

UNITED STATES PATENT OFFICE

2,250,472

METHOD OF PRODUCING COLORED COATINGS UPON MAGNESIUM AND ITS ALLOYS

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No Drawing. Application August 12, 1938,
Serial No. 224,510

9 Claims. (Cl. 148—6)

The invention relates to methods of producing coatings upon magnesium and its alloys. It more particularly concerns an improved method of producing a highly decorative, corrosion-resistant, strongly adherent, flexible coating in a wide variety of colors upon magnesium and its alloys.

Heretofore attempts to produce on magnesium and its alloys decorative coatings in a wide variety of colors and possessing a substantial resistance to corrosion have not been commercially successful.

An object of the invention is to provide a method of producing strongly adherent, corrosion-resistant coatings in a wide variety of colors upon magnesium and its alloys.

Other objects and advantages will appear as the description of the invention proceeds.

According to my invention such coatings are produced by treating the magnesium or magnesium alloy article with an aqueous solution containing a soluble base of an alkali or alkaline earth metal and a dye soluble therein, the treatment being effected under pressure at elevated temperature.

I am aware that it has been proposed to produce uncolored coatings on articles of magnesium and its alloys by subjecting the article to the action of water or water vapor at a temperature above 100° C. In testing such method, however, I have found colored coatings cannot be produced, and moreover such coatings as are obtained are relatively inferior in corrosion resistance compared to those obtainable by employing alkaline solutions containing a dye according to the invention.

In carrying out my invention the magnesium or magnesium alloy article is first cleaned, as by wire brushing, sandblasting, acid pickling, or buffing according to the degree of lustre desired in the ultimate colored coating. The degree of lustre depends upon the smoothness of the metal surface before being subjected to the coating process. For example, sandblasting the metal prepares it to exhibit a relatively dull colored coating, while buffing or polishing the metal to a bright smooth surface results in the article exhibiting a smooth lustrous surface of any desired color after treatment according to the invention.

After having suitably cleaned the article to be coated, it is then subjected to the action of an aqueous alkaline solution to which has been added a suitable dye in an autoclave at elevated temperature and pressure, the duration of such treatment depending upon the temperature (or

pressure) employed. The aqueous alkaline solution is made by dissolving in water from about 2 to 20 per cent or more by weight of an alkali, such as the carbonate or hydroxide of barium, lithium, sodium, or potassium. It is preferable to use either sodium carbonate or hydroxide in a concentration of about 10 per cent. The temperature to employ is from about 110° C. to 250° C. or more, and the pressure should be that corresponding to the vapor pressure of the solution at such temperature. Such vapor pressure may be from about 20 to 400 lbs. per sq. in. and may be used advantageously to regulate the temperature of the operation. The duration of the treatment with the alkaline solution may be from 1 to 30 minutes. At the higher temperatures (200° C. and above) a relatively short time of treatment (i. e. 1 to 5 minutes) suffices, 5 minutes being preferred at 200° C., which temperature corresponds to a vapor pressure of about 225 lbs. per sq. in. At lower temperatures (110° C.—150° C.) the treatment should be more prolonged. By the foregoing treatment there is produced upon the article a coating, with which it appears to form an integral part, that is relatively thin, flexible and hard, the coating being dyed throughout with a color depending upon the dye employed.

The amount of dye to employ should be between about 0.1 and 0.5 per cent or more by weight of the solution, depending upon the shade desired. In general, the more concentrated the dye in the solution, the deeper will be the shade of color produced. Dyes suitable for the purpose are those which are soluble in the alkaline solution and which do not decompose in the solution at the temperature employed. A wide variety of colors can be produced by the method, the dye employed being selected with reference to its solubility and stability as aforementioned.

The following dyes are illustrative of those suitable for use in the process, the number opposite the dye name being that of the "Color Index," 1st edition, January 1924, published by the Society of Dyers and Colourists, Assurance Buildings, Bradford, Yorkshire, England:

Dye

Color Index No.

Pontacyl Light Green SF	Yellowish	670
Malachite Green		657
Wool Green BS		737
Janus Green		133
Aniline Red		677
Methyl Red		211
Pigment Scarlet 3B		216
Fast Crimson 6BL		57

Dye	Color Index No.
Eosine Yellow	768
Quinaldine Yellow	801
Indian Yellow G	146
Naphthol Yellow S	10
Nitrazine Yellow	640
Methyl Violet	680
Crystal Violet 6B	681
Methylene Blue 2BC	922
Aniline Blue	689
Alizarin Blue S	1067
Eosine Bluish	771
Benzo Blue 2B	406
Alizarin Blue G	1066
Fast Acid Black N2B	304
Diazine Black "H" Extra	401
Niagara Sky Blue 6B	518
Acid Blue-Black	246
Diamine Black BH	401
Orange II	151
Orange GG	27
Methyl Orange	142
Alizarin Y 20% Paste	1040
Fluorescein	766
Rosolic Acid	724
Bismark Brown	331
Phenolphthalein	764
Acid Fuchsin	30
Azo Fuchsin 6B	154
Rhodamine B	749
Xylene Cyanol FF	715
Cochineal	1239
Alizarin Cyanine	1050
Bordeaux B	88
Safranin 6B	843
Lanafuchsin 6B	54
Dimethyl-amino-azo-benzene (Butter Yellow)	19

By the foregoing method coatings having practically any desired color or shade of color can be obtained. The coating is not only highly decorative but also affords excellent protection against corrosive attack and it is resistant to mechanical abrasion. The method also has the advantage of producing homogeneous coatings having the same color all the way through and, in the event the coating is scratched, it is not seriously marred, because the dye is laid down with the coating substance with which it forms an integral part.

Other modes of applying the principle of my invention may be employed instead of those explained, change being made as regards the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a method of producing a colored corrosion-resistant coating upon an article formed of a metal selected from the class consisting of magnesium and magnesium alloys, the step which consists in subjecting the article to the action of a solution consisting of water and a base selected from the class consisting of the soluble alkali and alkaline earth metal bases and a dye soluble in the solution, said step being carried out under a pressure of at least 20 pounds per square inch and at a temperature above the normal boiling point of the solution.
2. In a method of producing a colored corrosion-resistant coating upon an article formed of a metal selected from the class consisting of magnesium and magnesium alloys, the step which consists in subjecting the article to the action of a solution consisting of water and a base selected from the class consisting of the soluble alkali and alkaline earth metal bases and a dye soluble in the solution, said step being carried out under a pressure of at least 20 pounds per square inch and at a temperature above 110° C.
3. A method according to claim 2 wherein the base is an alkali metal hydroxide.
4. A method according to claim 2 wherein the base is an alkali metal carbonate.
5. In a method of producing a colored corrosion-resistant coating upon an article formed of a metal selected from the class consisting of magnesium and magnesium alloys, the step which consists in subjecting the article to the action of a solution consisting of water and between 2 and 20 per cent by weight of a base selected from the class consisting of the soluble alkali and alkaline earth metal bases and between 0.1 and 0.5 per cent by weight of a soluble dye, at a temperature between about 110° C. and about 250° C., and under a pressure corresponding to the vapor pressure of the solution at the operating temperature, said pressure being between about 20 and about 400 pounds per square inch.
6. A method according to claim 5 wherein the base is sodium hydroxide.
7. A method according to claim 5 wherein the base is lithium hydroxide.
8. A method according to claim 5 wherein the base is sodium carbonate.
9. An article formed of a metal selected from the class consisting of magnesium and magnesium alloys and having bonded integrally thereto an adherent corrosion-resistant homogeneously colored coating producing according to the method of claim 1.

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