Patented Apr. 7, 1942

2,279,268

UNITED STATES PATENT OFFICE

2,279,268

CALORIZED METAL AND METHOD FOR PRODUCING THE SAME

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No Drawing. Application May 16, 1939, Serial No. 273,946

5 Claims. (Cl. 91—70.1)

The present invention relates to coating metals with an alloy of aluminum and zinc. Prior to the present invention metals have been coated with aluminum by a process generally known as "calorizing." While several variations of the prior process have been suggested none has been found to be successful commercially. In some of the prior methods aluminum has been applied as a paint to the base metal. The vehicle for such paint has sometimes been a material which, upon application of heat, left a carbonaceous residue which interfered seriously with the combination of the aluminum and base metal. In other prior calorizing methods employing aluminum paint the vehicle for the paint has consisted of a nitrocellulose compound which, although it left no residue upon decomposition, nevertheless decomposed at a very low temperature thereby permitting the aluminum flakes to become detached from the base metal. Other aluminum paint vehicles which decompose without leaving a carbonaecous residue also have been employed in calorizing but results obtained by the use of such paints have been unsuccessful and uncertain so that such processes have never gone into practical use.

It is an object of the present invention to provide a simple and inexpensive method for applying to a base metal a calorized coating which will not become detached from the base metal. A further object of the invention is to provide ferrous metals and other alloys with a matte calorized surface which may be wetted by molten glass and which will resist oxidation.

In carrying out my invention, I employ a paint vehicle which consists of a zinc soap such as zinc stearate, palmitate, oleate, and the like which is dispersed in any suitable solvent, for example an aromatic solvent such as toluol or solvent naphtha. A vehicle consisting of about 21.4% zinc soap and about 78.6% solvent will provide satisfactory results. The paint vehicle is mixed with granular aluminum and the paint thus produced applied to the metal to be coated in any convenient manner, for example with a spray or brush. The coated article is dried at room temperature to remove the solvent and is thereafter heated at about 600 to 700° C. to alloy the coating with the base metal. The heating may be carried out in any suitable atmosphere for example air or hydrogen. However, the rate of heating to the elevated temperature should be slow enough to prevent the formation of blisters. The time which the coated article is held at the elevated temperature depends upon the desired degree of penetration or diffusion of the aluminum zinc alloy into the base metal. Generally a period of about two hours will be satisfactory. While the quantities of aluminum and paint vehicle employed may be varied, I prefer to employ about 51.4% vehicle and about 48.6% granular aluminum in the paint.

In my improved process the zinc soap melts under the influence of heat and acts as a flux. Further heating converts the soap to zinc oxide and volatile substances and the oxide thus formed is reduced to metallic zinc by the granular aluminum. The quantity of zinc present in the coating, although quite small, for example about one per cent, has an appreciable effect in combining or alloying the aluminum and base metal.

The calorized coating has a matte surface which may be wetted readily by molten glass. This result is advantageous for, although glasses heretofore have been devised which will wet nickel-iron alloys, such glasses will not wet steel. The matte surface produced by my process assists materially in effecting a satisfactory metal to glass seal. However, to obtain such a surface it is necessary to employ granulated instead of flake aluminum. Granular aluminum of 100 to 400 mesh is particularly desirable for this purpose.

While my improved process is particularly useful in the production of surfaces which may be wetted by molten glass it also may be employed to advantage in the production of calorized surfaces on chrome steel mercury boiler tubes, or on other metal devices which encounter oxidation and high temperature conditions. In producing a calorized surface on mercury boiler tubes it is desirable, before calorizing, to clean the tubes by sand blasting them lightly.

If desired, I may produce a zinc coating by the present process by the use of a fine mesh granulated zinc suspended in a zinc soap vehicle.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A method for coating ferrous metal which comprises applying a paint containing granular aluminum and a zinc soap to said metal, drying the coating thus obtained and thereafter heating the coated metal at about 600° C. to about 700° C.

2. A method for coating ferrous metal which comprises applying to the metal a paint containing granular aluminum, zinc soap, and a solvent for said soap, drying the paint and thereafter heating the coated metal at an elevated temperature to diffuse said coating into the metal.

3. A metal for coating ferrous metal which comprises applying to the metal a paint containing granular aluminum, zinc stearate, and a solvent for said stearate, and heating the coated metal at a temperature of about 600° C. to about 700° C.

4. A method for applying a protective coating to ferrous metal which comprises applying to the metal a metallic paint containing granular aluminum, a zinc soap and a solvent for said soap, and heating the coated metal at a temperature sufficiently high to melt the soap and diffuse the coating into the ferrous metal.

5. A method for coating ferrous metal which comprises applying to said metal a paint consisting of a paint vehicle and granular aluminum, said paint vehicle containing about 21.4% zinc soap and 78.6% of a solvent for said soap, said paint consisting of said vehicle and about 51.4% of granulated aluminum, coating said metal with said paint, drying the coating and then heating it to a temperature of about 600 to 700° C.

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