Feb. 21, 1933. G. B. HAGEN 1,898,661

ANTENNA SYSTEM

Filed Oct. 29, 1931

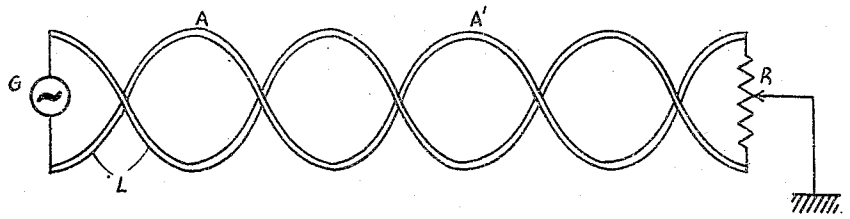


Fig. 1

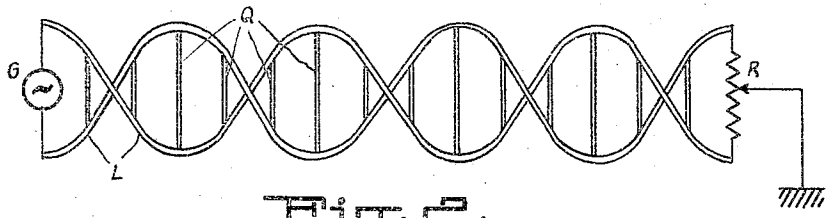


Fig. 2

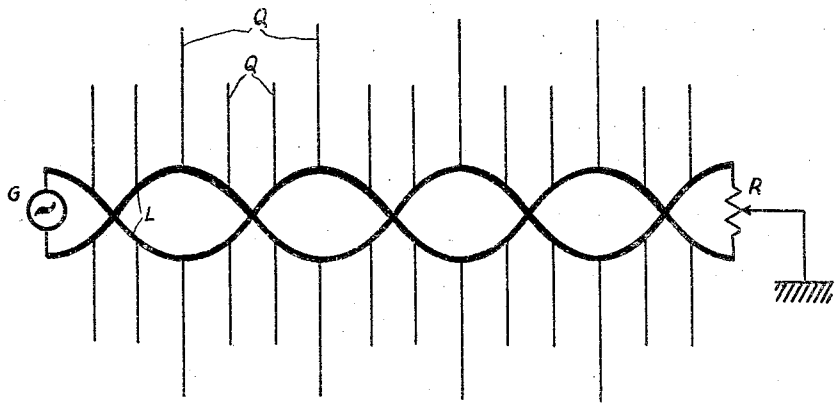


Fig. 3

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ANTENNA SYSTEM

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It is well known in the art that directional short-wave antennæ are adapted to insure unilateral directional transmission or reception of waves longitudinally of the antenna system. These so-called Beverage or "wave" antennæ consist of a linear aerial wire of several wave-lengths stretched out mostly parallel to the surface of the earth. It has also been suggested to use a double-wire line, with the two wires being about ½ wave-length apart, for the same purpose. To increase the radiation of such antennæ, the arrangement mentioned above has been modified in such a way that transversal radiators having a length which is small compared with the wave-length are arranged on a double-wire line, either between the two wires of the double-wire line or extending outwardly therefrom. If the lateral radiators are excited at a phase rotation which corresponds to a space wave propagating along a double-wire line, then if a is the distance between the various radiators, and c is the velocity of light, the time phase difference of the currents in two consecutive antennæ should be chosen a/c, with the transversal radiators being built up in the space of a progressing wave.

It is also known that circularly polarized waves are subject to fading only to a limited extent. For the production of directional circularly polarized waves as known in the prior art it has always been necessary to have available two distinct systems, each system possessing directional properties but having dissimilar polarizing properties, the two systems being cyclically and sequentially excited. Also, for the reception of circularly polarized waves it has heretofore been customary to employ two systems each system possessing particular directional properties, though both having different polarizing properties.

The present invention relates to a simplified directional antenna system adapted for operation with circularly polarized waves. In contradistinction to the arrangements in the prior art which use two separate and independent systems with dissimilar polarizing properties, recourse is had to the scheme of forming the heretofore rectilinear lines of a double-wire wave antenna in a helical manner, with transverse radiators being provided, if desired, between them.

The basic idea underlying the invention is diagrammatically illustrated in the accompanying drawing wherein Fig. 1 represents an unbranched double-wire antenna L wound helically about the longitudinal axis. Figs. 2 and 3 illustrate helical antennæ with transversal radiators Q. These transverse radiators Q are shown in Fig. 2 disposed between the double-wire line, whereas in Fig. 3 they are shown extending outwardly from the double wire line. A source of radio frequency energy G is provided for feeding the sending antenna. The two lines L may be connected at their ends with a resistance R. The full pitch (distance A A′, Figs. 1 to 3) of the helical line in this scheme should preferably be chosen equal to one wavelength; if it differs therefrom the arrangement will be found serviceable with the operation of elliptically polarized waves. In order to maintain suitable phase relations of the currents in the transversal radiators, conveniently proportioned series or parallel impedances may be mounted in the feeder wires.

I claim:

1. A short wave directional antenna system comprising a double wire line wound helically around the central longitudinal axis, transverse radiators connected to the wires of said line and spaced along the length of said line, high frequency apparatus connected to the wires at one end of said line, and a load connecting the wires at the other end of said line.

2. A short wave directional transmitting antenna system arranged to radiate circularly or electrically polarized waves comprising a double wire line wound helically around the central longitudinal axis, the pitch of the helical turns of the individual wires of said line being substantially equal to one wave length, transversal radiators connected to the wires of said line and spaced along the length thereof, energizing apparatus connected to the wires at one end of said

line and a surge impedance connecting the wires at the other end of said line.

3. A short wave transmission antenna system arranged to radiate circularly or electrically polarized waves comprising a double wire line wound helically around the central longitudinal axis, substantially closely spaced transversal radiators connected to the wires of said line, and high frequency apparatus connected to the wires at one end of said line.

4. A short wave transmission antenna system arranged to radiate circularly or electrically polarized waves comprising a double wire line wound helically around the central longitudinal axis, substantially closely spaced transversal radiators connected to the wires of said line, high frequency apparatus connected to the wires at one end of said line, a resistance connecting together the wires at the other end of said line, and a connection from the center point of said resistance to ground.

5. A system in accordance with claim 4, characterized in this, that the value of said resistance is equal to the surge impedance of the line.

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