

PATENT SPECIFICATION

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(54) PAINT COMPOSITIONS FOR CONCRETE BASES

(71) We, YOSHINORI SUZUKI, of 4-25-11, Kami-Ikedai, Ota-ku, Tokyo, Japan; and YUKIO IWASAKI, of 1-12-20, Higashi-Yukigaya, Ota-ku, Tokyo, Japan, both citizens of Japan, do hereby declare the invention for which we pray that 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:—

The present invention concerns a paint composition and a method of applying this paint composition, especially to a concrete base. More particularly, the invention concerns a paint composition which can be applied directly to an untreated base, and a method for applying the paint composition to the base.

Among the methods for applying a coating to a concrete base, brush-coating and spray-gun methods are well-known. Before paint is applied to a concrete base with a brush, usually the surface of the base is polished by a grinder in order to remove the unevenness or irregularities on the base's surface, and then the base is coated with mortar or putty, and further smoothed away by sand paper, and treated with a sealer primer. Then under coating, second coating and finishing coating are applied to the pretreated surface of the base by brush. In the case where a spray gun is used, the surface of the base is tidied up and the unevenness and irregularities are removed; pin holes are plugged up, and a sealer primer is applied to the surface of the base before under coat spraying and finishing spraying of the paint are carried out with the spray gun.

However, the known methods of coating concrete involve a number of complicated processes, and much time and labor are required for their practice. Especially when a hydraulic cement is sprayed by a spray gun at a low temperature, efflorescence is apt to take place, for which there is no remedy. Furthermore, a considerable skill is required for spraying paint with a spray gun, accompanied by not a little material loss. If hanging-type scaffolds are constructed for the paint-

spraying of a building, instead of expensive proper scaffolding, operational difficulty is increased, and the paint tends to be applied unevenly. 50

Many studies have been made for the purpose of overcoming the disadvantages involved in the known methods, but no satisfactory solution has been obtained as yet. 55

An aim of the invention is to provide novel paint compositions which can be applied directly to concrete bases without subjecting the bases to any pretreatment. Another aim is to provide a method for applying said compositions to these bases. 60

Still another aim of the invention is to provide a method for carrying out the application of the paint compositions in one step to give thick films thereof, which films can then be coated with a protective material to give a finishing coat. 65

Yet another aim of the invention is to provide paint compositions which are of the room temperature drying type, which have a short curing time, and which have little tendency to crack or fall off after being applied. 70

One more aim of the present invention is to give coated surfaces for indoor or outdoor use, which exhibit superior resistance to fading and weathering, which can present a glossy, ceramic appearance like that of tiles, and which reduce abrasion of human bodies coming into contact with them. Moreover, it is an aim of the invention to provide such coated surfaces which are washable with water while their color hardly changes or fades with the lapse of time. 75 80

The present invention provides a paint composition comprising a mixture of (a) Portland cement, (b) an aggregate, (c) 1—3 parts of calcium chloride, (d) 0.4—2 parts of naphthalene sulfonic acid formalin condensate, and (e) 1—2 parts of alkyl cellulose, all of said parts being by weight per 100 parts of the Portland cement. Further, the following may be added to the mixture: an anti-shrinking agent, an efflorescence preventive agent, a waterproofing agent, a defoaming agent, a coloring agent, and water, then the 85 90 95

[Price 33p]

SPECIFICATION AMENDED - SEE ATTACHED SLIP

Price 75p

resulting mixture is processed into a paste. The paste is applied by means of a porous hand roller to the surface of a concrete base, thereby carrying out a coating, along with the treatment of the base, in one step.

Calcium chloride added to the composition serves as a cure accelerator, its amount being 1—3 parts per 100 parts of the cement. As the alkyl cellulose, either methyl cellulose or ethyl cellulose is preferably used, having a high gel point, preferably above 90°C. As the naphthalene sulfonic acid formalin condensate, the sodium salt of α -methyl naphthalene sulfonic acid formalin condensate is used. To the mixture 0.5—10 parts of calcium sulfoaluminate ($3\text{CaO} \cdot 3\text{Al}_2\text{O}_3 \cdot \text{CaSO}_4$) may be added as an antishrinking agent, 5—15 parts of zeolite as an efflorescence preventive agent, 0.1—5 parts of calcium stearate may be added as a waterproofing agent, and 0.01—0.2 part of tributyl phosphate may be added as a defoaming agent, and a pigment in such an amount as to meet the purpose for which it is employed may be added. The composition also preferably comprises from 2 to 5 parts of propylene glycol, per 100 parts by weight of Portland cement.

If a synthetic rubber latex such as styrene-butadiene rubber or a vinyl resin emulsion such as acrylic ester copolymer is added to the above-given mixture, a film of more uniform quality will be produced, and the bond between an optional finishing coat and the film formed of the paint composition of the present invention will be generally strengthened. Further, if vinyl paint or acrylic acid or ester

copolymer paint is applied to the above-given composition-coated base to give a protective layer of a synthetic resin, a still more attractive decorative layer can be formed.

The method of the present invention is quite different from an ordinary roller painting method which comprises applying a paint composition, containing finely divided white limestone with a roller only to the surfaces of a porous base.

The method of the invention is also different from a roller application of a sand-textured coating, in which the aggregates mixed in the composition are apt to congregate or fly about, causing a big loss, which is liable to end in an uneven finish.

In order to achieve a satisfactory coating, it is usually required to have the paint composition applied several times, so that the coating layers become thick and tend to crack during drying.

The method of the present invention is substantially free from the disadvantages which are observed in the conventional methods, and can be easily practiced by means of a porous hand-roller with which the paint composition of the invention can be pressure-transferred onto a base at the rate of from 1.3 to 2.4 kg/cm², so that it requires no special skill.

The results in practice obtained by the method of the invention in comparison with those given by the known methods of spraying a hydraulic cement and spraying a sand-textured paint composition is given in Table 1 which follows, using a concrete base for the tests:

TABLE 1

Method	Number of coats	Amount of paint used (kg/m ²)	Amount of paint actually applied (kg/m ²)	Application efficiency (m ² /man-day)
Method of present invention	1	1.3—1.8	1.2—1.7	60—70
Spraying of a hydraulic cement	2	1.2—1.3	0.8—1.0	60
Spraying of a sand-textured paint composition	2	0.7—1.7	0.5—1.2	45

The surfaces of the spray-finished concrete base usually become dirtier with the passage of time, whereas the surfaces of the concrete base treated by the method of the invention, according to experience, were only a little contaminated even after the lapse of 2 years and 6 months; the contamination could be removed by washing with water.

Generally, coating conditions differ somewhat depending on where the coat is applied, for example, to walls or to ceilings of a room, either indoors or outdoors.

What is particularly required of outdoor coating is weather resistance, water resistance, adhesion, cleanliness, and rigidity; while as to indoor coating, what is required of the wall coating is adhesion, water resistance and rigidity, and what is required of ceiling coating is adhesion and water resistance as well as attractive appearance of the finished surface.

The method of the present invention is suitable for the coating of most inorganic materials, whether indoors or outdoors. The

films formed, after being allowed to stand for 28 days, have surfaces exhibiting glassy unevenness like that of ceramic tiles and such films serve the purpose of a decorative coating, which generally covers any irregularities

and pinholes on the surfaces of the base.

The maximum thickness of films prepared with the paint composition of the invention is generally from 2 to 3 mm, and the properties of such a film are given in Table 2 below.

TABLE 2

Item	Results of the test	Testing method or kind of standard employed.
1. Processability	Good	A porous hand roller was employed in conducting the test
2. Condition of coating film	Good	Uniformity and stability of the patterns presented by the film and uniformity of its color.
3. Impact resistance (on 28 day-old film)	No change at 1 kg $\times$ 75cm	JIS-A-5403
4. Adhesion (Under normal condition)	More than 3 kg/cm ²	An adhesion tester kept at the Architectural Research Institute of the Ministry of Construction, Japan, was employed in conducting the test.
5. Abrasion test (on 28 day-old film)	95 mg/1,000 times	Taber's abrasion tester. (Abraser: H 22, load: 250 g)
6. Washability	No change after being washed 2,000 times.	JIS-A 6909
7. Degree of luster	More than 70	JIS-K 5400
8. Freeze thaw stability	No change after 20 cycles.	In accordance with ASTM C-290-61T
9. Water penetration (on 28 day-old film)	Quantity of water penetrated: None	JIS-A 6101 Water pressure: 0.1 kg/cm ² .
10. Accelerated weathering	No change after 1,000 hours	Irradiation by a weathermeter

The invention will be further illustrated by the following examples.

Example 1

65 parts by weight of water were added to 100 parts by weight of the dry paint composition having the ingredients stated below in Table 3, and the resultant mixture was kneaded into a paste, which was then applied at a rate of 1.8 kg/m² to surfaces of a 315 m²

indoor concrete wall which had been made using a ply-wood mould. After the lapse of 24 hours (temperature: 20°C, relative humidity: 65%), a 25% toluol solution of an acrylic ester copolymer was applied at the rate of 0.45 kg/cm² to the film of the so-prepared paint composition. As a result, a glassy uneven finish was given like the one given by ceramic tiles, covering the irregularities of 2—3 mm and pinholes on the surface

of the base. No cracking or peeling off of the covering paint was observed. The efficiency of application was 65 m²/man-day. The adhesion of the film to the base was measured at 10 kg/cm² under normal conditions after the film had been allowed to stand for 28 days. The film was 3.0 mm thick and not permeable to water.

TABLE 3

Ingredients of the paint composition of Example 1

Item	Kind	Parts by weight
Cement	Hydraulic white Portland cement	100
Aggregate	Silica sand 100—200 mesh)	100
Pigment	Anatase titanium dioxide	10
	Zeolite (efflorescence preventive agent)	10
	Calcium chloride	3.0
	Naphthalene sulfonic acid formalin condensate*	1.2
25 Additives	Calcium stearate	0.5
	Calcium sulfoaluminate (antishrinking agent)	1.0
	Methylcellulose (4000 cp)**	1.0
30	Tributyl phosphate	0.1
	Propylene glycol	2.0

* Tradename: Nopcosant (Nopco Chemical) (Registered Trade Mark).

**Tradename: Methocel (Dow Chemical) (Registered Trade Mark).

Example 2

To 100 parts by weight of the dry paint composition having the ingredients stated below in Table 4 were added 70 parts by weight of water and 20 parts of 46% acrylic ester copolymer emulsion. The mixture was kneaded into a paste. The paste was applied at a rate of 2.0 kg/cm² to 101 m² outdoor concrete wall (which has been made using a metal mould) which had not been pretreated. After the lapse of 24 hours, (temperature: 20°C, relative humidity: 65%), white enamel (solid content: 40%) in a toluol solution of an acrylic ester copolymer was applied to the film prepared of the paint composition at the rate of 0.4 kg/cm². As a result, glassy unevenness like the one given by ceramic tiles, was given covering the pinholes on the surface of the concrete base. No cracking or peeling off of the coating paint was observed. The efficiency of application was 70 m²/man-day. The film of the so-prepared paint composition was observed to possess properties similar to those shown in Example 1. The addition of the polymer emulsion to the paint composition proved to help produce a film of uniform quality and improve the adhesion of the film to the finishing material.

TABLE 4
Ingredients of the paint composition of Example 2

Item	Kind	% by weight
Cement	Hydraulic white Portland cement	100
Aggregate	Silica sand (100—200 mesh)	150
Pigment	Anatase titanium dioxide	10
	Zeolite	12
	Calcium chloride	2.0
	Naphthalene sulfonic acid formalin condensate*	1.5
Additives	Calcium stearate	0.5
	Calcium sulfoaluminate	1.2
	Methylcellulose (4000 cp) **	1.5
	Tributyl phosphate	0.1
	Propylene glycol	4.0

*Tradename: Nopcosant (Nopco Chemical) (RTM).

**Tradename: Methocel (Dow Chemical) (RTM).

WHAT WE CLAIM IS:—

1. A paint composition comprising a mixture of (a) Portland cement, (b) an aggregate, (c) from 1 to 3 parts by weight of calcium chloride, (d) from 0.4 to 2 parts by weight of naphthalene sulfonic acid formalin condensate, and (e) from 1 to 2 parts by weight of alkylcellulose, all of said parts being based upon 100 parts of said Portland cement.

2. A composition according to claim 1, also comprising per 100 parts of said Portland cement, from 2 to 5 parts by weight of propylene glycol.

3. A composition according to claim 1 or 2, also comprising, per 100 parts of said Portland cement, from 0.5 to 10 parts by weight of calcium sulfoaluminate.

4. A composition according to claim 1, 2 or 3, also comprising, per 100 parts of said Portland cement, from 5 to 15 parts by weight of zeolite.

5. A composition according to any one of the preceding claims, also comprising, per 100 parts of said Portland cement, 0.1 to 5 parts by weight of calcium stearate.

6. A composition according to any one of the preceding claims, also comprising per 100 parts of said Portland cement, from 0.01 to 0.2 part by weight of tributyl phosphate.

7. A composition according to any one of the preceding claims, wherein the aggregate is silica sand.

8. A composition according to any one of the preceding claims, wherein the alkyl cellulose is methyl cellulose.

9. A composition according to any one of

of the base. No cracking or peeling off of the covering paint was observed. The efficiency of application was 65 m²/man-day. The adhesion of the film to the base was measured at 10 kg/cm² under normal conditions after the film had been allowed to stand for 28 days. The film was 3.0 mm thick and not permeable to water.

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TABLE 4
Ingredients of the paint composition of Example 2

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1. A paint composition comprising a mixture of (a) Portland cement, (b) an aggregate, (c) from 1 to 3 parts by weight of calcium chloride, (d) from 0.4 to 2 parts by weight of naphthalene sulfonic acid formalin condensate, and (e) from 1 to 2 parts by weight of alkylcellulose, all of said parts being based upon 100 parts of said Portland cement. 90

2. A composition according to claim 1, also comprising per 100 parts of said Portland cement, from 2 to 5 parts by weight of propylene glycol. 100

3. A composition according to claim 1 or 2, also comprising, per 100 parts of said Portland cement, from 0.5 to 10 parts by weight of calcium sulfoaluminate. 105

4. A composition according to claim 1, 2 or 3, also comprising, per 100 parts of said Portland cement, from 5 to 15 parts by weight of zeolite. 110

5. A composition according to any one of the preceding claims, also comprising, per 100 parts of said Portland cement, 0.1 to 5 parts by weight of calcium stearate. 115

6. A composition according to any one of the preceding claims, also comprising per 100 parts of said Portland cement, from 0.01 to 0.2 part by weight of tributyl phosphate. 120

7. A composition according to any one of the preceding claims, wherein the aggregate is silica sand.

8. A composition according to any one of the preceding claims, wherein the alkyl cellulose is methyl cellulose.

9. A composition according to any one of



the preceding claims, comprising also a pigment.

10. A composition according to any one of the preceding claims, comprising water and in the form of a paste.

11. A composition according to claim 10, comprising also a styrene-butadiene rubber latex.

12. A composition according to claim 10, comprising also a vinyl resin emulsion.

13. A composition according to claim 1, substantially as hereinbefore described in Example 1 or 2, in dry or paste form.

14. A method of coating a base, which

15 method comprises applying a paste according

to any one of claims 10 to 13 with a porous roller to said base, to form a film thereon.

15. A method according to claim 14, where- 20
in the base is of concrete.

16. A method according to claim 14 or 15, comprising also the step of coating a vinyl or acrylic acid or ester copolymer paint onto the film. 25

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