

Dec. 11, 1951

J. P. SHANKLIN
RADIANT ENERGY ANTENNA

2,578,154

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2 SHEETS—SHEET 1

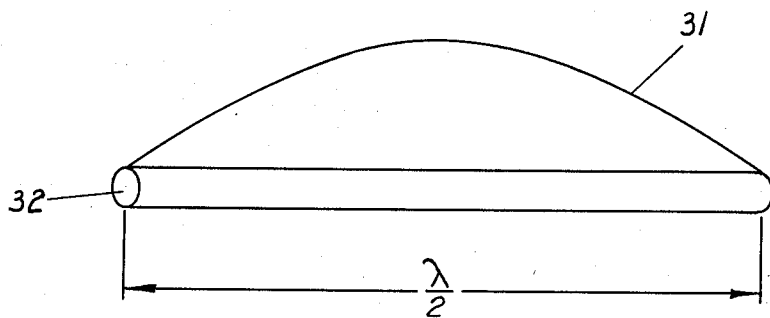


FIG. 1

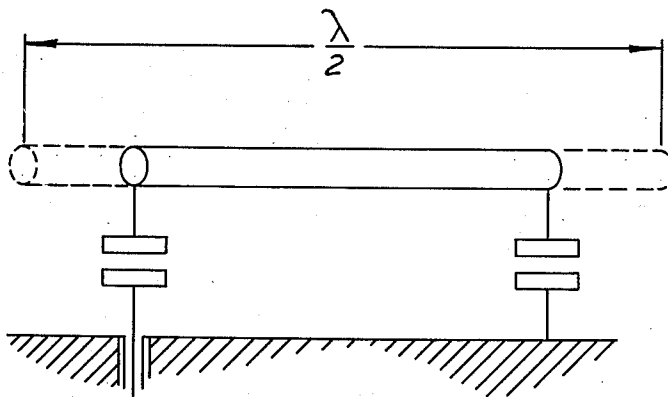


FIG. 2

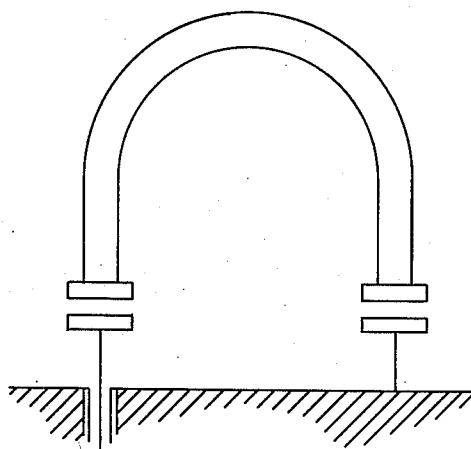


FIG. 3

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2 SHEETS—SHEET 2

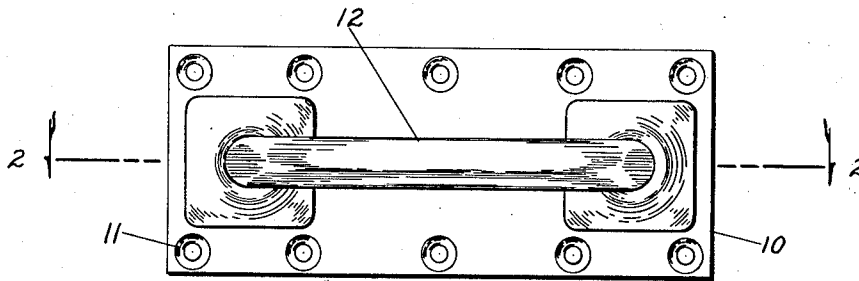


FIG. 4

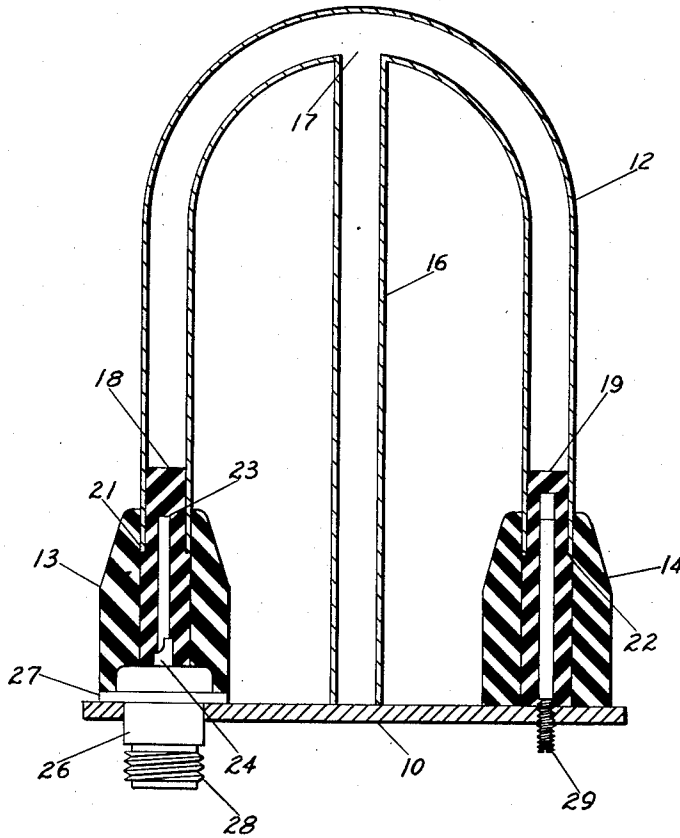


FIG. 5

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RADIANT ENERGY ANTENNA

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5 Claims. (Cl. 250—33)

1

This invention relates in general to antennas and in particular to a half-wave capacitive series fed antenna.

It is an object of this invention to provide an antenna which is compact, strong, and may be easily mounted on an airplane or other mounting base.

To provide an antenna which may be cheaply manufactured is another object of this invention.

Another object is to provide an antenna which may be capacitively tuned by adjusting a pin in one end of the antenna.

Yet another object of this invention is to provide an antenna which has a radiation pattern which is substantially omnidirectional.

Still another object is to provide an antenna which has wide band coverage.

Another object is to provide an efficient and accurate glide path antenna for an airplane landing system.

To provide an antenna which has a feed impedance that may be varied is another object of this invention.

A feature of this invention is found in the provision for a U-shaped hollow radiating member having cylindrical capacitive members extending from the ends of both legs. Hollow cylindrical insulators fit over the capacitive members and metallic pins extend longitudinally within the capacitive members to a point within the confines of the hollow radiating member. The antenna is mounted on the outer surface of an airplane or other supporting surface and a support member is connected between the base and the midpoint of the radiating portion.

Further objects, features, and advantages of the antenna will become apparent from the specifications and drawings in which;

Fig. 1 illustrates the current distribution in a half-wave antenna;

Fig. 2 illustrates an antenna of the same frequency as the one shown in Fig. 1 but wherein the physical length has been shortened and end-loading capacitances added;

Fig. 3 shows the development of the applicant's invention from the antenna illustrated in Fig. 2 by shaping it into an arcuate structure;

Fig. 4 is an end elevational view of the antenna of this invention; and

Fig. 5 is a sectional view taken on a line 2—2 in Fig. 4.

As shown in Fig. 1 the current distribution 31, along a half-wave dipole antenna 32, is substantially sinusoidal with a maximum in the center. According to the power equation

2

$$R = \frac{P}{I^2}$$

where P is the power furnished to the antenna, I is the current at some point along the antenna, and R is the resonant impedance at the point where I is measured. If the antenna is series fed at different points along the antenna, any impedance above its minimum or center impedance may be obtained.

Both ends of the antenna shown in Fig. 2 have been connected to a ground plane by end loading capacitances. These capacitances effectively shorten or cut off the ends of the antenna for resonance at given frequency so that the current through these capacitances will represent a feed impedance depending on the shortening effect caused by them.

This antenna is basically applicant's antenna which may be seen by comparing Fig. 2 with Fig. 3. The straight portion has been curved into a U or semi-circular shape. This gives advantages over the antenna of Fig. 2 in that the antenna may be mounted on a shorter base, the band width is substantially increased, and the radiation pattern is more nearly omnidirectional.

Fig. 4 shows a rectangular base member 10 which is formed with a plurality of counter-sunk mounting holes 11. The base member may be mounted on the nose of an aircraft or at any other suitable position. A substantially U-shaped radiating portion 12 is supported on the base member 10 by means including insulators 13 and 14. The radiating portion 12 may also be semi-circular. As best shown in Fig. 5, a tubular support 16 extends upwardly from the base 10 to the midpoint 17 of the radiating portion 12.

The radiating portion 12 is of a hollow tubular structure and may be made, for example, from aluminum.

A pair of capacitive members 18 and 19 extend partially into the ends 21 and 22, respectively, of the radiating portion 12. The capacitive members may be polystyrene, for example. Capacitive member 18 is formed with a longitudinal opening which extends upward to a point within the confines of the radiating portion 12. A metal pin 23 is received within this opening and is attached by means of a bracket 24 to the center conductor of a coaxial cable socket 25. The socket 26 extends through an aligned opening in the base 10 and is formed with a shoulder 27 for preventing it from pulling through the base plate. The extending portion 28 is threaded for receiving the outer conductor of a feed

coaxial line, not shown. It is noticed that the shoulder 27 of the socket 26 is in contact with the base 10 and, therefore, the outer conductor of the coaxial feed cable is grounded to the base 10. The inner conductor including the pin 23 and bracket 24 are insulated from the base 10.

The hollow insulator 13 fits over the capacitive member 18 and socket 26 to furnish mechanical support to the outwardly extending portion of the antenna.

The capacitive member 19 is also formed with a longitudinal opening into which extends a metal pin 29. The pin 29 has one end extending through a threaded aligned opening in the base plate 10. By turning pin 29 its position may be changed and, thus, the end loading capacitance of the antenna may be varied.

It is noticed that the pin 29 is grounded to the base plate 10. The insulator 14 is formed with a longitudinal opening and extends substantially over the capacitive member 19 to furnish insulation and mechanical support to the antenna.

This antenna is effectively one half-wave long and, therefore, the center point 17 of the antenna is a modal or zero potential point. The support 16 also serves to maintain the antenna at the same D.-C. potential as the base 10.

It is seen that this invention provides an antenna which has a radiation pattern in the plane of the loop which is substantially omnidirectional.

Although this invention has been described with respect to a preferred embodiment thereof, it is not to be so limited because changes and modifications may be made therein which are within the full intended scope as defined by the appended claims.

I claim:

1. A half-wave antenna comprising a substantially one-half wave length semi-circular radiating portion, a first substantially non-conducting fastening member connected to one end of said radiating portion, a second substantially non-conducting fastening member connected to the other end of said radiating portion, said fastening members connected to an electrically conducting base, and a coaxial feeding cable with the outer conductor connected to said base and the inner conductor extending into said first fastening member to feed said antenna.

2. A half-wave antenna comprising, a hollow half wave radiating portion of a substantially U-shape, a capacitive member on each end of said radiating portion, said capacitive members connected to a conducting base member, an axially adjustable metal pin connected to said base member and into one of said capacitive members and one leg of said radiating portion, and a coaxial cable with the outer conductor connected to said base member and the inner

conductor extending into the other capacitive member and the other leg of the radiating portion.

3. A half-wave antenna comprising a substantially half wave hollow radiating member, capacitive members attached to and extending partially within each end of said radiating members, metallic pins extending into said capacitive members with their ends terminating within the confines of said hollow radiating member, a conducting base member supporting said capacitive members, one of said pins connected to said base member, and a coaxial cable with the outer conductor connected to said base member and the inner conductor connected to the other of said pins.

4. A half-wave antenna mounted on a conducting base member and comprising a U-shaped hollow radiating portion, capacitive members attached to and extending partially within either end of said radiating portion, said capacitive members attached to said base, a pin extending into each of said capacitive members, the first of said pins connected at one end to said base member and the other end extending within said hollow radiating portion, the second of said pins connected at one end to the center conductor of a coaxial conductor and the other end extending within said hollow radiating portion, the outer conductor of said coaxial conductor connected to the base member, and a support member extending from said base to the mid-point of said radiating portion.

5. A half-wave antenna comprising a substantially U-shaped hollow radiating portion, cylindrical capacitive members extending partially within each end of said radiating portion, hollow insulating members concentric about said capacitive members and the ends of said radiating portion, metallic pins extending longitudinally within said capacitive members, a conducting base member supporting said capacitive members and said insulating members, one of said pins connected to said base, the other of said pins connected to the center conductor of a coaxial cable, and a support member between the base and the mid-point of the radiating portion.

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