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COATED IRON ARTICLE

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4 Claims. (Cl. 148—6.5)

This invention relates to an article having an iron or steel surface coated with ferrous oxalate formed in situ and substantially integral with the surface, and is a division of my application Serial No. 663,002, filed March 27, 1933.

When an iron or steel surface of an article is submerged in a hot solution of oxalic acid, a coating is formed on said surface. This coating is very fine grained, smooth and adherent, and forms an excellent base for paint, enamel, lacquer or the like. When oxalic acid is used alone, the coating is of an olive greenish color and by chemical analysis is shown to have a composition corresponding quite closely to the formula $FeC_2O_4(H_2O)_2$, and therefore may be termed ferrous oxalate. It is insoluble in acetic acid but is soluble in warm sodium acetate.

When the hot oxalic acid solution comes in contact with the iron surface, some of the iron is dissolved to form ferrous oxalate. This oxalate is so slightly soluble that it requires only a trace thereof to saturate the solution, and thereafter the coating of ferrous oxalate is formed on the surface.

The coating action of an oxalic acid solution upon iron may be accelerated by an oxidizing agent so that it will take place promptly at room temperature. There is a wide choice of oxidizing agents. Strong agents may be employed, and on the other hand a chemical, such as sodium sulphite, frequently referred to as a reducing agent, acts as an oxidizing agent in the oxalic acid and oxalate bath, as more fully described in my application for "Coating metal with an organic salt of the metal", filed July 14, 1930, Serial No. 467,958, which issued May 30, 1933 as Patent No. 1,911,537.

Ferric iron, added to the solution in any suitable manner, acts as an oxidizing agent, expediting the coating action of the solution. Ferric sulphate, ferric nitrate, ferric chloride and ferric acetate may be cited as examples of soluble ferric salts which give such acceleration. These salts may be used in widely different proportions, but an amount of the order of 1% may be mentioned as a good working proportion.

Of course, when these salts are introduced into the solution, a substantial amount of ferric oxalate is formed. Ferric oxalate acts as an oxidizing agent and accelerates the coating operation. When a stronger oxidizing agent, such as manganese dioxide or hydrogen peroxide, is used, it oxidizes the small amount of ferrous oxalate which normally saturates the solution, changing it to soluble ferric oxalate, which acts with the stronger agent in oxidizing hydrogen at the surface of work and expediting the coating action. Additional amounts of ferrous oxalate are dissolved and changed to ferric oxalate until equilibrium is reached.

While the solution is customarily saturated with ferrous oxalate and may contain varying amounts of the highly soluble ferric oxalate, the actual attack on the metal is evidently by the oxalic acid itself, and therefore there must be sufficient oxalic acid employed so that it is present as free acid after the formation of such oxalates as are in the solution. The strength of oxalic acid may vary from ⅛ of 1% to saturation, but 2% may be cited as one satisfactory working strength. At this or a much greater strength the oxalic acid coats rather than pickles when the solution is heated or when the colder solution is properly accelerated by an oxidizing agent.

Manganese dioxide is worthy of special mention, as the manganese enters into the coating, blackening it and somewhat improving its quality. Hydrogen peroxide is given special mention, as it contains nothing which can remain as a harmful residue in the solution.

Compounds of some metals may be added to the solution and further accelerate the coating action, but that and other features of the method of producing the coating form no part of the invention which this application is intended to cover, since the claims of this divisional application cover the article specified therein, however formed.

What is claimed is:

1. An article having a surface of iron or steel coated with a fine grained, strongly adherent coating formed integrally in situ on said surface, at least the major portion of said coating being oxalate having a composition corresponding approximately to the formula FeC_2O_4.

2. An article in accordance with claim 1, and and in which over 95% of the coating corresponds to the formula $FeC_2O_4(H_2O)_2$.

3. Iron and steel articles having on their surfaces a fine grained, strongly adherent coating of an olive green color having a composition corresponding approximately to the formula $FeC_2O_4(H_2O)_2$ and being insoluble in 10% acetic acid.

4. An article having a surface of iron or steel coated with a fine grained, strongly adherent coating formed integrally in situ on said surface, at least the major portion of said coating being oxalate having a composition corresponding approximately to the formula FeC_2O_4, and said coating being colored black with a compound of manganese incorporated in the coating during its formation.

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