Aug. 27, 1957 W. J. POLYDOROFF 2,804,617

ANTENNA SYSTEMS

Filed June 2, 1954

FIG. 1.

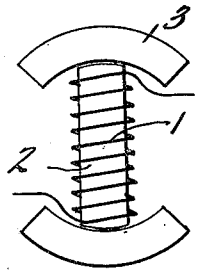


FIG. 2.

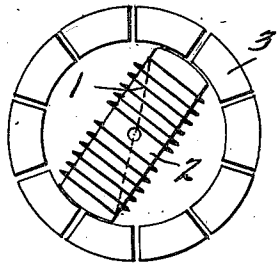
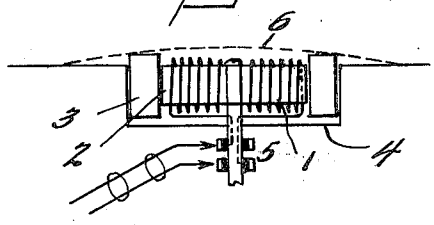


FIG. 3.



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ANTENNA SYSTEMS

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5 Claims. (Cl. 343—788)

This invention relates to antennas of a closed type; so-called loop or coil antennas equipped with ferromagnetic materials in the field of coils.

Hitherto, for the efficient operation of such antenna, it was recognized that the "open type" magnetic circuit should be employed in order to achieve penetration of a radiated magnetic wave or its magnetic field component into the coil. The present invention is based upon the discovery that the mass of magnetic material in the magnetic field acts as a collector of the electromagnetic field of radiations which may be directed further towards a pick-up coil which constitutes the collecting means of the loop antenna. This phenomenon is particularly pronounced with the materials of high permeability such as ferrites.

It is therefore proper to describe, as one object of the present invention, such new constructions of magnetic circuits associated with the antenna which produce an increased efficiency of the antenna. Another object is to provide those circuits adaptable to rotatable loop antennas. Still another object is to be able, by means of new magnetic construction to collect, deflect, and condense at the desired part of the magnetic circuit, the electromagnetic fields derived from the electromagnetic radiations.

The invention will be better understood if reference is made to the accompanying drawings in which:

Fig. 1 shows one practical application of the invention for loops adaptable for the rotation.

Fig. 2 shows a modification of Fig. 1.

Fig. 3 shows the side view of the construction of Fig. 1 and Fig. 2.

Referring now to Fig. 1, one can see a conventional loop composed of pick-up coil **1** and its core **2** similar in construction and operation to the ones described in my Letters Patent #2,624,004. In addition, two crosswise members **3** are added to the main core at its ends; those members would partially "close" the magnetic circuit and may be expected to reduce the efficiency. Actual measurments, however, indicated that the proximity of curved segments **3** increased the effective height of the antenna by 3–4 db as compared with single antenna **1, 2**, both being measured at the same inductance and frequency. Thus it is possible to improve the pick-up property of a loop antenna and as an example of such practical construction, the loop of Figs. 1 and 2 is shown with the members arranged at the ends of the loop proper with a curvature to facilitate the rotation of the loop. It has been found useful to make such collecting members stationary by allowing the loop proper to rotate around several such collecting bars arranged in a circle, such as shown in Fig. 2. Fig. 3, being a side view of Figs. 1 and 2, illustrates another advantage obtained by such magnetic collector members **3**; the loop **1, 2** being rotatably arranged in the center is deep inside the metal container **4**. The commutating rings or "rotating field transformer" may be at the other side of the container such

as shown by **5**. Practice shows that with the arrangement of Fig. 3 one may expect a pick up just as good or better than otherwise obtainable with a fully exposed loop. It is preferable that the collecting members **3** should be so arranged with respect to the rotating loop **2**, that an equal number of magnetic gaps between the segments in the circle lie adjacent to ends of main core at any angle of its rotation so as to preserve the inductance of the loop at all positions. Further to this purpose these magnetic gaps may be so proportioned in their width as to compensate for inequalities in the size, shape and magnetic properties of members **3**. It is known in the art that the shortening of the gaps will cause higher effective permeability and consequent inductance and efficiency of the loop so that the "proportioning" will include the adjustment of the magnetic gaps.

In the event of electrostatic shielding requirements, the construction of Fig. 3 allows a simple expedient in wrapping the structure with the "shielding cloth" **6** and additionally shielding of the ends of the system.

The invention is not limited to the above described examples but should be extended to any other similar applications.

What I claim is:

1. A directional antenna system for the reception of electromagnetic radiations comprising a ferromagnetic loop antenna including a high permeability elongated bar with rounded ends, the length of said bar being considerably greater than its width and its thickness, and a pick-up coil wound with uniform cross-section along the length of said bar, a metal container open at one end to receive said radiations and having means to rotate said antenna substantially in the middle of said container, and a plurality of stationary magnetic members interposed between said antenna and the vertical walls of said container, said magnetic members being in the shape of curved segments of a circle and arranged around the circle of rotation of said antenna with a set of magnetic gaps between said magnetic members, said gaps being considerably greater than each of magnetic gaps formed between said members and said antenna, and said plurality of magnetic members constituting the sole means to attract and deflect the fields of said radiations into said antenna.

2. An antenna system according to claim 1 characterized in that said pick-up coil possesses an inductance which is maintained constant throughout the entire circle of rotation of said antenna by placing said magnetic members to form a complete circle with substantially equal spacing between said adjacent members and by proportioning magnetic gaps between said members.

3. An antenna system according to claim 1, characterized in that said members are of greater height than the thickness of said antenna.

4. An antenna system according to claim 1, characterized in that said members protrude in height above the walls of said container.

5. An antenna system according to claim 1, characterized in that current-collecting means are attached to said means to rotate the antenna to form a self-contained assembly for the entire system.

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