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PROCESS FOR PRODUCING AN ALUMINIUM-COATED METAL ARTICLE IN WHICH MAGNESIUM FORMS THE BASE METAL

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This invention relates to improvements in metal-coated metal articles, and particularly articles, in which the base metal consists of magnesium or a magnesium base alloy.

In view of the comparatively low resistance of magnesium and magnesium base alloys to corroding agents, various methods have been suggested for applying protective coatings to articles made therefrom. In dealing with magnesium and magnesium base alloys in sheet form, it has e. g. been attempted to plate the products with magnesium base alloys of comparatively high chemical resistance. Since, however, all magnesium base alloys afford a pure resistance to corrosion, a plating of this kind is still far from satisfactory.

It is desirable that a metallic coating, besides affording sufficient protection to the base metal from the action of corroding agents, also be mechanically resistant and cling tenaciously to the base metal on to which it is plated. The present invention aims at producing a metal-coated metal article in which magnesium or a magnesium base alloy forms the base metal and which will comply with the aforesaid requirements.

Attempts to apply aluminum or an aluminium base alloy directly on to the body of magnesium or magnesium base alloy have failed, since the adhesion to the base metal is insufficient. I have, however, found that, by the interposition, between the aluminium or aluminium base alloy (the latter hereinafter simply being included in the term "aluminium") outer layer and the magnesium or magnesium base alloy (the latter hereinafter simply included in the term "magnesium") body, of an intermediate layer consisting of a metal or alloy capable of alloying both with magnesium and, at least in the presence of magnesium, also with aluminium, then a metal article is produced having a coating of aluminium which offers a comparatively high resistance to corroding agents, while, at the same time, being mechanically resistant and not liable to peeling off.

Examples of metals suitable for forming the intermediate layer are zinc, tin, cadmium, lead, and antimony, and also alloys of these metals. The intermediate layer is preferably applied to the base metal by the well known spraying (metallic atomisation) process, although other means may be employed: thus it is also possible to apply the intermediate layer on the base metal in the form of a foil.

In accordance with the invention, the base metal covered with the intermediate layer is subjected to a short heating preferably at or slightly below the temperature of the eutectic between the base metal and the metal constituting the intermediate layer, so as to cause at least part of the metal forming the intermediate layer to alloy with or diffuse into the base metal, whereby the intermediate layer is keyed in a reliable manner on to the latter, whereupon the outer layer consisting of aluminium is applied in any convenient manner, such as by pressing or rolling aluminium foil on to the workpiece; the outer layer may even be applied in the molten form, e. g. by quickly dipping the workpiece already provided with the intermediate layer in a bath of molten aluminium or by spraying, a manner of working which is particularly useful in the case of workpieces of irregular shape such as castings. During or following such application of the outer layer, the workpiece is preferably again heated for a short time, e. g. by shock-heating or by passing an oxy-hydrogen blow-pipe flame over the workpiece, so as to facilitate the formation of an alloy between the intermediate layer and the inner surface of the outer layer by superficial melting or by diffusion.

In certain cases, viz. when diffusion of the metal forming the intermediate layer into the basic metal as well as into the outer layer of aluminium can be caused to take place at one and the same temperature, it is possible to perform the aforesaid two separate steps simultaneously. In such cases, in accordance with the invention, the intermediate layer is first applied to the basic magnesium, and the outer layer of aluminium is then immediately applied on to the coated article thus obtained, whereupon the whole composite article is subjected for a short time to the temperature at which diffusion of the intermediate layer will take place in an inward and in an outward direction. Preferably, this is done by hot rolling the composite article, whereby a yet more reliable bondage between the base metal and the various layers is attained.

According to a further modification of the present invention, the metal forming the intermediate layer may be first applied both to the magnesium workpiece to be plated and to the aluminium intended to form the outer coating, whereupon the aluminium provided with the metal coating is placed on the workpiece to be plated in such a manner that the layers of the metal forming the intermediate layer contact, whereupon the whole article is subjected to heating and compression, e. g. by hot rolling.

Example

A band consisting of a magnesium alloy which contains 8 per cent of aluminium and 0.5 per cent of zinc is uniformly roughened by sand blasting on the surface to be plated and then coated with a thin foil of zinc. The surface is then exposed for five minutes to a temperature of 340° C. in an inert atmosphere, e. g. nitrogen. In a similar manner a strip of pure aluminium intended to form the outer plating is coated on one side with a foil of zinc; in this case an annealing temperature of 380° C. for the diffusion is maintained. The zinced side of the strip of pure aluminium and the zinced surface of the band are then superposed and the strip is rolled on to the band at a temperature of 340° C. The plating firmly adheres to the surface of the workpiece whereby the latter is reliably protected against corroding actions.

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