United States Patent [19]

Monola

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[45] **June 5, 1973**

[54] **MULTIBAND QUAD AND LOOP ANTENNA**

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[52] **U.S. Cl.** **343/744,** 343/730, 343/752

[51] **Int. Cl.**.....**H01q 11/12**

[58] **Field of Search**.....343/725, 726, 741, 343/744, 730, 752

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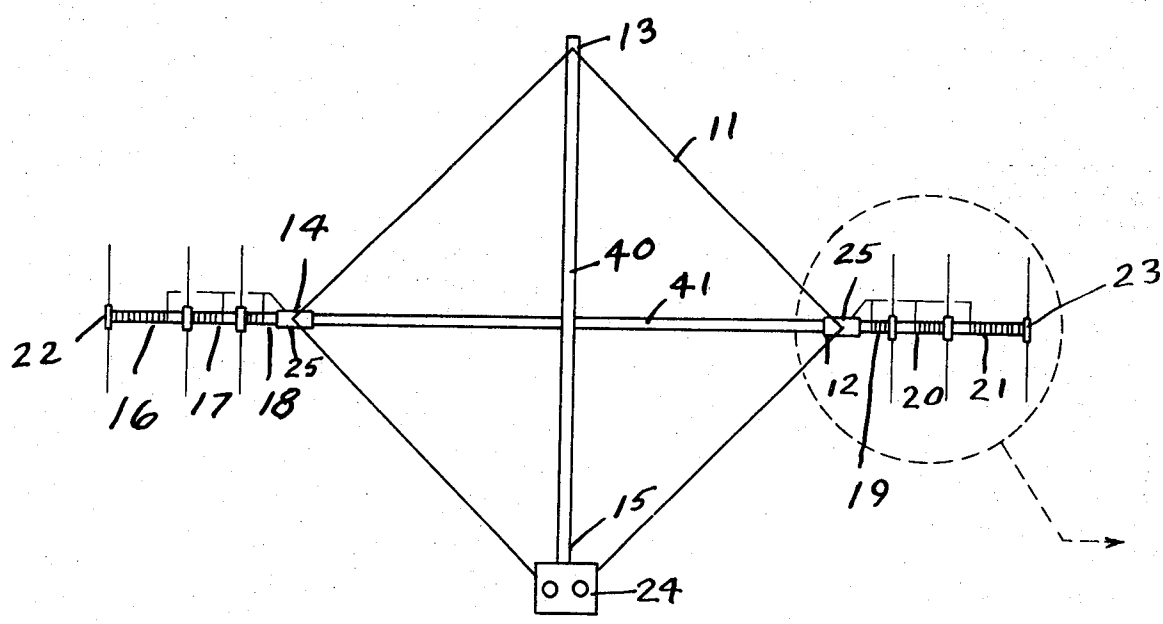
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[57] **ABSTRACT**

An antenna which incorporates a single four-sided radiating element or loop in conjunction with series or parallel connected loading units to cover a multiple of operating frequencies.

7 Claims, 7 Drawing Figures



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SHEET 1 OF 2

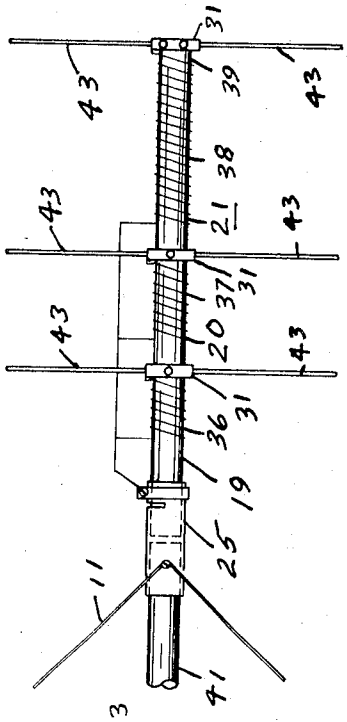


FIG. 1a

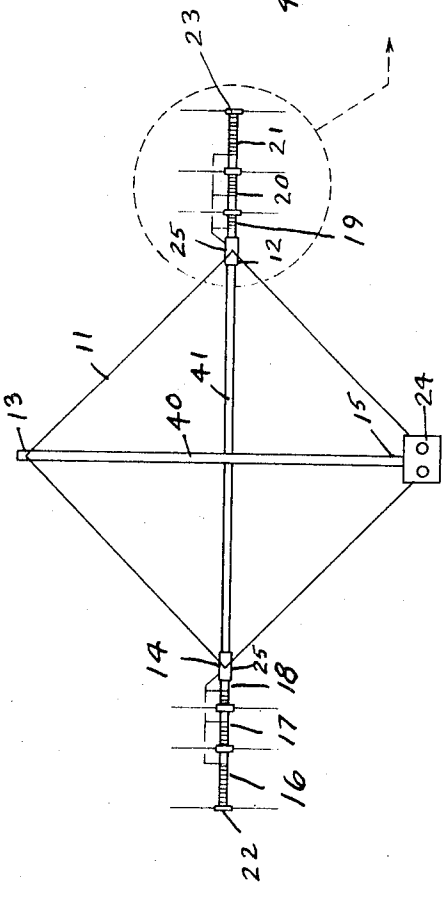


FIG. 1

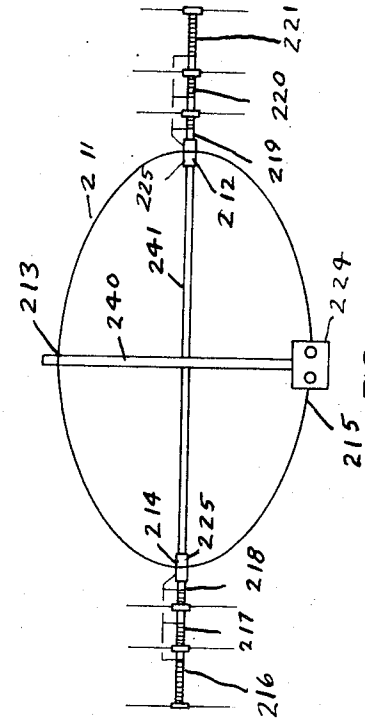


FIG. 3

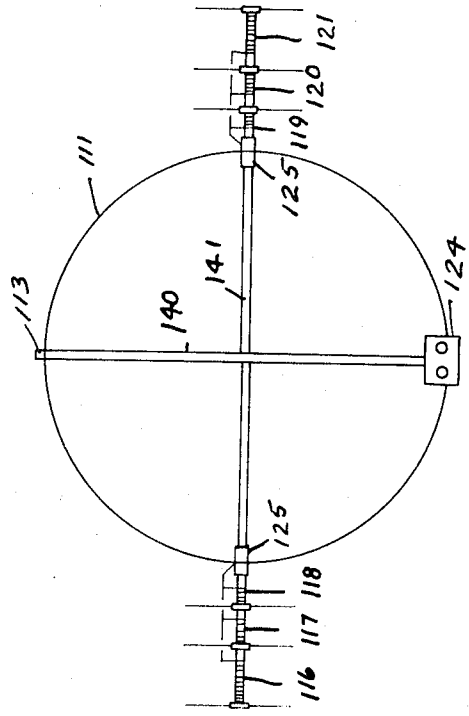


FIG. 2

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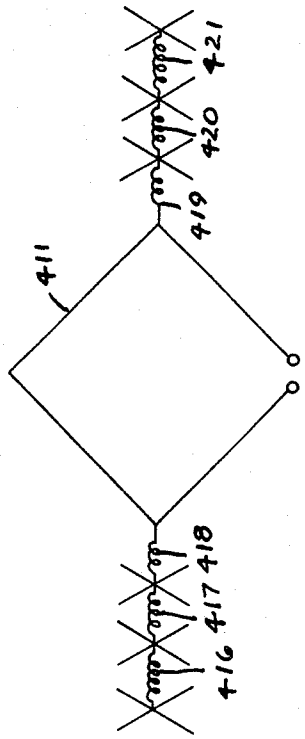


FIG. 5

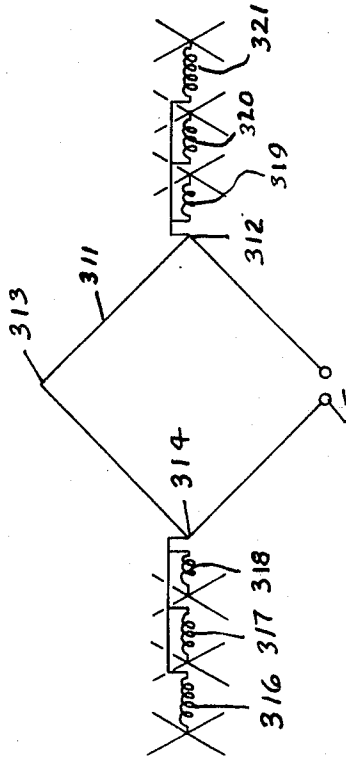


FIG. 4

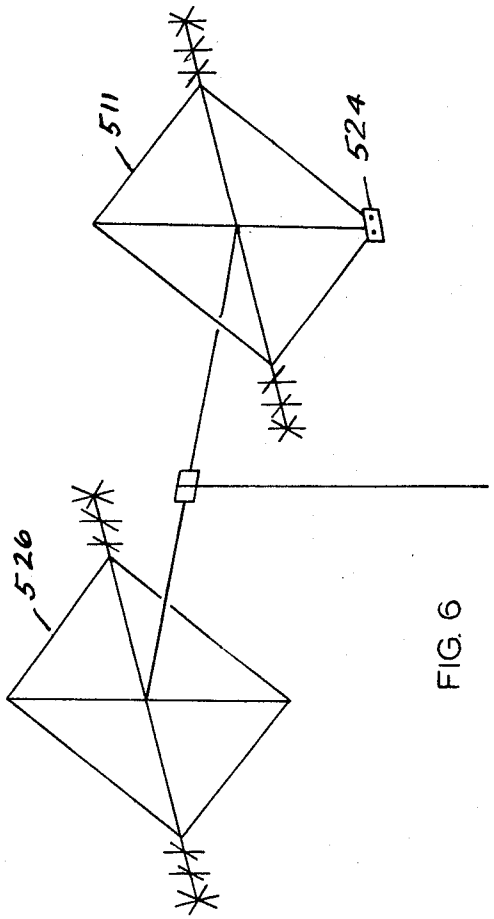


FIG. 6

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MULTIBAND QUAD AND LOOP ANTENNA

REFERENCE TO PRIOR ART

The loading units used on the antenna disclosed herein are described fully in my previous U.S. Pat. No. 3,089,140.

GENERAL DESCRIPTION OF INVENTION

The loading units are mounted 180° apart at the high voltage points of the radiating element, thereby effecting a substantial reduction in physical size and, at the same time, retaining the maximum current-carrying portion of the radiator for most efficient radiation.

The loading units may be either series or parallel connected and are attached 180° apart to the high voltage points of the four-sided quad or loop radiator with the transmission line or feed point situated midway between. The antenna operates as an electrical full wave loop on all frequencies for which it is designed. These single multiband elements may be combined on a common boom or structure to form higher gain, directional multi-element arrays such as two and three element quads.

OBJECTS OF THE INVENTION

It is, accordingly, an object of the present invention to provide a multiband quad or loop antenna whose physical size is determined by the highest frequency of desired operation rather than the lowest frequency as with conventional multiband quad antenna.

Another object of the invention is to provide an improved miniature antenna suitable for operation over a plurality of frequencies.

Yet another object of the invention is to provide an improved multiband antenna suitable for restricted and limited space installation.

Still a further object of the invention is to provide a multiband antenna which is simple in construction, economical to manufacture, and efficient to operate.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

GENERAL DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a single element four-band quad antenna.

FIG. 1A is an enlarged view of one of the loading units connected to the radiator as shown in FIG. 1.

FIG. 2 shows a circular radiator with multiband loading units mounted 180° apart at the high voltage points of the radiator.

FIG. 3 shows a modified elliptical radiator with multiband loading units mounted 180° apart at the ends of the radiator.

FIG. 4 shows a schematic drawing of a parallel connected four-band quad antenna.

FIG. 5 shows a schematic drawing of a series connected four-band quad antenna.

FIG. 6 shows a two-element four-band quad antenna with reflector and driven element.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to the embodiment shown in FIG. 1, FIG. 1 shows a single element four-band quad antenna comprising a wire radiator 11 fastened to the four ends

12, 13, 14, and 15 of a supporting cross member 40 and 41 made of insulating material and sufficiently strong to support the multiband loading units 16 through 21 mounted on the ends that are diametrically opposite each other at 22 and 23. A terminal board 24 is attached to the insulated cross member at 15 and is connected to the wire radiator for fastening the transmission lines.

The metallic sleeve 25 shown in FIG. 1A should have a diameter sufficiently large to support coil form 19. Coils 36, 37 and 38 are connected to the corner of the radiator 11 through the metallic sleeve 25. The cross member 41 is made of insulating material. The loading capacitors, consisting of rings 31 and spokes 43 are supported on the coil form, as shown. The spokes 43 are made of conducting material and have reduced size threaded ends which engage the mounting rings 31.

The embodiment of the invention shown in FIGS. 2 and 3 are similar to the embodiment shown in FIG. 1, however, they have circular and oval shaped radiators. The parts corresponding to the parts shown in the embodiment of FIG. 1 have 100 added to them in the embodiment of FIG. 2 and have 200 added to them in the embodiment shown in FIG. 3.

The embodiments shown in FIGS. 4, 5, and 6 show schematic views of a four-band quad antenna in FIGS. 4 and 5 and a two-element four-band quad antenna in FIG. 6 with reflector and driven element. The driven element in FIG. 6 is indicated at 511 and the feed line connecting board is indicated at 524. The reflector element is indicated at 526.

The foregoing specification sets forth the invention in its preferred practical forms but it is understood that the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An antenna comprising a radiator consisting of a single continuous loop of wire forming a geometrical configuration and having two spaced ends adjacent each other, and having a total distance around the loop of approximately one wave length at a predetermined frequency,

two terminals disposed adjacent each other, one said terminal being connected to one said end and the other said terminal being connected to the other said end of said loop,

said radiator having a pair of loading units each comprising a series connected inductor and loading capacitor mounted 180° apart at the high voltage points of said radiator and being connected thereto to extend outwardly along an axis of symmetry,

said inductors having a sufficiently high impedance to act as a radio frequency choke at said predetermined frequency,

said inductors and said loading capacitors acting as an additional electrical length to said radiator at a lower frequency than said predetermined frequency, thus providing operation on two different frequencies.

2. The antenna recited in claim 1 wherein a second inductor with a loading capacitor in series therewith is connected in series with said first mentioned inductor and loading capacitor,

said second inductor being of a value to act as a radio frequency choke at said lower frequency and to act as an additional electrical length to said radiator and said first inductor and loading capacitor at a still lower frequency then said lower frequency, thus allowing operations on three frequencies.

3. The antenna recited in claim **2** wherein a third inductor and loading capacitor are connected in series with each other and with said second inductor and said second loading capacitor, thus allowing operation on four frequencies.

4. The antenna recited in claim **2** wherein a third inductor with a loading capacitor in series therewith is connected in parallel at the inductor end with said first mentioned inductor and to said radiator and acting as an additional electrical length to said radiator at a frequency lower than said radiator's predetermined frequency.

5. The antenna recited in claim **1** wherein a second inductor with a loading capacitor in series therewith is

connected in parallel at the inductor end with said first mentioned inductor and to said radiator,

said second inductor and capacitor being of a value to act as a radio frequency choke at said lower frequency and to act as an additional electrical length to said radiator at a still lower frequency than said lower frequency and thus allowing operation on three frequencies.

6. The antenna recited in claim **5** wherein a third inductor with a loading capacitor in series therewith is connected in parallel at the inductor end with said first and second mentioned inductors and to said radiator, thus providing operation on four frequencies.

7. The antenna recited in claim **1** wherein a multiple of inductors with loading capacitors in series therewith are connected in parallel at the inductor end with said first mentioned inductor and to said radiator to provide a multiple of frequencies lower than said radiator frequency.

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