Feb. 2, 1954 W. A. VON WALD, JR., ET AL 2,668,187

LEAD THROUGH INSULATOR

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FIG. 1

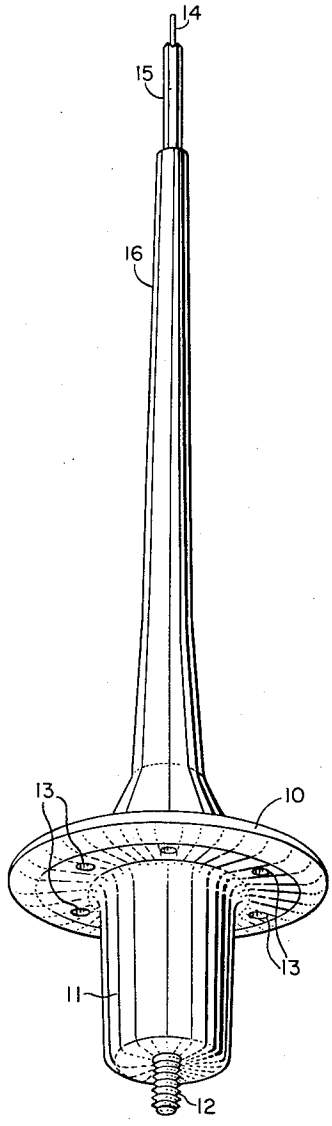
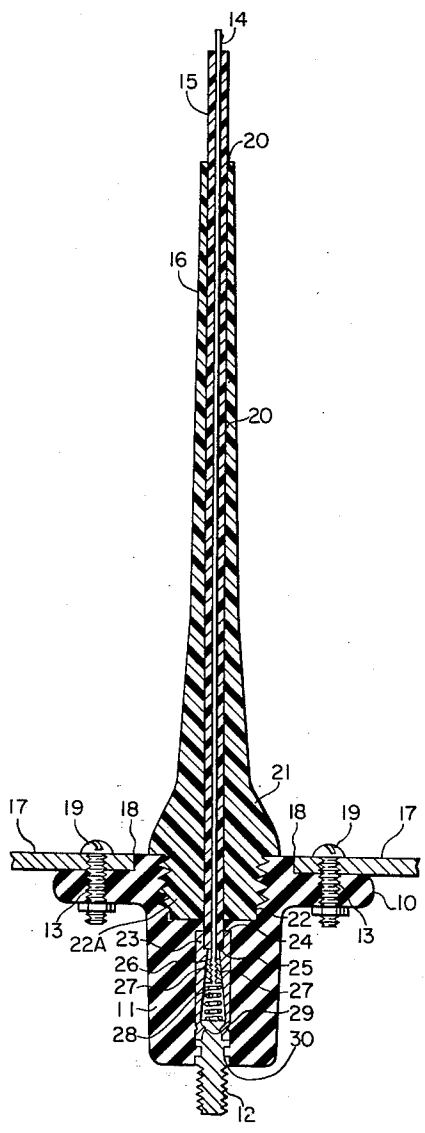


FIG. 2



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FIG. 3

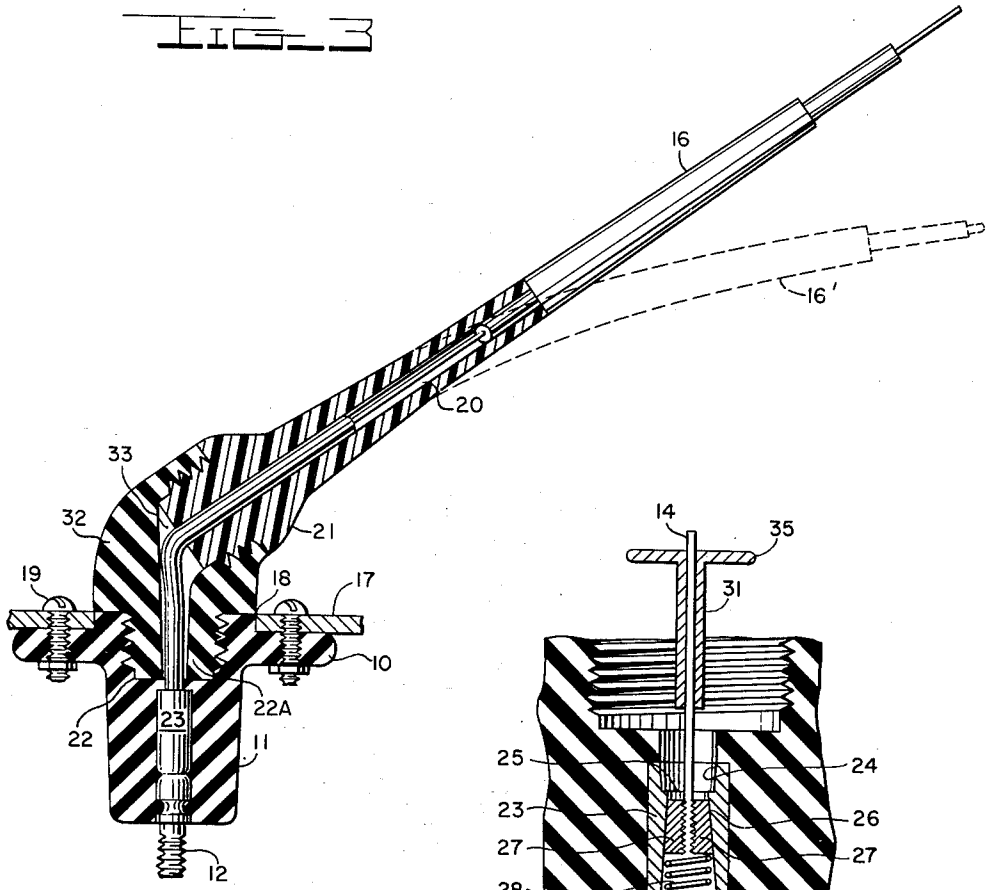


FIG. 4

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LEAD THROUGH INSULATOR

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6 Claims. (Cl. 174—153)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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This invention relates generally to insulated terminals and more particularly to wire antenna lead through insulators with terminals.

In wire antenna installations such as are required for aircraft service, the antenna lead-in wire must pass through the metal exterior surface of the aircraft with sufficient insulation to withstand transmitter voltages of several thousand volts. Because of slipstream and vibration, aircraft wire antennas are subject to frequent breakage which necessitate replacement of the antenna wire. And because lead through insulators may be and often are located in positions which are not readily accessible from the interior of the aircraft, it is desirable to provide a lead through insulator which will permit replacement of the antenna wire from outside the aircraft.

One type of lead through insulator provides a terminal post on both the inside and outside of the aircraft and a new wire may be connected simply by attaching it to the outside terminal. However this type cannot be used with an insulated wire antenna designed to eliminate precipitation static. Such antennas must maintain 100% insulation up to several hundred thousand volts to prevent corona discharge on the antenna. Rather than attempt to maintain said insulation about an external binding post it is preferred to run the insulated wire to a terminal inside the aircraft since the corona effect does not extend to the interior of the aircraft.

Therefore it is an object of this invention to provide a high voltage lead through insulator having an internal terminal which may be externally engaged.

It is another object of this invention to provide a lead through insulator for insulated wire antennas having an internal terminal which may be externally engaged.

It is another object of this invention to provide a lead through support having a tapered flexibility operative to minimize wire breakage at the lead through insulator.

Other objects and advantages of this invention will be apparent from the following description and accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Fig. 1 is an exterior perspective view of a preferred embodiment of this invention;

Fig. 2 is a cross sectional view of the embodiment of Fig. 1;

Fig. 3 is a cut away view of a variant embodiment of this invention, and

Fig. 4 is an enlarged view of a portion of Fig. 2.

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Briefly, this invention provides a lead through insulator adapted for flush mounting in an aircraft or other surface and having its external terminal disposed within the insulator and below the mounting surface. The external terminal is preferably a wire gripping chuck molded into the insulator whereby the antenna may be connected from outside the mounting surface by inserting the lead-in into the jaws of the chuck and may be disconnected from outside the mounting surface by inserting a small instrument alongside the wire into the chuck to release the jaws. The insulator may be adapted to receive elbow and flexible fittings to avoid sharp bends in the wire and thereby minimize breakage.

Referring now to the drawings in detail, Fig. 1 is a perspective view of a lead through insulator constructed according to this invention as seen from slightly below the flange 10. The flange 10 may be circular and of about twice the diameter and molded integral with the insulator body 11. A threaded member 12 protrudes from the bottom of insulator body 11 and comprises the internal antenna terminal for connection to any desired radio equipment. The flange is preferably provided with holes 13 for mounting the assembly upon the surface through which the antenna lead is to be passed.

The embodiment shown in Fig. 1 is designed for use with insulated antenna wire. This wire is typically a 50 circular mil copper weld wire 14 molded in a $\frac{3}{16}$'' diameter polyethelene sheath 15. In Fig. 1 the insulator 11 is shown fitted with a lead through support 16 which tapers from substantially the diameter of the insulator 11 to that of insulating sheath 15 and preferably has a length 25 or more times the diameter of the insulating sheath 15. The support 16 is preferably molded of polyethelene, which is a flexible dielectric that does not become stiff even at extremely low temperatures. The configuration of support 16 therefore provides a tapering flexibility which prevents sharp bending of wire 14 in the vicinity of insulator 11. The tapered flexibility of support 16 is illustrated by dotted lines in Fig. 3.

Fig. 2 is a side elevational view of the embodiment of Fig. 1 showing a cross section taken along the longitudinal axis. The wire 14 is not shown in cross section. In Fig. 2 the insulator is shown mounted on a metal surface 17 such as the aluminum skin of an aircraft. The insulator should be mounted with the terminal 12 on the interior of the craft. Surface 17 is provided with a suitable hole large enough to receive the shoulders 18 of insulator 11 and a number of smaller holes corre-

sponding to the holes 13 in flange 10 to receive mounting bolts 19. Support 16 has an axial opening 20 large enough to permit insertion of antenna wire and sheath 14 and 15 but still small enough to provide a snug fit. The snug fit over the length of support 16 prevents moisture from running down antenna wire 15 into the insulator 11. The opening 20 may be more clearly seen in Fig. 3 where the sheath is cut away.

The tapered support 16 has its larger end terminating in a pedestal member 21 which firmly seats against shoulders 18 of insulator 11 to further prevent sharp bends in wire 14 near its fixed termination in insulator 11. The pedestal member 21 is subtended by a threaded section 22A which engages an internally threaded recess 22 in insulator 11.

The chuck body 23 has a cylindrical opening 24 at its upper end large enough to receive sheath 15. As may be more clearly seen in the enlarged view in Fig. 4, opening 24 terminates in the smaller end 25 of the tapered bore 26 machined into chuck body 23. A pair of serrated jaws 27 are inserted in the tapered bore 26 and are pressed toward the small end of the taper by a spring 28. The action of the spring and the taper forces the jaws together. Terminal member 12 has a pair of annular grooves 29 and 30 at its upper end. The terminal 12 is inserted inside the chuck body 23 against spring 28 until the upper groove 29 is within the chuck. The end of chuck body 23 is then swedged into groove 29 to firmly hold the two pieces together. Groove 30 fills with dielectric 11 when the insulator is molded around the chuck firmly holding the chuck with the insulator.

To install an antenna lead-in, the lead-in is first inserted through hole 20 in support 16. A short length of sheath 15 is removed exposing bare wire 14. This is inserted into insulator 11 until the end of wire 14 has passed between the jaws 27. The lead-in is now securely connected, and the lead through support may be screwed into recess 22. Any forces tending to pull the wire 14 from the insulator will cause the serrated jaws 27 to bite into the wire. The jaws will then tend to move with the wire, and because of the tapered bore 26, the jaws will be forced together and will grip the wire tighter. It has been found that the wire will break before the jaws will release the wire.

However, the wire may be very easily disengaged from the chuck from outside the aircraft, thus facilitating the replacement of a broken antenna wire. To disengage the wire, support 16 is removed from insulator 11 and wire 14 is cut off leaving a portion protruding from the insulator body. The insulating sheath 15 is easily pulled off leaving only a bare wire. A metal tube 31 having an inner diameter large enough to accommodate wire 14 is slipped over the protruding end of wire 14 and pushed into the chuck body 23 until it engages jaws 27. By pushing jaws 27 against spring 28 with tube 31, the jaws will release their grip on wire 14. Manipulation of the wire retrieving tube 31 may be facilitated by soldering a handle member 35 to one end thereof. Alternatively, tube 31 may be split longitudinally into two halves, thereby permitting the halves to be placed around the wire instead of inserting the wire into the tube, thus obviating the necessity for cutting wire 14.

Therefore it will be seen that an insulated wire antenna may be connected to and disconnected from the lead through insulator from outside the aircraft. The only time that a connection need be made inside the plane is to terminal 12 when the insulator is installed.

An alternative embodiment is shown in Fig. 3 which is particularly desirable for installations where the lead-in wire runs considerably less than 90 degrees from the surface of the plane. In this embodiment an elbow connector 32 is screwed into recess 22 of insulator 11. The elbow has another recess 33 threaded like recess 22 but disposed at an angle of about 45 degrees therefrom. Support 16 is screwed into the latter recess 33 and is accordingly held at an angle of about 45° with the surface 17. The support is also shown by dashed lines in a bent position 16' to illustrate the effect of its tapered flexibility in removing sharp bends from the wire at the insulator. By using the elbow insert 32 the lead-in may be run parallel to surface 17 without serious strain or bending of the wire.

Although certain specific embodiments of this invention have been herein disclosed and described, it is to be understood that they are merely illustrative of this invention and modifications may, of course, be made without departing from the spirit and scope of the invention as defined in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, an insertion type terminal molded into said body member and having an inner end terminating inside said body member and an outer end protruding from the other end of said body member, the flange end of said body member having a recess formed therein to provide access to the inner end of said terminal, said inner end having a straight-walled recess formed therein coaxial with the body member recess, at least a portion of the body member recess having a transverse dimension equal to that of the terminal inner end recess to provide a straight-walled channel penetrating said insertion terminal.

2. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, a wire gripping chuck assembly molded into said body member and having its wire gripping end terminating inside said body member and its other end protruding from the other end of said body member, the flange end of said body member having a cylindrical recess formed therein to provide access to the wire gripping end of said chuck assembly, a hollow cylinder integrally formed in the chuck assembly at the wire gripping end thereof and disposed coaxial with the body member recess, at least a portion of the body member recess having an inner diameter equal to that of the hollow cylinder to provide a straight-walled channel penetrating said chuck assembly.

3. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, a wire gripping chuck assembly molded into said body member and having its wire gripping end terminating inside said body member and its other end protruding from the other end of said body member, the flange end of said body member having inner and outer coaxial cylindrical recesses

formed therein to provide access to the wire gripping end of said chuck assembly, said outer cylindrical recess having a larger diameter than said inner cylindrical recess, a hollow cylinder integrally formed in the chuck assembly at the wire gripping end thereof and disposed coaxial with said body member recesses, said hollow cylinder having an inner diameter equal to that of said inner body recess to provide a straight-walled channel penetrating said chuck assembly, a flexible tapered member having an axial bore of the same inner diameter as said hollow cylinder, the larger end of said tapered member having an outer diameter substantially equal to the inner diameter of said outer body recess and insertable therein.

4. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, a wire gripping chuck assembly molded into said body member and having its wire gripping end terminating inside said body member and its other end protruding from the other end of said body member, the flange end of said body member having a cylindrical inner recess and a threaded outer recess coaxially formed therein to provide access to the wire gripping end of said chuck assembly, a hollow cylinder integrally formed in the chuck assembly at the wire gripping end thereof and disposed coaxial with said body member recesses, the outer body member recess having a larger inner diameter than said inner body recess, the inner body member recess having an inner diameter equal to that of the hollow cylinder to provide a straight-walled channel penetrating said chuck assembly, a flexible tapered member having an axial bore of the same inner diameter as the hollow cylinder, the larger end of said tapered member being threaded to engage the threads of said outer body member recess.

5. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, a wire gripping chuck assembly molded into said body member and having its wire gripping end terminating inside said body member and its other end protruding from the other end of said body member, the flange end of said body member having a cylindrical inner recess and a threaded outer recess formed therein to provide access to the wire gripping end of said chuck assembly, a hollow cylinder integrally formed in the chuck assembly at the wire gripping end thereof and disposed coaxial with said body member recesses, the outer body member recess having a larger inner diameter than said inner body recess, the inner body member recess having an inner diameter equal to that of the hollow cylinder to provide a straight-walled channel penetrating said chuck assembly, an elongated tapered flexible dielectric member having a base end with a larger diameter than said outer body recess and tapered to a tip end not substantially larger than said inner body recess, a threaded section

at the base end of said tapered member, said tapered member having an axial bore of the same inner diameter as said hollow cylinder, the threaded section of said tapered member being adapted to fit said threaded outer recess.

6. A lead through insulator and terminal comprising, a dielectric body member having a mounting flange at one end thereof, a wire gripping chuck assembly molded into said body member and having its wire gripping end terminating inside said body member and its other end protruding from the other end of said body member, the flange end of said body member having a cylindrical inner recess and a threaded outer recess coaxially formed therein to provide access to the wire gripping end of said chuck assembly, a hollow cylinder integrally formed in the chuck assembly at the wire gripping end thereof and disposed coaxial with said body member recesses, the outer body member recess having a larger inner diameter than said inner body recess, the inner body member recess having an inner diameter equal to that of the hollow cylinder to provide a straight-walled channel penetrating said chuck assembly, an elongated tapered flexible dielectric member having a base end with a larger diameter than said outer body recess and tapered to a tip end not substantially larger than said inner body recess, a threaded section at the base end of said tapered member, said tapered member having an axial bore of the same inner diameter as said hollow cylinder, a dielectric elbow-shaped member having a threaded recess at one end identical to the outer body member recess and a threaded section at the other end thereof identical to the threaded section at the base of said tapered member, an internal channel connecting the ends of said elbow member and having an inner dimension at least as large as the inner diameter of said hollow cylinder, said elbow member being insertable between the tapered member and the body member to provide a supported angular entry to said body member.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
705,597	Murray	July 29, 1902
1,380,063	Hitner	May 31, 1921
1,753,317	Rothen	Apr. 8, 1930
1,878,247	Beck	Sept. 20, 1932
2,014,056	Noorden	Sept. 10, 1935
2,082,566	Berndt	June 1, 1937
2,166,458	Berndt et al.	July 18, 1939
2,171,331	Folsom	Aug. 29, 1939
2,280,711	Machlett et al.	Apr. 21, 1942
2,515,897	Rennie	July 18, 1950

FOREIGN PATENTS

Number	Country	Date
414,115	Great Britain	Jan. 23, 1934