

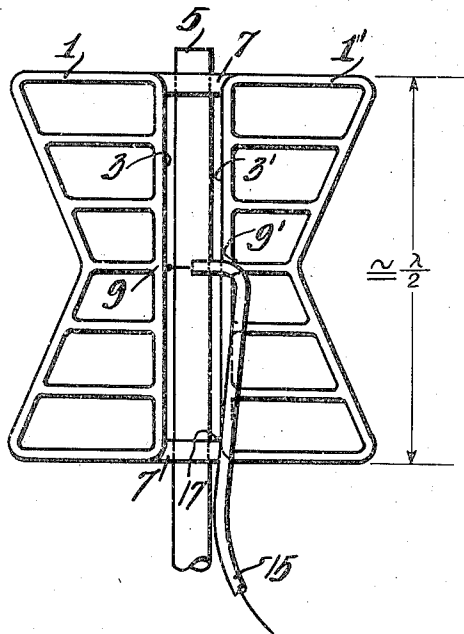
Aug. 30, 1949.

R. W. MASTERS

2,480,155

ANTENNA SYSTEM

Filed Feb. 28, 1945



INVENTOR.
Robert W. Masters
BY *C. D. Huska*
ATTORNEY

UNITED STATES PATENT OFFICE

2,480,155

ANTENNA SYSTEM

Robert W. Masters, Erlton, N. J., assignor to
Radio Corporation of America, a corporation
of Delaware

Application February 28, 1945, Serial No. 580,120

9 Claims. (Cl. 250-33)

1

2

This invention relates to antennas and has for its principal object the provision of improved feed means for dipole antennas of the sheet radiator type, such as those described in copending U. S. patent applications Ser. No. 574,898 and Ser. No. 574,899, filed January 27, 1945, by Robert W. Masters and entitled Antenna.

In order to feed a dipole antenna from a coaxial line or other unsymmetrical circuit, it is necessary to provide some kind of balance conversion means in the connection between the dipole and the feed means. Various systems of balance conversion are well known in the prior art, and it is deemed unnecessary to describe any of them herein, except to point out that all of them require some structure in addition to the main feed line and the antenna itself, and that in substantially every case this structure includes reactive elements which limit the band width throughout which the system will operate efficiently.

One system in which the need for a separate converter structure is eliminated is described in copending U. S. application Ser. No. 579,983, filed February 27, 1945, now U. S. Patent No. 2,433,183 issued December 23, 1947, to Lester J. Wolf and entitled Antennas. The present invention is an improvement upon that of said Wolf application.

The invention will be described with reference to the accompanying drawing of which the single figure is a schematic view in elevation of a dipole antenna of the sheet radiator type embodying my improved feed system.

A preferred embodiment of the antennas described in said application Ser. No. 574,899 is illustrated, comprising a pair of sheet radiators 1 and 1', each including a substantially rectilinear edge 3 and 3' respectively. The rectilinear edges 3 and 3' are each of the order of one half wavelength long at the operating frequency. In the present case, each sheet element comprises a plurality of rod or tube members spaced from each other by a small fraction of a wavelength, so that electrically each radiator acts as a continuous sheet.

The radiators 1 and 1' are supported upon a conductive mast 5 by brackets 7, at the upper and lower ends of the edges 3 and 3'. In addition to supporting the radiator elements, the brackets also serve to ground the upper and lower ends of the edges 3 and 3' to the mast 5. The radiators 1 and 1' are to be fed at points 9 and 9' on their respective longitudinal edges 3 and 3'. Although the points 9 and 9' are the midpoints of the edges 3 and 3' in the present illustration, other points

along said edges may be fed instead to provide a different input impedance. As in the more conventional types of dipole structure, the two feed points must be energized 180 degrees out of phase with each other. In accordance with prior art, this would be accomplished by running two lines down the mast 5 from the feed points 9 and 9' to a line balance convertor, or possibly by providing a convertor in the mast, between the radiators. In either event, the above-mentioned disadvantages of line balance convertors would have to be borne.

In accordance with my invention, the main feed line 15 extends up the mast 5 to the lower bracket 7 of one of the radiators, for example the radiator 1'. The outer conductor of the line 15 may be connected to the said bracket 7, as at the point 17. From the point 17, the line 15 is disposed along the surface of the radiator 1', up to the point 9', where the outer conductor of the line 15 is connected to the radiator 1'. The outer conductor of the line 15 may be connected also to points on the radiator 1' intermediate the points 17 and 9', although this is not necessary to the operation of the system.

The outer conductor of the line 15 may extend beyond the point 9' about half way to the other feed point 9. The inner conductor of the line 15 is connected to the radiator 1 at the feed point 9.

In the operation of the system, the portion of the outer conductor of the line 15 lying between the points 17 and 9' acts as if it were a part of the radiator 1', so that the same impedance is presented between the point 9' and ground as appears between the point 9 and ground. Thus the voltage across the line 15 divides equally between the radiators 1 and 1', exciting the antenna in the proper fashion for dipole operation.

The mast 5 need not be made of conductive material, as long as the edges 3 and 3' are connected together by the means 7 to provide neutral points which are at ground potential. The term "grounded point" as used herein is intended to include such neutral points which are at the same potential as ground although not connected directly thereto.

The invention has been described as an improved feed system for dipole antennas of the sheet radiator type, wherein the use of a line balance convertor or equivalent additional structure is not required. The necessary conversion is obtained by placing the feed line along the surface of one of the radiator elements so that the normal impedance of the radiator appears between the end of the outer conductor and ground.

The outer conductor is connected to one of the radiator elements and the inner conductor is connected to the other. Although the invention has been illustrated as embodied in a particular type of sheet structure, it will be apparent without further description that the invention may be applied equally well to other types of sheet radiator dipoles, or any dipole structure wherein each of the radiator elements is grounded at at least one point and fed at another point.

I claim as my invention:

1. A radio antenna including at least one pair of radiator elements each having at least one ground point and a feed point, a coaxial line with its inner conductor connected to the feed point of the first of said radiator elements and its outer conductor connected to the feed point of the second of said radiator elements, said line lying against said second radiator element between its said feed point and its said ground point.

2. A radio antenna including a pair of sheet radiator elements with respective feed points to be fed 180 degrees out of phase with each other, a coaxial line having its inner conductor connected to the first of said elements and its outer conductor connected to the second of said elements, said line being conductively connected to said second radiator element between said feed point and one end of said second radiator element.

3. A radio antenna including at least one pair of radiator elements, each having at least one grounded point and one feed point, and means for feeding said radiator elements 180 degrees out of phase with each other, comprising a coaxial line with its outer conductor connected to one of said ground points and to one of said feed points, with said line lying against the surface of the corresponding radiator element between said points of connection, the inner conductor of said line being connected to said feed point of said other radiator element.

4. A radio antenna including at least one pair of radiator elements, each of said elements having at least one substantially rectilinear edge, means for supporting said elements with said respective rectilinear edges approximately parallel and adjacent one another, a coaxial line extending generally along said supporting means to one end of the said rectilinear edge of one of said elements, thence substantially along the surface of said last-mentioned element to a point on said rectilinear edge thereof, with its outer conductor connected to said point and its inner conductor connected to the corresponding point of said other element.

5. A radio antenna including at least one pair of coplanar flat sheet radiator elements, each of said elements having at least one substantially rectilinear longitudinal edge, means for supporting said elements with said respective rectilinear edges approximately parallel and adjacent one another, a coaxial line extending generally along said supporting means to one end of the said rectilinear edge of one of said elements, thence substantially along the surface of said last-mentioned element to a point on said rectilinear edge thereof, with its outer conductor connected to said point and its inner conductor connected to the corresponding point of said other element.

6. A radio antenna including at least one pair

of coplanar flat sheet radiator elements, each of said elements having at least one substantially rectilinear longitudinal edge, conductive means for supporting said elements with said respective rectilinear edges parallel and adjacent one another, a coaxial line extending generally along said supporting means to one end of the said rectilinear edge of one of said elements, thence substantially along the surface of said last-mentioned element to the midpoint of said rectilinear edge thereof, with its outer conductor connected to said midpoint and its inner conductor connected to the corresponding point of said other element.

7. An antenna including a pair of sheet radiator elements, said elements being supported upon conductive supporting means by at least one short conductive connection to said supporting means, said radiator elements each having a feed point, said feed points being remote from said conductive connection, a coaxial transmission line having an inner conductor connected to one of said feed points and an outer shell connected to the other of said feed points, said transmission line lying along one of said radiators from said other feed point to said conductive connection.

8. An antenna including a pair of radiator elements, each of said elements being supported on conductive supporting means by at least one conductive connection to said supporting means, said radiator elements each having a feed point, said feed points being remote from said conductive connections, a coaxial transmission line having an inner conductor connected to one of said feed points and an outer shell connected to another of said feed points, said transmission line lying along one of said radiators from said other feed point to said conductive connection and along said conductive connection to said supporting means.

9. An antenna system including a number of radiating elements having feed points closely adjacent, a conductive supporting means for said radiating elements, conductive connections from said supporting means to said radiating elements at voltage nodal points on said radiating elements, a two conductor transmission line having one conductor connected to each of said feed points, said transmission line lying along one of said radiators from its feed point to said conductive connection and along said conductive connection to said supporting means.

ROBERT W. MASTERS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,960,006	Hagen	May 22, 1934
2,153,298	Cork	Apr. 4, 1939
2,160,053	Barbour	May 30, 1939
2,313,513	Brown	Mar. 9, 1943
2,321,454	Brown	June 8, 1943
2,433,183	Wolf	Dec. 23, 1947

OTHER REFERENCES

Dual Rocket Antenna Characteristics, by G. Hendrickson, Radio, July 1946, pp. 14-15.