Nov. 15, 1966 J. R. McLOUGHLIN ETAL 3,286,019

POROUS CONDUCTOR JACKET

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Fig. 1.

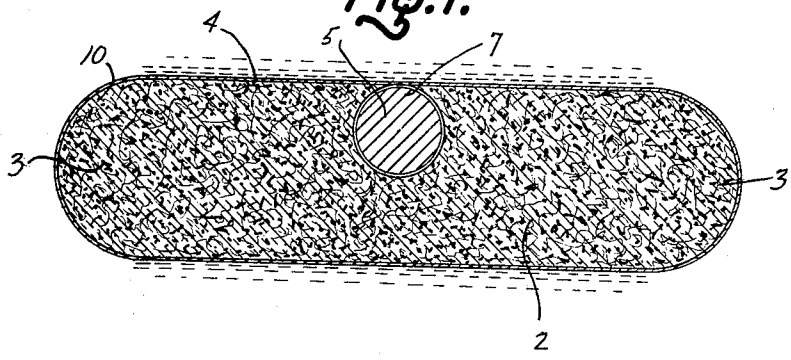
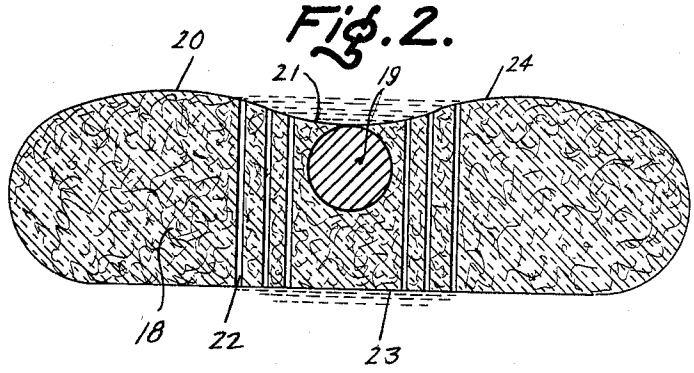


Fig. 2.



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POROUS CONDUCTOR JACKET

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6 Claims. (Cl. 174—42)

Our invention relates to electrical transmission lines, and more particularly, to an apparatus for preventing the buildup of moisture on transmission lines.

In the copending patent application of Joseph R. McLoughlin, 14D-3267, S.N. 421,017, entitled, "Covering for Power Line Conductors To Reduce Windage, Corona Loss and Radio Frequency Interference," there is disclosed an apparatus for reducing corona loss, windage and radio frequency interference of transmission lines. The apparatus is basically a flat air foil shaped member, which is fastened to an electrical transmission line to induce streamlined flow of air around and behind the transmission line to reduce windage, and also to increase the effective circumference of the transmission line to reduce corona loss thereon. Because the member has a substantially flat top surface which is in a horizontal plane, there is a tendency for moisture especially rainwater to collect thereon. Runoff of this rainwater along the sides of the member causes an increase in corona loss of the conductor, as will subsequently be described, instead of a decrease as is desired. The need then arises for means to prevent moisture from interfering with the proper functioning of a corona loss reducing attachment for electrical transmission cables.

Our invention envisions an aerodynamically air foil shaped member which is attached to a power cable to reduce corona loss and windage thereon, having a plurality of openings through it for the dissipation of moisture collected thereon, to prevent this moisture from interfering with the corona loss and windage reduction functions of the air foil member.

The chief object of our invention is the provision of a plurality of openings through an air foil member, which is secured to a power cable for corona loss and windage reduction purposes, where said opening prevent moisture from interfering with the effective operation of the member.

Another object of our invention is the provision of an air foil shaped member having a cross section with an elongated horizontal configuration which fits over a power transmission cable for reducing windage, corona loss and radio frequency interference thereon, and where said member has a plurality of openings therethrough for preventing moisture from forming on the upper surface of the member and interfering with the effective operation thereof.

Another object of our invention is the provision of an aerodynamically shaped member, having a flat upper surface and rounded ends, that fits over a power cable for reducing corona and windage losses thereon, where the member has a plurality of predetermined openings therethrough, for causing moisture that forms on the flat upper surface of the member to flow through the member and not over its rounded ends; so as not to interfere with effective operation of the member in reducing corona losses.

A further object of our invention is the provision of an aerodynamically shaped air foil member, having a substantially flat upper surface, that fits over a power cable, which member has a coating for reducing corona losses and radio frequency interference, and is constructed of a porous material which permits the drainage of moisture therethrough, to prevent the accumulation of moisture on said member.

These and other objects of our invention will be more readily perceived from the description which follows.

One of the features of our invention is an air foil shaped member for reducing windage losses, corona losses and radio frequency interference on a power transmission cable having a plurality of openings therethrough for dissipating moisture to prevent its interference with the effective operation of said member in reducing corona losses.

The attached drawing illustrates preferred embodiments of our invention in which:

FIGURE 1 is a cross-sectional view of the apparatus of our invention;

FIGURE 2 is a cross-sectional view of a modification of the apparatus of our invention.

In FIGURE 1 there is shown a cross-sectional view of the areodynamically shaped air foil member, having means for the drainage of moisture therethrough, embodying our invention. The construction includes member **2**, being constructed of a light weight porous material such as polystyrene, polyethylene, polypropylene, epoxy, rubber or urethane foams, having a configuration that includes rounded edges **3** and flat or slightly curved upper and lower surfaces **4** to produce an overall streamlined shape. Member **2** is secured in a horizontal fashion to cable **5** so that the top and bottom surfaces are substantially parallel to the earth. Since the force of wind is generally in a horizontal or nearly horizontal direction, flow is in a streamlined manner over member **2** and either trailing edge **3**, to thereby avoid disruptive vortical flow around and behind the member. Windage drag on conductor **5** is thereby reduced by as much as 80% even though the entire member **2** is far larger than member **5** alone. This is more fully discussed in the aforementioned application of McLoughlin.

For the purposes of reducing corona loss, the ionizing discharge that occurs during transmission of high voltages, a thin coating of a semiconductor or conductor is placed around the entire member **2** and connected electrically with conductor **5** at point **7**. The effective circumference of the conductor for corona loss purposes then is the circumference of the entire member **2** and not just the circumference of conductor **5** alone. A higher voltage then can be applied to conductor **5** without the subsequent undesirable corona loss arcing that might occur otherwise. Corona loss is inversely proportional to the size of the conductor being used, so even though conductor **5** has not been increased in size, the effective circumference of the conductor now becomes the circumference of member **2**, which is far greater than member **5** alone and thus corona loss is substantially decreased. Radio frequency interference is also decreased by this same coating **10** which surrounds the entire member **2**, when it is a semiconductor. This is also more fully discussed in the aforementioned application of McLoughlin.

Coating **10** may comprise a fine mesh semiconducting screen completely surrounding member **2** to provide both the conducting surface for preventing corona loss and the semiconducting surface for attenuating radio frequency. Alternatively, surface **10** may consist of a rubber or plastic such as polyvinyl chloride with carbon black, or metal particles therein to provide this semiconducting surface. Coating **10** may also be a thick plastic semiconducting sleeve surrounding member **2**. In all cases there are a sufficient plurality of apertures through the coating for the drainage of moisture therethrough, as will be discussed.

When it rains, or moisture is present in excessive amounts in the atmosphere, there tends to be a buildup of moisture on upper surface **4** of member **2** which mois-

ture not only adds to the weight of member **2** to interfere with its proper windage function, but also tends to flow along sides **3** leading to corona discharge at these points, which are the points of highest voltage gradient. In other words, as the moisture builds up along sides **3**, the radius of curvature of the water drops in relation to the member becomes very small, and it is at surfaces of small radii where corona discharge takes place. To prevent this, there are sufficient holes on top surface **4** through coating or member **10** for water to pass therethrough and through member **2**, which is porous, to form on the bottom surface where it dissipates to the surrounding air. The buildup of moisture on top surface **4** is thus prevented and at the same time moisture is prevented from flowing over ends **3** and interfering with the proper operation of member **2**. A semiconductor may also be employed for coating **10**, with the proper resistivity so that attenuation of radio frequency waves along the conductor takes place and radio frequency interference is thereby substantially reduced. Means are thus provided for preventing any moisture from accumulating on the member and running off over edges **3** to interfere with its operation in reducing corona loss on power transmission cables.

In FIGURE 2 there is shown a cross-sectional view of a modification of the apparatus of FIGURE 1. In this mode, upper surface **20** of member **18** has a trough-like indentation or depression **21** located in the center thereof for the collection of water. Trough **21** is positioned over drainage slots **22** which pass through member **18** and its outer covering so that water collected thereon drains through slots **22** to be collected on bottom surface **23** of member **18** where it dissipates to the atmosphere. Member **18** operates in exactly the same manner as the device of FIGURE 1 but a specific location is provided where moisture accumulates and is drained off. Member **18** operates in the same manner as the mode of FIGURE 1 to reduce windage losses, corona losses and radio frequency interference on a transmission cable. Member **18** also may be chosen from the plastic foams as is member **2** in FIGURE 1, but since it does not have to be porous as does member **2** because there are defined apertures **22** therethrough, it may consist of any light weight material, and also alternatively may be hollow. It is also noted that upper surface **20** of member **18** does not need to contain a plurality of apertures therein but simply apertures corresponding to holes **22** so that water can properly drain off. It is further noted that as mentioned with respect to FIGURE 1, a fine mesh screen may be employed as coating **24** or a semiconducting plastic or elastomeric coating or sheath may also be employed, alternatively, as discussed with respect to FIGURE 1. These operate in exactly the same manner as FIGURE 1. The six apertures **22** shown in the drawing are by way of illustration only and are not to be construed as a limitation on our invention.

It is now apparent that our invention attains the objectives set forth. Apparatus embodying the invention is sturdy in construction and well adapted for use in conjunction with outdoor environments. Prevention of the accumulation of moisture on transmission cables and the successful removal thereof in a simple and efficient manner is accomplished.

Specific embodiments of our invention have been illustrated but the invention is not limited thereto since many modifications may be made by one skilled in the art and the appended claims are intended to cover all such modifications as fall within the true spirit and scope of our invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising
- an air aerodynamic foil affixed to the conductor in a substantially horizontal plane,
- trailing edges on said air foil at both ends thereof positioned to reduce the effects of windage thereon,
- an upper surface of said air foil positioned in a horizontal plane, and
- means for preventing moisture formed on said upper surface from dripping over said edges and interfering with the effective operation of the air foil.

2. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising
- an air aerodynamic foil having an elongated cross-sectional length affixed to the conductor with its cross-sectional length in a substantially horizontal plane,
- trailing edges on said air foil at both ends of said cross-sectional length positioned to reduce the effects of windage thereon,
- an upper surface of said air foil positioned in a horizontal plane, and
- means for permitting moisture formed on said upper surface to flow through said air foil to dissipate to the atmosphere without flowing over the edges and interfering with the effective corona loss operation of the air foil.

3. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising
- an air foil affixed to the conductor in a substantially horizontal plane,
- trailing edges on said air foil at both ends thereof positioned to reduce the effects of windage thereon,
- an upper and lower surface of said air foil interconnecting said edges and positioned in a horizontal plane,
- conductive means coating the outer surfaces including the edges of said air foil to increase its effective circumference for reducing corona losses thereon, and
- porous means for permitting moisture formed on said upper surface to flow through said air foil and dissipate to the atmosphere without flowing over the edges and interfering with the effective corona loss operation of the air foil.

4. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising
- an air foil affixed to the conductor in a substantially horizontal plane,
- trailing edges on said air foil at both ends thereof, positioned to reduce the effects of windage thereon,
- an upper and lower surface of said air foil interconnecting said edges and positioned in a horizontal plane,
- conductive means coating the outer surfaces including the edges of said air foil to increase its effective circumference for reducing corona losses thereon,
- porous foam material, comprising the interior of said air foil, which permits moisture formed on said upper surface to seep through said air foil to the lower surface thereof, and dissipates to the atmosphere without flowing over the edges and interfering with the effective corona loss function of said air foil.

5. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising
- an air foil affixed to the conductor in a substantially horizontal plane,
- trailing edges on said air foil at both ends thereof, positioned to reduce the effects of windage thereon,
- an upper surface of said air foil interconnecting said edges and positioned in a horizontal plane,

having an indentation for collecting moisture therein,

conductive means coating the outer surfaces including the edges of said air foil to increase its effective circumference for reducing corona losses thereon,

means defining a plurality of apertures for permitting moisture formed in said indentation on said upper surface to flow through said air foil to dissipate to the atmosphere without flowing over the edges and interfering with the effective corona loss function of the air foil.

6. An apparatus for reducing the effect of corona loss and windage on an electrical conductor comprising

an air foil affixed to the conductor in a substantially horizontal plane,

trailing edges on said air foil at both ends of its cross-sectional length positioned to reduce the effects of windage thereon,

an upper and lower surface of said air foil interconnecting said edges and positioned in a horizontal plane,

conductive means having a plurality of apertures therein, coating the outer surfaces including the edges of said air foil to increase its effective circumference for reducing corona losses thereon, and

porous means for permitting moisture formed on said upper surface to flow through said air foil and said conductive means to dissipate to the atmosphere without flowing over the edges and interfering with the effective corona loss operation of the air foil.

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