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BICONICAL HIGH-FREQUENCY ANTENNA

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Antennas for receiving high frequency television and frequency modulation signals are generally either of the half wave dipole type or a simple array comprising a dipole and a reflector mounted at as great a height above the ground as possible. To obtain an optimum signal to noise ratio and to eliminate reflected signals, such antennas must be carefully tuned and oriented after installation, an operation requiring the services of a skilled mechanic because of the criticalness of such adjustments and the height above the ground at which such adjustments are necessarily made. Being tuned to a single wave length, such antennas of the dipole type inherently give poorer performance on all other wave lengths so that it is often necessary to use several such antennas to cover the television frequency band. In order to avoid some of these disadvantages, the use of wide band antennas of the horn type has been proposed but these systems have heretofore been quite heavy, difficult to construct and install, and expensive.

Objects of this invention are to provide a high frequency antenna of the biconical type which maintains a good impedance match to the transmission line over a wide frequency band, which is easily adjusted and oriented, which can be installed indoors, which can be assembled and connected without special tools or skill, which is light in weight, which is inexpensive to construct, and which advances the art of antenna manufacture generally.

In a broad aspect the invention contemplates a high frequency antenna comprising a pyramidal structure of insulating material with one side thereof covered by a conducting foil. The thickness of the foil is small relatively to the thickness of the insulating material so that the foil is supported thereby. In another aspect two such pyramidal structures are maintained in axial alignment with the apexes thereof in spaced relationship by a connecting member of insulating material.

In a specific aspect the pyramidal antenna structure comprises a plurality of triangular pieces of insulating material for example fiber board or plywood. A plurality of tabs project from each of two respective sides of each triangular piece. Each tab has a finger projecting normally therefrom which is formed by a slot having a side in alignment with the edge of the triangular piece supporting the tab. Each slot and finger engage a corresponding finger and slot respectively on the adjacent edge of another of said pieces thereby to complete the structure. A

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thin foil such as aluminum, copper or other conducting material covers the outside of each of the triangular pieces.

To increase the mechanical strength and rigidity of the pyramidal structure, a polygonally shaped stiffening member, having a number of sides which corresponds with the number of triangular pieces in the pyramidal structure, is inserted within the structure with each of its sides abutting the inner surface of a respective triangular piece. An ear projects from each respective side of the polygonal member through a corresponding aperture in the abutting triangular piece to fasten the polygonal member in position within the structure. The apex of the structure is strengthened by a conducting member having a plurality of arms each of which is attached to the apex of a respective triangular piece thereby insuring the electrical interconnection of the foils.

A further feature of the invention is a connecting member which may be a rod of insulating material with one end projecting through two holes located on the axis of the pyramidal structure in the polygonally shaped member and the conducting member respectively. The opposite end of the connecting member projects through similarly located holes in the polygonally shaped and conducting members of a second pyramidal structure thereby to maintain these structures in axial alignment with the apexes thereof in spaced relationship.

These and other objects and aspects of the invention will be apparent from the specific embodiment thereof illustrated in the drawing in which

Fig. 1 is an isometric view of such embodiment;

Fig. 2 is a plan view of two adjacent triangular pieces showing one method of interlocking them;

Fig. 3 is an enlarged fragmentary cross sectional view on line 3—3 of Fig. 1;

Fig. 4 is an elevation of the conducting member; and

Fig. 5 is a partial elevation of the polygonally shaped stiffening member.

In Fig. 1 are shown two identical pyramidal supporting structures 11 with their axes in horizontal alignment and the apexes thereof in spaced relationship. Each of the structures 11 comprises eight triangular pieces 12 of light weight insulating material, for example corrugated fiber board, positioned with their respective edges abutting to form an eight sided hollow pyramid with an open base. As is shown in Fig. 3 the

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outside of each triangular piece 12 is covered with a conducting foil 15, for example aluminum, the thickness of which is small relatively to the thickness of the fiber board so that the foil is supported thereby.

Two edges of each respective piece 12 are each provided with three tabs 13 which interlock with the respective corresponding tabs on the abutting edges of the corresponding adjacent pieces. As is shown in detail in Fig. 2 each tab 13 includes a finger 14 projecting normally therefrom parallel to the adjacent edge of the piece 12. Each finger 14 is formed by a slot 16 one side of which is in alignment with the edge of the piece 12 supporting the tab 13. The fingers on the respective edges of each piece 12 point in opposite directions. Two adjacent pieces 12 are interlocked by engaging the fingers 14 and the slots 16 of one piece 12 in the corresponding slots and fingers of the adjacent piece.

It is also possible to point the fingers 14 on both edges of one piece 12 in the same direction. When this is done the fingers 14 on both edges of each piece 12 must point in the opposite direction, the fingers on adjacent pieces being directed in opposite directions. Although the above described methods of interlocking are preferred because of its simplicity and the ease of assembly, it is also possible to connect the pieces 12 by other well-known means, for example, staples, gummed tape or any of the various types of interlocking tabs or ears.

The apexes of the interlocked pieces 12 are fastened together by a metal conducting member 17 which is inserted inside the pyramidal structure 11. As is shown in Figs. 3 and 4, the conducting member 17 has a plurality of arms 18, each of which is fastened to a respective triangular piece 12 by a self tapping screw 19. The screws 19 project through holes 21 (Fig. 2) near the apex of each of the triangular pieces 12 to engage the holes 22 in the respective arms 18. A washer 23 is placed under the head of each screw 19 to make contact with the foil 15 on each of the respective triangular pieces 12 to insure electrical interconnection of all the foils through the conducting member 17.

Further to reinforce the pyramidal structure 11, a polygonally shaped stiffening member 24 of insulating material is inserted therein so that an ear 26 (Fig. 5) on each of the respective sides thereof projects through an aperture such as the slot 27 in each respective abutting triangular piece 12.

The pyramidal structures 11 are maintained in axial alignment with their apexes in spaced relationship by a connecting member of insulating material such as the wooden rod 28. One end of the rod projects through the holes 29 and 31 axially located in the polygonal member and the conducting member respectively of one pyramidal structure 11. The opposite end of the rods engage similarly located holes in the other pyramidal structure. A plastic collar 30 is attached at the center point of the rod 28 so that the apexes of the respective pyramidal structures 11 cannot make electrical contact with each other.

The antenna is located indoors at as great a height above the ground as practicable, for example, in an attic or under the roof of a garage. Assembly is preferably performed at the final location by laying out the triangular pieces 12 upon the floor with the foil 15 downwardly and then interlocking the adjacent pieces 12 by slid-

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ing the respective fingers 14 and slots 16 into engagement as described above.

Before completing the final joint, the assembly should be lifted and formed into the eight sided pyramidal structure 11 with the apex thereof downward and the foil 15 on the outside. With the apex of the structure 11 resting upon the floor, the ears 26 of the polygonal shaped reinforcing member are then inserted in the respective slots 27 in the triangular pieces 12.

The structure 11 is next turned over so that its base rests upon the floor and the conducting member 17 inserted inside the apex of the structure 11 and rotated so that the holes 22 in the arms 18 thereof are in alignment with the respective holes in the triangular pieces 12. The conducting member 17 is secured in this position by inserting one of the screws 19 in each of respective pair of aligned holes. Before inserting each screw 19 a washer 23 is placed under the head thereof.

The second pyramidal structure 11 is assembled in a similar manner. To maintain the structures 11 in horizontal axial alignment the ends of the connecting rod 28 are inserted in the holes 29 and 31 of the respective polygonal stiffener and star shaped conducting member of the structures 11. Each of the wires of the lead-in cable 32 is clipped under a respective screw 19 in the apex of each of the pyramidal structures 11.

When thus assembled the antenna is ready for use. Adjustment to give a maximum performance of the receiver is made by rotating the assembly about a vertical line through the collar 30 of the rod 28.

Under some conditions most satisfactory results may be obtained by the use of a reflector such as indicated at 33 of Fig. 1, comprising a sheet of conducting foil, similar to the covering foil 15, hung in a vertical plane parallel to and located approximately $3\frac{1}{2}$ feet from the horizontal axis of the structures 11. This distance is varied to obtain the optimum location where the best results without double images are obtained. In some cases double images may be eliminated by rotating structures 11 so that there is a small angle between the axis thereof and the plane of the reflector 33.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A high frequency antenna comprising a plurality of triangular pieces of insulating material each with an aperture therein, a plurality of tabs projecting from each of two respective edges of said pieces, each tab having a finger projecting normally therefrom, said finger being formed by a slot having one side in alignment with the edge of the triangular piece supporting the tab, said slot and finger engaging the corresponding finger and slot respectively of the edge of another of said pieces thereby to complete a pyramidal supporting structure, a thin conducting foil covering the outside of each of the respective triangular pieces, a polygonally shaped stiffening member of insulating material with an ear projecting from each of the respective sides thereof to engage apertures in adjacent triangular pieces, and a conducting member having a plurality of arms each of which is fastened to the apex of one of the respective trian-

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gular pieces thereby insuring electrical interconnection of said foils.

2. A high frequency antenna comprising two pyramidal structures each including a plurality of separate triangular pieces of insulating material, each piece having an aperture therein and a plurality of tabs projecting from each of two respective edges thereof, each tab having a finger projecting normally therefrom, said finger being formed by a slot which has a side in alignment with the edge of the triangular piece supporting the tab, and each of said slots and fingers engaging the corresponding fingers and slots respectively on the adjacent edge of another of said pieces thereby to complete said structure; a thin conducting foil covering the outside of each of the respective triangular pieces; a polygonally shaped stiffening member of insulating material having a hole in the center thereof and an ear projecting from each of the respective sides thereof to engage the apertures in adjacent triangular pieces; a conducting member having a hole in the center thereof and a plurality of arms each of which is fastened to the apex of a respective triangular piece there-

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by insuring electrical interconnection of said foils; and a connecting rod of insulating material having one end projecting through the respective holes in said connecting member and said polygonal member of one of said structures, the other rod end projecting through the respective holes in said conducting member and polygonal member of the other of said structures thereby to maintain the apexes of said structures in axial alignment and spaced relationship.

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