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SOLUTION FOR SMOOTHING ZINC SURFACES

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1 Claim. (Cl. 148-6.21)

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This invention relates to a composition for providing on the surfaces of zinc base metals a bright, smooth, attractive finish which has an increased resistance to tarnish. I intend to include in the term "zinc," as used in the specification and claims, any zinc alloy surface composed mainly of zinc and acting in the same manner as zinc. For convenience, these metal surfaces will hereinafter be collectively referred to as "zinc," and may be composed of zinc castings or of other metals plated with or dipped in zinc.

The object of the invention is to provide a very cheap quickly acting composition for forming on relatively dull zinc surfaces a bright, smooth and reflective finish, and for improving the lustre on so-called bright zinc-plated surfaces. The resultant finish also renders the zinc surface more resistant to tarnishing and finger-printing.

My improved composition may be employed on zinc surfaces generally. For example, these surfaces may be presented by a zinc die casting; by a zinc plating deposited electro-galvanically in a zinc sulphate-acid bath (in which instance the deposit is usually gray and slightly rough); or by a zinc plating produced in a zinc cyanide-sodium cyanide bath (in which instance the surface is also gray and dull in appearance). It may also be employed to improve the lustre of the surfaces of so-called bright zinc deposits which may be plated from zinc cyanide-sodium cyanide baths by the addition of suitable metallic addition agents and suitable organic addition agents.

In using my improved composition, the zinc-surfaced article is subjected to a two stage process. In the first stage the article is dipped for a short period (a few seconds generally sufficing) in a controlled acid bath, the composition of which forms the present invention. The function of this controlled acid bath is to attack the zinc surface while limiting the depth of the attack by forming a resistant film upon the metal. The amount of metal removed in a single dipping will be on the order of 0.00002 inch, the time of immersion not being critical inasmuch as acid action is automatically stopped by the formation of the resistant film. This film being brown in color the necessary time can be gauged readily by eye upon rinsing test pieces dipped for varying periods. It is obviously undesirable for economic reasons to continue the acid dip beyond this period.

The metal is then preferably rinsed, and is dipped in a caustic solution which either removes the film or, more probably, reduces it into a col-

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orless transparent film since the resulting surface is less subject to tarnish than the original untreated zinc. However that may be, the combined effect of the controlled acid and caustic dips is to give to the zinc a greatly enhanced lustre and brightness. In general, one treatment is sufficient to produce the desired brightness, but it is one striking feature to the process that brightness may be further increased by going through the sequence of operations a second or even a third time. Other brightening processes, or undesirable modifications of the proportions of the controlled acid dip described below, will in general cause a decrease in brightness on repeated dipping.

While I do not wish to be limited by the theory, I believe that the explanation of the action of the controlled acid dip lies in the unequal attack made by the acid on the surface-roughening projections and protuberances and on the valleys between these projections. The projections are attacked from all sides, so that their peaks are cut down much more than the 0.00002 inch which is removed from the sides of the projections in common with the valleys. Were the acid bath not self-stopping, new roughnesses would be set up by the unevenness of the acid attack on areas of metal having different degrees of resistance to acids. The film-forming action of the bath, however, prevents this, with the result that an even removal of metal occurs except for the lowering of the peaks of the projections. When the film is removed or decolorized a much brighter surface will result. It is easy to see that, assuming this theory to be correct, a repeated dipping will carry further the removal of projections, if this be necessary, with only a uniform cutting away of the flat portions of the metal surface.

The following example will illustrate the process:

Solution A (controlled acid dip):

Chromium trioxide	-----lbs--	2
Concentrated sulfuric acid	fluid ounces--	2½
Glacial acetic acid	-----do-----	1
Water to make	1 gallon	

Solution B (caustic dip):

Sodium hydroxide	-----ounces--	8
Water to make	1 gallon	

The article was dipped in solution A, rinsed, dipped in solution B, and again rinsed. Acetic acid appears to be the main attacking agent. Sulfuric acid and chromium trioxide (chromic

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acid) react to deposit a protective film, probably zinc dichromate, upon the surface which rapidly becomes thick enough to inhibit further attack. The proportions and dilutions are important without being critical. Acetic acid gave only fair results in concentrations above 2 oz. per gallon, with spotting and dullness occurring on repeated dips. In a concentration of 1 oz. per gallon, acetic acid gave fair brightening, the brightening being improved on repeated dips. In this connection it should be noted that if the zinc is first given a dichromate film and then dipped in various acids the film will be dissolved in hydrochloric and sulfuric acids but not in acetic acid. It thus is a requisite of the acid bath that in addition to the film producing chemicals there should be present an acid which will attack zinc but which will not dissolve the protecting film.

A concentration of chromium trioxide above a minimum value is necessary. In a concentration of 8 oz. per gallon (other ingredients being in the proportions of the example above) no brightening occurred even with repeated dips. A concentration of either 16 or 24 oz. per gallon gave fair brightening with one dip and good results upon repetition. Either 32 or 40 oz. per gallon gave good results both on a single dip and upon repetition.

An optimum concentration of sulfuric acid is necessary, 1 oz. per gallon (other ingredients being in the proportions of the example) giving no brightening with either one or more dips, while 5 oz. per gallon gave fair brightening with

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one dip but spotted upon repetition, 2 to 4 oz. per gallon appearing to be the preferable range. Neither phosphoric, hydrochloric, nor acetic acids appear to be satisfactory substitutes for sulfuric acid. It is possible to replace part of the sulfuric acid with other sources of sulfate ions such as sodium or aluminum sulfate or sodium bisulfate, although for best results it is necessary to supply some or all of the sulfate ions from sulfuric acid rather than from a salt.

The caustic dip does not appear to be critical either in composition or concentration, since its only function is to reduce or remove the protective film, which is subject to attack by an alkaline substance generally.

I claim:

A composition for smoothing zinc surfaces comprising an aqueous solution of glacial acetic acid, sulfuric acid, and chromium trioxide in substantially the respective proportions 1 fluid oz., 2½ fluid oz., and 2 lbs. per gallon of water.

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The following references are of record in the file of this patent:

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