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PAINTING PROCESS WHEREIN A CONDUCTIVE UNDERCOAT IS ELECTROPHORETICALLY DEPOSITED

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ABSTRACT OF THE DISCLOSURE

The invention relates to an electrophoretic painting process which comprises applying to an article to be coated which possesses a conductive outer layer, a conductive undercoat and thereafter applying to the so-coated article a further coating of a paint by means of electrophoretic deposition. The conductive undercoat is a water-thinnable paint comprising a sufficient amount of a conducting pigment to render the undercoat conducting and a water dispersible resin. The conductive pigment is usually carbon, for example in the form of lamp-black. The water-dispersable resin is preferably a phenolic/alkyd or melamine/alkyd resin.

Background of the invention

Electrophoretic painting processes are known and have been described in, for example, the article entitled, "Electrophoretic Painting—Processes Applied to the Motor Industry," which was published in the April 1963 issue of the Metal Finishing Journal. The known process generally consists in immersing a metal article which is to be coated in a bath of a water-dispersible resin and a pigment in an aqueous medium. The article to be coated is generally made the anode, the cathode being provided generally by the containing vessel. Direct voltages of the order of 20 to 150 volts are applied and a moderate current density is obtained. The specific current density depends in part on the thickness of the film required. Completion of the formation of the film, which consists essentially on the resin in the pigment, is indicated by a fall to a substantially constant value in the current flow. An alternative mode of applying a coating by an electrophoretic painting process employs an increasing voltage such that a substantially constant current density is achieved; complete film formation is indicated by noting the point at which no change occurs in the current on increase of the applied voltage.

Electrophoretic painting process confers many advantages and it is likely that in the future this method of painting will become important. A problem that has been found to exist when the process is applied to metal articles is that metal ions are found to be present in the surface layer of the paint. Paint applied by electrophoretic processes is generally stoved for example by heating at temperatures of about 130 to 160° C. for 30 minutes or more. Metal atoms present in the coating of paint lead to discoloration of the paint film with the result that hitherto electrophoretic painting processes when applied to metal articles cannot be satisfactorily carried out with paints of pastel shades. Such discoloration is particularly troublesome when the article to be painted contains iron.

Furthermore, it has not been proposed previously to employ electrophoretic painting processes to articles such as articles of plastics material or glass which do not have a conductive outer surface.

According to the present invention there is provided electrophoretic painting processes, which processes comprise applying to the article to be coated an undercoat so

that a conductive layer is formed on the article and thereafter applying to the so-called article a coating by means of electrophoretic deposition of a paint.

When the article to be coated possesses a conductive outer layer, the undercoat is preferably deposited by electrophoretic means. When the article to be coated has an outer surface consisting of plastics material or glass or other substances which do not possess the necessary conductive properties, the undercoat will be applied by any suitable means such as by spraying.

The undercoat must necessarily be of a kind which provides a conductive layer in order that the subsequent electrophoretic deposition of the paint may be effected. The undercoat is preferably a water-thinnable paint comprising a pigment and a water-dispersible resin which on deposition on to the article acts as a binder for the pigment. In order that the layer is conductive the pigment must contain a sufficient amount of a conducting material such as carbon black pigments, e.g. lamp black. If desired the pigment may comprise finely-divided metal.

The water-dispersible resin is desirably the stovable resin such as those of the phenolic/alkyd or melamine/alkyd types. These resins are stovable and the article coated with a paint comprising such a thermo-setting resin is desirably stoved prior to the application of the next coating of paint. The water-thinnable paint is readily formulated by dispersing the pigments in the water-dispersible resin. The paint may include other additives to vary the properties of the paint. The paint may contain such organic materials which aid solution as isopropyl alcohol. Such compounds are normally present, however, in the resins as sold by the resin manufacturers.

The water-thinnable paint which is employed to provide the preferred undercoats will contain from 5 or 10 to 20% by weight of the resin. Preferred amounts of carbon pigments are from ¼ to 1 lb. and more preferably ½ lb. per gallon. In general, it is also preferred to employ between 1.25 and 7 parts by weight of resin per part by weight of pigment and a ratio of about 3 to 1 is generally preferred.

After the undercoat has been applied the further coating of paint by electrophoretic deposition is then carried out; the further coat may be provided by any paint suitable for use in electrophoretic painting processes. It will be appreciated that if this further coat contains no substances which confer on it conducting properties, the coated article will not be recoatable by an electrophoretic process. However, such finishing coats may be provided by paints which are formulated from a wide variety of pigments including pastel shades or white pigments.

Following is a description by way of example of a process in accordance with this invention.

EXAMPLE

An iron article was provided with an undercoat by immersion in a bath of water-thinnable paint, the article being made the anode and the bath the cathode. The water-thinnable paint comprised of a phenolic/alkyd water-soluble resin sold under the trade name Resydorl P411. This resin as supplied had a solids content of 67%. For the present application the resin as supplied was diluted with water, three parts of water to one part of water-soluble resin being employed. The paint also contained a carbon black pigment sold under the name Magicole 888 in an amount of ½ lb. of pigment per gallon of paint.

The undercoat was applied by use of a fixed D.C. voltage of about 50 volts and the applied voltage was cut off when the film had been built up to a maximum as indicated by the fall in the current to a low value. During deposition the paint was subjected to mechanical stirring.

The article was removed from the bath and washed

with water until all the removable paint had been removed. The article possessed an adhering film of resin plus the carbon pigment; the undercoat was wet on the surface with the water employed for washing but no water was present in the body of the film. The undercoat was then stoved by heating at a temperature of about 160° C. for 30 minutes. Metal atoms present in the film of undercoat were immobilised by the stoving process and could not affect the colour of a subsequently applied coat of paint.

The stoved article was then immersed in a further bath and a normal coating of paint was applied by an electrophoretic process. This further coat of paint was of a pastel shade and comprised a similar phenolic/alkyd resin together with a suitable pigment. The article was further stoved to provide an article having a pleasing finish.

The invention is not limited to the details of the foregoing example; for instance, the article may be formed from plastics material and the undercoat applied by spraying a water-thinnable paint which confers a conductive layer to the article. It will be appreciated that the water-thinnable paint must contain sufficient of a conducting pigment to provide in the surface the required conductive property and also sufficient binder to give an adequate film strength. If desired, more than one undercoat may be applied provided that each undercoat of itself provides a conductive layer. The paints which provide the undercoat may contain a relatively small amount of extenders, e.g. barium sulphate (i.e. Blanc Fixe) and also anti-corrosive pigments, e.g. strontium chromate or red oxide of iron; they may also contain small amounts of white pigments.

I claim:

1. An electrophoretic painting process which process comprises applying by electrophoretic means to an article to be coated, which possesses a conductive outer layer, a conductive undercoat which is deposited from an aqueous bath comprising a dispersion of a paint which paint incorporates a conductive pigment whereby the undercoat is conductive after curing, curing the undercoat and thereafter applying to the so-coated article a further coating of a paint by means of electrophoretic deposition.

2. An electrophoretic painting process as claimed in claim **1**, wherein the dispersion of paint which provides the undercoat is a water-thinnable paint comprised of said conductive pigment and a water-dispersable resin which on deposition on to the article acts as a binder for the pigment.

3. An electrophoretic painting process as claimed in claim **2** wherein the conductive pigment is carbon.

4. An electrophoretic painting process as claimed in claim **3** wherein the carbon is lamp-black.

5. An electrophoretic painting process as claimed in claim **2** wherein the water-dispersable resin is selected from the group consisting of phenolic/alkyd and melamine/alkyd resin.

6. An electrophoretic painting process as claimed in claim **2** wherein the water-thinnable paint contains from 5 to 20% by weight of the water-dispersable resin.

7. An electrophoretic painting process as claimed in claim **2** wherein the water-thinnable paint contains from 2.5% to 10% by weight of the conducting pigment.

8. An electrophoretic painting process as claimed in claim **2** wherein the ratio by weight of water-dispersable resin to total pigment in the water-thinnable paint is between 1.25:1 and 7:1.

9. A coated article comprising an article having an outer conductive layer coated with a cured electrophoretically deposited paint dispersion containing distributed therethrough a conductive pigment and said cured paint dispersion coating is coated with a cured, electrophoretically deposited paint dispersion.

10. An article according to claim **9** wherein the conductive pigment is carbon.

11. An article according to claim **10** wherein the paint dispersion is comprised of said conductive pigment and a water-thinnable paint which contains from 5 to 10% by weight of a water-dispersable resin selected from the group consisting of a phenolic/alkyd resin and a melamine/alkyd resin.

12. An article according to claim **11** wherein the ratio by weight of the water-dispersable resin to the total pigment in the water-thinnable paint is between 1.25:1 and 7:1.

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