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W. E. ROBBINS

2,640,932

ANTENNA

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FIG. 1

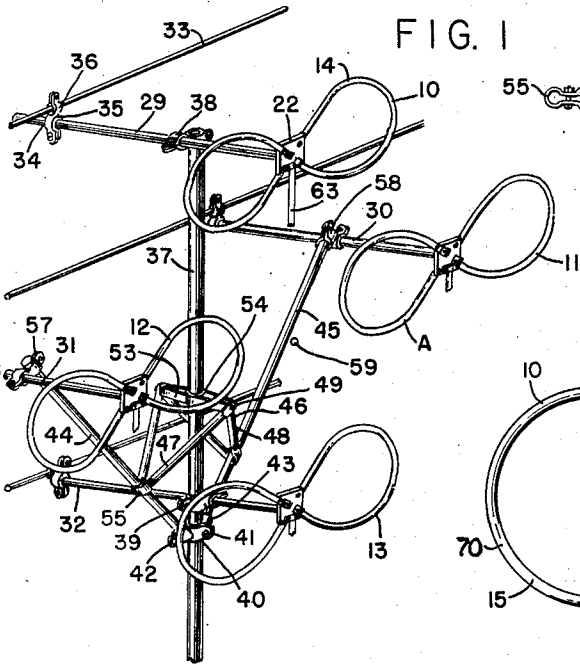


FIG. 8

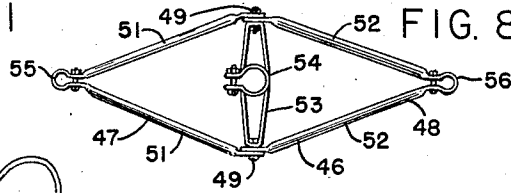


FIG. 7

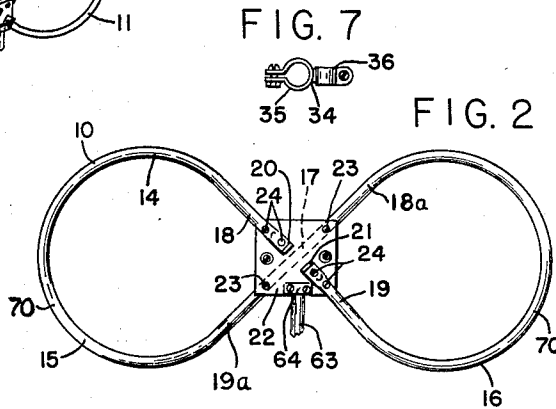


FIG. 2

FIG. 5

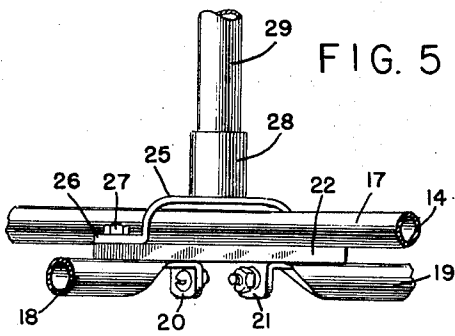


FIG. 4

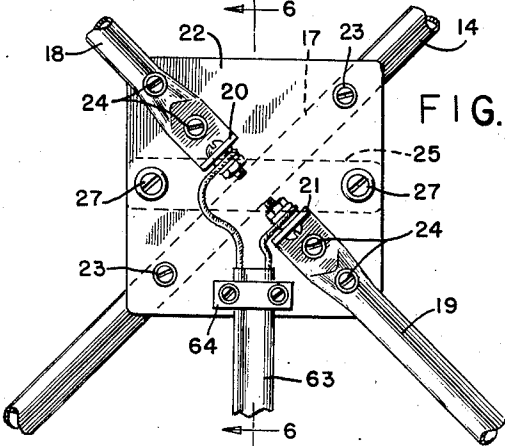


FIG. 3

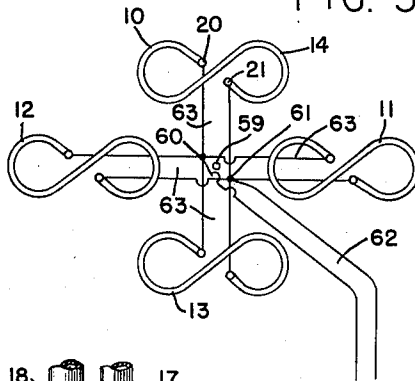
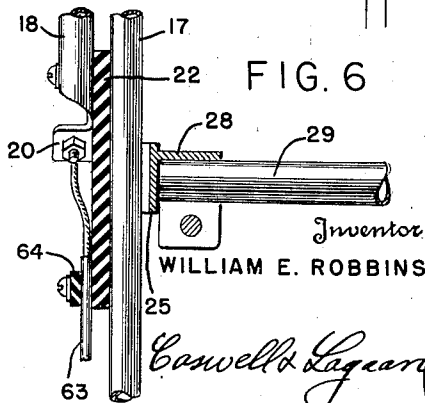


FIG. 6



ATTORNEYS

UNITED STATES PATENT OFFICE

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ANTENNA

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13 Claims. (Cl. 250—33.53)

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The herein disclosed invention relates to antennae and has for an object to provide an antenna particularly adapted for use with television apparatus and other short wave apparatus.

Another object of the invention resides in providing an antenna which will have sensitivity greatly in excess of the antennae now used for the purpose.

A still further object of the invention resides in providing an antenna which will have great structural strength and which will effectively resist the stresses produced by the weather elements.

Another object of the invention resides in providing an antenna S-shaped in form with two oppositely extending loops and in providing the terminals of the antenna at the ends of conductor from which the antenna is formed.

An object of the invention resides in constructing the antenna of such dimensions that the length of the conductor from which the antenna is constructed is equal to approximately one wave length.

A still further object of the invention resides in bringing the terminals of the antenna at the center of the same and at the locality of the crossover portion of the antenna.

An object of the invention resides in arranging the loops of the antenna in a vertical plane.

A feature of the invention resides in providing a single support for the antenna located at the crossover portion of the same and supporting the ends and crossover portion as well as forming an insulator for supporting the transmission line connected to the terminals of the antenna.

An object of the invention resides in providing a composite antenna comprising a number of S-shaped antennae arranged in a single vertical plane symmetrically about a common center and spaced from said center a distance from the center of each antenna equal to approximately one-quarter wave length.

Another object of the invention resides in providing a composite antenna consisting of four S-shaped antennae arranged in a vertical plane in the form of a diamond with the major axis of each antenna parallel to the ground and arranged so that the distance between the center of each antenna and the center of the diamond is approximately one-quarter wave length and in connecting all of the antennae in parallel to a common transmission line having terminals at the center of the diamond.

Another object of the invention resides in the specific construction of the supporting structure for the antennae.

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Other objects of the invention reside in the novel combination and arrangement of parts and in the details of construction hereinafter illustrated and/or described.

In the drawings an antenna S-shaped in form has been illustrated which is constructed from a single conductor bent to form two loops with a crossover portion and with the ends of the conductor from which the antenna is constructed in close proximity to the crossover portion at the center of the antenna. The crossover portion and the ends of the conductor from which the antenna is constructed are connected to an insulator and are supported thereby and the ends of the conductor are insulated from one another and the crossover portion to form terminals to which a transmission line may be connected. The total length of the conductor from which the antenna is constructed is substantially equal to one wave length. In the drawings a composite antenna is shown which consists of four S-shaped antennae arranged in a vertical plane in the form of a quadrilateral. These antennae are situated so that the distance from the center of each antenna to the center of the quadrilateral is approximately equal to one-quarter wave length. These antennae are connected in parallel and to a transmission line having terminals at the center of the quadrilateral. A supporting structure for the antennae is shown which comprises cross-bars carrying the antennae and reflectors used in conjunction therewith and mounted on fittings and supporting arms attached to a suitable mast.

In the drawings:

Fig. 1 is a perspective view of a composite antenna illustrating a number of antennae each of which shows an embodiment of the invention.

Fig. 2 is an elevational view of one of the antennae shown in Fig. 1 and drawn to a greater scale than the scale used for Fig. 1.

Fig. 3 is a wiring diagram of the invention shown in Fig. 1.

Fig. 4 is an elevational view of the mounting of the antenna shown in Fig. 2 and drawn to a greater scale.

Fig. 5 is a plan view of the structure shown in Fig. 4.

Fig. 6 is an elevational sectional view taken on line 6—6 of Fig. 4.

Fig. 7 is an elevational view of one of the mountings of the invention and drawn to a reduced scale.

Fig. 8 is a plan view of the brace of the invention and drawn to the same scale as Fig. 7.

The invention disclosed in the drawings consists of a composite antenna indicated in its en-

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tirety by the reference character A. This antenna consists of four individual antennae 10, 11, 12 and 13, each constructed in accordance with the invention. These antennae being identical in construction, only the antenna 10 will be described in detail.

The antenna 10 as best shown in Fig. 2 consists of a conductor 14 constructed of aluminum tubing, or other suitable material and which is bent in the form of a letter S to provide first and second loops 15 and 16 with curved outer portions 17 and angularly disposed right-hand inner portions 18 and 18a and left-hand inner portions 19 and 19a. The portions 18a and 19a lie in continuation of one another and are integral and form a crossover portion 17 between the two loops 15 and 16. The portions 18 and 19 of the conductor 14 are the end portions of the conductor 14 and lie in continuation of one another. These portions terminate in close proximity to the crossover portion 17 of the said conductor. The direction of extent of the end portions 18 and 19 form with the direction of extent of the crossover portion 17 and angle of substantially 90°. The extreme ends of the end portions 18 and 19 of the conductor are flattened out and bent up to form terminals 20 and 21 by means of which the antenna may be connected to the apparatus with which it is to be used. The conductor 14 is supported by means of an insulator 22 constructed of a plate of polystyrene or some other suitable insulating material which can be readily machined and which has sufficient insulating characteristics at high frequencies. The crossover portion 17 of the conductor 14 extends on one side of the insulator 22 and the end portions 18 and 19 are disposed on the other side of said insulator. Screws 23 hold the crossover portion 17 attached to the insulator while screws 24 hold the end portions 18 and 19 attached to the insulator. It will be noted that the terminals 20 and 21 are spaced from one another so that the said terminals are insulated from each other and that crossover portion 17 is on the opposite side of the insulator 22 from the end portions 18 and 19 so that said terminals are also insulated from the crossover portion.

The insulator 22 has attached to it a U-shaped strap 25 which straddles the crossover portion 17 of the conductor 14 as best shown in Figs. 5 and 6. This strap has feet 26 which rest on said insulator. Bolts 27 extending through the said feet and the insulator clamp the said strap in position. The strap 25 has brazed or welded to it a tube clamp 28 in which is mounted a supporting tube 29. Similar tubes 30, 31 and 32 are attached to the antennae 11, 12 and 13.

The antenna 10 utilizes a reflector 33 which is attached to the tube 29 by means of a mounting 34 shown in detail in Fig. 7. This mounting 34 consists of two tube clamps 35 and 36 which are arranged at right angles to each other and welded or brazed together. The clamp 35 is adapted to receive the end of the tube 29 while the clamp 36 is adapted to receive the reflector 33. In this manner the antenna and reflector are supported in proper relation to one another.

The tube 29 is attached to the upper end of a mast 37 by means of another mounting 38. This mounting is identical with the mounting 34. The antenna 13 is supported in the same manner as the antenna 10, being carried by a mounting 39 also identical with the mounting 34. Directly below the mounting 39 is a mounting 40 which consists of a tube clamp 41 embracing the mast 37

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and two tube clamps 42 and 43 arranged at an angle. These tube clamps receive the ends of supporting arms 44 and 45 which extend angularly outwardly from the mast 37 and in a plane parallel to the plane of the antennae 10 and 13. The arms 44 and 45 are held in position by means of a brace 46 which consists of two sections 47 and 48 hingedly connected together by means of hinge bolts 49. The sections 47 and 48 include tubes 51 and 52 and through which the bolts 49 extend. These bolts also pass through a cross bar 53 which is provided at its center with a tube clamp 54. This tube clamp receives the mast 37 and serves to rigidly secure the brace to the same. The ends of the tubes 22 are flattened out and are formed to provide tube clamps 55 and 56 which are adapted to receive and clamp the arms 44 and 45. The outer ends of the arms 44 and 45 have mountings 57 and 58 attached thereto which are identical with the mounting 34 and which support the tubes 30 and 31.

The length in feet of the conductor 14 forming the antennae 10, 11, 12 and 13 is determined by dividing 984 by the frequency in megacycles per second, giving a length substantially equal to one wave length at the frequency at which optimum performance is desired. At the geometric center of the composite antenna which is diagrammatically indicated at 59 in Fig. 1 is provided a terminal not shown in the drawings. The four antennae 10, 11, 12 and 13 are all located in the form of a quadrilateral being situated so that the centers of the insulators 22 of the said antennae are equally spaced from the center 59 and a distance equal to substantially one-quarter wave length. The antennae are all situated substantially in a common vertical plane. The length of the reflector 33 is approximately equal to 59.7% of a wave length while the spacing of the reflector from the antenna varies from 15% to 30% of a wave length.

In the wiring diagram shown in Fig. 3 two terminals 60 and 61 are diagrammatically designated which are at the locality of the center 59. These terminals have connected to them a transmission line 62 which, when the antenna is used for television reception, may be a 300 ohm line. The said terminals are connected by means of feeder lines 63 to the terminals 20 and 21 of the various antennae whereby all of the antennae are connected in parallel and to the transmission line 62. The various antennae are connected in the manner shown in Fig. 3 so that the currents in said antennae all travel in the same direction in all of the antennae. Likewise the current in each of the antennae travels in the same direction throughout the conductor forming the said antenna.

I have found that in actual use an antenna constructed in accordance with the instant invention is far more efficient than a doublet or folded dipole or other similar antenna now used for the purpose. I have also found that the composite antenna utilizing the four individual antennae arranged in the form of a quadrilateral and spaced apart substantially one-half wave length gives remarkable results far greater than might be normally expected. With such an antenna interference is greatly reduced.

Changes in the specific form of the invention, as herein described, may be made within the scope of what is claimed without departing from the spirit of the invention.

Having described the invention, what is

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claimed as new and desired to be protected by Letters Patent is:

1. In an antenna a conductor S-shaped in form having two oppositely extending loops with a crossover portion therebetween and with the ends of the conductor situated adjacent the center of the crossover portion and insulated therefrom and from one another to form separate ungrounded terminals to which a twin lead transmission line may be connected.

2. In an antenna a conductor S-shaped in form having two oppositely extending loops with a crossover portion therebetween and with the ends of the conductor situated adjacent the center of the crossover portion and an insulator disposed between said crossover portion and the ends of the conductor and to which said crossover portion and the ends of the conductor are attached.

3. In an antenna conductor S-shaped in form with the ends of the conductor insulated from one another and from the rest of the conductor and disposed at the center of the antenna and forming terminals to which a transmission line may be connected.

4. In a composite antenna a number of antennae each S-shaped in form each having terminals near its center, said antennae being arranged substantially in a vertical plane and arranged about a geometric center at a distance from said center to the center of the antennae substantially equal to one-quarter wave length, two terminals located substantially at said geometric center, a transmission line connected to said terminals and feeders connected to said terminals and to the terminals of said antennae.

5. In a composite antenna a number of antennae each S-shaped in form each having terminals near its center, said antennae being arranged substantially in a vertical plane and arranged about a geometric center at a distance from said center to the center of the antennae substantially equal to one-quarter wave length and a transmission line connected to the terminals of said antennae and connecting said antennae in parallel, said transmission line having terminals at said geometric center.

6. In a composite antenna a number of antennae each S-shaped in form each having terminals near its center, said antennae being arranged substantially in a vertical plane and arranged about a geometric center at a distance from said center to the center of the antennae substantially equal to one-quarter wave length, terminals at said geometric center, feeders connected to said terminals and to said antennae and connecting said antennae in parallel and a transmission line connected to said terminals.

7. In a composite antenna four antennae each S-shaped in form each having terminals near its center, said antennae being arranged substantially in a vertical plane in the form of a quadrilateral and about a geometric center, the distance between the center of each antenna and said geometric center being substantially a quarter wave length, two terminals located substantially at said geometric center, a transmission line connected to said terminals and feeders connected to said terminals and to the terminals of said antennae.

8. In a composite antenna four antennae each S-shaped in form each having terminals near its center, said antennae being arranged substantially in a vertical plane in the form of a quadrilateral and about a geometric center, the dis-

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tance between the center of each antenna and said geometric center being substantially a quarter wave length, the major axes of all of said antennae being parallel to the ground, two terminals located substantially at said geometric center, a transmission line connected to said terminals and feeders connected to said terminals and to the terminals of said antennae.

9. In an antenna, a conductor formed in the configuration of a letter S with the ends of the conductor in juxtaposition near the center of the configuration and insulated from one another and a twin lead transmission line connected to the extreme ends of said conductor.

10. In an antenna, a conductor provided with first and second oppositely facing loops disposed substantially in a common plane each having curved outer portions and angularly disposed right-hand and left-hand inner portions, the right-hand inner portion of the first loop being connected to and disposed in alignment with the left-hand inner portion of the second loop to form an ungrounded crossover portion between said loops, the left-hand inner portion of the first loop and the right-hand inner portion of the second loop being disposed in alignment with one another and the extreme ends thereof falling short of one another and of said crossover portion and being disposed in juxtaposition near the center of said crossover portion and an ungrounded twin lead transmission line connected to the extreme ends of the left-hand inner portion of the first loop and the right-hand inner portion of the second loop.

11. In an antenna, a conductor provided with first and second oppositely facing loops disposed substantially in a common plane each having curved outer portions and angularly disposed right-hand and left-hand inner portions, the right-hand inner portion of the first loop being connected to and disposed in alignment with the left-hand inner portion of the second loop to form a crossover portion between said loops, the left-hand inner portion of the first loop and the right-hand inner portion of the second loop being disposed in alignment with one another and the extreme ends thereof falling short of one another and of said crossover portion and being disposed in juxtaposition near the center of said crossover portion, the direction of extent of the left-hand inner portion of the first loop and the right-hand inner portion of the second loop forming with the direction of extent of said crossover portion an angle of substantially ninety degrees and a transmission line connected to the extreme ends of the left-hand inner portion of the first loop and the right-hand inner portion of the second loop.

12. In an antenna, a conductor provided with first and second oppositely facing loops disposed substantially in a common plane each having curved outer portions and angularly disposed right-hand and left-hand inner portions, the right-hand inner portion of the first loop being connected to and disposed in alignment with the left-hand inner portion of the second loop to form an ungrounded crossover portion between said loops, a four cornered insulator, said crossover portion extending diagonally across two of the corners of said insulator and secured to the insulator, the left-hand inner portion of the first loop and the right-hand inner portion of the second loop being disposed in substantial alignment with one another and the extreme ends thereof falling short of one another and of said

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crossover portion and being disposed in juxtaposition near the center of said crossover portion and extending diagonally across the other corners of the insulator and attached thereto and an ungrounded twin lead transmission line connected to the extreme ends of the left-hand inner portion of the first loop and the right-hand inner portion of the second loop.

13. In an antenna, a conductor provided with first and second oppositely facing loops disposed substantially in a common plane each having curved outer portions and angularly disposed right-hand and left-hand inner portions, the right-hand inner portion of the first loop being connected to and disposed in alignment with the left-hand inner portion of the second loop to form an ungrounded crossover portion between said loops, a plate-like insulator, said crossover portion extending across said insulator on one side thereof and being attached to said insulator outwardly of the center thereof, the left-hand inner portion of the first loop and the right-hand inner portion of the second loop being disposed in substantial alignment with one

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another and the extreme ends thereof falling short of one another and of said crossover portion and being disposed in juxtaposition near the center of said crossover portion and extending transversely of said crossover portion on the other side of said insulator and secured thereto outwardly of the center thereof and of said crossover portion, and an ungrounded twin lead transmission line connected to the extreme ends of the left-hand inner portion of the first loop and the right-hand inner portion of the second loop.

WILLIAM E. ROBBINS.

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