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PROCESS OF SEALING ANODIZED ALUMINUM AND ALUMINUM BASE ALLOYS

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The present invention relates to improvements in the process of sealing aluminum oxide coatings on articles made of, or having a surface of, aluminum or of alloys the major constituent of which is aluminum.

It has already been proposed to produce artificial coatings of aluminum oxide on aluminum and aluminum alloys by the expedient of forming such an oxide by electrolytic methods. This was usually accomplished by submerging the aluminum or aluminum alloy article in a solution of sulfuric acid, the articles being made the anode, and passing direct electric current through the solution so that the aluminum would be coated with an adherent layer of a form of aluminum oxide. It was found, however, that coatings thus prepared were deficient in providing the desired protection against pitting and corrosion by chemical influences.

Attempts to overcome this difficulty have involved the heating or boiling of the aluminum oxide coated articles in water, preferably at temperatures between about 180° F. and 212° F. This, however, consumed considerable time, even though fairly effective. It is believed that a certain amount of hydration of the aluminum oxide coating was thus effected.

It is one of the objects of the present invention to provide an improved method of rendering anodic aluminum oxide coatings less pervious and hence of enhanced protective power.

It is a further object of the present invention to provide articles made of aluminum, or of aluminum alloys, with a quite impervious layer of aluminum oxide which provides far better protection against corroding influences than do the oxide coatings of the prior art.

In accordance with the present invention, the aluminum or aluminum alloy articles are first provided with the usual type of aluminum oxide coating produced by anodic electrolytic methods. The coating thus produced is still somewhat porous, and hence would not withstand the usual one thousand hour salt-spray test to which articles thus coated are usually subjected in order to determine their effectiveness.

In order to seal the electrolytic coating, the articles thus coated are then heated in a dilute aqueous solution of sodium nitrite for a period of fifteen minutes at a temperature above about 160° F. and below the boiling point of the solution. It is preferred to use a 5% solution of sodium nitrite, although smaller amounts thereof may be used. The protection afforded by thus boiling in a dilute sodium nitrite solution is far superior to that obtained by merely boiling the articles in water.

I am not able definitely to point out what actual reaction may take place during the boiling of the aluminum oxide coating in the sodium nitrite solution, but the sealing effect obtained is far greater, as shown by comparative salt-spray tests.

As an example of my present invention, I subjected an article made of an aluminum-copper alloy to electrolytic oxidation in a sulfuric acid electrolyte for fifteen minutes, and thereafter sealed the aluminum oxide coating thus obtained by heating it in merely hot water for fifteen minutes. The coating thus obtained broke down in only 20 hours of a 20% salt spray, becoming pitted and corroded. On another entirely similar article, and with the same time and conditions for producing the electrolytic anodic aluminum oxide coating, but heating the coating in a 5% aqueous solution of sodium nitrite, the coating thus produced in accordance with my present invention withstood the same 20% salt spray test for 780 hours, at the end of which time no pitting or corrosion had taken place.

In a second example, the anodizing was carried out for thirty minutes, followed by the usual immersion in hot water for the usual period. The article thus produced was submitted to a 20% salt spray test, and broke down after 100 hours, becoming pitted and corroded. Another example, anodized for fifteen minutes and then treated with a hot 5% sodium nitrite solution instead of with water, withstood the 20% salt spray test for 780 hours.

This therefore shows the advantages of my present invention, in that it will permit of a shortening of the anodizing time while yet providing adequate protection aganst corrosion by such agencies as salt. A further advantage is that aluminum oxide coatings sealed by heating in aqueous solutions of sodium nitrite will withstand the corroding influences, such as are exemplified by a salt-spray test, for a much longer time, for instance 780 hours as compared with but 20 hours. That this represents a decided advantage, and a most unexpected result, will be quite evident. This is particularly useful in the case of high strength aluminum alloys, as they will thus retain their surfaces free from pitting and corrosion for a much longer time than if they had been treated by merely the prior art sealing process involving the use of ordinary water.

I claim:

1. Process of sealing aluminum oxide coatings on aluminum or aluminum alloys which comprises heating an article having an electrolytically produced aluminum oxide coating for about fifteen minutes in an aqueous solution of sodium nitrite within a temperature range of from about 160° F. to below the boiling point of said solution.

2. Process of sealing aluminum oxide coatings on aluminum or aluminum alloys which comprises heating an article having an electrolytically produced aluminum oxide coating for about fifteen minutes and at a temperature ranging from about 160° F. to the boiling point in a 5% aqueous solution of sodium nitrite.

3. Aluminum or aluminum alloy articles having an aluminum oxide coating which has been sealed by its adsorption of sodium nitrite.

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