

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) LOOP ANTENNA

- (71) I, SHIU-CHANG LOH, a British Subject, of 12 Cooper Road, Jardine's Look-out, Hong Kong, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The invention relates to a loop antenna.
- According to the invention a loop antenna comprises a conductor in the form of a loop of one or more turns a first plane conductive reflector parallel to the plane of the loop spaced apart therefrom on the axis thereof and a second plane conductive reflector parallel to the plane of the loop on the axis thereof and on the side thereof remote from the first conductive reflector, the second reflector being smaller than the first reflector.
- The loop and each reflector may be mounted on a common axial shaft which is of insulating material or from which they are insulated. Preferably each reflector is adjustably mounted on the shaft so that its position with respect to the loop may be altered. The spacing of the reflectors will depend upon the radiation resistance required for the particular application. However, it should normally be within one wavelength of the radiation to be received or transmitted.
- Preferably each reflector is constituted by a conductive mesh.
- Preferably the circumference of the loop is approximately equal to one wavelength of the radiation to be received or transmitted. The loop may be of any closed shape but is conveniently circular, square or rectangular.
- Each reflector may be of any shape. Preferably the first reflector has a minimum linear dimension which is greater than one wavelength of the radiation to be received or transmitted. Preferably the second reflector has a minimum linear dimension which is greater than one quarter of the wavelength of radiation to be received or transmitted.
- The invention will further be described with reference to the accompanying drawings of which:—
- Figures 1, 2 and 3 shows in side elevation three examples of a loop configuration which may be used in an antenna in accordance with the invention; and
- Figures 4 and 5 show respectively in side elevation and end elevation respectively an antenna in accordance with the invention.
- Referring to Figure 1 the loop 1 comprises a single turn of copper tubing formed into a circle of radius a . The circumference $2\pi a$ is approximately equal to λ , the wavelength of the radiation to be received or transmitted.
- Referring to Figure 2 the loop 1 is again of copper tubing formed in a single turn in a square loop. The side of the square is d and $4d$ is approximately equal to λ .
- Referring to Figure 3 the loop is of copper tubing formed into a rectangle of sides d_1 and d_2 . In the case 2 ($d_1 + d_2$) is approximately equal to λ .
- Referring now to Figures 4 and 5 there is shown a loop antenna in accordance with the invention in which a loop 1 as in Figure 1 is mounted on an insulating shaft together with a first reflector 3. Loop 1 is supported by an insulating strut 1a which is fastened to shaft 2. Reflector 3 is formed of a mesh of copper wire cut into circular form. The diameter D_1 of the circle is arranged to be greater than λ . The reflector 3 is mounted to be adjustable on shaft 2 so that the spacing between loop 1 and reflector 3 can be changed to the optimum value.
- Shaft 2 is extended through loop 1 and carries at its end remote from reflector 3 a further, smaller, reflector 4. Reflector 4 is also constituted by a mesh of copper wire as shown in Figure 5. The mesh is cut to circular form and has a diameter D_2 which is greater than $1/4\lambda$. Reflector 4 is mounted to be adjustable on shaft 2 so that its spacing from loop 1 may be set to the optimum. The optimum spacing for reflectors 3 and 4 will depend upon the particular radiation resistance required for the antenna.
- For acceptable performance the dimensions of the antenna have a tolerance of plus or minus 20% about the optimum. In use, the antenna is arranged so that the loop 1 is in

a vertical plane which is directed towards the transmitter or receiver, as the case may be, from which or to which the radiation is transmitted. Both vertically and horizontally polarized radiation may be received.

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The invention is not restricted to the details of the foregoing example described with reference to the accompanying drawings. For example, the loop may be made of more than one turn, it may be of any desired shape and may be constituted by a conductor which is, say, of tubular aluminium or steel or of solid conductive material. The shape of the reflectors need not be circular, but they may be square or rectangular, for example. The reflectors need not be made of mesh and may be solid, perhaps perforated. The material of the reflectors may be any suitable conductive material such as aluminium or steel and need not be copper.

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WHAT I CLAIM IS:—

1. A loop antenna comprising a conductor in the form of a loop of one or more turns, a first plane conductive reflector parallel to the plane of the loop spaced apart therefrom on the axis thereof and a second plane conductive reflector parallel to the plane of the loop on the axis thereof and on the side thereof remote from the first conductive reflector, the second reflector being smaller than the first reflector.

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2. A loop antenna as claimed in claim 1

wherein the loop and each reflector are mounted on a common axial shaft which is of insulating material or from which they are insulated.

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3. A loop antenna as claimed in claim 2 wherein one or each reflector is adjustably mounted on the shaft.

4. A loop antenna as claimed in any of the preceding claims wherein the reflectors are spaced apart a distance equal to or less than the circumference of the loop.

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5. A loop antenna as claimed in any of the preceding claims wherein one or each reflector is constituted by a conductive mesh.

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6. A loop antenna as claimed in any of the preceding claims wherein the first reflector has a minimum linear dimension which is greater than the circumference of the loop.

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7. A loop antenna as claimed in any one of the preceding claims wherein the second reflector has minimum linear dimension which is greater than one quarter of the circumference of the loop.

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8. A loop antenna substantially as hereinbefore described with reference to the accompanying drawings.

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2. A loop antenna as claimed in claim 1

wherein the loop and each reflector are mounted on a common axial shaft which is of insulating material or from which they are insulated.

3. A loop antenna as claimed in claim 2 wherein one or each reflector is adjustably mounted on the shaft.

4. A loop antenna as claimed in any of the preceding claims wherein the reflectors are spaced apart a distance equal to or less than the circumference of the loop.

5. A loop antenna as claimed in any of the preceding claims wherein one or each reflector is constituted by a conductive mesh.

6. A loop antenna as claimed in any of the preceding claims wherein the first reflector has a minimum linear dimension which is greater than the circumference of the loop.

7. A loop antenna as claimed in any one of the preceding claims wherein the second reflector has minimum linear dimension which is greater than one quarter of the circumference of the loop.

8. A loop antenna substantially as hereinbefore described with reference to the accompanying drawings.

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