Sept. 16, 1958 S. ZISLER ET AL 2,852,775

AERIAL FOR WIDE FREQUENCY BANDS

Filed May 31, 1956

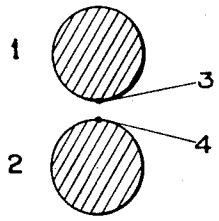


Fig: 1

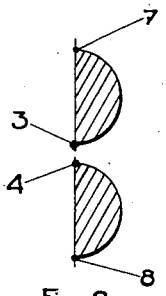


Fig: 2

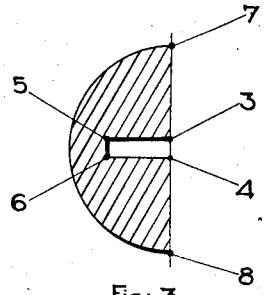


Fig: 3

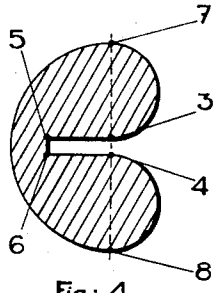


Fig: 4

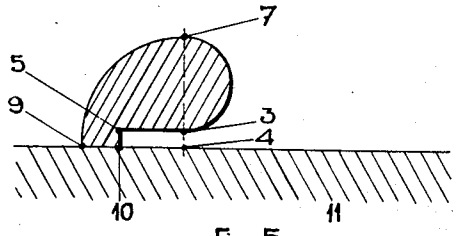


Fig: 5

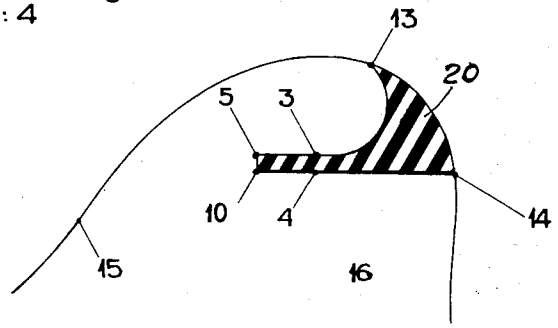


Fig: 6

United States Patent Office 2,852,775 Patented Sept. 16, 1958

2,852,775

AERIAL FOR WIDE FREQUENCY BANDS

Siegfried Zisler, Bievres, and Sigmund Von Welser, Paris, France, assignors to Sadir-Carpentier, Paris, France, a corporation of France

Application May 31, 1956, Serial No. 588,374

Claims priority, application France June 16, 1955

6 Claims. (Cl. 343—767)

The present invention relates to broad frequency band aerials in the range of short and very short waves.

Aerials of this type are known which comprise two coplanar circular discs located in the proximity of each other. High frequency voltage is applied to the aerial across the points of the discs which are the nearest to each other.

The invention will be best understood from the following drawing wherein:

Fig. 1 illustrates an antenna arrangement of the prior art;

Figs. 2 and 3 show respectively two portions of an aerial according to the invention;

Fig. 4 shows an aerial according to the invention;

Figs. 5 and 6 show modifications of the aerial of Fig. 4.

Referring to the known aerial shown in Fig. 1, two circular discs **1** and **2** are shown in the plane of the figure and high frequency voltage is applied across points **3** and **4** corresponding to the minimum spacing between the discs.

The applicants have considered the aerial of Fig. 1 as being constituted by the parallel arrangement of two aerials, each comprising two semi-circular discs as shown in Fig. 2 which illustrates two semi-circular discs bordered by vertical diameters passing respectively through points **3**, **7** and **4**, **8**, ultra high frequency energy being fed, as in the case of Fig. 1, across points **3** and **4**.

Applicants have also found that the disc sections removed from discs **1** and **2** may be advantageously replaced by a metal plate of the shape illustrated in Fig. 3. This plate forms a semi-circular disc, the vertical diameter of which is defined by the distance **7—8** in Fig. 2 and in which a medial rectangular slot is cut out, the apices of which are points **3**, **4**, **5** and **6**. Sides **3—5** and **4—6** are normal to the diameter **7—8**, and equal to one quarter the average operating wavelength.

The presence of this quarter-wave slot makes the impedance of the arrangement shown in Fig. 3 very high relative to that of the aerial of Fig. 2. Furthermore the continuity of the metal structure, obtained by integrally assembling the plate of Fig. 3 with the two semi-circular discs of Fig. 2 on the left hand side thereof, to provide the complete aerial shown in Fig. 4, is such that the electric field of the two semi-circular discs is practically identical in Fig. 4 and in Fig. 1.

Consequently the aerial shown in Fig. 4 has an impedance which is substantially equal to that of the assembly of Fig. 2, i. e. an impedance which is twice that of the aerial illustrated in Fig. 1.

In order to obtain favorable results, it is preferable for the characteristic impedance of the slot **3—6** to be practically above 200 ohms, which may be readily obtained.

Under such conditions, the radiation pattern of the aerial according to the invention is substantially identical to that of the aerial of Fig. 1 with practically the same frequency band.

It should be remarked that it is not essential for the slot **3—6** to have a length exactly equal to one quarter

of the average working wave length. It suffices that the impedance of the slot be, within the frequency band considered, high with respect to the impedance of the aerial.

The right hand portions of the antenna of Fig. 4 which correspond to those shown in Fig. 2 need not be exactly circular and can depart from this shape and still preserve the essential characteristics of the antenna shown in Fig. 4. This latter is symmetrical with reference to the horizontal axis of the slot **3—4—5—6**.

Fig. 5 illustrates the application of the theory of electrical images to the embodiment of Fig. 4; in other words, the aerial shown in Fig. 4 is cut along its horizontal axis of symmetry and a metal sheet which for all practical purposes may be considered as infinite, is substituted for its lower section. The aerial of Fig. 5 comprises an upper section, having a right hand portion in the shape of half a circle limited by the diameter **3—7**, or having a similar shape, and an adjacent left hand portion equivalent to the half of the plate of Fig. 3, and a lower section in the shape of a continuous sheet **11**, connected to the above left hand portion along the line **9—10**. The impedance of the aerial according to this modification is equal to half that of the aerial illustrated in Fig. 4.

The modification shown in Fig. 5 can be used in a particularly advantageous manner as an airplane aerial, because such an aerial may be easily fitted on the rear section of a vertical fin without any modification of the original contour of the fin, as shown in Fig. 6. This figure shows the upper end of an airplane fin **16** with the aerial formed by the rear portion thereof, while the contour of its leading edge **15** remains unaltered. Experience has shown that the lower part of the fin, i. e. the part which is below the slot, can be used as the metal sheet **11** of Fig. 5. An insulating element **20** is fitted into the trailing edge of the fin for obvious reasons.

Experience shows that the aerial thus incorporated into the airplane fin operates substantially in the same manner as that illustrated in Fig. 5, its radiation diagram, its impedance and its frequency bandwidth being the same.

Since an airplane fin of the type illustrated has two metal surfaces arranged symmetrically with reference to the median plane, it is possible to provide two aerials according to the invention on either sides of such a fin respectively. Due to the small distance between such two aerials, it is possible to feed them in parallel and consequently to consider them as forming together a single aerial.

Obviously the embodiments described can undergo many other modifications without departing from the scope of the invention as defined in the accompanying claims.

What we claim is:

1. An aerial comprising a substantially quarter-circular metal sheet defining a substantially quarter-circular peripheral arc and two mutually perpendicular radii connected to the ends of the arc, said sheet defining a rectangular recess longitudinally disposed along one of the radii and intersecting the other of the radii, an arcuate metal sheet with a peripheral arc connected intermediate the recess and the quarter-circular arc, said metal sheets being connected, and a conductive element connected to said quarter-circular sheet and bordering the recess so as to make a slot thereof.

2. An aerial as claimed in claim 1 wherein the length of the slot is substantially equal to one quarter of the average wavelength to be processed.

3. An aerial as claimed in claim 2 wherein the metal sheets and conductive element form a symmetrical configuration about the longitudinal axes of the slot.

4. An aerial as claimed in claim 2 wherein the conductive element is a metal sheet.

5. An aerial as claimed in claim 2, wherein the sheets

and conductive elements are parts of an airplane fin, comprising an insulator fillet filling in the slot and rounding off the contour of the fin.

6. An aerial as claimed in claim 2 comprising means for feeding energy across the slot.

References Cited in the file of this patent

UNITED STATES PATENTS

2,555,433 Harvey ..... June 5, 1951