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METHOD OF APPLYING A DECORATIVE COATING TO A SURFACE

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This invention relates to coating and coating materials and methods of making the same. It relates, more particularly, to decorative, protective surface coatings containing a plurality of colors and methods of applying the same, such as heretofore known but which have been characterized by inherent disadvantages. Ornamental paints, enamels and lacquers of different colors tend to merge one into another when applied to a surface simultaneously and, due to flowing and spreading, they may undergo such diffusion as to confuse and obscure any contrast between the different colors of the components. Earlier methods employed for overcoming this disadvantage consisted in applying to the surface to be covered a single colored coating composition, drying it and then repeating the procedure with a partial coating of different color as many times as required by the number of different colors desired. This is a time-consuming and costly procedure and many attempts were made to overcome such defects by mixing, for a short period of time, the various color components without merging one with another and applying this mixture to the surface to be coated. However, the individual colors of such a mixture tended to merge into one another and as a consequence did not produce patterns with the desired distinctiveness of individual colors. Further attempts were made to produce such a coating by dispersing the individual colors in a liquid, such as water, in which they were relatively immiscible. Such coatings possessed, however, inherent limitations which made their use excessively costly and often unsatisfactory in result.

Coating compositions of different colors dispersed in water do not flow nor spread well when applied directly to the surface of an article because of high interfacial tension existing between the resin dissolved in a hydrophobic solvent and the hydrophylic liquid such as water, in which the resin solution is dispersed.

It is a well known fact, for instance, that difficulties are encountered in obtaining a continuous film in coating articles, such as Easter eggs, with multi-colored pigmented nitrocellulose lacquer, which is usually spread over and beneath the surface of the water. Repeated dipping of the articles in this coating composition produces overlapping and diffusion of the colors, resulting in an unattractive pattern and excessive consumption of lacquer. To minimize the tendency toward merging of different colored lacquers, it has been proposed to incorporate into the lacquer dispersion a stabilizer commonly used in oil or resin base paint dispersed in water. The incorporation of a thickener-stabilizer overcame in part the tendency toward diffusion of color, but obstructed the flow and spreading of the composition over the surface so that it impeded continuous covering of the surface, retarded the rate of application and required excessive consumption of the coating composition. Furthermore, the preparation of uniform coating dispersion with particles of the composition larger than those commonly found in paint emulsions is difficult to control because a large number of factors influence the size and shape of the particles, such as the rate and duration of agitation, type of

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agitator, type and concentration of stabilizer, type and quantity of solvents contained in the composition, ratio of pigmented coating to the water medium, the pH of the disperser, the presence of surface active material, temperature, viscosity and the like.

One object of the invention, therefore, is to provide an improved coating and method of making the same characterized by a more continuous and complete coverage and protection of the surface to be coated.

Another object is to provide a coating and method of making the same capable of being more rapidly, economically and conveniently applied to the surface.

Another object is to provide a coating and coating method more economical in the consumption of coating materials.

Another object is to produce such a coating containing an improved material for providing such a coating with varied and ornamental color effects as well as a method for making the same.

To these and other ends the invention resides in certain improvements and combinations of parts and method steps, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

I have found that defects and difficulties are largely overcome by first coating the surface to be covered with a continuous layer of a base coating composed, for example, of a pigmented resinous material dissolved in an organic solvent or mixture of organic solvents preferably containing auxiliary materials, such as plasticizers, light and heat stabilizers and dulling agents. While such base coating is still wet, I spray over it sparingly an aqueous dispersion of small cellulose particles coated with varicolored organic coatings immiscible in water, leaving some areas of the continuous base coating exposed and thus producing, on drying, a finish of somewhat rough texture with spattered, dotted, speckled, streaky and cobweb designs or patterns having a plurality of distinctly visible and contrasting colors and of a pleasing and attractive appearance.

The small cellulose particles, such as sawdust, wood chips, cotton thread and the like, coated with pigmented resin solutions of one or more colors and dispersed in a continuous water phase, can be applied by any method, such as spray application over the undried base coating after which the base coating and the coated and colored cellulose particles overlying and adhering to it are then dried simultaneously.

Some of the cellulose particles are preferably coated with resin solution of a color contrasting with that of the base coating, while other cellulose particles are coated with resin solutions of one or more other colors, as the desired ornamental effect may indicate and a wide variety of varicolored finishes is thus produced.

The range of size of the cellulose particles, of sawdust, for example, is in the order of a major dimension preferably between about 0.01 and 0.1 of an inch, although smaller and larger particles may be employed. In the majority of applications, the color of individual coated particles having a major dimension less than 0.01 of an inch are barely discernible by the unaided eye, while particles having a major dimension larger than 0.1 of an inch may plug the orifice of an ordinary spray gun. The degree of coarseness of the final finish will increase with the increase of the cellulose particle size, while the smoothness of the finish will increase with the decrease in the particle size.

In the event the ratio of organic coating to the cellulose particles is high, then such particles serve as solid nuclei or centers to which the coating is attached by cohesion as a relatively thick layer. On the other hand,

when relatively small ratios of organic coating to cellulose particles are employed, then each particle is coated with a relatively thin film of the organic coating. As a consequence, the ratio of cellulose particles to the organic coating can be varied within suitable limits. A sufficiently wide variety in texture of coating can be produced by varying the quantity of cellulose particles within a range of, say, 1 to 30%, based on the weight of organic coating.

Organic coatings for the cellulose particles which harden merely by evaporation of solvent, such as nitrocellulose lacquers, are preferred in my process because they show little or no tendency toward merging of the different colors employed. The cellulose particles coated with pigmented resin solution are held in suspension in a continuous water phase. When this material is applied over a wet film of the organic base coating, the coated particles are surrounded by a film of water which acts as a temporary barrier between the coated particles and the base coating on the surface to be covered. In the course of drying, both the water surrounding the coated cellulose particles and the organic solvents contained in the coated materials all evaporate simultaneously. Both the organic base coating and the organic coatings of the overlying cellulose particles then begin to set and a firm adhesion of the coated cellulose particles to the base coating takes place without merging of the respective colors. If a plurality of colors are used, then the coating of each color is separately applied to the cellulose particles. The cellulose particles, after being coated as described, are then dispersed in water by stirring. This process is repeated with the particles of each color and the dispersions thus obtained are combined to form a coating material containing the cellulose particles coated with the different colors.

Satisfactory dispersions are prepared by using approximately one part of cellulose coated particles to one to three parts by weight of water.

In order to adjust the viscosity of the aqueous phase, and to stabilize the dispersion, ordinary thickeners for this purpose can be employed, such as starch, vegetable gums, alginates, carboxymethyl cellulose, methyl cellulose, polyvinyl alcohol, etc. The thickeners are usually dissolved in water prior to the addition of the coated cellulose particles. It was found that the best results can be obtained by first dissolving one-half of the total portion of the thickener before adding the coated cellulose particles and then adding the remaining portion of concentrated solution of the thickener after the dispersion of the coated cellulose particles took place. In using this method the preparation of dispersion is facilitated and its stability is improved.

A relatively mild agitation for a short time is sufficient to produce satisfactory dispersion. The time and speed of agitation has no pronounced effect on the shape and size of the individual particles, particularly when relatively high ratio of coated particles to pigmented resin solution is used. When a low ratio of cellulose particles to pigmented resin solution is employed, then the preferred method of dispersion comprises the addition of coated cellulose particles to water with stirring at 200 to 1000 R. P. M. for a period of 5 to 30 minutes.

The resin solutions are prepared by dissolving such resins as nitrocellulose, polystyrene, polyacrylate resin, an epichlorhydrinbisphenol condensation product, polyvinyl chloride-polyvinyl acetate copolymer, and like products in an organic solvent, which is relatively immiscible in water. Plasticizers and other auxiliary materials, such as light and heat stabilizers, may also be incorporated into the formulation of the resin solution. The resin solution and the pigments are then charged into a pebble mill and ground for a period of 24 to 48 hours. The pigmented resin solution is then transferred to a stirring kettle and a selected amount of cellulose particles is added thereto. Additional quantities of solvent can be

added during the mixing of cellulose particles in the event the mixture becomes too viscous. The coated cellulose particles thus prepared are then dispersed in water by the method described above.

The examples which follow are given for illustration and are not for limitation or restriction. The variations within the spirit of the invention are intended to be included in the scope of the appended claims.

Example 1.—Base coat, light gray

Base coat of following composition was prepared:

	Parts
Nitrocellulose	100
Resin	140
Dibutyl phthalate	42
Titanium dioxide, rutile	240
Yellow iron oxide	1.2
Superba black	.37
China clay	60
Solvent	1,200

The solvent in the example had the following composition:

	Parts
Methyl isobutyl ketone	347
Methyl isobutyl carbinol	45
Toluene	608

The viscosity of the base coating was 93 seconds on the No. 4 Ford cup at 25 deg. C.

Example 2.—Dispersion of white cellulose particles

10 parts of sawdust passing through a 20 mesh and retained on a 40 mesh screen were coated with 50 parts of white nitrocellulose modified lacquer and added without drying to 60 parts of aqueous solution containing 2% of methyl cellulose of 15 centipoises viscosity, stirred at 666 R. P. M. The stirring was discontinued as soon as coated cellulose particles were separated and dispersed in the above aqueous solution.

The nitrocellulose modified lacquer used for coating the cellulose particles had the following composition:

	Parts
Nitrocellulose	61
Resin and plasticizers	142
Titanium dioxide	87
Isopropyl acetate	71
Isopropyl alcohol	50
Methyl isobutyl ketone	42
Butyl acetate	85
Methyl amyl acetate	35
Methyl isobutyl carbinol	28
Toluene	269
Xylene	60
Hi-flash naphtha	35
Butyl Cellosolve	21

The viscosity of the above lacquer when measured by Brookfield viscometer was 360 cps. at 25 deg. C.

Example 3.—Dispersion of black nitrocellulose particles

15 parts of sawdust passing through 60 mesh and retained on 80 mesh screen were coated with 50 parts of black nitrocellulose modified lacquer to which 20 parts of solvents were added for thinning purposes. The coated cellulose particles were added with stirring to 65 parts of 2% methyl cellulose, 15 cps., aqueous solution. The stirring was continued until all coated cellulose modified lacquer particles were dispersed.

The black nitrocellulose modified lacquer had the following composition:

	Parts
Nitrocellulose	75
Resin and plasticizer	70
Superba black	6
Solvents	295

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The viscosity of the lacquer was 7,000 cps. at 25 deg. C.

Example 4.—Dispersion of brown cellulose particles

2 parts of sawdust passing through 20 mesh screen and retained on 100 mesh screen were coated with 38 parts of brown nitrocellulose modified lacquer. The coated cellulose particles were added to 40 parts of 1% methyl cellulose 400 cps. aqueous solution while the latter was stirred at 971 R. P. M. The stirring was discontinued when satisfactory dispersion was obtained.

The composition of the brown nitrocellulose lacquer was as follows:

	Parts by weight
Nitrocellulose	75
Resin and plasticizer	70
Brown iron oxide	6
Solvents	295

The viscosity of the lacquer was 7,200 cps. at 25 deg. C.

Example 5.—Dispersion of varicolored cellulose particles and its application

The aqueous dispersions of white coated cellulose particles described in Example 2, one-tenth of the black cellulose particles described in Example 3, and the cellulose particles suspended in brown coating and described in Example 4 were combined and mixed. The mixture was sprayed sparingly in such a manner that it spotted an .008" thick base coat of the light gray lacquer described in Example 1, applied just previous to spraying and while still wet on a laminated fibre board surface.

The spotted coating was dried under forced draft ventilation at 205 deg. F.

An attractive pattern with rough texture was produced containing all colors of the original dispersions and of the base coating over which the combined dispersion was applied.

Example 6.—Light gray base coating

A light gray base coating having the following composition was prepared:

	Parts
Polystyrene	65
Titanium dioxide	200
Tinting pigments	29
Para-tertiary butyl catechol	1.0
Solvents	226

This coating was subsequently applied over the surface of a cellulose fibre board just prior to the application of the aqueous dispersion of multicolored coating composition described below.

2 parts of sawdust passing through 60 mesh and retained on an 80 mesh screen were mixed with 200 parts of white polystyrene coating. The mixture was then dispersed in 200 parts of aqueous solution containing 1.5% of methyl cellulose, 100 cps.

0.5 parts of sawdust passing through 60 mesh and retained on an 80 mesh screen were mixed with 50 parts of yellow polystyrene coating. The mixture was dispersed in aqueous solution containing 1.5% of methylcellulose, 400 cps.

1 part of sawdust and 100 parts of black polystyrene coating were mixed and poured into 100 parts of 1.5% methyl cellulose, 400 cps., solution with stirring. The stirring was continued until satisfactory dispersion was obtained.

All aqueous dispersions of this example were poured together and stirred gently for a few minutes.

The combined dispersion was subsequently sprayed sparingly over the base coating, freshly rolled over the surface of fibre board, and produced a speckled cobweb-like design having four distinct colors.

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The practicing of my process promotes economy in consumption of materials and increase in the speed of coating application and of drying.

The base coating serves for covering the surface thoroughly with a continuous film at a low rate of material consumption. This film serves primarily as a protective coating. The coated cellulose particles sprayed sparingly over freshly applied continuous film, which remains partly uncovered, serves primarily for decorative purposes. Both the base coating and coated cellulose particles scattered over its surface are dried simultaneously.

The method of producing an aqueous dispersion containing coated particles eliminates many disadvantages of the prior practices of the art.

Dispersions containing coated cellulose particles produce decorative designs which have a thickness greater than the particles of coating surrounding the particles and thus create the appearance of use of a generous amount of decorative coating, so as to enhance the artistic appearance of the design. All of the above advantages are achieved with economy in time, effort and consumption of materials.

It will thus be seen that the invention accomplishes its objects and while it has been herein disclosed by reference to the details of preferred embodiments, it is to be understood that such disclosure is intended in an illustrative, rather than a limiting sense, as it is contemplated that various modifications in the construction and arrangement of the parts and method steps will readily occur to those skilled in the art, within the spirit of the invention and the scope of the appended claims.

I claim:

1. The method of coating a surface comprising the steps of covering said surface with a continuous base coating composed mainly of a pigmented resinous material dissolved in a hydrophobic organic solvent and applying over said base coating, while wet, a composition comprising relatively small, discrete, solid particles of cellulose material having a major dimension between about 0.01 and about 0.1 of an inch, said particles being coated with a solution of pigmented resinous material immiscible in water and dispersed in a medium composed mainly of water.

2. The method of coating a surface comprising the steps of covering said surface with a continuous base coating composed mainly of a pigmented hydrophobic resinous material dissolved in an organic solvent and applying over said base coating, while wet, a composition comprising relatively small, discrete, solid particles of cellulose material, having a major dimension between about 0.01 and about 0.1 of an inch, said particles being coated with solutions of pigmented resinous materials in organic solvents immiscible in water and dispersed in mediums composed mainly of water, and said particles having coatings varying in color from the pigment of said base coating to produce ornamental patterns for said surface.

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