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MECHANICALLY RIGID COUNTERPOISE STRUCTURE

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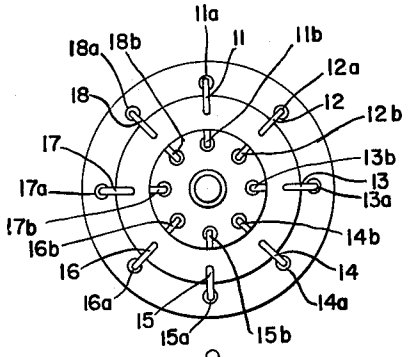


FIG. 1.

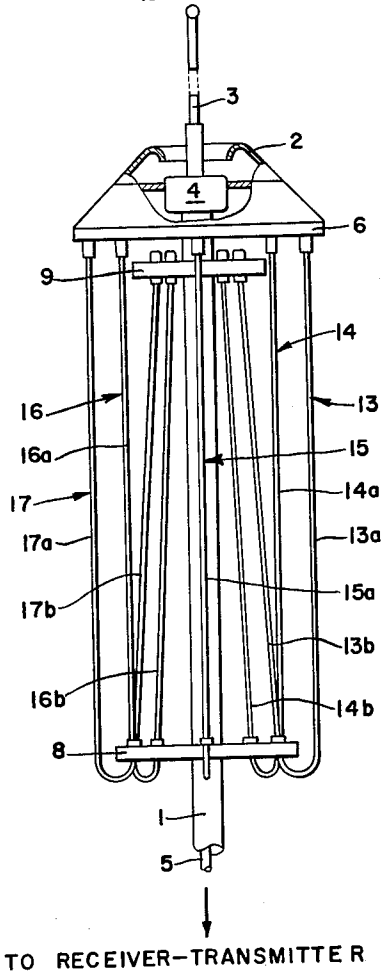


FIG. 3.



FIG. 2.

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MECHANICALLY RIGID COUNTERPOISE STRUCTURE

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The present invention relates to an antenna and, more particularly, to a blocking device designed for and connected to an antenna.

Such blocking devices are generally known in the art and comprise, basically, a $\lambda/4$ coaxial conductor having an open pot-shaped configuration.

In general, it is not necessary that the wave impedance of a blocking device be selected in relation to a particular ratio to the wave impedance of the conductor system connected to or branched off at the point of blocking. Such a selection usually is also not required for impedance matching with regard to conductors for wave propagation. Thus, one is free, within reasonable limits, of course, to determine the wave impedance of the blocking device for obtaining optimum effects of other kinds. It is known, in general, that the blocking effect exhibited by devices of increasing wave impedances becomes less dependent upon the frequency. Thus, it is of advantage to use high wave impedances in order to obtain a large band width in the blocking characteristic of such blocking device. Such high way impedance is present if, for example, several separate conductors are used as the outer conductor of the blocking device.

One type of blocking device is known in which several transmission aerials are arranged circularly around a vertically positioned antenna, which aerials were substituted for the outer conductor of the blocking device of the antenna. Outer conductors of a blocking device for an antenna which are divided into several, circularly arranged conductor elements exhibit the undesired effect of reduced mechanical strength, which is particularly troublesome in case of strong winds which deflect the antenna to such a great extent that the various conductors touch each other or beat against the inner conductor. Also, if such an antenna were used on a vehicle, low-lying branches or other obstacles will at times strike the conductors and bend them out of shape. Strengthening means and mechanical reinforcements, such as an insulating ring attached to the ends of the conductors, have been found unsatisfactory.

It is therefore, an object of the present invention to provide a new and improved blocking device for an antenna which overcomes the deficiencies of the prior art as indicated above.

It is another object of the present invention to provide a new and improved blocking arrangement mounted on an antenna and having considerable mechanical strength, thereby increasing even the electrical qualities of the antenna.

It is a further object of the instant invention to provide a new antenna structure for so-called intercom systems, as used for radio communication between vehicles, etc.

According to one aspect of the invention, in a preferred embodiment thereof, a plurality of hairpin-shaped wires are positioned around a conductive supporting mast of an antenna. These wires are supported at one of their ends by a conductive disk which is also mounted on the mast, while the other ends of the wires support a disk which is preferably made of insulating material.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a bottom view of a blocking device for an antenna according to one embodiment of the invention.

FIGURE 2 is a cross section through one conductor element used in the blocking device of FIGURE 1.

FIGURE 3 is a side view of the blocking device shown in FIGURE 1, but partially cut open.

Referring now to the drawing, there is shown a vertical mast **1** supporting an antenna system having a relatively thin vertical transmission aerial or antenna **3** which has a rod-shaped configuration. Such aerials are preferably used in intercom systems as, for example, a radio communication system between vehicles and/or a stationary installation. The aerial is matched for optimum efficiency to the two communication frequencies of the intercom system by means of a matching circuit network of a suitable known design, housed in container **4**.

The position of the two communication frequencies in the frequency scale requires a correspondingly broad blocking of the blocking pot or tank to be used. The blocking member according to the invention comprises a short-circuiting plate **6** of electrically conductive material which is electrically connected to mast **1**, the latter also forming the inner conductor of the blocking device. The blocking device further comprises several V-shaped or hairpin-shaped conductors or wires **11**, **12**, **13**, **14**, **15**, **16**, **17**, and **18** each having an electrically effective length of about one-quarter of the average operating wave length. The illustrated embodiment of the present invention shows eight conductors of this type circularly arranged around the inner conductor constituted by the mast **1**. The outer portions of these conductors, designated by **11***a* through **18***a*, form the corners of a regular octagon, it being clear that if more or less conductors are used, they will be placed at the corners of a corresponding regular polygon. The inner portions of the conductor, indicated by **11***b* through **18***b*, are bent towards the inner part of this polygon and terminate on an insulating plate **9** positioned below the conductor plate **6**. These terminals of conductor portions **11***b* through **18***b* thus are positioned between inner conductor or mast **1** and the terminals of the outer conductor portions **11***a* through **18***a*, respectively.

Plate **9** is ring-shaped and passed through by mast **1**. The inner terminals of the conductors **11** through **18** support the ring **9** which also serves as a spacer. The conductors **11** through **18** are guided, near their bends, through a ring-shaped insulator **8**. Thus, this insulator **8** supports and keeps the conductors or wires **11** to **18** in position with respect to each other and with respect to mast **1**. The relation between the wires and the ring is one of mutual support which also provides a resilient spacing of the wires with respect to mast **1**.

The conductor arrangement shown in the drawing has a shape somewhat similar to a fishing cage and has a high degree of mechanical stability while being very resilient.

FIGURE 2 is a cross-section through one of the conductors **11** through **18** and shows that the conductive core of such conductor is coated with an electrically insulating layer, preferably made of a synthetic.

The short-circuiting conductor plate **6** supports a cover **2** enclosing the container **4** for the matching and coupling circuit elements of the antenna. A coaxial high frequency conductor **5** runs from the input terminal of this coupling circuit network through the mast **1** to the transmitter-receiver (not shown) of the intercom system. The aerial **3** is connected to the output terminals of the coupling circuit network and protrudes upwardly through a central hole at the top of cover **2**.

Mast **1** can be designed as a tubular conductor of fixed length, but, alternatively, it can be of telescopic configuration and have at its top portion the blocking device as shown in the drawing.

The structure as shown has the advantage of reduced

spacial dimensions as compared with prior art devices with respect to the required electrically effective length. The hairpin-type conductors are positioned so that the conductor ends are not subject to being caught or struck by obstacles, as was the case with the spear-type conductors used in the prior art. The round bottom portion of the conductors can hardly be caught by any passing object. Furthermore, the conductors or wires in the structure as illustrated exhibit sufficient elastic strength to resist deformation of the antenna if it strikes or is struck by an object, this being due to the supporting effect of the disk or ring **9** and ring **8**. Ring **8** particularly serves as a shock distributor and serves to maintain the proper position of the conductors with respect to each other as well as with respect to the inner conductor.

Furthermore, the conductors will not hit each other when the antenna is subjected to strong winds or when the vehicle on which the antenna is mounted is subjected to strong shocks.

Tests have shown that the frequency band width of this blocking device is even better than the band widths of the prior blocking devices with their inferior mechanical qualities. The improvement of the electrical properties of the antenna according to the present invention is probably due to the non-homogeneous distribution of inherent capacitance and inductance in every one of the several conductors, or wires. The bend of each conductor is predominantly inductive while the conductor ends are predominantly capacitive.

Looking back at FIGURE 3, it will be observed that the inner portions **11***b* through **18***b* of the conductors can be considered as being positioned on the surface of an imaginary frusto-conical body having its smallest cross-section at the terminals of these inner portions of the conductors. This has also an effect of shifting the inherent capacitance from the bends towards the ends of the conductors, thereby improving the blocking effect.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. A broad band electrical blocking device for a broad band vehicle antenna having an elongated conductor, comprising: a conductive disk supported by said conductor;

a plurality of hairpin-shaped wires each having first and second ends and a bend located substantially centrally with respect to said ends, said conductive disk supporting the first end of every wire in symmetrical circular relationship to said conductor and the wire portions between said bends and said second ends of said wires being arranged in frusto-conical configuration with decreasing diameter toward said second ends; an insulating disk positioned below said conductive disk, and means for attaching said second ends of said wires to said insulating disk in symmetrical relationship with respect to said conductor and said first ends supported by said conductive disk.

2. An electrical blocking device as set forth in claim 1 further comprising an insulating ring supporting and positioning said bends in symmetrical relationship with respect to said conductor.

3. An electric blocking device as set forth in claim 2, wherein said wires are provided with an electrically insulating layer.

4. A broad band blocking device for a broad band vehicle antenna, said blocking device being in the form of a coaxial conductor having a length of about one-quarter wave length, said blocking device being generally cylindrical and open at one end and short-circuited at the other, said blocking device having inner and outer conductors, said outer conductor being composed of a plurality of individual conductor elements which are spaced relative to each other, each of said conductor elements having an approximately V-shaped configuration with one leg of the V constituting an outer conductor portion whose free end is electrically connected to said inner conductor and with the other leg being bent inwardly and having a free end in the space between said outer conductor portion of said conductor element and said inner conductor.

References Cited in the file of this patent

UNITED STATES PATENTS

1,553,244	Jacobs	Sept. 8, 1925
2,373,660	Closson	Apr. 17, 1945
2,647,211	Smeby	July 28, 1953

FOREIGN PATENTS

1,055,064	Germany	Apr. 16, 1959