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2,800,422

PROCESS FOR RUST-PROOFING AND
PASSIVATING IRON ARTICLES

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No Drawing. Application April 20, 1953,
Serial No. 349,963

1 Claim. (Cl. 148—6.15)

It is known to prepare the surfaces of iron articles for painting by previously providing thereon a protecting film of inorganic salts, such as iron, zinc and manganese phosphates or coating them with a metallic film, for example, by zinc-plating, chrome-plating, nickel-plating, or copper-plating. It is also known to treat protecting phosphate films with chromate or dichromate ions.

Such treatments suffer, however, from a serious drawback consisting in the formation, on the surface of the treated iron articles and underneath the paint film, of a layer of considerable thickness, easily susceptible to cracking and forming a brittle base for the coat of paint provided on the surface of the articles.

The object of the present invention is to provide an improved process for preparing the surfaces of iron articles for receiving paint coatings and making them rust-proof, without providing them with a brittle coating.

The process according to this invention consists in:

(a) Forming on the surface of such articles a coating of a phosphate, or phosphates of iron, zinc and/or manganese,

(b) Dissolving the phosphate coating so formed, and

(c) Passivating the newly exposed surface by the use of a solution containing chromate or dichromate ions.

The treatment according to the above disclosed process will preferably be preceded by cleaning or degreasing of the articles to be treated when they are particularly soiled or smeared. This may, however, be eliminated if the articles are relatively clean by reason of the fact that the composition used in carrying out the process cleans the article surface to a sufficient extent.

An example of a manner of carrying out the process according to this invention as well as substances suitable for this purpose will now be described. The substances may be for instance as follows:

The term "ethylene oxide condensate" used below is intended to designate any of the well-known detergents which are sold commercially under trade names such as "Igepal."

Substance No. 1: Any of the known detergent agents known for cleaning sheet metal, when this step is required:

Substance No. 2:	Percent
Zn (NO ₃) ₂ (zinc nitrate)-----	11
H ₃ PO ₄ (phosphoric acid)-----	5.7
Zn(H ₂ PO ₄) ₂ (acid zinc phosphate)-----	64
Ethylene oxide condensate-----	19.3

Substance No. 3:	Percent
Zn(NO ₃) ₂ (zinc nitrate)-----	18
HNO ₃ (nitric acid)-----	38.5
H ₃ PO ₄ (phosphoric acid)-----	35
Ethylene oxide condensate-----	8.5

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Substance No. 4:	Percent
Cr ₂ O ₃ (chromic anhydride)-----	46
H ₃ PO ₄ (phosphoric acid)-----	54

5 Substance No. 5: Silicone containing foam inhibitor.

A manner of carrying out the process by using the above mentioned substances shall now be described.

10 *1st liquid—preliminary pickling, if necessary.*—Any desired pickling and scouring agents, such as higher sulfonated fatty alcohols at a temperature of approximately 60–70° C. can be employed.

15 *2nd liquid—cleaning and phosphatising.*—This liquid is prepared of substance No. 2 in a proportion of 7 grams to the liter of solution ready for use, its free acidity should range between 0 and 0.2 and its total acidity should range between 5 and 12.

The treatment is carried out by spraying at room temperature for a period of one to three minutes according to the type and conditions of sheet metal or other 20 ferrous articles treated.

25 *3rd liquid—solution of the freshly formed phosphates.*—This solution is prepared by substance No. 2 in a proportion of 7 grams to the liter of solution ready for use, which is further admixed with substance No. 3 in a proportion of 3 grams to the liter of solution ready for use. Treatment is effected by spraying for a period of about one minute at room temperature.

30 The solution should be made up by using exclusively substance No. 3 in order to maintain the following values constant: free acidity, 1–2.5; total acidity, 20–25. The articles treated by this liquid are rapidly rinsed in cold water.

35 *4th liquid—passivation.*—The liquid is prepared by substance No. 4 in a proportion of 0.8–1 gram to the liter, according to the hardness of water. Free acidity of the bath should be 0.4 and its total acidity 2.

The liquid is kept during treatment at a temperature of 50–60° and the period of treatment is 30 to 60 seconds.

40 The liquid should be made exclusively by substance No. 4.

In order to avoid foaming of the first and second liquid, small percentages of foam inhibitor (substance No. 5) are added thereto.

45 In some cases the 1st liquid treatment (preliminary cleaning) may be omitted, when the article immediately undergoes the action of the liquid prepared by using substance No. 2 as disclosed above. The presence of ethylene oxide condensate ensures a sufficient cleaning if the article surface is not particularly soiled or smeared.

50 The process of the present invention may be carried out without treating the article surface, on which a coating of a phosphate or phosphates have been formed, with the liquid referred to above as the 3rd liquid. Thus, the coated surface may be subjected directly to the action of the liquid prepared by using substance No. 4 in the manner disclosed above, dissolving of the phosphate coating formed and passivating of the newly exposed surface being ensured by using a liquid of the specified acidity values.

55 It will be understood that in carrying out the present invention the preparation of the iron articles for painting need not necessarily be effected by three separate liquids or in three separate baths. It is immaterial how the three stages in the process are caused to take place on the sheet metal.

Should it be impossible owing to the character of the plant or other reasons to carry out steps 1–2–3 or steps

2 and 3 separately, the above mentioned three or two steps can be combined to one step.

What I claim is:

A process for rustproofing and preparing iron articles for painting which consists in the steps of forming on the surfaces of said articles a coating of at least one phosphate selected from the group consisting of iron phosphate, zinc phosphate, and manganese phosphate, dissolving the phosphate coating thus formed, and passivating the newly exposed metal surface by applying to said surface a solution containing a member of the group consisting of chromate ions and dichromate ions.

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