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CLEANING AND PROTECTING METALS AGAINST RUSTING

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The present invention relates to improvements in the use of phosphoric acid for cleaning metals and protecting them from further rusting and comprises solutions of aqueous phosphoric acid and ethers and a common, water soluble solvent for phosphoric acid and said ethers.

It is well known that sheet metal which has been given a thin coating of phosphate as, for example, by dipping in phosphoric acid or a phosphate solution, has certain rust resistant properties that metal without this protective film of phosphate does not have. The simplest form of treatment is to immerse the piece of sheet into a bath of aqueous phosphoric acid or phosphate. However, ordinary sheet metal as it comes from the fabricating operations is covered with scale, rust, etc., and has spots of grease and oil on its surfaces. The phosphoric acid, while removing the rust and scale, is unable to penetrate through the films of oil and grease and at such places the protective phosphate film is not formed. In further handling of the article, such grease spots are liable to rust and the paints or other coatings will not adhere as well to such unprotected spots.

I have found that the addition of organic ethers, preferably those which are liquid at and boil above room temperature, to phosphoric acid solutions allow the latter to form a protective phosphate film at greasy or oily spots when the metal is treated with a phosphate solution.

Ethers are the aryl or alkyl oxides of the general type R—O—R' wherein R and R' are the same or different hydrocarbon radicals.

Among the more common, technically available ethers useful in the preparation of my novel cleaning solutions, I can mention ethyl ether which boils at 34.6° C.; while this boiling point is somewhat low for the present purpose, ethyl ether could be used. I prefer, however, to use higher boiling ethers, such as iso-propyl-ether, B. P. 69° C.; propyl-ether, B. P. 90.7° C., butyl ethers boiling above 100° C., ethyl-propyl-ether B. P. 63–64° C., ethylene glycol mono-ethyl-ether B. P. 134.8° C. etc.

These ethers are not completely miscible with aqueous phosphoric acid of the concentrations commonly used in rust protecting operations. I, therefore, emulsify the small amounts of ethers required in such phosphoric acid solutions.

More convenient is to add to the cleaning and rust preventing bath a water soluble solvent in which both the aqueous phosphoric acid and the ether is soluble, such as for instance methyl alcohol, ethyl alcohol, acetone, etc.

In preparing an efficient metal cleaning and rust preventing bath, I mix for instance 1 vol. 85% phosphoric acid with 1 vol. denatured alcohol or similar solvent and 1½ vol. water and from 1 to 5% of an ether such as for instance iso-propyl-ether.

The amount of ether needed to allow the phosphoric acid to produce a continuous film over greasy metals is not particularly critical and the amounts above 5% could just as well be used though they would be less economical as amounts between 1 and 5% as stated above.

Rusted and oily sheet iron, when dipped in such solutions, were readily wetted, the rust dissolved and the metal was coated with a thin and even film of phosphate which imparted to the whole surface of the article an excellent rust resistance.

I claim:

1. A metal cleaning and rust preventing solution comprising 1 volume of 85% phosphoric acid, 1 volume denatured alcohol, 1½ volume of water and from 1 to 5% of the total of iso-propyl-ether.

2. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid, iso-propyl-ether and a water soluble common solvent for phosphoric acid and said ether.

3. A metal cleaning and rust preventing solution comprising aqueous phosphoric acid and iso-propyl-ether.

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