

UNITED STATES PATENT OFFICE

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COLORING ALUMINUM ALLOYS

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The subject of the invention is a process for the production of colored protective layers, grey or blackish for example, on aluminum alloys, especially those containing silicon, and/or zinc, and on articles made of such alloys.

It is well known to provide aluminum and aluminum alloys with protective coatings, which resist the action of weather and similar corrosive influences, by an oxidizing treatment with alkaline chromate solutions. It is also known to apply protective metallic coatings to articles of aluminum or aluminum alloys by dipping the articles in a hot alkaline solution containing the protective metal, such as chromium, in the form of a salt.

According to the present invention, extremely durable protective coatings can be produced by treating the aluminum-alloy articles, for example by dipping, at elevated temperature, with solutions which contain, in addition to relatively very small quantities of chromates (such as potassium or sodium chromate), relatively larger amounts of substances with an alkaline reaction, such as sodium carbonate, caustic soda or the like. The amount of chromates employed, whether in the form of the ordinary chromates or as dichromates (for example potassium dichromate) is below about 0.25% (and preferably below 0.2%) by weight, calculated as potassium dichromates, of the treating solution. The amount of the alkalis or substances with an alkaline reaction, should be at least 1.5% (preferably about 2% or over) by weight, calculated as, or equivalent to, Na_2CO_3 , of the treating solution, it being a general principle that the amount of the alkalis employed should be greater in proportion as the amount of chromate used is increased; so that the ratio of alkali (calculated as, or equivalent to Na_2CO_3) to chromate (calculated as potassium dichromate) is at least 5:1, but is preferably not below 8:1 to 10:1. Instead of employing the chromates singly—for example as sodium or potassium chromate or dichromate—or single alkalis—such as sodium or potassium carbonate, sodium or potassium hydroxide, and the like—

mixtures of two or more chromates or alkalis may also be used if desired.

In the process of the present invention, in contradistinction to the known processes, neither an oxidic nor a metallic coating is formed on the articles treated, but, on the contrary, by virtue of the action of the relatively large amount of alkali contained in the solutions, aluminum is dissolved out of the metallic surface to a certain depth, thereby exposing and coloring the alloying components, such as silicon, manganese and the like, whilst—according to the experience of the applicant—the very small amount of chromate present serves to distribute the said alloying components exposed by the dissolving out of the aluminum over the residual surface and to fix same thereto. The process when performed in the manner hereinbefore described, and preferably at elevated temperatures, such as near the boiling point of the liquid employed in the treatment, occupies only an exceedingly short time, so that, in most cases, handsomely colored and durable protective layers can be obtained in a few (e. g. 2) minutes, whereas, with the other known processes, the time required is far longer and may extend to several hours.

The alloys suitable for treatment comprise all the known aluminum alloys, those containing silicon and zinc in particular; and preferably, for example, the aluminum silicon alloys known under the registered trademarks, "Silumin" and "Alpax"; also the alloys containing, for example, manganese, antimony, molybdenum, copper, silver, tin, zinc, tungsten and the like. It is possible by suitably varying the alloying components, to influence the shade of the resulting protective layer as desired, within certain limits. It has also been ascertained that similar effects can also be obtained by the addition of very small quantities of the salts of certain metals,—such as those enumerated above—to the treating solutions.

In general, it has been found desirable, especially in the treatment of aluminum-alloy castings, to subject these articles to a preliminary mechanical treatment of known kind, such as sandblasting, scrubbing

with wire brushes, and the like, which will remove any superficial film of oxide present and facilitate the action of the alkaline solution on the clean metallic surface thereby exposed.

Example I

An article composed of an alloy containing about 87% of aluminum and 13% of silicon is first subjected to mechanical treatment with a revolving wire brush, and is then dipped into an aqueous solution,—heated to about 90° C.—containing 1 grm. of potassium dichromate and 15 grms. of sodium carbonate (Na_2CO_3) or the equivalent quantity of caustic soda, per litre. The formation of the superficial layer will be complete in about two minutes, whereupon the article is taken out of the bath, well washed with water and dried in the usual manner. The protective layer formed thereon is dark grey in color, with a high lustre, and displays high powers of resistance to moisture, neutral saline solutions and the like.

Example II

An article composed of an alloy containing about 90% of aluminum and 10% of zinc, is first treated mechanically, for example, by sandblasting, and is then dipped into an aqueous solution, at about 90° C. containing 2 grms. of potassium dichromate and 20 grms. of sodium carbonate (Na_2CO_3), or the equivalent amount of caustic soda, per litre, the formation of the superficial layer will be complete in about two minutes, whereupon the article is taken out of the bath, well washed with water and dried in the usual way. This produces a strong, adherent, glossy black finish.

Having thus described my invention what I claim is:

1. A dipping solution for the production of a colored protective coating on the surface of articles made of aluminum-containing alloys which contains a small amount of a soluble dichromate salt, not exceeding .02% of the weight of the solution in company with at least about 1.5% of alkali carbonate or hydroxide.

2. A dipping solution as set forth in claim 1 in which the ratio of alkali to chromate is greater than five to one.

In testimony whereof I hereunto affix my signature.

ALADAR PACZ.