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UNITED STATES PATENT OFFICE

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PROCESS FOR MAKING COATING MATERIALS FOR DEOXIDATION OF RUST

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This invention relates to a process for removing and preventing the formation of rust on iron, a composition of matter to be used for this purpose and a process for making such a composition. Hitherto it has been customary to remove rust by dissolving it in acids thereby leaving a fresh clean surface of iron exposed. This method is objectionable since the body of iron is gradually destroyed. Moreover, the fresh iron surface is not only susceptible to further rusting, but such rusting is actually promoted by acid which cannot be entirely removed from the pores of the iron.

It is true, methods are already known for deoxidation of the rust, but with them it is, on principle, a matter of exposing the rusted iron parts in baths to the action of hydrogen. For coating materials such methods are not applicable; besides they do not produce a rust protecting effect at the same time.

According to the present invention, however, compounds are applied to the surface of the iron which react with the iron rust and by deoxidation convert it into magnetic oxide of iron (Fe_3O_4). The reduced metal compounds which are formed remain in solution and in this solution exert the deoxidizing action on the rust. In consequence of the evaporation of the solvent or vehicle, the metal compounds gradually precipitate onto the magnetic oxide of iron and form with the latter corresponding complex compounds, thus forming a protective layer or coating on the iron.

With the present process such metal compounds are employed in their reduced state and dissolved in reducing organic solvents without a fat- or oil-character, which, in consequence of their tendency to oxidize themselves deprive the rust of a part of its oxygen, reducing it to magnetic oxide and being themselves oxidized thereby and also by taking up some oxygen from the air to oxidized substances which are chemically indifferent to substances promoting the formation of rust.

By the expression "reduced state" is meant that the metal compounds used contain the metal at a valency which is lower than the highest valency of that metal; for example, in the compound used the valency of the metal may be 2 whereas the metal may also have a valency of 3 or more. In other words the "ous" compounds rather than the "ic" are used.

The reduction of the metal compounds will be best accomplished by means of uric acid alone or in combination with urea, dissolved in formaldehyde and that in the presence of metals such as zinc dust, copper, lead, aluminium, mercury as catalysts.

It has been found, that the dissolving of the uric acid in formaldehyde takes place easily in the presence of these catalysts and without heating the formaldehyde up to its boiling point, whilst in their absence the uric acid goes only poorly and but partly into solution after a prolonged heating up to the boiling point.

In place of formaldehyde or together with the same its polymerization- or condensation products as well as compounds splitting off formaldehyde may be used as reducing organic solvents for the uric acid or for the metal compounds reduced by it respectively.

The compounds of chromium, molybdenum, tungsten and lead, soluble in the aforementioned solvents and reducible in the corresponding manner have been found, among others, to be particularly suitable. For the attainment of complex reducible metal compounds the above mentioned metal compositions may be combined with suitable compounds of antimony-, manganese- or zinc compounds.

For example, by the present process 5 parts by weight of uric acid are mixed with 50 parts by weight of formaldehyde and 0.5 parts by weight of zinc dust are added. On shaking, the mixture is then heated up to 60–70° C. A yellowish clear liquid results, that may be marked: "Original solution" in the following examples. The liquid is decanted from the settled zinc. The composition may be prepared by the use of the "original solution" as such or the uric acid may be mixed with the reducible metal compound and any other ingredients desired to be

incorporated and the mixture dissolved in the aldehyde organic solvent.

Example 1

0.8 parts by weight of tungstic anhydride, 0.5 parts by weight of caustic potash (1:2) and 0.5 parts by weight of phosphoric molybdic acid are dissolved in 40 parts by weight of "original solution". A dark green liquid is obtained, containing the metal compounds in the reduced state which is indicated by the color of the solution.

Example 2

0.8 parts by weight of tungstic anhydride, 1 part by weight of caustic potash (1:2) and 0.4 parts by weight of uric acid are well ground together and then mixed and well ground with 1 part by weight of orthophosphoric acid (1,7 specific gravity). Then are added 40 parts by weight of formaldehyde and 0.1 part by weight of zinc dust. The whole is heated up to 75° C., a blue solution resulting.

Example 3

1 part by weight of tungsten trioxide, 0.5 parts by weight of caustic potash (1:2), 0.4 parts by weight of uric acid and 10 parts by weight of paraformaldehyde are ground together, until the mixture has assumed a green color. Then the mixture is dissolved in 20 parts by weight of water through boiling with the addition of a small portion of zinc dust. A blue solution will be the result.

Further experiments have shown, that greater amounts of reduced metal compounds will dissolve in the "original solution" or in formaldehyde respectively, if urea will be added to the uric acid or to the formaldehyde or to both of them. It was further found out, that especially with the use of metal salts or metallic oxides the addition of acids will not only facilitate the reduction of the former through uric acid, but also the dissolving in formaldehyde or in the "original solution" respectively. As acids, weak inorganic or organic acids may be used.

Example 4

2 parts by weight of uric acid, 3 parts by weight of phosphoric molybdic acid and 3 parts by weight of urea are well grounl together and then dissolved in 50 parts by weight of formaldehyde.

Example 5

0.5 parts by weight of red lead are dissolved in 14 parts by weight of "original solution", acidified with a small quantity of lactic acid, by prolonged heating with a reflux condenser. A colorless solution will be obtained.

For the accomplishment of the reduction of the metal compounds also tannic acid or similar organic reducing agents soluble in formaldehyde may be added to the uric acid or to the uric acid-formaldehyde solution.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is:

1. The process of deoxidizing rust and preventing further formation of the same which comprises coating a rusty surface with a solution of a tungsten compound in a mixture of uric acid and formaldehyde.

2. The process of deoxidizing rust and preventing further formation thereof which comprises coating a rusty surface with a solution of a compound of a metal selected from the class consisting of chromium, molybdenum, tungsten and antimony in a mixture of uric acid and formaldehyde.

3. The process of deoxidizing rust and preventing further formation thereof which comprises coating a rusty surface with a solution of a compound of tungsten and molybdenum in a mixture of uric acid and formaldehyde.

4. The process of deoxidizing rust and preventing further formation thereof which comprises coating a rusty surface with a solution of a compound of tungsten, molybdenum and chromium in a mixture of uric acid and formaldehyde.

In testimony whereof I hereunto affix my signature.

RUDOLF EBERHARD.