July 7, 1953 J. J. ROOT 2,644,888

HIGH-FREQUENCY ANTENNA

Filed Jan. 25, 1949

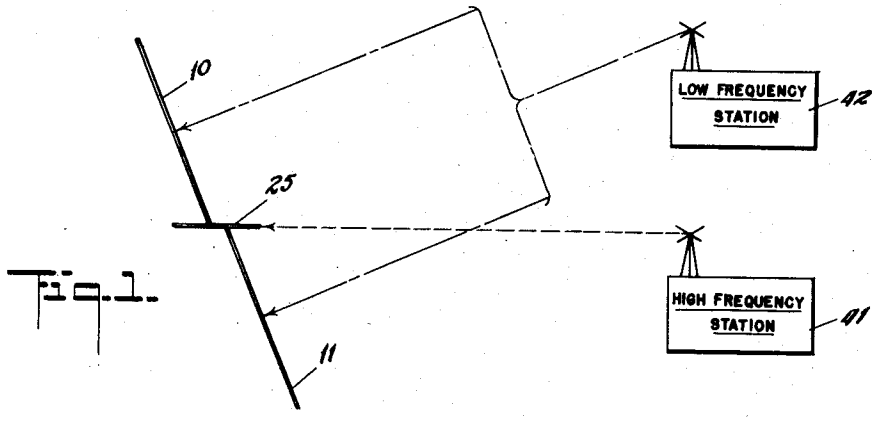


Fig. 1.

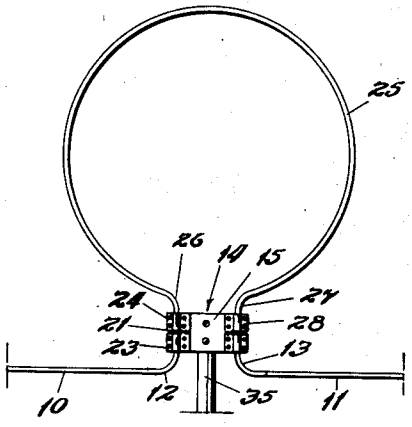


Fig. 2.

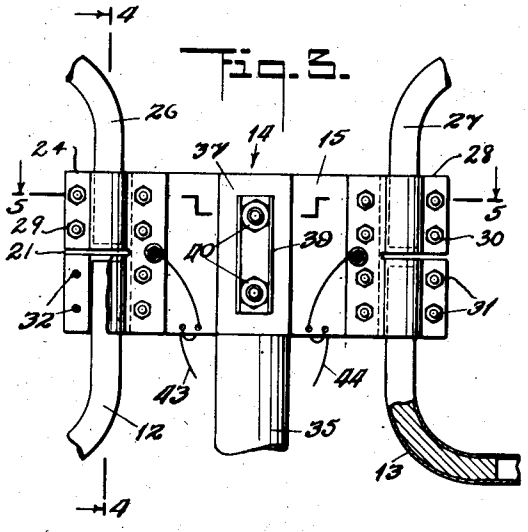


Fig. 3.

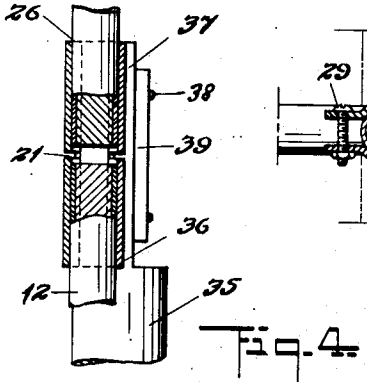


Fig. 4.

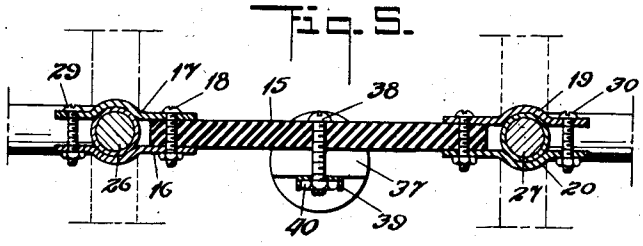


Fig. 5.

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Patented July 7, 1953

2,644,888

UNITED STATES PATENT OFFICE

2,644,888

HIGH-FREQUENCY ANTENNA

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Application January 25, 1949, Serial No. 72,699

5 Claims. (Cl. 250—33.51)

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This invention relates to antennas for high frequency uses and in particular for television and frequency modulation receiving systems where a plurality of stations may be located in various directions in relation to the receiver.

The use of dipole antennas for the above mentioned purposes is, of course, well known. It is common to employ two sets of dipoles, each cut to predetermined frequencies. The smaller dipoles are oriented to the high frequency stations while the larger are oriented to the low frequency stations and common leads are generally used to connect the antenna to the television receiver. The present invention has for its object the provision of such an antenna system which has greater sensitivity than that described and which takes the form of a more unitary structure. The antenna of the instant invention is of further utility in that the high frequency and low frequency elements do not hinder each other in their respective ranges of operation, but, on the contrary, enhance the efficiency of the complementary component as will be hereinafter described.

In the form shown, the antenna combines a dipole and a loop in a series relationship, the loop being formed or connected at the inner ends of the two dipole arms. Thus, a more or less continuous or unitary structure is formed. Means are further provided to orient the loop in respect to the dipole without interfering with the electrical continuity and for the purpose of directing the antenna elements to the proper stations, the loop serving as the high frequency responsive element while the dipole serves as the low frequency responsive element of the antenna. The television band at present covers a range of about 50 to 220 megacycles and the loop and dipole elements respectively serve the upper and lower portions of this band.

An antenna constructed according to the instant invention is of further utility in that considerable metal is conserved while nevertheless providing an antenna of extremely high efficiency. This conservation of metal is of importance and the reduced bulkiness of the structure render it more wind-resistant.

The invention will be further understood from the following description and drawings, in which:

Fig. 1 is a schematic view illustrating the orientation of the antenna elements to the stations to be received.

Fig. 2 is an elevational view of the antenna per se, the dipole being shown broken away.

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Fig. 3 is a fragmentary view illustrating the connection of the loop to the dipole.

Fig. 4 is a sectional view taken along the lines 4—4 of Fig. 3.

Fig. 5 is a sectional view taken along the lines 5—5 of Fig. 3.

Referring to Fig. 2, the antenna comprises a pair of dipole arms 10 and 11 which are cut to a predetermined frequency in the low frequency portion of the band to be received. In the present instance, such low frequency portion may be from about 60 to 100 megacycles. As such, the dipole may be cut to resonate at about 80 megacycles.

The dipole arms are formed with offset ends 12 and 13 to permit of their connection to bracket 14 wherein they may be oriented as required. Bracket 14 comprises a block of insulation 15. Clamps 16 and 17 are connected as by bolts 18 to one side of block 15 while clamps 19 and 20 are connected to the other side. Each clamp has a slot 21 formed transversely thereof so as to provide upper and lower clamp sections which may be independently tightened. Thus, clamp section 23 accommodates the offset end 12 of dipole arm 10 while clamp section 24 accommodates one end of the loop 25.

Loop 25, in the form shown, is a single turn of metal, open, as conventional, at the loop ends. Loop ends 26 and 27 are received in the clamp sections 24 and 28 respectively. In order to make the loop secure within the bracket clamp sections, tightening bolts 29 and 30 are screwed down so as to secure the ends 26 and 27. In the same manner, tightening bolts 31 and 32 secure the offset ends 12 and 13 of the dipole.

A mast 35 serves to support the antenna structure above disclosed. The mast is formed with an upper platform shoulder 36 upon which the block 15 rests. A vertical section 37 is also provided which rests flatly against the face of block 15, as illustrated in Fig. 5. Bolts 38 transverse block 15 and are received through openings of channel member 39 where they are engaged by nuts 40. In this way, the block 15 and the antenna elements supported thereby are made fast to the mast 35.

The antenna of the instant invention is utilized as follows:

Referring to Fig. 1, the loop 25 is pointed at high frequency station 41 by directing one edge of the loop thereat. This is, of course, the normal way of orienting a loop to any particular station. In the form shown, the loop 25 may be about 22 inches in diameter in order to serve the

high frequency range above mentioned. Nuts 31 and 32 are maintained in semi-tightened condition in order to permit orientation of the dipole relative to the loop. The dipole arms 10 and 11 are then rotated in their clamp sections until they are broadside to the low frequency station 42. At this time, the nuts 31 and 32 are tightened so as to maintain the antenna elements in their predetermined relationship. It will be understood that the stations may be somewhat dispersed in relation to the antenna. Accordingly, both the loop and the dipole components may be oriented to intermediate points between stations so as to obtain the best coverage as will be understood. The lead wires 43 and 44 generally comprise the wires of co-axial cable or the like so as to effect electrical connection to the television receiver.

It will be observed that the dipole may be oriented without disturbing the electrical connection to the loop because of the metallic bracket clamps. Such orientation is rendered very convenient by virtue of the offset dipole ends which rotate in the respective clamp sections. It is believed that the efficiency of the dipole is particularly enhanced by the physical formation of the loop which appears to function as a matching stub for the dipole. It is the central position of the loop in respect to the dipole which achieves this result. It is understood, of course, that the size of loop 25 is chosen so that its inductance serves the high frequency end of the television band generally about 110 megacycles and upwards to 220 megacycles. The loop provides a good response at 110 megacycles and its efficiency appears to further increase at the higher frequencies. Its matching stub function is found to be of particular utility in relation to dipole arms 10 and 11 when it is constructed according to the approximate dimensions described.

What is claimed is:

1. An antenna comprising a pair of dipole arms in a horizontal plane and having one end of each substantially adajcent the other, metallic bracket means in which said ends are rotatably received, and a loop, the ends of the loop being connected to said metallic bracket means so as to be electrically connected to said respective dipole arm ends, said dipole arm ends being electrically insulated from each other apart from their connection to said loop, said bracket means comprising an insulating block having a pair of clamping brackets on the respective sides thereof, each of said clamping brackets being slotted transversely to form upper and lower clamp sections, said dipole arm ends being received in the lower clamp sections and the loop ends being received in the upper clamp sections.

2. An antenna according to claim 1 and wherein said dipole arms are formed with offset inner ends for physical reception into said lower clamp sections, said offset ends being rotatable in said lower clamp sections, and means to tighten said lower clamp sections to prevent rotation when the dipole arms have been properly oriented.

3. An antenna comprising a pair of substantially aligned dipole arms, one end of each being adjacent the other, an insulator connecting said ends, metallic clamping brackets on the respective sides of said insulator, said dipole ends being offset from the remainder of the dipole arms, each of said clamping brackets being slotted transversely to form upper and lower clamp sections, said offset dipole ends being received in the lower clamp sections and being rotatable therein when said lower clamp sections are not tightened, a loop, the ends of the loop being received in said upper clamp sections, means to tighten the loop ends in said upper clamp sections so as to be supported thereby, means to tighten said lower clamp sections after said dipoles have been suitably oriented in respect to said loop, said dipole arms being of a size so as to jointly resonate at approximately 80 megacycles and said loop being a single turn approximately 22 inches in diameter, said loop thereby functioning as a matching stub for the dipole arms.

4. An antenna comprising a horizontal receiving rod and a loop connected at an end thereof so as to be electrically continuous therewith, said rod being swingable in a horizontal plane relative to the loop so that it may be oriented relative to the loop, said loop being disposed in a vertical plane and being of a diameter so as to resonate at a substantially higher frequency than said horizontal receiving rod.

5. An antenna comprising a pair of horizontal dipole arms having one end of each substantially adjacent the other, a loop connecting said dipole arm ends, and means to orient said loop independently of said dipole arms, said loop being disposed in a vertical plane and being of a diameter so as to resonate at a higher frequency than said pair of dipole arms.

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