

UNITED STATES PATENT OFFICE

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METAL COATING

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4 Claims. (Cl. 91—70.2)

This invention relates to a novel metallic coating composition and to the process of producing and employing the same. The invention has more particularly to do with improvements in galvanizing.

A feature of the invention resides in the provision of a zinc coating which has a high luster at least over portions of its surface and which has superior physical properties such as adherence and ductility.

Another feature resides in a superior process for simply and expeditiously producing and applying the coating.

Other features and objects and advantages will be in part apparent and in part pointed out in connection with the following detailed description of an illustrative embodiment in accordance with the invention.

Merely by way of example, to a ton of molten zinc or spelter, possibly containing some other metals in small amounts, there may be added two pounds of phosphor-tin containing five parts of phosphorus to ninety-five parts of tin by weight. The phosphor-tin may be prepared in any convenient, known manner, and may be added to the bottom of the bath, and allowed to thoroughly distribute itself through the zinc, the tin serving primarily as a carrier for the phosphorus.

The coating bath, preferably maintained at about 790° F. to 890° F. (preferably 800° F. to 835° F.), may then be employed to treat iron or other material to be coated. For instance, the material to be coated may be dipped in the bath, removed and allowed to cool at a normally advised rate for galvanizing processes, or the galvanizing may be carried out in other known manner, with or without additional finishing steps.

If desired a small quantity of flux alloy may be added to the zinc bath. For this purpose, an alloy of ninety parts zinc and ten parts tin, or a similarly proportioned alloy of zinc and aluminum may be employed in suitable amounts, for instance two pounds per ton of zinc. The latter alloy seems to aid in producing the desired sheen in addition to its fluxing action in the bath. However, a flux alloy is not required, and it may be preferable in certain cases to avoid the introduction of an element foreign to the carrier for the phosphorus. When a flux alloy is employed it may be preliminarily melted with the phosphorus and carrier and pigged for later use in the bath.

The phosphorus in the bath will tend to diminish at the temperatures mentioned and may be

replenished from time to time, or continuously, by adding phosphorus to the bath to replace calculated or determined losses, to maintain the composition of the bath as nearly as practicable uniform. The losses may advantageously be made up by forming pellets of zinc and phosphorus and introducing them into the bath, at any suitable point, advantageously near the bottom thereof, to aid the diffusion through the bath. As an indication of the required additions of phosphorus, it has been found that in a zinc bath maintained at slightly above the galvanizing temperature, an initial quantity of phosphorus corresponding to .097% will be reduced to about .03% at the end of four hours.

It will be seen from the foregoing that the amount of phosphorus which is employed may advantageously be extremely small, for instance about .005% of the zinc used. When phosphorus is employed in about this proportion a coating is produced having a mottled appearance, with portions of brilliant sheen contrasting with other relatively or somewhat dull portions of the surface. An even smaller percentage of phosphorus may produce satisfactory results for certain purposes, and the proportion of phosphorus may be increased within limits. For instance, as much as .5%, or even 1 to 2½% of phosphorus-tin may be employed, based on the zinc, but these larger amounts produce somewhat less brilliance, or duller frost, probably due to the increase in the tin. The temperature of the bath and rate of cooling of the coating appear to affect the character of the mottling and the factors should therefore be controlled, preferably though not necessarily, as mentioned.

While tin has been suggested as a carrier for the phosphorus, and is highly satisfactory for enabling the ready introduction of phosphorus into the zinc bath, the invention in its broader aspects is not limited to any particular carrier or even to the use of a carrier. However, a carrier is recommended, since the addition of phosphorus directly to large amounts of zinc may tend to produce an insoluble phosphide which is not readily distributed uniformly through the zinc. As examples of other possible carriers mention is made of aluminum, zinc, lead, bismuth, antimony, copper, magnesium, and boron, although certain of these may be excessively expensive or otherwise undesirable for certain reasons, some of which have been indicated, and others of which are understood by those skilled in the art. On the whole, tin is preferred, while aluminum appears as second choice.

The phenomena underlying the results produced are not entirely understood, and accordingly a discussion of theories as to the action of the phosphorus will not be undertaken. Suffice it to say that through the present invention there is provided an extremely effective and simple method of producing a galvanized surface having a brilliant sheen at least over certain portions of the surface. Furthermore, a mottled surface can be produced, in which there are sharply contrasting brilliant and frosted spangles. The coating produced is considerably more ductile than the ordinary zinc coating, possibly due in part to the presence of tin. In addition a particularly firm bond is produced between the coating and the iron or other metal to which the coating is applied.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described, or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. Method of galvanizing articles, which comprises maintaining a bath of molten zinc at a temperature above the melting point of zinc, incorporating in the bath an alloy of phosphorus and a carrier metal therefor in such proportions that the phosphorus constitutes from about five-thousandths of one percent to about five-hundredths of one percent of the zinc, and the carrier metal constitutes less than about one percent of the zinc, and coating said articles with said molten bath.

2. Method of galvanizing surfaces of articles to be coated which comprises maintaining a bath of molten zinc at a temperature above the melting point of the zinc, incorporating in said bath an amount of phosphor tin which is less than about one percent of the bath, the phosphorus being present in amount from about five-thousandths of one percent to about five-hundredths of one percent of the bath, and applying said bath to the surfaces to be coated.

3. Method of galvanizing articles, which comprises maintaining a bath of molten zinc at a temperature above the melting point of zinc and below about 890° F., incorporating in the bath an alloy of phosphorus and a carrier metal therefor in such proportions that the phosphorus constitutes from about five-thousandths of one percent to about five-hundredths of one percent of the zinc, and the carrier metal constitutes less than about one percent of the zinc, and coating said articles with said molten bath.

4. Method of galvanizing articles, which comprises maintaining a bath of molten zinc at a temperature above the melting point of zinc, and between about 800° F. and 835° F., incorporating in the bath an alloy of phosphorus and a carrier metal therefor in such proportions that the phosphorus constitutes from about five-thousandths of one percent to about five-hundredths of one percent of the zinc, and the carrier metal constitutes less than about one percent of the zinc, and coating said articles with said molten bath.

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