

Jan. 4, 1966

NOBUO KITAMURA ET AL
DIPOLE ANTENNA WITH MOVABLE REFLECTOR ALL
SUPPORTED BY COAXIAL CABLE

3,228,031

Filed Dec. 18, 1963

3 Sheets-Sheet 1

FIG - 1

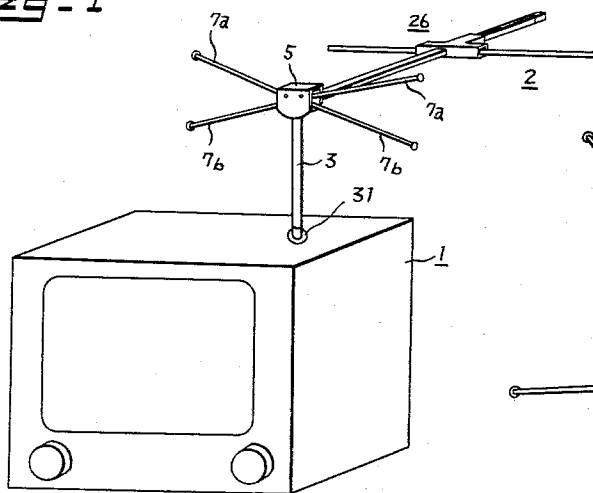


FIG - 3

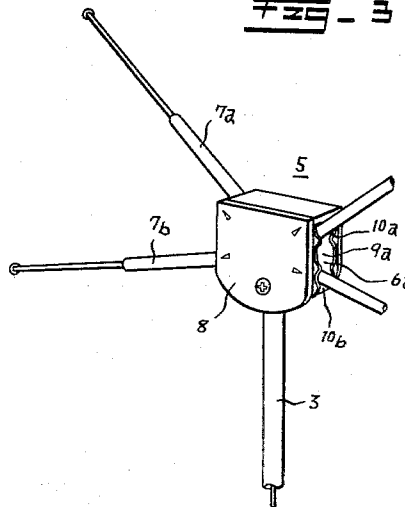


FIG - 2

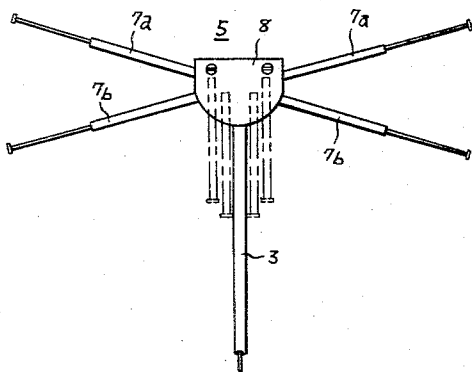
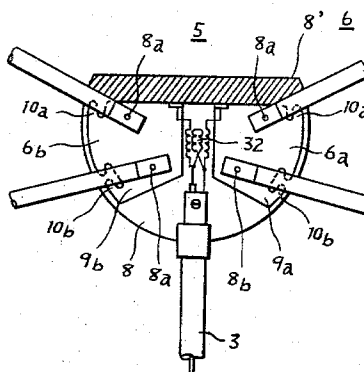


FIG - 4



INVENTORS
Nobuo Kitamura
Motomu Tadama
Yuko Koyama

by

Hill, Sherman, Messer, Chas. & Simpson

Attys.

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FIG - 5

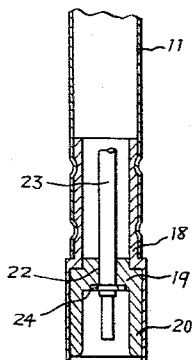
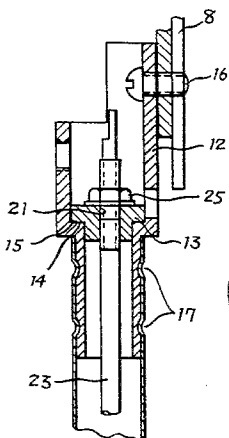


FIG - 7

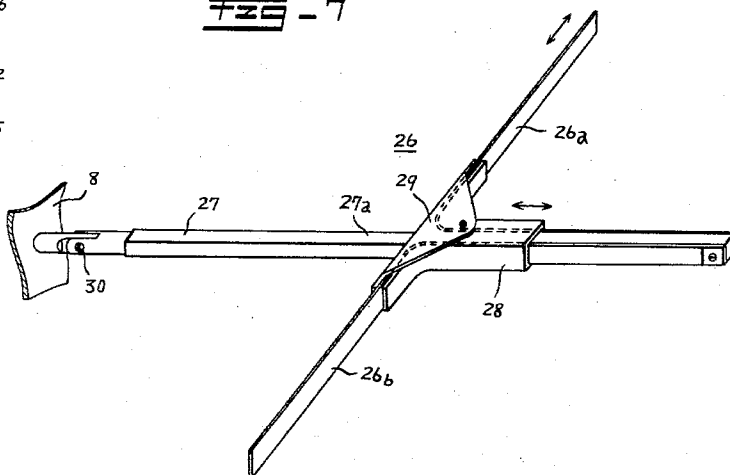
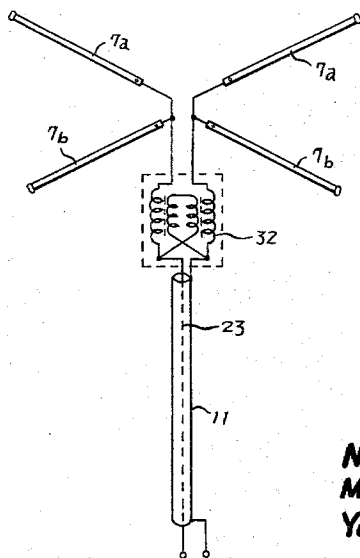


FIG - 6



INVENTORS
Nobuo Kitamura
Motomu Tadama
Yuho Koyama

by

Hill, Sherman, Merrill, Gross & Simpson

Attys

Jan. 4, 1966

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Fig. 9

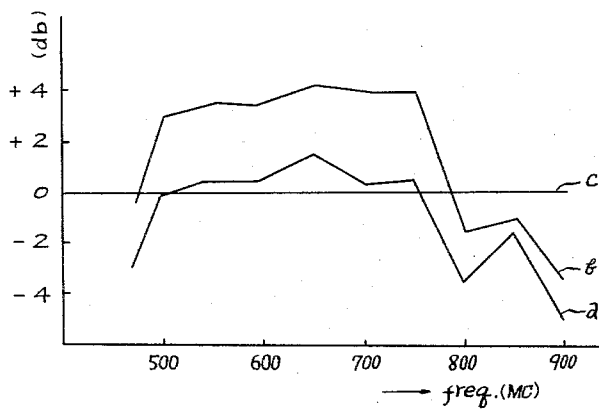
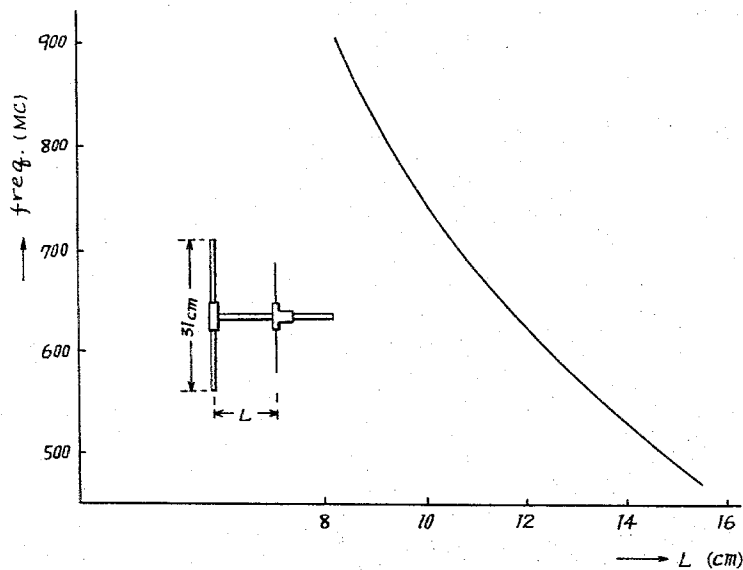


Fig. 10



INVENTORS
Nobuo Kitamura
Motomu Tadama
Yuho Koyama

by

Hill, Sherman, Merri, Chase & Simpson

Attys

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3,228,031

**DIPOLE ANTENNA WITH MOVABLE REFLECTOR
ALL SUPPORTED BY COAXIAL CABLE****Nobuo Kitamura, Kanagawa-ken, and Motomu Tadama
and Yuho Koyama, Tokyo, Japan, assignors to Sony
Corporation, Tokyo, Japan, a corporation of Japan**

Filed Dec. 18, 1963, Ser. No. 331,566

3 Claims. (Cl. 343-805)

The present invention relates to a dipole antenna assembly, and more particularly to a dipole antenna assembly suitable for use in connection with television receivers, FM radio receiving apparatus, and the like.

The present invention provides an antenna of high sensitivity and broad band characteristics, particularly suitable for use in the UHF band of television reception. The dipole assembly of the present invention is characterized by the elimination of lead-in or feeder wires, as the mast or support for the dipole antenna itself is in the form of a coaxial cable which not only provides the structural support for the antenna but also provides the feed means.

Another feature of the present invention is the provision of an adjustable reflector behind the dipole elements, which reflector can be conveniently folded into an out of the way position when not in use.

An object of the present invention is to provide an antenna of high sensitivity and broad band characteristics but still simple in structure and operation.

Another object of the invention is to provide a dipole antenna which eliminates the necessity of lead-in wires, and uses a supporting mast in the form of a rigid coaxial cable.

Another object of the invention is to provide a dipole antenna assembly with an adjustable reflector, the reflector being hingedly secured to the remainder of the antenna so that it may be folded into an out of the way position when not in use.

Other objects and features of the present invention will be apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a view in perspective of the antenna assembly of the present invention secured to a television receiver;

FIGURE 2 is a front elevational view of the antenna structure shown in FIGURE 1;

FIGURE 3 is a view in perspective, partly broken away, of the antenna structure;

FIGURE 4 is a cross-sectional view of the antenna to illustrate its interior construction;

FIGURE 5 is a cross-sectional view of the support mast and supporting structure employed with the antenna of the present invention;

FIGURE 6 is a schematic diagram of the antenna illustrating its electrical circuit;

FIGURE 7 is a perspective view of the reflector element employed with the antenna of the present invention;

FIGURE 8 is a graph indicating the optimum spacing between the dipole and the reflector for various frequencies; and

FIGURE 9 is a plot of antenna gain for the antennas of the present invention with and without the reflector element being present.

As shown on the drawings:

In the assembly shown in FIGURE 1, reference numeral 1 has been applied to a television receiver with which the antenna structure 2 of the present invention is to be associated. The antenna structure 2 is secured to the television receiver 1 by means of a mast 3 which takes the form of a coaxial cable, as will be described more completely in succeeding portions of this specification.

The antenna member itself includes a housing 5 consisting of a pair of side plates 8 composed of a synthetic resin or similar insulating material. The two side plates 8 are separated by a spacer 8' as best illustrated in FIGURE 4 of the drawings.

A pair of telescoping dipole antennas 7a and 7b extend from the housing 5, the antenna members being movable within slots 6a and 6b formed in the sides of the housing 5. Within the housing 5, as shown in FIGURE 4 of the drawings, the ends of the antenna members are pivotally mounted on pins 8a and 8b extending within the housing 5.

Along the slots 6a and 6b there is provided a pair of conductive plates 9a and 9b which contact the antenna elements 7a and 7b. The conductive plates 9a and 9b may include undulating portions 10a and 10b which resiliently engage the antennas 7a and 7b to hold them in a preselected position within the slot. The upper limit of travel of the antenna members is defined by the abutment of the antenna members with the spacer 8'.

The construction of the mast 3 is best illustrated in FIGURE 5 of the drawings. The outer shell of the mast consists of a metal tube 11, the upper end of which is secured to the side plates 8 by means of a sleeve 12 closing off the upper end of the tube 11, and a screw 16 which connects the upper end of the sleeve to the side plate 8. The outer tube 11 may be locked to the sleeve 12 by providing crimping 17 or other suitable locking means. An insulating plug 13 closes off the upper end of the tube, the plug 13 having an annular shoulder 15 which is arranged to be seated upon an internal annular shoulder 14 of the sleeve 12.

At the lower end of the metal tube 11, there is provided a sleeve 18 extending therein and closed off by means of an insulating plug member 19. The latter has an annular wall portion 20 tightly received within the sleeve 18. Apertures 21 and 22 are provided in the plug 13 and in the plug member 19, respectively, to position a conductive wire or rod 23 therein. Nuts 24 and 25 are secured to opposite ends of the wire 23 on suitably threaded portions.

As best seen in FIGURE 6, dipole elements 7a and 7b are connected to the coaxial cable support by means of a balance to unbalance transformer 32, commonly called a "Balun." This device matches the impedance characteristics of the coaxial cable and the antenna structure.

Another feature of the present invention resides in the reflector element which can be combined with the dipole element of the antenna structure. The reflector element is best illustrated in FIGURE 7 of the drawing wherein reference numerals 26a and 26b are applied to reflector elements made of steel or the like. The reflector elements 26a and 26b are bent at generally right angles and passed through a guide member 29 whereupon they embrace a rectangular rod 27 extending at right angles to the mast 3. One end of each of the elements 26a and 26b is secured to the free end of the rod 27 as shown in FIGURE 7. On the rod 27, there may be calibration markings 27a to indicate frequencies or channel numbers. Thus, the relative spacing between the dipole antenna and the reflector element can be varied by moving the collar portion 28 of the guide 29 along the rod 27, and at the same time, the lengths of the reflector elements is varied by changing the location of the bend in the elements, as shown by the arrows of FIGURE 7.

As seen in FIGURE 7, the end of the guide rod 27 is hingedly secured to the remainder of the antenna assembly by means of a hinge 30 so that the rod 27 can be pivoted downwardly when not in use and thereby be removed to an out of the way position. As indicated in

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FIGURE 1, the lower end of the mast 3 is secured to the television set 1 by means of a socket 31.

From the foregoing, it will be seen that the antenna structure 2 is supported by the mast 3 which also serves to feed the input signal from the antenna to the television receiver. Accordingly, no conventional feed system is required and since the feeding mechanism is a coaxial cable, the loss of antenna input signal is small and antenna feeding is effected accurately even when the mast 3 is rotated.

The graph of FIGURE 8 shows the relationship between the distance L separating the dipole structure from the reflector at which maximum gain is obtained at various frequencies.

FIGURE 9 is another graph illustrating antenna gain characteristics plotted against frequency, the curve labeled *a* being that which is obtained without using the reflector, the curve *b* representing the gain of the dipole antenna with the reflector element, and the curve *c* being the gain of a standard half-wave dipole antenna.

It should be evident that various modifications can be made to the described embodiments without departing from the scope of the present invention.

We claim as our invention:

1. An antenna assembly comprising a doubly open ended housing, a plurality of dipole antenna elements each having one end pivotally mounted within said housing and extending through an open end thereof, a rigid coaxial cable having its outer conductor secured to said housing and serving as a support therefor, the inner and outer conductors of said cable being electrically connected to said dipole antenna elements, a support rod connected to

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said housing and extending at generally right angles thereto, and a reflector element slidably mounted on said rod for adjustable positioning with respect to said dipole antenna elements.

2. The antenna assembly of claim 1 in which said rod is connected to said housing by a hinged connection permitting said rod to be folded inwardly toward said coaxial cable.

3. The antenna assembly of claim 1 in which said housing includes detent means for selectively positioning said dipole antenna elements in predetermined positions relative to each other.

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HERMAN KARL SAALBACH, *Primary Examiner*.

ELI LIEBERMAN, *Examiner*.