Dec. 23, 1941. N. E. LINDENBLAD 2,267,613

BROADCAST ANTENNA

Filed Sept. 8, 1938

Fig. 1

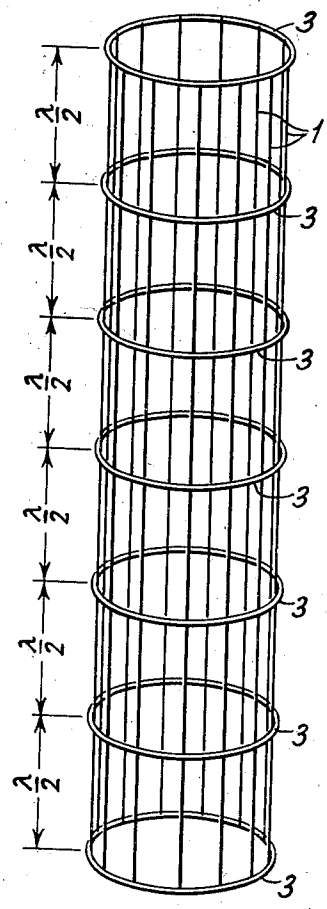


Fig. 2

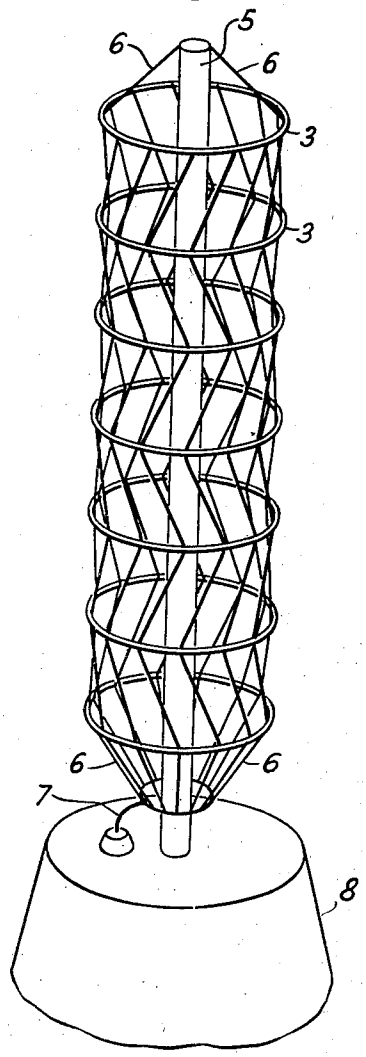
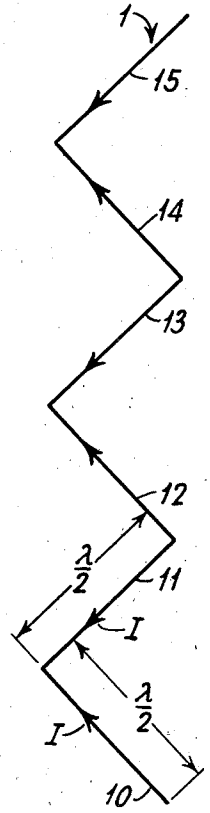


Fig. 3



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BROADCAST ANTENNA

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7 Claims. (Cl. 250—33)

The present invention relates to a short wave antenna and, more particularly, to a broadcast antenna for radiating a horizontally polarized wave.

A primary object of the present invention is to enable the transmission of short radio waves having a predominantly horizontal polarization with a substantially uniform and maximum radiation in a horizontal plane.

Another object of my invention is to provide an antenna for radiating a horizontally polarized electro-magnetic wave which may be conveniently mounted in a restricted space such as on a small roof top or the top of a tower.

The foregoing objects and others which may appear from the foregoing specification are achieved by providing an antenna having a plurality of radiating sections, each section being composed of a number of half wave dipole antennas arranged cylindrically about a common vertical axis, the dipoles of each section being inclined with respect to those of the adjacent sections so that the resultant radiated wave has a predominantly horizontal polarization. The dipoles of each section are so inclined with respect to those of the adjacent sections that the vertical component radiated from the sections is in phase opposition and therefore is cancelled.

A better understanding of the present invention may be had by referring to the following detailed description which is accompanied by a drawing in which Figure 1 illustrates the antenna in the process of construction, while Figure 2 illustrates a completed antenna and Figure 3 illustrates diagrammatically the current distribution through one of the conductors of the antenna.

As may be seen from Figure 1, the antena comprises a large cylindrical cage composed of longitudinal wires 1 held together at half wave intervals by circular rings 3. The diameter of rings 3 is preferably slightly more than a half the length of the operating wave or an odd multiple thereof. The cage thus constructed is then supported in any suitable manner from a vertical central pole and the adjacent rings 3 are given opposite twists so that the originally straight longitudinal wires 1 describe a zig-zag line, as shown in Figures 2 and 3. The antenna may be fed from the bottom, as indicated in Figure 2, by transmission line 7 and a desired number of sections cascaded to give a great vertical directivity. In Figure 2, the antenna is indicated as being supported from the central mast 5 by means of supporting wires 6. The antenna may be supported on the top of a tower 8 or on a comparatively small roof top.

From the schematic diagram in Figure 3 it will be apparent that the current in adjacent half wave dipole sections 10, 11, for example, have an in phase arrangement to give a horizontally polarized rotating component. However, from the standpoint of the vertically polarized component it will be seen that the currents in the adjacent sections, as indicated by I and I' are in opposite directions and will therefore cancel. The greater the number of sections 10, 11, 12, 13, 14 and 15 that are provided the greater will be the resulant directivity.

The antenna, as shown in Figure 2 with the adjacent sections effectively fed in series will have a sharp tuning characteristic which is highly desirable in short wave broadcasts or for telegraphic signals. However, this sharp tuning effect results in an insufficient band width for television purposes. This may, however, be overcome by using a multiple parallel feed at each ring 3 through a feed system which in itself is not cascaded. This feed system may, for example, consist of a multiple branched transmission line or a separate transmission line or each section may be used.

While I have shown and particularly described an embodiment of my invention, it is to be clearly understood that my invention is not limited thereby but that modifications may be made within the scope of my invention.

I claim:

1. A broadcast antenna comprising a plurality of radiating sections disposed in vertical alignment, each section comprising a plurality of radiators arranged to form a closed geometric figure in the horizontal plane and disposed at an angle of 45° with the horizontal said radiators on opposite sides of said figure being so spaced as to radiate substantially uniformly in all directions toward the horizon, the radiation of adjacent sections being so related that the horizontal components of the wave are additive and the vertical components are substractive whereby substantially only a horizontally polarized wave is radiated.

2. A broadcast antenna comprising a plurality of radiating sections, each section being composed of a number of half wave dipole radiators arranged cylindrically about a common vertical axis, the effective diameter of each section being such that the radiation from diametrically opposite radiators is combined in an additive relationship, the radiators of each section being so

inclined with respect to the radiators of adjacent sections that the horizontal components of the wave radiated from each section are in an additive relationship with the wave radiated from adjacent sections while the vertical components are mutually in phase opposition.

3. A broadcast antenna comprising a plurality of radiating sections, each section being composed of a number of half wave dipole radiators arranged about a common vertical axis to form a cylinder having a diameter equal to an odd multiple, including unity, of a half of the length of the operating wave, the radiators of each section being inclined at such an angle with respect to the radiators of adjacent sections that the horizontal components of the wave radiated are in an additive relationship while the vertical components are mutually in phase opposition.

4. A broadcast antenna comprising a plurality of radiating sections each section being composed of a number of half wave dipole radiators arranged about a common vertical axis to form a cylinder having a diameter equal to an odd multiple, including unity, of a half of the length of the operating wave, the radiators of each section being inclined at an angle of 45 degrees with respect to the vertical, the radiators of adjacent sections being inclined in opposite directions whereby substantially only a horizontally polarized wave is radiated.

5. A broadcast antenna comprising a plurality of supporting rings co-axially disposed about a common vertical axis, a plurality of conductors attached to said rings forming a cage, the portions of said conductors between adjacent rings being inclined with respect to the vertical, the inclination between adjacent pairs of rings being in opposite direction and means for energizing said antenna, said rings having a diameter equal to an odd multiple, including unity, of a half of the length of the operating wave.

6. A broadcast antenna comprising a plurality of conductive supporting rings co-axially disposed about a common vertical axis, a plurality of continuous conductors attached to said rings to form a cage, the portions of said conductors between adjacent rings being inclined with respect to the vertical, the inclination between adjacent pairs of rings being in opposite directions and means for energizing said antenna whereby only a horizontally polarized wave is radiated, the diameter of each of said rings being such that the radiation from diametrically opposite radiators is combined in an additive relationship.

7. A broadcast antenna comprising a plurality of conductive supporting rings co-axially disposed about a common vertical axis, a plurality of continuous conductors attached to said rings to form a cage, the portions of said conductors between adjacent rings being inclined with respect to the vertical, the inclination between the adjacent pairs of rings being in opposite directions and means connected to the end one of said rings for energizing said antenna whereby only a horizontally polarized wave is radiated, said rings having a diameter equal to an odd multiple, including unity, of a half of the length of the operating wave.

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