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ALUMINUM CONDUCTING SURFACE TREATMENT

Filed May 3, 1945

FIG. 1.

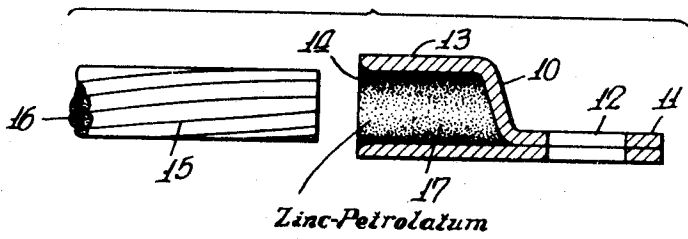
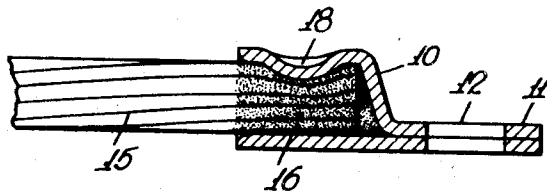


FIG. 2.



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ALUMINUM CONDUCTING SURFACE
TREATMENT

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3 Claims. (Cl. 173-269)

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My invention relates to a method for treating aluminum conductors and/or connectors to increase the electrical joint efficiency of the connection between the two. This application is a continuation-in-part of my application entitled "Aluminum conductor surface treatment," filed June 26, 1943, Ser. No. 492,416.

In my earlier application I disclosed a method of treating aluminum surfaces by first applying concentrated nitric acid to the surface, drying the treated surface by air, and thereafter covering the surface with a zinc-petrolatum coating.

In the present application I have discovered that the electrical resistance of the connection can be reduced, especially where a stranded aluminum cable is employed, by just coating the strands of the cable with the zinc-petrolatum.

Accordingly the primary object of my invention is to provide a method of treating aluminum conductors, and/or connectors, so that a connection comprising a connector secured by pressure to an aluminum conductor will have an electrical resistance equal to or less than an unbroken cable having the same length as the combined connection.

Another object is to provide a method of treating such a connection where the conductor comprises a stranded aluminum cable.

I accomplish these and other objects and obtain my new results as will be apparent from the device described in the following specification, particularly pointed out in the claims, and illustrated in the accompanying drawing in which:

Fig. 1 is an exploded side view of a piece of aluminum stranded cable and an electrical terminal connector, shown in section and filled with zinc-petrolatum.

Fig. 2 is a side view showing in section the final connection.

In the drawing, reference numeral 10 designates an aluminum terminal, having a tongue section 11 provided with an aperture 12, and a barrel 13, having a bore 14 sufficient in diameter to receive an aluminum conductor designated as 15, composed of strands 16.

The bore 14 is completely filled with zinc-petrolatum 17, a mixture of metallic zinc dust suspended in a heavy petrolatum jelly, and when a connection is desired, the cable 15 is inserted into the bore of the barrel, forcing the zinc-petrolatum to completely fill the interstices of the cable end. The final indentation of the barrel as shown by reference numeral 18, results in a final connection that has approximately one-half the electrical resistance of the untreated connection.

This has been brought out by tests in which untreated connections were compared to connections that were treated in the foregoing manner.

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For a pair of terminals indented to the ends of short lengths of No. 4 aluminum aircraft cable to form jumpers having an overall length of $2\frac{1}{4}$ ", the resistance in microhms for the untreated connections was 91.92. Where the cable ends were treated with the zinc-petrolatum the resistance was 69.57. In other words, the relative conductivity in percent had increased from 88.9 to 117.5.

The improvement can be attributed to the method of treatment alone since all other variables such as size, stranding of cable, size of terminal, depth of indentation, length, etc., were kept constant.

Thus, starting with exactly the same cable, terminal, and indentation, the electrical conductivity of the finished connection can be increased by one-third by the addition of the zinc-petrolatum treatment alone.

In addition to providing lower initial resistance, the zinc-petrolatum mixture helps to inhibit corrosion of the cable connection as was pointed out in my earlier application. The tests made show, after considerable exposure, a relatively small increase in resistance of the treated connections, as compared with the larger increase in resistance of the untreated connections.

The zinc-petrolatum having considerable zinc dust contained therein, the pressure of the indented connection is apparently sufficient to cause the zinc dust to penetrate the oxide film formed on the aluminum surfaces and to furnish a conducting path from aluminum to aluminum through the zinc particles. Where stranded cable is used, and the zinc petrolatum is forced between the ends of the cable strands, the particles of metallic zinc coating each strand, break through the film of oxide and thereby provide numerous low resistance current paths from strand to strand, and from strand to connector. This effectively reduces the transverse resistance between strands, and prevents the cable from operating as a series of parallel conductors having high resistance between them. Moreover the zinc-petrolatum prevents and inhibits the formation of oxides and other products of corrosion in the electrical connection after it has been made and is in actual use.

Where a terminal is provided with an open back, it is important to temporarily close this second opening while inserting the cable, in order to prevent the zinc-petrolatum from escaping from the open back instead of penetrating the stranded cable end. This temporary blocking of the open back may be accomplished by covering the second opening with a finger during the insertion of the cable.

It is possible to use a metal other than zinc, and a binder other than petrolatum. A metal to replace zinc would have to be close to zinc in the galvanic series. Such a metal would be

cadmium, magnesium, etc. The substitute for petrolatum would have to be some unctuous substance, non-drying, and have the consistency of substantially that of petrolatum at room temperature. Many wax or wax-like substances have these properties.

When convenient, the contacting connector may be cleaned by degreasing using Oakite, etched by a trisodium phosphate solution, bright dipped in diluted nitric acid and zinc flashed. Other materials may be used to accomplish these operations. Some additional improvements in the electrical and corrosion characteristics may be thus obtained.

I have thus described my invention, but I desire it understood that it is not confined to the particular forms or uses shown and described, the same being merely illustrative, and that the invention may be carried out in other ways without departing from the spirit of my invention, and, therefore, I claim broadly the right to employ all equivalent instrumentalities coming within the scope of the appended claims, and by means of which, objects of my invention are attained and new results accomplished, as it is obvious that the particular embodiments herein shown and described are only some of the many that can be employed to attain these objects and accomplish these results.

I claim:

1. An electrical connector having a tubular body for inserting an aluminum conductor therein, said body completely filled with a material comprising a mixture of an unctuous substance with fine metal particles taken from a group consisting of zinc, cadmium and magnesium.

2. A connector, according to claim 1, in which the material filling the body thereof is zinc-petrolatum.

3. A connection comprising a stranded aluminum cable, and a connector indented thereto, that portion of the cable contained in the connector having the interstices between the cable strands completely filled with zinc-petrolatum.

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The following references are of record in the file of this patent:

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