March 17, 1970 J. VELEZ 3,501,767

ULTRA-HIGH FREQUENCY TABLE TOP DIPOLE MAT ANTENNA

Filed Nov. 18, 1968

FIG.1

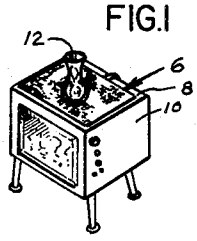


FIG.2

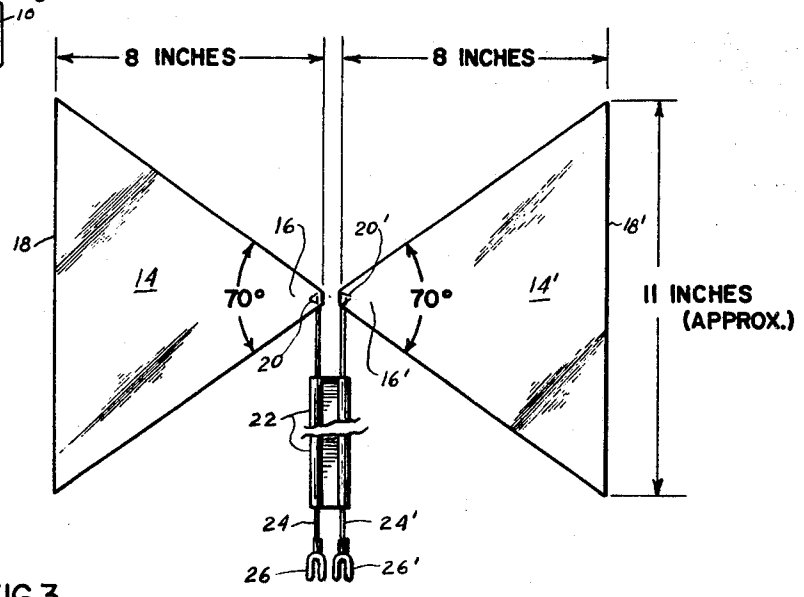


FIG.3

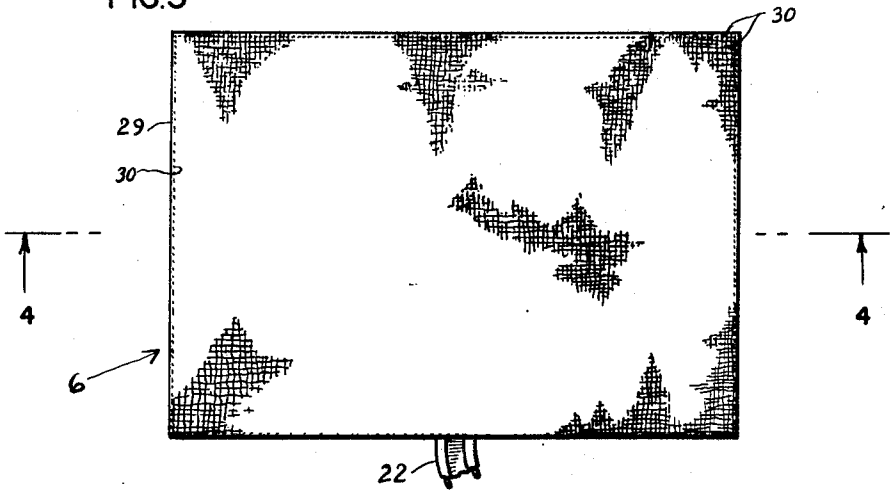
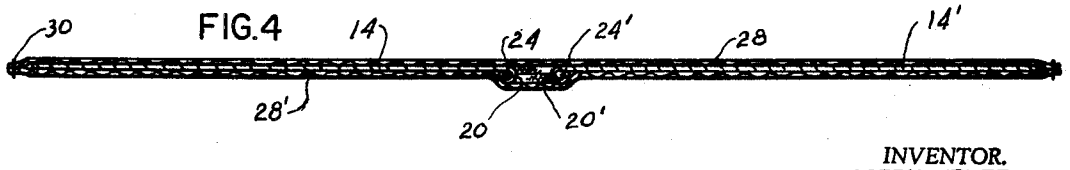


FIG.4



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ULTRA-HIGH FREQUENCY TABLE TOP DIPOLE MAT ANTENNA

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U.S. Cl. 343—795 4 Claims

ABSTRACT OF THE DISCLOSURE

An antenna for use in the ultra-high frequency range for television operation. The antenna comprises a pair of coplanar triangular metal laminae. The apices of said triangular laminae are directed towards, and are spaced from, one another. The triangular laminae bases are disposed parallel to each other. Each of the apices constitutes a 70° angle. The bases are 11 inches long. The perpendicular span between each of the apices and its respective base is 8 inches. A two wire, 300 ohm transmission line is connected to the apices.

BACKGROUND OF THE INVENTION

This invention relates to antennas and more particularly an antenna for receiving television signals on the upper transmission band known as U.H.F. (ultra-high frequency).

In recent years the use of this band has been rapidly increasing for economic and technical reasons, due to the availability of a large number of ultra-high frequency channels as compared with the heretofore used very high frequency channels. Reception of the ultra-high frequency band signals is often poor because insufficient signal energy reaches the antennas for satisfactory operation of television receivers. The present invention constitutes a substantial improvement in antenna performance over known portable antennas used heretofore for ultra-high frequency reception.

It is accordingly an object of the invention to provide a small light-weight antenna structure which will provide the most efficient transfer of energy to a television receiver while accommodating uniform response throughout the ultra-high frequency band.

Another object of the invention is to provide an antenna for indoor reception of television signals on the ultra-high frequency band having dimensions approaching the optimum values for good signal reception.

A further object of the invention is to provide a receiving antenna of the character described which can be laid on a horizontal plane surface and at the same time be inconspicuous.

Yet another object of the invention is to provide an antenna of the above mentioned character which can serve simultaneously as a mat for decorative objects placed thereon, without affecting its optimum values for signal reception.

Still another object of the invention is to provide an antenna of the above-described character which is extremely simple and inexpensive to fabricate, easy to install and which requires no maintenance.

Other objects, features and advantages of the invention will be apparent from the following detailed specification when read with the accompanying drawing.

It is to be understood, however, that the invention is not limited to the precise details disclosed, but that changes in detail, construction materials and parts may be made within the scope of the appended claims.

In the drawing:

FIG. 1 illustrates the antenna as used with a television receiver;

FIG. 2 is a top plan view of the antenna elements proper, according to the invention;

FIG. 3 is a top plan view of the antenna enclosed in suitable cover; and

FIG. 4 is a cross-section taken on line 4—4 of FIG. 3.

Referring now to the drawing in detail, the complete antenna **6** is placed substantially horizontally on the top **8** of a television receiver. A vase **12** illustrates the use of the antenna **6** as a decorative mat.

The antenna elements **14** and **14'** comprise a pair of triangular laminae arranged with their apices **16**, **16'** opposite one another. Each apex constitutes a 70° angle, while the bases **18**, **18'** of the triangle laminae measure 11 inches each, the perpendicular span between the bases **18**, **18'** and apices **16**, **16'** being 8 inches in each case.

The laminae are preferably made of aluminum, due to its low cost. They can be made, however, of copper, zinc or other good conductors, if desired.

Secured to the apices **16**, **16'** by known means, at **20**, **20'** is a two-wire 300 ohm transmission line lead **22**, the free ends **24**, **24'** of which are provided with lugs **26**, **26'** for connecting the lead **22** to the television receiver's antenna posts.

As shown in FIGS. 3 and 4, both laminae arranged in the above described manner are encased in an envelope-like cover consisting of a pair of non-conductive sheets of material **28**, **28'** which are sewn to one another about their peripheral edges **29** by seams **30**. Such material may preferably be a non-conductive plastic in which case the edges thereof may be welded together electronically. For additional insulation and rigidity, it desired, a pair of smooth surface ozite boards (not shown) 1/16" thick, cut to approximately 17½" x 11" may be used to "sandwich" the antenna therebetween. Provision is made in securing the material edges together, to allow the lead **22** to pass outwardly of the edges **29**.

The dimensions indicated above are derived from mathematical computations for maximum efficiency for such antenna structures in compliance with ultra-high frequency operation as specified.

An antenna is derived by the ability of a structure to attract a given band of frequencies. The first consideration that must be given in designing an antenna is to make the electrical wavelength correspond to the physical length of the structure.

Equation 1 illustrates this consideration

$$\lambda(\text{feet}) = \frac{468}{670(\text{mHz.})} \times 2 \cong 1.4 \text{ or } 16.8 \text{ inches}$$

The next consideration to be given is to provide a proper match to a 300 transmission line. The radiation resistance, antenna efficiency, directional pattern, and directive gain are not affected by the failure to match impedance. Matching merely makes it easier to get the available power from the antenna to the receiver, reduces the transmission loss, and lowers the maximum voltage stress in the transmission system.

To satisfy this requirement throughout a changing band of frequencies, two triangles were selected. The non-uniform cross-section with wider diameters at the bases provides broad band characteristics.

The angle of the triangles was derived by the relationships of Equations 2, 3, and statement 5 which follow below:

Equation 2 (simplified)

$$\sin \measuredangle = \frac{\sqrt{2}}{2\left(\frac{4\pi}{\lambda}\right)} \approx .94 \text{ or } 70°$$

Equation 3 (simplified)

$$Z=\frac{\lambda^2}{\sin \not\propto}$$

Z=impedance≈300 ohms

Equation 4 (simplified)

$$>\not\propto<Z$$

Equation 5 (simplified)

This equation illustrates how with the increased area of the triangles more energy can be intercepted. The result of higher gain is apparent, opposed to a thin wire reference dipole antenna.

$$\text{DIRECTIVE GAIN}=4\pi\frac{A}{\lambda^2}=4.0$$

A=Area of Triangles≈88 sq. inches

Summarizing the above disclosure it has been found that the horizontal and vertical polar patterns are the same, since the parasitic element is not included in the field. The reception has been increased to a maximum heretofore unachievable with an indoor UHF antenna.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States of America, is:

1. An antenna for use in the ultra-high frequency range for television operation, said antenna comprising a pair of coplanar triangular metal laminae, the apieces of said triangular laminae being directed towards one another in spaced relationship, said triangular laminae having bases disposed parallel to each other, each of said apieces constituting a 70° angle, each of said bases being of a length of **11** inches, the perpendicular span between each of said apices and its respective base being 8 inches, a two wire 300 ohm transmission line having a pair of wire ends secured to said laminae apices respectively, the free ends of said transmission line being provided with lugs for connection to antenna posts of a television receiver.

2. An antenna as claimed in claim **1**, being further provided with a closed envelope-like flat cover, enclosing said laminae, said cover having an opening for the passage of said transmission line.

3. An antenna as claimed in claim **2**, wherein said cover consists of a pair of non-conductive plastic sheets having coextensive peripheral electronically welded portions.

4. An antenna as claimed in claim **2**, which is further provided with a pair of flat non-conductive sheets of material, said metal laminae being received therebetween, said metal laminae and said non-conductive sheets of material being enclosed in said cover.

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ELI LIEBERMAN, Primary Examiner

U.S. Cl. X.R.

343—873