Patented Mar. 4, 1941 2,233,422

UNITED STATES PATENT OFFICE

2,233,422

METHOD OF COATING COPPER AND ITS ALLOYS

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No Drawing. Application June 6, 1938, Serial No. 212,209

5 Claims. (Cl. 148—6)

This invention relates to the coating of copper and its alloys with a non-metallic corrosion retarding surface to form a good base for paint and enamel that will firmly unite such a coating with the metal articles in such a way as to prevent their peeling.

Copper and its alloys present a real problem when it is desired to apply paint or the like to the surface thereof because copper has a type of surface which prevents the proper adhesion of paint. The peculiar characteristics of such a surface cannot be entirely overcome by any of the well known cleaning methods. The present invention discloses a new and improved process for converting the metal surface to one of non-metal so that there is present a non-metallic bond for paint or the like.

In the coating of iron, steel and zinc with phosphate solutions it has been found that the introduction of certain oxidizing agents such as nitrates, nitrites and sulphites greatly reduce the processing time. It has now been discovered that the introduction of oxidizing agents such as the chlorates, bromates, quinone, periodates and hypochlorites, to phosphate solutions bring about phosphate coatings in a very short time when treating copper and its alloys.

The main object of the present invention is to provide a new and improved method of coating copper and its alloys by means of phosphate solutions.

Another object of the present invention is to provide a new and improved method of reducing the time within which a phosphate coating may be formed on copper and its alloys.

The above and other objects will appear more fully from the following more detailed description.

In building up the solution it has been found that the best results are obtained from the use of either zinc or manganese acid phosphate, although cadmium or magnesium acid phosphates may be employed. Copper, and an alloy such as brass, do not react the same so far as their ability to take a coating is concerned; for example, it has been found that the most satisfactory solution for the coating of brass consists of a solution made up in the following manner.

To 100 gallons of water add:
(a) 60 gallons of 75% phosphoric acid
335 pounds of normal manganese phosphate

The last constituent should be added slowly while the acid is being heated to approximately 200° F.

A processing solution is now made up by adding:

To 100 gallons of water
5 gallons of solution (a) and
9 pounds of sodium chlorate

This solution is heated to approximately 210° F.

This solution should test about:

Free acid	5.0
Total acid	22.0

Based on a titration of a 1 cc. sample with N/50 sodium hydroxide using methyl orange and phenolphthalein indicators respectively. The work is immersed in the solution for approximately three to five minutes.

A small amount of zinc, approximately .02% introduced as zinc carbonate into the above processing solution has also been found to be very helpful in that it tends to eliminate smudgy coatings and thus do away with a wiping operation prior to painting. Per 100 gallons add about 2 pounds.

I have found that if heavy grease is on the articles to be coated, the same should first be removed by a grease solvent. If no such grease is present a hot water immersion or spray for approximately two minutes has been found very beneficial.

A very good solution for use on copper is as follows:

To 100 gallons of water, add:
25.2 pounds of zinc dihydrogen phosphate
9 pounds of sodium chlorate.

Bring to a boil. The increase of zinc content in the above solution by adding 9 pounds of soluble zinc salt, such as zinc sulphate or zinc nitrate, improves the coating on copper a great deal. A good processing solution for copper containing 9 pounds of zinc nitrate per 100 gallons in addition to the above mentioned chemicals, will test:

Free acid	2.2
Total acid	15.5

based on the same titration as above outlined.

Both of these baths dissolve considerable copper which is retained in the solution to some extent and apparently has some balancing effect to produce a better coating as the solution is aged.

The copper compound, such as copper carbonate, may be added before processing, where desired.

The following accelerating metals may also be used: antimony, nickel, silver and manganese.

A very good solution for use on brass is as follows:

To 100 gallons of water, add:
26 pounds magnesium dihydrogen phosphate
4.5 pounds sodium bromate

Temperature 210° F. Processing time approximately five minutes.

The work may be immersed into the above solutions, or these solutions may be sprayed onto the work.

It has been further discovered that when the coatings produced in accordance with this invention are subject to a final rinse in a solution of the kind described below, the corrosion resistance is still further enhanced. For this purpose a dilute solution of chromic acid, phosphoric acid, oxalic acid or a salt of iron, chromium or aluminum may be used, such as aluminum nitrate or sulphate, ferrous sulphate, ferric nitrate and chromic sulphate or nitrate. A particular advantage derived from the use of one of these final rinses is that subsequent paint blistering is reduced to a minimum. The solutions may be used from 150° to 180° F.

From 7 to 21 ounces of the acid or salt per 100 gallons is the preferred strength from the standpoint of economy, although stronger solutions are just as effective. A treatment of one minute in these solutions is sufficient.

There has been disclosed a new and improved process for coating copper and its alloys whereby a metallic surface is converted to a non-metallic phosphate coating which may be readily painted. Objects of copper, brass or the like have presented a problem for years on account of their tendency to tarnish when exposed to atmospheric conditions for any great length of time and the impossibility to make paint adhere to its surfaces. After the object has been treated, as disclosed in the present application, the article may be painted any desirable color, and the paint, enamel or the like forms an additional protective coating for the metal. The articles may be immersed in the solution or the solution may be quickly sprayed upon the metal surface followed by the rinses disclosed herein.

I claim:

1. A process for producing corrosion retarding coatings on articles of copper and its alloys which comprises subjecting the surface thereof to the action of a solution containing an acid phosphate selected from the group consisting of zinc, manganese, cadmium and magnesium and an oxidizing agent selected from the group consisting of chlorates, bromates, periodates, hypochlorites and quinone.

2. A process for producing corrosion retarding coatings on articles of copper and its alloys which comprises subjecting the surface thereof to the action of a solution containing an acid phosphate selected from the group consisting of zinc, manganese, cadmium and magnesium and an oxidizing agent selected from the group consisting of chlorates, bromates, periodates, hypochlorites and quinone, and thereafter subjecting the articles to a final rinse in a solution containing an acid selected from the group consisting of chromic acid, phosphoric acid and oxalic acid.

3. A process for producing corrosion retarding coatings on articles of copper and its alloys which comprises spraying upon the surface of said article a solution containing an acid phosphate selected from the group consisting of zinc, manganese, cadmium and magnesium, and an oxidizing agent selected from the group consisting of chlorates, bromates, periodates, hypochlorites and quinone.

4. A copper metal object having on a surface thereof an integral coating having the composition resulting from treating the copper metal object with a solution containing an acid phosphate selected from the group consisting of zinc, manganese, cadmium and magnesium, and an oxidizing agent selected from the group consisting of chlorates, bromates, periodates, hypochlorites and quinone.

5. A composition of matter for use in retarding corrosion of copper articles comprising an acid phosphate selected from the group consisting of zinc, manganese, cadmium and magnesium, and an oxidizing agent selected from the group consisting of chlorates, bromates, periodates, hypochlorites and quinone.

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