

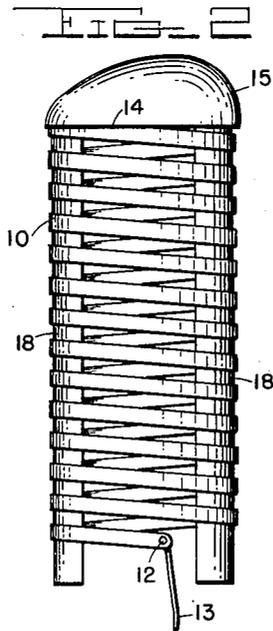
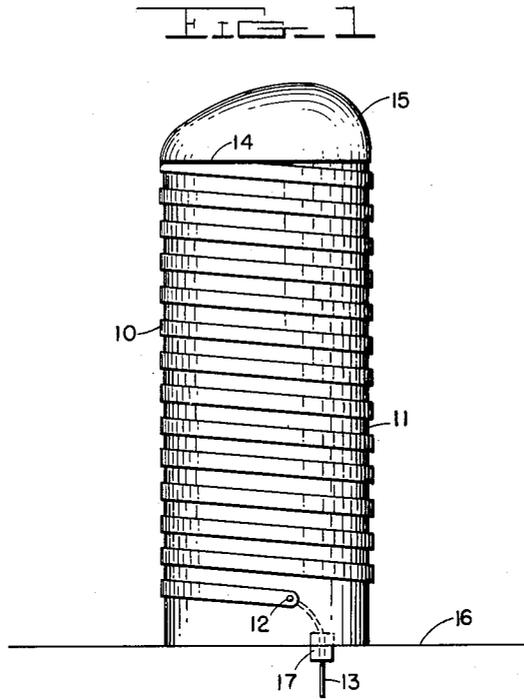
Nov. 20, 1951

R. J. WOHL

2,575,377

SHORT WAVE ANTENNA

Filed Nov. 13, 1945



Inventor
ROBERT J. WOHL

By *Ralph K. Chappell*

Attorney

UNITED STATES PATENT OFFICE

2,575,377

SHORT WAVE ANTENNA

Robert J. Wohl, United States Navy

Application November 13, 1945, Serial No. 628,337

5 Claims. (Cl. 250—33)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

This invention relates to an antenna for transmission or reception of short wave radio energy.

It is one object of this invention to provide a short wave radio antenna suitable for transmission or reception of radio waves having any frequency within a wide frequency band.

It is another object of this invention to provide such an antenna small in size and simple in construction.

The invention will be further explained with reference to the attached drawing, in which:

Figure 1 shows one embodiment of this invention, and

Figure 2 shows a second embodiment of the invention.

In accordance with the present invention an antenna for transmission or for reception of short wave radio energy is provided comprising a broad conductor of thin cross section arranged in the form of a helix having closely spaced adjacent turns, the longitudinal dimension of the helix being a small fraction of the operating wave length and the transverse dimension of the helix being a fraction of the aforesaid longitudinal dimension. Additional loading of the antenna is effected by means of a cap shaped conductor connected to one end of the helix.

Referring now to the drawings, and in the first instance to the embodiment shown in Figure 1, a thin strip 10 of a conducting material such as copper is wound helically upon a dielectric form 11. The resulting helix is fed at one end 12 by another conductor 13. Connected to the other end 14 is a cap-shaped member 15, formed of a conducting material such as copper.

In Figure 1 dielectric form 11 and member 15 comprise an airfoil which is attached to a fuselage 16 of a vessel or a missile to be propelled through space. The antenna shown may be used for any application requiring reception of radio signals over a fairly broad band. Since conducting strip 10 is of very small thickness and can be caused to adhere directly to the surface of form 11, the contours of the airfoil will not be spoiled by the presence of the antenna. For purposes of illustration the thickness of conductor 10 is greatly exaggerated in the drawing. Conductor 10 and the airfoil may be covered, if desired, by a thin coat of a dielectric such as plastic or paint to help secure conductor 10 in place.

For a given airfoil, the width of the frequency band for which the antenna embodying this invention is suitable will be determined largely by the width of conductor 10, the spacing of the turns in the helix, and the dimensions of member

2

15. The frequency at which quarter wave resonance occurs will be determined by the width of conductor 10, the total length of conductor 10, the number of turns in the helix and their spacing, and the dimensions of member 15 which loads the antenna. Not all these factors are independent, of course, since they are all interrelated by the given dimensions of form 11.

In the embodiment of Figure 1 the antenna is fed by conductor 13, which is passed through insulating sleeve 17. Sleeve 17 is constructed of some dielectric material such as Bakelite, and extends through an aperture in fuselage 16, being secured to the fuselage in a suitable manner.

The embodiment of Figure 2 is designed to be placed entirely within the surface of an airfoil. In this embodiment conductor 10 is helically wound upon a frame comprising two spaced insulating members 18 which are dielectric material such as polystyrene. As in the embodiment of Figure 1, one end 12 of conductor 10 is connected to feed conductor 13, and the other end 14 of conductor 10 is connected mechanically and electrically to cap-shaped member 15 which is a part of the external surface of the airfoil.

The same factors influence the bandwidth and resonant frequency of the embodiment of Figure 2 as influence these two characteristics in the embodiment of Figure 1. For an actual specimen of the arrangement of Figure 2, the standing wave ratio over the frequency band 34.0 to 41.7 mc./sec. was measured to be less than 5 to 1, which was found to be suitable for the reception of radio waves over this band. The standing wave ratio for this specimen was also found to be less than 2 to 1 from 36.6 mc./sec. to 38.6 mc./sec. The helical shape and capacitive top-loading of the antennas of Figures 1 and 2 result in considerable foreshortening effect, as is exemplified by a comparison of the physical and electrical lengths of the abovementioned actual specimen of the antenna. In this specific embodiment, the specimen, a helix of 22½ turns, exhibited quarter wave resonance at 37.8 mc./sec. although its physical length of 14¼" represented only about 1/23 of one wave length at this frequency.

It will be understood that the embodiments described and shown are exemplary of this invention, the scope whereof may be ascertained with reference to the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

3

What is claimed is:

1. A quarter wave resonant antenna for transmission or reception of short wave radio energy comprising a conductor in the form of a helix having adjacent turns spaced by an amount substantially equal to the conductor width, the longitudinal dimension of said helix being less than the wave length of the operating wave, the transverse dimension of the helix being a fraction of said longitudinal dimension, the conductor having a broad, thin cross-section, and a cap shaped conductor connected to one end of said helical conductor.

2. An antenna for transmission or reception of short wave radio energy comprising a supporting structure of airfoil cross sectional characteristics, a conductor in the form of a spiral having adjacent turns spaced by an amount substantially equal to the conductor width wound on the supporting structure, the longitudinal dimension of said spiral being less than a quarter of the wavelength of the operating wave, the maximum transverse dimension of the spiral being a fraction of said longitudinal dimension, and a cup shaped conductor disposed at one end of the supporting structure conductively connected to one end of the spiral conductor.

3. An antenna for transmission or reception of short wave radio energy comprising a supporting structure of airfoil cross sectional characteristics, a conductor in the form of a spiral having adjacent turns spaced by an amount substantially equal to the conductor width wound on the supporting structure, the longitudinal dimension of said spiral being less than a quarter of the wavelength of the operating wave, the maximum transverse dimension of the spiral being a fraction of said longitudinal dimension, a cup shaped conductor disposed at one end of the supporting structure conductively connected to one end of the spiral conductor, and means connecting another end of

4

the spiral conductor to the radio energy transmitter or receiver.

4. An antenna, comprising a conductor wound in the form of a helix having spaced adjacent turns, the longitudinal dimension of said helix being a small fraction of the wave length of the operating wave, the transverse dimension of the helix being a fraction of said longitudinal dimension, the conductor having a broad, thin cross-section, and a cap shaped conductor connected to one end of said helical conductor to further load the antenna.

5. An antenna comprising a supporting structure of airfoil cross-sectional characteristics, a conductor wound on the supporting structure in the shape of a helix having spaced adjacent turns, the longitudinal dimension of said helix being less than a quarter of the wavelength of the operating wave, the maximum transverse dimension of the helix being a fraction of said longitudinal dimension, and a cup shaped conductor disposed at one end of the supporting structure conductively connected to one end of the helix conductor.

ROBERT J. WOHL.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,581,133	Mackenzie	Apr. 20, 1926
1,680,217	Keator	Aug. 7, 1928
1,684,009	Brown	Sept. 11, 1928
1,828,910	Speaker	Oct. 27, 1931
2,005,805	Round	June 25, 1935
2,125,804	Nickle	Aug. 2, 1938
2,258,953	Higgins	Oct. 14, 1941
2,287,220	Alferd	June 23, 1942
2,344,171	Rote	Mar. 14, 1944
2,369,556	Gamet	Feb. 13, 1945
2,463,547	Meier	Mar. 8, 1949
2,482,767	Hansen	Sept. 27, 1949