June 9, 1942. C. J. KIRKES 2,285,588

RADIO ANTENNA

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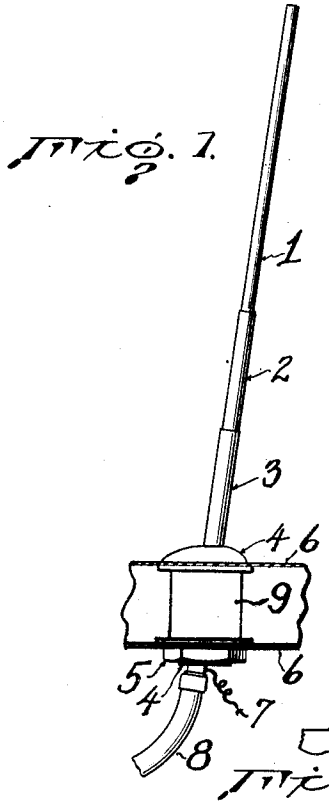


Fig. 1.

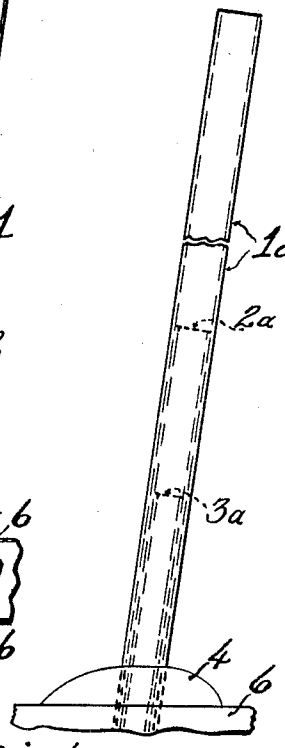


Fig. 4.

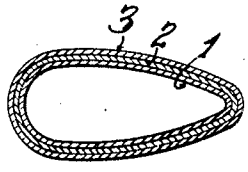


Fig. 3.

Fig. 2.

Inventor

Clyde J. Kirkes

By

G. Ben. J. Chromy

Its Attorney

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RADIO ANTENNA

Clyde J. Kirkes, Washington, D. C.

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8 Claims. (Cl. 250—33)

This invention relates to electrical apparatus generally. More particularly this invention relates to vehicle or aircraft radio antenna systems which have means incorporated therein to prevent the formation of ice on the surfaces thereof.

An object of this invention is to provide a tubular antenna adapted to be carried projecting from the surface of a vehicle or craft, said antenna having means adapted to circulate a heated fluid medium in contact with it for preventing the formation of ice thereon.

Another object of this invention is to provide a tubular antenna adapted to be carried projecting substantially vertically from a surface of a vehicle or craft, said antenna having means for circulating a heated medium therethrough to prevent the formation of ice thereon.

A further object of this invention is to provide an antenna of tubular material adapted to be carried projecting in mast-like fashion from the outside of a mobile craft or vehicle, said antenna being supported by suitable insulation means at one end thereof having a passage therethrough communicating with the inside of a cabin of the vehicle or craft for feeding heated gas, for example, air from said cabin into the tubular antenna, the other end of the tubular antenna being provided with a device facilitating the drawing or passage of the heated gas through the tubular antenna.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification and the claims.

My invention is particularly adapted for use on aircraft which are equipped for radio communication which must be available for use under all forms of weather conditions. As is well known to aviators, ice forms very readily on various parts of the exterior of the aircraft, especially when said craft is flying at high altitudes. These ice formations may occur in the summer as well as in the winter although, of course, they occur more frequently in the winter time.

Ice forming on the antenna may break the antenna conducting member or cause it to sway and break off and damage the aircraft.

Furthermore, ice formation on the antenna insulators impairs the electrical insulating qualities of the insulators and renders the antenna and the radio communication facilities of the aircraft useless as long as the ice formation exists. It is the main object of my invention to overcome these difficulties caused by ice forming on the antenna or parts thereof. As will be observed, my invention is also applicable to use on ships and boats equipped with radio apparatus as well as motor vehicles, trains, aeroplanes and the like.

In accordance with this invention I provide an antenna of tubular material supported by a special insulator assembly at one end thereof on the frame, fuselage, wing or other surface of the aircraft. A supply of air from the inside of the cabin of the vehicle or craft is passed through the tubular antenna member through the passage formed in the insulator. The air fed through the tubular antenna member from the inside of the cabin is of a temperature well above freezing, consequently in passing through the tubular antenna member, this air will heat the said member and maintain it above freezing temperature or at a sufficiently high temperature to prevent the usefulness of the antenna from being impaired either by ice, frost, condensation or the like forming thereon.

While I have shown the use of heated air passing through the antenna from the inside of the aircraft cabin, other gases may be passed through the antenna and various ways of heating the gases, such as, electrical heating devices, the exhaust gas of combustion engines and the like may be employed. A suitable stove for obtaining heated air or other gas from the exhaust of the combustion also may be used for feeding heated gas to the antenna.

Referring to the drawing, briefly, Figure 1 illustrates the application of my radio antenna to a craft; Figure 2 is a view of an embodiment of my antenna shown in vertical cross-section; Figure 3 is a sectional view along the line 3—3 of Figure 2; Figure 4 is a view of another form of antenna.

On Figure 1 I have shown a vertical tubular antenna member 1 supported on the fuselage or other structure of an aircraft by means of the insulator assembly structure 4. The top portion of the antenna member consists of a single tube as is more definitely illustrated in Figure 2 and the part of the antenna member passing through the insulator assembly 4 consists of three concentric tubes 1, 2 and 3. These tubes are preferably of streamline cross-section and in the course of the manufacture of the antenna member these three tubes are drawn or fabricated together so that they fit over each other so closely that it is difficult to be able to tell that there are really three tubes. The intermediate portion 2 extends to approximately one-half the

height of the antenna member although of course this distance may be varied. The section 3 is terminated at a lower point from that at which the section 2 terminates. All three sections however pass through the insulator supporting structure 4 in order to strengthen and reinforce the antenna.

The insulator supporting structure 4 consists of a hollowed-out casing member for receiving the insulation material 11 which surrounds the outside of the tubular antenna member and tightly grips this member. Various insulation materials may be employed and among these are all of the plastics which are not affected by the lower temperatures. Various fillers such as asbestos fibres and mica flakes may be used in the plastic insulation if desired.

It will be observed that the antenna is set into the insulation support at a slight angle and this gives the antenna the desired rake. After the antenna is set into the insulation support and the insulation plastic poured or forced around the antenna into the casing the insulation may be cured by suitable heating treatment. A supporting member 4 is preferably made of some light metallic material such as aluminum, aluminum and magnesium alloys, zinc, and the like. However, where desired, the entire structure including the insulation supporting casing 4 and the insulation 11 may be made of suitable plastic material having either textile fibre or metallic reinforcing webs or members therein. The bottom of the member 4 is threaded to receive a nut 5 for clamping the surfaces 6 of the aircraft or other vehicle structure between the upper flange of the member 4 and the nut 5. A reinforcing element 9 is riveted, welded or otherwise attached between the surface members 6 and when the nut 5 is tightened on the member 4 the element 9 is placd under compression so that the antenna is rigidly supported on the members 6. Suitable set screws or other locking devices may be provided to the nut 5 for engaging the threaded portion of the member 4 to prevent the nut 5 from being loosened by vibration. Before the tubular antenna element is placed into the insulation 11 the outer surface of the member 3 which is coextensive with the insulation 11 is roughened so as to form a better bond with the plastic insulation material.

An electric heating winding or windings 12 may be embedded in the top of the member 4 adjacent to the insulation 11 surrounding the antenna tube to prevent ice from forming on this exposed insulation. This winding 12 is electrically insulated from the member 4 and is connected to a battery or generator which furnishes the heating current therefor. Another winding 13 may be wound around the member 4 as illustrated and energized by a relatively high frequency current, such as, 500 cycles, for example, to maintain the upper part of the member 4 at a temperature high enough to prevent freezing, condensation and the like thereon. This is accomplished by inducing eddy currents into the member 4 from the primary winding 13.

The bottom of the antenna element is connected to a pipe 8 which feeds heated air or other gas to the antenna. This air or gas is sucked through the antenna by means of suction produced by the slipstream of atmosphere passing around the outside of the antenna element 1 and the holes 10 formed in the trailing edge near the top of said element. The suction formed by the holes 10 is sufficient to draw the air through the antenna. These holes are each preferably of small cross-section, for example, approximately one-eighth of an inch in diameter and when additional suction is desired the number of holes is increased rather than the size of each individual hole.

In Fig. 4 is illustrated a modified form of the reinforced antenna tube. In this case the reinforcing tubes 2*a* and 3*a* are inside of the tube 1*a*. Otherwise the antenna element 1*a* is supported in the insulation structure 4 in the same manner as is illustrated in Fig. 2.

The pipe 8 may be made of insulation material and if it is made of electrical conducting material it must be insulated from the antenna element by suitable insulation member. A connection 7 leading to the radio receiving or transmitting apparatus is attached to the antenna element either by welding, solder or a suitable binding post or clamp.

It will be observed that I have described the various features of this invention in detail. However I do not desire to limit the invention to the exact details described and illustrated except insofar as those details are defined by the claims.

What I claim is as follows:

1. A radio antenna adapted to be carried by a moving vehicle, comprising: a tubular antenna element adapted to be mounted on the surface of the vehicle and projected therefrom so that the free end of said tubular element extends substantially away from surfaces of said vehicle, insulation supporting means for rigidily clamping a portion of said tubular antenna element to surfaces of said vehicle, the bottom portion of said tubular antenna element passing through said insulation supporting means, and reinforcing means for said tubular antenna element, said reinforcing means consisting of additional tubular members closely fitted into the bottom portion of said tubular antenna element and extending well up into said antenna element.

2. A radio antenna as set forth in claim 1, having suction means at the free end thereof, said suction means including a plurality of small holes formed through the trailing edge of said tubular element.

3. A radio antenna as set forth in claim 1 in which said insulation means consists of an elongated hollow clamping member having plastic insulation in the hollow portion thereof for bonding the tubular antenna element therein.

4. A radio antenna as set forth in claim 1, further characterized in that said tubular antenna element is of substantially streamline cross-section having suction means formed at the free end thereof, said suction means consisting of a plurality of small holes formed through the trailing edge of the streamlined tubular element.

5. A radio antenna as set forth in claim 1, further characterized in that said reinforcing means consists of a plurality of separate concentric tubular members drawn together with said antenna tubular element, said separate members being staggered with respect to each other and said tubular element.

6. A radio antenna as set forth in claim 1, further characterized in that said insulation supporting means consists of a rigid member surrounding said tubular member and insulation disposed between said rigid member and said tubular member, and electrical heating means supported by said rigid member for preventing the formation of ice and condensation on exposed

surfaces of said rigid members and said insulation.

7. A radio antenna as set forth in claim 1, having an electrically energized winding carried by said insulation supporting means for heating said latter means.

8. A radio antenna as set forth in claim 1, having a winding carried by said insulation supporting means, and a source of relatively high frequency current connected to said winding for producing by induction a heating current in said supporting means.

CLYDE J. KIRKES.