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METHOD OF PREPARING METAL SURFACE FOR PLATING

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This invention relates to a method of coating metals, together with the article which results from following the method.

An object of this invention is to provide a method of creating a stable and lasting plate upon an aluminum surface or the like. Another object is to provide a method of the above character wherein a bond between the surface of an aluminum body and a coating metal is effected. Another object is to provide a simple and practical method of plating aluminum. Another object is to provide a method of the above character which may be practiced commercially and inexpensively. Another object is to provide a method of preparing an aluminum surface for metal plating. Another object is to produce a plated aluminum body which has a smooth, permanent, non-corrosive surface. Another object is to produce a metallic article which is light in weight and at the same time has a permanent, smooth, non-corrosive surface. Other objects will be in part obvious and in part specifically pointed out in the description below.

The invention accordingly consists in the features of construction, combination of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In order that certain features of this invention may be more clearly brought out, it seems desirable to point out that in attempting to plate aluminum and alloys of a similar character commercially many difficulties have been encountered. The surface of aluminum is relatively soft and is therefore easily damaged. Thus, in attempting to plate the surface of aluminum by known processes the surface thereof has become pitted so that the finished article is rough, unseemly in appearance and subject to rapid deterioration. The metal used to form the plate is ordinarily one which is hard and non-corrosive so as to provide a hard, smooth surface. Due to the dissimilarity between aluminum and such metals, the bond between the aluminum and a plate formed of the hard metal by known processes has not been secure. Plated aluminum bodies made in the past have blistered and peeled, thus being commercially worthless. Many attempts have been made to avoid these difficulties without success. One of the various objects of this invention is to provide a method in which the above-mentioned difficulties, as well as many others, are successfully overcome.

In producing articles of aluminum or its alloys, it is often desirable to plate the material and then work it as by drawing or rolling it. This tends to emphasize defects in the bond between the base material and the plating; the bond must therefore be not only even but must be very strong so that the metal may be worked properly.

The preferred embodiment of this invention is a process for securely and permanently forming a metallic plate upon a surface of aluminum or aluminum alloy. One of the important features of this embodiment is the initial treatment of the aluminum surface so as to create a secure bond between the aluminum or aluminum alloy and a plate of another metal such as iron. In forming the plate of iron upon the aluminum surface no pitting of the aluminum surface occurs and the iron plate forms evenly over the entire surface, resulting in a smooth iron surface. In doing this, the iron fills minute recesses in the aluminum surface.

In placing the iron plating upon the aluminum, the article is thoroughly cleaned and then placed in an etching solution which is made up as follows: 40 to 60 grams of ferrous chloride

($FeCl_2 \cdot 4H_2O$)

and 50 c.c. of concentrated hydrochloric acid per liter of water. This solution is preferably maintained at a temperature between 92° and 95° C. The article is held in this solution from one-half minute to one minute, depending upon such factors as the thickness of the iron plate desired, after which it is removed and rinsed.

While the article is in this etching solution, a chemical reaction takes place wherein aluminum from the outer surface of the article replaces iron in the solution and the iron from the solution is deposited thereon. This results in a thin coating of iron on the aluminum. This coating may then be plated in any desired manner with nickel, chromium, or any other desirable coating metal, providing a hard, smooth, durable surface for the aluminum.

It has been found that most desirable results are obtained by using 50 grams of ferrous chloride in the above solution, but very excellent results may also be obtained with any quantity between 40 and 60 grams. While the hydrochloric acid improves the result, it has been found that under certain conditions the process may be carried on without adding any acid. The tempera-

ture of the solution may be varied to suit conditions, but best results for normal purposes are obtained at temperatures within the above-noted range.

In carrying out this process, it should be noted that the size of the article, the thickness of the plate desired, the purity of the aluminum or constituency of the aluminum alloy, the time available for the process and various other factors make it desirable to vary the exact details to be followed. It has been found, for example, that in varying the amount of ferrous chloride which is used in making allowances for varying conditions it is desirable at times to vary the amount of hydrochloric acid in approximately the same proportion. In this way, the number of c. c. of concentrated hydrochloric acid used is equal to the number of grams of ferrous chloride.

In the preferred embodiment of this invention the metal chosen for the initial coating upon the aluminum surface is iron, as iron has many desirable characteristics which are not found in other metals. Iron provides a better bond with aluminum and, at the same time, forms an excellent base to which other metals will readily adhere. Iron is also relatively inexpensive.

The particular compound of iron chosen is ferrous chloride. By using ferrous chloride, many difficulties are overcome which may be encountered if other compounds are used. Of the various compounds which may be chosen, ferrous chloride contains a relatively large amount of iron per gram and more iron is therefore available for plating purposes.

Ferrous chloride also reacts with aluminum in a surprising fashion to deposit the iron upon the surface of the aluminum and make for a secure and lasting bond therebetween. This reaction between ferrous chloride and aluminum is very rapid and much time is saved, thereby reducing manufacturing costs.

Articles plated by this process are free from pitting and blistering and may be readily worked without disrupting the bond between the layers of metal. The plating will not flake off, even though the article is bent to the breaking point. At the same time, a hard, non-corrosive surface is obtained. It has been found that articles produced by this process are not damaged by extreme changes in temperature or by other conditions which would normally disrupt the bond holding the plate upon a surface.

As many possible embodiments may be made of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In the art of treating a surface of an article made of aluminum or its alloys, the step of immersing the article in a solution comprising approximately 50 grams of ferrous chloride and 50 cubic centimeters of concentrated hydrochloric acid per liter of water, the said solution being heated to approximately 92° C., withdrawing the immersed article within a period not to exceed one minute, rinsing the article, and finally, electro-plating a deposit of nickel on said article over the surface produced by said immersion.

2. The herein described art of treating a surface of an article made of aluminum or its alloys including maintaining a solution comprising between 40 and 60 grams of ferrous chloride and between 40 and 60 cubic centimeters of concentrated hydrochloric acid per liter of water at a temperature between 92° and 95° C., immersing said article in said solution for a period between one-half minute and one minute, rinsing the article, and finally electro-plating a deposit of nickel on said article over the surface so produced.

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