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TREATMENT FOR COATED MAGNESIUM AND ITS ALLOYS

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This invention relates to the treatment of a corrosion resistant coating on magnesium and its alloys and one of the objects is to increase the durability and the protective characteristics of the coating.

The method specifically relates to treating coatings produced by chemical reaction on magnesium or magnesium alloys by subjecting the coated metal to a second treatment which, with the first coating, forms not only a seal for the first coating but a new coating that increases the durability of the article coated to wear and improves its resistance to corrosion. The protective coating obtained by my treatment is dependent on the presence of a prime coating and is not in itself a prime surface treatment.

The article to be treated according to this invention is washed free of the primary coating solution which is applied by the dip or immersion method and then is immersed in and subjected to the chemical reaction of my secondary coating and sealing solution, the temperature of which may vary from room to the boiling point of the solution.

The secondary coating and sealing solution should be an aqueous solution containing (1) one or more soluble salts of chromic acid, or a mixture of chromic acid and a salt thereof soluble in the solution, or a mixture of chromic acid and oxides soluble in a chromic acid solution so as to produce the desired salts of chromic acid; and (2) magnesium fluoride. The concentration of the salts of chromic acid is limited only by their solubility in the solution, while the magnesium fluoride being only slightly soluble, very minute additions in terms of percentage up to the saturation point of magnesium fluoride in the solution are effective. The concentrations of the substances may be varied to conform with the temperature of the solution, time of application, and quality of coating desired. Good sealed coatings have been obtained by subjecting the coated metal to treatment for periods varying from 5 minutes to 60 minutes in solutions at temperatures ranging from 85° C. to the boiling point of the solution.

The magnesium or magnesium alloy is first thoroughly cleaned, a clean surface being essential to the formation of good films, and then the metal is provided with an adherent coating formed integrally therewith by the chemical reaction of a solution containing nitric acid and salts of chromic acid. The coated metal is then washed and subjected to the chemical reaction of an aqueous solution containing salts of chromic acid and magnesium fluoride adjusted within the pH range of 3 through 6.5. The total concentration of chromic acid salts may vary from 1% to the point of saturation of the salts in the solution, and the magnesium fluoride may vary from minute additions in percentage up to the saturation point of this substance. The temperature of the solution may vary from room temperature to the boiling point of the solution, the preferable temperature being substantially between 80° C. to the boiling point of the solution.

Specifically, as an example, if a coating is formed on magnesium or its alloys by dipping or immersing the metal for a period of ½ to 2 minutes in a bath containing a water soluble dichromate, such as sodium dichromate, and nitric acid or in a bath containing chromic acid and nitric acid, its corrosion resistance will be improved if it is immersed for a period of 5 minutes to 60 minutes in an aqueous solution containing approximately 10% sodium dichromate saturated with magnesium fluoride, the time of treatment depending upon the temperature of the solution and the resultant coating desired, a temperature approximately at the boiling point of the solution giving the best results.

My protective seal produces the best results with the prime coating known in the art as "Chrome-pickle." This treatment is a simple dip operation requiring ½ to 2 minutes in a bath of the following composition:

Sodium dichromate	pounds	1.5
Concentrated nitric acid	pints	1.5
Water, to make	gallon	1.0

The combined coating and seal of my invention may be applied at room temperature or even lower. However, more favorable conditions are found in hot solutions, in that it takes less time to complete a satisfactory treatment. In like manner, time of treatment depends on concentration of the salt in the solution. That is, immersions requiring 45 to 60 minutes in a boiling 10% dichromate solution saturated with magnesium fluoride may be applied in 30 minutes or less in a boiling 20% dichromate solution saturated with magnesium fluoride.

Any water soluble chromate or dichromate may be used with the magnesium fluoride to make up my solution for sealing the coated magnesium. However, sodium, potassium, and ammonium chromates or dichromates are preferred because of commercial availability.

The above mentioned substances used in my improved coating and sealing treatments are

mentioned by way of illustration and not limitation, since the invention comprehends treatments of the character indicated broadly above and is not to be limited except by the appended claims.

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

I claim:

1. A method of producing corrosion resistant coatings on magnesium and magnesium alloys in which magnesium predominates, comprising forming on the surface of the metal an adherent coating by subjecting the metal to the action of an aqueous solution containing a water soluble dichromate and nitric acid and thereafter subjecting the coated metal to the action of an aqueous solution containing magnesium fluoride and a water soluble salt of chromic acid.

2. A method of producing corrosion resistant coatings on magnesium and magnesium alloys in which magnesium predominates, comprising forming on the surface of the metal an adherent coating by subjecting the metal to the action of an aqueous solution containing sodium dichromate and nitric acid for a period of from ½ minute to 2 minutes and thereafter subjecting the coated metal to an aqueous solution of sodium dichromate saturated with magnesium fluoride for a period of from 5 minutes to one hour, the temperature of the second solution being maintained during treatment between 80° C. and the boiling point of the solution.

3. A method of producing corrosion resistant coatings on magnesium and magnesium alloys in which magnesium predominates comprising forming on the surface of the metal an adherent coating by subjecting the metal to the action of an aqueous solution containing sodium dichromate and nitric acid for a period of from ½ minute to 2 minutes and thereafter subjecting the coated metal to an aqueous solution containing approximately 10 percent sodium dichromate saturated with magnesium fluoride for a period of from 5 minutes to one hour, the temperature of the second solution being maintained during treatment between 80° C. and the boiling point of the solution.

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