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NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in or relating to Aqueous Dispersion Coating Compositions

We, REVERTEX LIMITED, a British Company, of 51—55 Strand, London, W.C.2., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to pigmented, unpigmented or coloured water-thinnable dispersion coating compositions such as emulsion paints, polish compositions, clear lacquers and other coating compositions well known in the art wherein aqueous dispersion of a water-insoluble film forming resin constitutes a part or the whole of the film forming and binding component.

We have discovered that the addition of certain organic nitrogen-containing compounds to a water-thinnable dispersion coating composition improves the gloss of the dried coatings obtained from the liquid composition.

In accordance with the present invention there is provided a coating composition comprising an aqueous dispersion of at least one water insoluble film forming resin as hereinafter defined and a gloss improving agent selected from 2-iminazolidone; 2-pyrrolidone; 2-oxazolidone; N-acetyl 2-oxazolidone; caprolactam; acetanilide; α -chloro-acetanilide; thiourea; methylene-bis-thiourea and N-phenyl

thiourea said gloss improving agent being present in a concentration of 0.28 to 15% by weight of the coating composition.

As indicated above, these gloss improving agents impart high gloss to the coatings obtained from aqueous dispersion coating compositions such as emulsion paints, or compositions which on drying yield a transparent or translucent film. It has also been found that many of them have the effect of promoting levelling and coalescence. They are added in an amount of from 0.25 to 15% by weight based on the total weight of the aqueous dispersion coating composition, and preferably in an amount of from 0.5 to 3% by weight.

In addition to enhancing the gloss of the coatings obtained from aqueous dispersion coating compositions, it has been found that the incorporation of the aforesaid agents may lead to considerable improvements in the wet-rub resistance of emulsion paint coatings.

The gloss promotion caused by the aforesaid agents is found to be most effective when pigments used in the manufacture of pigmented aqueous dispersion coating compositions are dispersed in the presence of glycols, such as di-, tri-, and higher poly alkylene glycols having one or more ether linkages in the molecule particularly di-, tri- and polypropylene glycols or mixed ethylene and pro-

[Price 4s. 6d.]

pylene polyglycols in the forms of either random or block copolymers.

The gloss improving agents may be added either in the binder dispersion of the aqueous dispersion coating composition, or in the pigment dispersion which is to be mixed with the binder dispersion or at any stage of the preparation of aqueous dispersion coating compositions. If a polyglycol is employed, then it is preferably employed in the manufacture of the pigment dispersion, although it may alternatively be incorporated in the coating composition at other stages of its preparation; e.g. in the binder dispersion. If polyglycols are used in unpigmented coating compositions they may be incorporated in the composition at any stage of its manufacture.

The film-forming resin is a water insoluble polymer or copolymer of vinyl acetate and/or an ester of acrylic or methacrylic acid or a water insoluble copolymer of styrene and/or vinyl toluene with butadiene or isoprene.

Suitable binders include dispersions of polymers or interpolymers of the esters of methacrylic and acrylic, acid and interpolymers of the aforementioned esters with, for example, styrene, vinyl toluene, vinyl chloride or butadiene.

Other ethylenically unsaturated compounds such as α , β unsaturated carboxylic acids, amides, unsaturated dicarboxylic acids and their half esters and other components well known in the art of emulsion polymerisation may also form part of the monomer composition from which the copolymers or interpolymers are prepared.

The usefulness of the gloss improving agents is not restricted to coating compositions in which the binder consists exclusively of dispersed polymeric resins. The present invention may also be implemented in aqueous coating compositions in which the binder consists of mixtures of the resin dispersions and aqueous solutions of water soluble polymeric resins.

The invention will now be illustrated by the following Examples:

EXAMPLE 1

A pigment dispersion was prepared by mixing the ingredients listed below in a high speed mixer and passing the slurry thus obtained through a single roll mill:—

	Parts by weight
55 Rutile Titanium Dioxide	55.00
Micronised Dolomite	0.20
5% Hydroxyethyl Cellulose Solution having a viscosity of 300 cps. at 25°C.	10.00
60 Tripropylene Glycol	5.00
25% Aqueous Ammonia	0.20
Phenyl Mercury Hydroxide (Preservative)	0.05
Water	29.50

For the preparation of an emulsion paint,

a vinyl acetate/n-butyl acrylate copolymer dispersion (copolymer constituents: vinyl acetate 88%, butyl acrylate 12%, obtained by a process of emulsion polymerisation and having a resin content of 55% by weight) was mixed with 3.5% of its weight of 2-iminazolidone contained in 11.5% of the emulsion weight of water. The mixture was allowed to stand for 24 hours at a temperature of 40°C. 115 parts by weight of the above-described mixture were added to 66.5 parts by weight of the pigment dispersion with stirring. 0.25 parts of 25% ammonia, 5 parts of water, 0.4 parts of Pine Oil and 0.1 part of a commercially available foam breaker were then added to the mixture, thus completing the preparation of the emulsion paint.

Three successive coats of the paint were applied by brush on the surface of composition board. A highly glossy surface was obtained which when illuminated by a beam of light at an angle of 45° to the paint surface and viewed at the same angle after reflection gave a reflectance value of 73% (standard plate glass=100% reflectance).

The above procedure was repeated but the 2-iminazolidone was replaced by water. The paint film obtained without any nitrogen containing compound as additive gave a reflectance value of 62%.

EXAMPLE 2

The procedure of Example 1 was repeated in every detail except that the polymer emulsion mixed with caprolactam in place of 2-iminazolidone. The resulting emulsion paint coating gave a reflection value of 82%. The liquid emulsion paint was remarkable in that it exhibited a thixotropic gel structure while at the same time maintaining excellent leveling properties.

EXAMPLE 3

The procedure of Example 1 was repeated in every detail except that the polymer dispersion was mixed with thiourea in place of 2-iminazolidone. After preparation, the paint was left for 7 days at ambient temperature and then brushed out in the same manner as in Example 1. The paint film had a reflectance value of 81%.

EXAMPLE 4

The procedure of Example 1 was followed with the exception that in place of 2-iminazolidone, acetanilide was mixed with the polymer dispersion. The reflectance value of the paint film was 74%.

EXAMPLE 5

The procedure of Example 1 was followed except that the 5% aqueous solution of hydroxyethyl cellulose was replaced with a 10% solution of polyvinyl pyrrolidone. The

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paint thus obtained exhibited exceptionally good levelling characteristics.

EXAMPLE 6

The procedure of Example 1 was followed but a vinyl acetate/2-ethylhexyl acrylate copolymer dispersion with a resin composition vinyl acetate 85%/2-ethylhexyl acrylate 15% was substituted for the vinyl acetate/n-butyl acrylate copolymer dispersion. The reflectance value of the paint film was 76%.

EXAMPLE 7

A pigment dispersion was made in the manner described in Example 1 with the following ingredients:

	Parts by weight
Rutile Titanium Dioxide	55.00
2% Hydroxyethyl Cellulose Solution, having a viscosity of 5,500 cps. at 25°C.	23.00
Tripropylene Glycol	5.00
25% Aqueous Ammonia	0.25
Phenyl Mercury Hydroxide (Preservative)	0.03
Water	16.70
Thiourea	6.50

Into 42 parts by weight of this pigment dispersion were mixed 60 parts by weight of a methyl methacrylate/n-butyl acrylate/methacrylic acid copolymer emulsion (copolymer constituents methyl methacrylate 44%/n-butyl acrylate 55%/methacrylic acid 1%: Solids content 50%). 0.2 parts of Pine Oil were then added, followed by 0.1 part of a commercially available defoaming agent.

A paint film applied in the manner described in Example 1 had a reflectance value of 57%.

The above procedure was repeated without thiourea in the pigment dispersion. The reflectance value of the paint film was found to be 43%.

EXAMPLE 8

A pigment dispersion was made as described in Example 1 except that the tripropylene glycol was replaced by polypropylene glycol (molecular weight approx. 750). A paint was prepared with this pigment dispersion in precisely the same way as described in Example 1. The reflectance value of the paint film was 81%.

EXAMPLE 9

The procedure of Example 2 was repeated except that the pigment dispersion used was that described in Example 8. The paint film showed a reflectance value of 86%. The liquid emulsion paint exhibited the same thioxotropic gel structure as described in Example 2.

EXAMPLE 10

A pigment dispersion was prepared in the same manner as described in Example 1 except

for the replacement of tripropylene glycol with "Ucon 50-HB-2000". "Ucon" is the registered trade-mark of the Union Carbide Corporation. "Ucon 50-HB-2000" is described as a mixed ethylene/propylene polyglycol in the form of a random copolymer. A coating composition was made from this pigment dispersion in the manner described in Example 2. The dried film obtained from this composition had a reflectance value of 76%.

EXAMPLE 11

The procedure described in Example 1 was followed in all respects except that in the pigment dispersion "Pluronic L.61" was substituted for the tripropylene glycol. "Pluronic" is the registered trade-mark of the Wyandotte Chemicals Corporation. "Pluronic L.61" is described as a mixed ethylene and propylene polyglycol in the form of a block copolymer. The paint film obtained from the composition had a reflectance value of 65%.

EXAMPLE 12

A pigment dispersion was prepared in accordance with the formula given in Example 1. To 100 parts of this dispersion were added 5 parts of caprolactam. The mixture was then passed through a single roll mill. 42 parts of the milled dispersion were mixed with 60 parts of the copolymer emulsion described in Example 7. 0.2 parts of Pine Oil and 0.1 part of a commercial foam breaker were then added to complete the coating composition. The dry film obtained from this coating composition showed a reflectance value of 64%.

A composition prepared in the same way as described above but with the omission of caprolactam from the pigment dispersion dried to a film which showed a reflectance value of only 39%.

EXAMPLE 13

An unpigmented vinyl acetate/n-butyl acrylate copolymer dispersion (polymer constituents: vinyl acetate 90%, n-butyl acrylate 10%) prepared by a process of emulsion polymerisation and having a resin content of 55% by weight was spread evenly on a smooth laminated plastic board and allowed to dry. The coating obtained had a film thickness of 0.05 mm. and gave a reflectance value of 58%. The experiment was repeated with the same resin dispersion containing 2.5% by weight of thiourea. The dry coating deposited from this dispersion, which had previously been matured for 48 hours at 40°C., had a reflectance value of 74%.

EXAMPLE 14

A copolymer dispersion (polymer constituents: styrene 65%, butadiene 32%, methacrylic acid 3%) prepared by a process of emulsion polymerisation and having a polymer content of 50% was applied to a laminated

lastic board as described in Example 13. The partially crazed dry film of 0.06 mm. thickness gave, in the un-crazed area, a reflectance value of 55%. The same dispersion, containing 2.5% by weight of caprolactam, dried to a smooth un-crazed homogeneous film gave a reflectance value of 85 to 90%.

EXAMPLE 15

38 parts by weight of the pigment dispersion described in Example 1 were mixed with 50 parts by weight of the vinyl acetate/n-butyl acrylate copolymer dispersion described in Example 1, and 1.5 parts by weight of caprolactam dissolved in 5 parts by weight of water. To this mixture were then added 0.2 parts by weight of 25% aqueous ammonia and 0.2 parts by weight of Pine Oil. Finally, 10 parts by weight of a 40% solution of an alkali soluble resin were added to the mixture. The solution of the alkali soluble resin had the following composition:

	Weight %
25 Copolymer resin (copolymer constituents: 2-ethoxy-ethyl methacrylate 50% dimethyl itaconate 42.5% acrylic acid 7.5%)	40%
30 Ethylene Glycol Mono Iso Propyl Ether	20%
25% Aqueous Ammonia Solution	4%
Water	36%
35	100%

The paint made in accordance with the formula given above exhibited exceptionally good levelling and dried to a hard glossy film having a reflectance value of 73%.

Notwithstanding the above-mentioned examples the invention may be implemented in the preparation of aqueous dispersion coatings having additional ingredients well known to those skilled in the art. Examples of such ingredients are dispersing agents, stabilisers, solvents, plasticisers, corrosion inhibitors, colour pigments, pigment extenders, wetting agents and buffers. Thickening agents usually but not necessarily also form part of aqueous dispersion coating compositions. In the above-mentioned examples hydroxyethyl cellulose and polyvinyl pyrrolidone are mentioned but other types of water-soluble or water-dispersible polymeric materials may be employed, as

may also certain mineral thickeners of which montmorillonite and hectorite are typical examples. Thickeners which like polyvinyl pyrrolidone and polyvinyl oxazolidone contain in their molecular make up a multiplicity of the grouping No. 1 as previously defined are particularly suitable ingredients for aqueous coating compositions made in accordance with the present invention.

WHAT WE CLAIM IS:—

1. A coating composition comprising an aqueous dispersion of at least one water insoluble film-forming resin as hereinbefore defined and a gloss improving agent selected from 2-iminazolidone; 2-pyrrolidone; 2-oxazolidone; N-acetyl 2-oxazolidone; caprolactam; acetanilide; α -chloro-acetanilide; thiourea; methylene-bis-thiourea and N-phenyl thiourea said gloss improving agent being present in a concentration of 0.25 to 15% by weight of the coating composition.

2. A coating composition as claimed in Claim 1, additionally comprising a glycol.

3. A coating composition as claimed in Claim 2, wherein the glycol is a di-, tri-, or higher polyalkylene glycol or a mixed ethylene and propylene polyglycol in the form of a random or block copolymer.

4. A coating composition as claimed in any preceding claim, wherein the aqueous resin dispersion is prepared by emulsion polymerisation.

5. A coating composition as claimed in any preceding claim, additionally comprising one or more opacifying and/or colouring pigments.

6. A coating composition as claimed in any preceding claim, and further comprising at least one extender.

7. A coating composition as claimed in any preceding claim, wherein the gloss improving agent is present in a concentration of from 0.5 to 3% by weight of the coating composition.

8. A coating composition as claimed in any preceding claim and further comprising at least one water soluble polymer.

9. A coating composition substantially as described herein with reference to the Examples.

10. Articles coated with the composition as claimed in any preceding claim.

TREGEAR, THIEMANN & BLEACH,
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Melbourne House,
Aldwych,
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Index at acceptance

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[Price 4s. 6d.]

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	% Weight
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2. A coating composition as claimed in Claim 1, additionally comprising a glycol.
3. A coating composition as claimed in Claim 2, wherein the glycol is a di-, tri-, or higher polyalkylene glycol or a mixed ethylene and propylene polyglycol in the form of a random or block copolymer.
4. A coating composition as claimed in any preceding claim, wherein the aqueous resin dispersion is prepared by emulsion polymerisation.
5. A coating composition as claimed in any preceding claim, additionally comprising one or more opacifying and/or colouring pigments.
6. A coating composition as claimed in any preceding claim, and further comprising at least one extender.
7. A coating composition as claimed in any preceding claim, wherein the gloss improving agent is present in a concentration of from 0.5 to 3% by weight of the coating composition.
8. A coating composition as claimed in any preceding claim and further comprising at least one water soluble polymer.
9. A coating composition substantially as described herein with reference to the Examples.
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