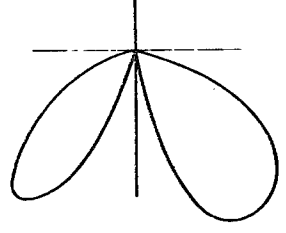


Fig. 4.



INVENTORS
HENRI G. BUSIGNIES
NATHAN MARCHAND

BY Percy P. Lantzy

ATTORNEY

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ANTENNA SYSTEM

Henri G. Busignies, Forest Hills, and Nathan Marchand, New York, N. Y., assignors to Federal Telephone and Radio Corporation, New York, N. Y., a corporation of Delaware

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3 Claims. (Cl. 343—115)

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The present invention relates to antenna systems and particularly to antenna systems adapted for use in direction finding equipment.

Heretofore in antenna systems it has been customary to provide separate antenna units for the reception of vertically and horizontally polarized waves. In direction finding equipment the use of two such antenna units introduces interference and distortion of the directional pattern of one of the units by the other. If the separate units are separately coupled to the direction finding equipment as by means of a direction finding receiver it further becomes necessary to add switching devices to continuously switch from one unit to the other in order to make certain that reception is being had of differently polarized waves.

An object of the present invention is the provision of an antenna system in which a single antenna unit serves for both horizontally and vertically polarized waves.

Another object of the present invention is the provision in a direction finding system of an antenna adapted to receive both vertically and horizontally polarized waves simultaneously.

A further object of the present invention is the provision of an antenna unit of the type hereinabove described which provides a satisfactory pattern of reception for both horizontally and vertically polarized waves.

Other and further objects of the present invention will become apparent and the invention will be best understood from the following description of an embodiment thereof reference being had to the drawings in which:

Fig. 1 is a schematic diagram of a direction finding system embodying our invention;

Fig. 2 is a front elevation of an embodiment of an antenna system according to our invention, and

Figs. 3 and 4 are polar diagrams of the actual reception patterns received with an antenna of the type disclosed in Fig. 2 for horizontal and vertical reception respectively.

Referring now to Fig. 1, the direction finding system there illustrated includes an antenna system generally designated by the numeral 1 consisting of two dipoles 2 and 3 respectively, arranged in front of a reflector 4. The system is of the null detection type and accordingly the dipoles are connected in phase opposition, with the transmission lines 5 and 6, connecting the dipoles 2 and 3, effectively cross-connected as will be seen from said figure. The midpoints of lines 5 and 6 are connected by means of a dual transmission line 7 to a balance box 8 which converts

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from the dual transmission line 7 to a single coaxial line 9, the line 9 in turn being connected to the direction finding receiver 10 in whose output an indicator 11, such as for example an oscilloscope may be provided.

The dipoles 2 and 3 are preferably adapted for wide band reception. Each of the dipoles 2 and 3 preferably consists of two arms 12 (Fig. 2), each having a cylindrical portion 13 merging into a conically tapered portion 14, the ends of which conically tapered portions 14 are mounted close together. The tapering of these portions 14 reduces the capacity between the arms. The dipoles 2 and 3 are preferably mounted on the reflecting screen 4 and spaced a distance of ⅜ wavelength or less from the screen. One of the dipoles may have an electrical length of 360°; usually it is preferred that they have the length of 180°. The distance between the centers of the two dipoles is preferably 180° or less. All these foregoing dimensions are in terms of the mean frequency of the band of frequencies over which said system is designed to operate.

The reflecting screen 4 is a planar member, vertically extending, and may be a solid sheet of conducting material or if desired may be made in the form of a meshed screen or grill work.

It is preferably substantially larger than the length of the dipole such as for example twice as high as the length of the dipole and several times as wide.

The dipoles 2 and 3 are adapted to receive equally well waves having vertical polarization as well as waves having horizontal polarization. This operation is accomplished without requiring any position change or shifting of the dipole. In order to accomplish this in accordance with our invention the dipoles 2 and 3 are mounted on the reflecting screen 4 so that they are at substantially a 45° angle with both the vertical and the horizontal. The dipoles also extend in a vertical plane substantially parallel to the plane in which the reflector extends. In this angular position the dipoles respond equally well to vertically and horizontally polarized waves, as will be seen from Figs. 3 and 4 which respectively show actual results obtained with an antenna system of the type hereinabove described in response to horizontally and vertically polarized waves respectively. It will be seen that the null is very sharply and clearly defined in both instances. The irregularity of the two lobes was due to an unbalance in the actual system employed. In order to rotate the pattern of the antenna system the reflector 4 rotates around a vertical axis such as axis 15 shown in Fig.

2, thus the antenna system scans the entire azimuth, the null being used for directional indications.

While we have described our invention in connection with the direction finder receiving system, it will be apparent that the antenna system of our invention may be employed in a transmission system such as for example in a beacon system.

Accordingly, while we have described above the principles of our 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 our invention as defined in the accompanying claims.

We claim:

1. In a direction finder system a pair of dipoles extending at an angle of substantially 45° to the vertical and spaced apart, a planar reflector adjacent said dipoles and lying in a substantially vertical plane parallel to the plane in which said dipoles lie, and means for connecting said dipoles in phase opposition.

2. In a directional antenna system, a pair of spaced apart antenna elements each extending at an angle to the vertical at substantially less than 90° parallel to each other, said elements being spaced a distance apart equivalent to 180° or less at the mean frequency at which said system is

designed to operate, means for coupling said elements together in phase opposition, and a reflector adjacent said elements and extending in a vertical plane.

3. A direction finding system comprising a pair of dipole antenna elements extending at substantially the same angle, other than 90° to the vertical, a planar reflector adjacent to said elements and lying in a vertical plane substantially parallel to a plane in which said elements lie, said reflector and antenna elements being mounted for rotation about a vertical axis, a receiver, an indicator, means for applying the output of said antenna elements in phase opposition through said receiver to said indicator.

HENRI G. BUSIGNIES.
NATHAN MARCHAND.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,952,326	Ludenia	Mar. 27, 1934
2,082,347	Lieb et al.	June 1, 1937
2,311,435	Gerhard	Feb. 16, 1943