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(54) METHOD FOR THE COLOURLESS ELASTIC COATING OR SEALING OF CRACKS, JOINTS, DEFECTS, AND THE LIKE IN STRUCTURES OR STRUCTURAL PARTS

(71) We, DEUTSCHE SOLVAY WERKE Gesellschaft mit beschränkter Haftung, a body corporate organised under the laws of the German Federal Republic, of 6, Langhansstrasse 5650 Solingen-Ohligs, German Federal Republic, 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 a method for the elastic sealing of cracks, joints, defects, and the like in structures or structural parts, utilising an adherent and expandable painting medium or coating material which can be applied with the aid of painting and coating apparatus known *per se*, preferably with the aid of brushes, rollers, or spray apparatus.

It has already been proposed to use for coating or facing painting media based on various plastics materials. Thus, coloured or colourless coatings or impregnating media of more or less low viscosity and based on aqueous or solvent-containing systems with or without additions of silicone resins have been proposed for application in one or more operations.

With previously proposed painting and coating media, however, the permanently elastic, colourless, flowing closing or bridging-over of hair cracks, pores, defects, holes, and the like cannot be achieved. In many cases only dry layers having a thickness of up to about 40 μm can be obtained with the paints or coatings.

In order to effect surface sealing, for example of concrete parts, it has already been proposed to apply a priming or base coat or a top coat of plastics materials to the concrete parts requiring sealing. In this method the base coat applied may also be a polyacrylic alkyl ester in the form of a solution in organic solvents or in the form of an aqueous dispersion, this coat after hardening or drying being covered by a top coat which is based on epichlorohydrin resin, polyester resin, or a polysilicone and which is made elastic with the aid of plasticisers.

It has, however, been found that with this method it is possible to achieve functionability only through a determined selection of the synthetic resins indicated for the base and top coats. Moreover, it is a disadvantage of this method that the elongation at rupture of the top coat is greater than the adhesion of the ground coat, so that in a number of cases wrinkling at cracks is unavoidable and the elastic nature of the top coat in conjunction with mineral fillers contained in the coats has the consequence that it is impossible to obtain a colourless coating or a coating which dries matt so as to leave the optical appearance of the base coat unchanged or substantially unchanged.

According to the present invention there is provided a method for the elastic coating or sealing of cracks, joints, defects, and the like in a structure or structural part, wherein there is applied to the structure or structural part a base coat painting or base coating medium which is a slightly thixotropic plastics material dispersion which is of viscous structure and is capable of drying to a colourless, permanently elastic film which is adhesive on its surface, said dispersion comprising 96 to 99% by weight of one or more polyacrylic ester dispersions and/or one or more acrylic ester copolymer dispersions, the solids content of which is at least 48% by weight (based on the weight of the plastics material dispersion), the minimum film-forming temperature of

which is from −2° to +5°C, and of which the dried film after immersion in water for 24 hours shows a water absorption below 12%, and from 4.0 to 1.0% by weight of one or more organic solvents which effect the incipient swelling or incipient dissolution of the plastics particles present in the dispersion and which have an evaporation number above 10, and wherein, afer drying, a top coat or finish coat is applied which is based on one or more polyacrylic ester dispersions or solutions or a polyvinyl acetate dispersion or solution, which coat after drying forms a colourless, elastic layer.

With the present method it is possible to achieve a good elastic coating or sealing, with great expansibility and good adhesion, of cracks, joints, defects, and the like in structures or structural parts. In a preferred embodiment a colourless or almost colourless or transparent coating and/or sealing can be achieved without varying the optical appearance of the surface to be sealed, so that the existing structure and colouring are maintained or are substantially maintained. In order that the permanently elastic coating or permanently elastic sealing should be and continue to be effective it is desirable that a coating thickness greater than 140 μm, preferably greater than 200 μm, is achieved. The coating or sealing should in addition have good watertightness or low swellability in water.

The base medium or base coating material used is a slightly thixotropic plastics material dispersion which has a viscous structure and which dries to a colourless permanently elastic film which is adhesive on the surface, this material being based on one or more polyacrylic ester dispersions, preferably one or more acrylic ester copolymer dispersions containing up to 30% by weight of copolymer (referred to total polymer), this dispersion consisting of 96 to 99% by weight, preferably 97.5 to 98.5% by weight, of one or more polyacrylic ester dispersions and/or one or more acrylic acid copolymer dispersions the solids content of which is at least 48% by weight (referred to 100% by weight of pure plastics material dispersion), the minimum film-forming temperature of which is from about −2° to +5°C, preferably 0°C, and of which the dried film when kept immersed in water for 24 hours shows a water absorption below 12%, and of from 4.0 to 1.0% by weight, preferably from 2.5 to 1.5% by weight, of one or more organic solvents which effect the incipient swelling or incipient dissolution of the plastics material particles contained in the dispersion and have an evaporation number above 10, preferably above 35, and/or of one or more additives known *per se* (with the exception of fillers, pigments, or opacifying substances), preferably anti-foaming and/or preservation media. After the drying of the ground coat a top coat or finish coat is applied which is based on one or more polyacrylic ester dispersions or solutions or a polyvinyl acetate dispersion or solution, preferably based on one or more vinyl acetate copolymer resin dispersions or solutions, this coating, on drying, forming a colourless elastic layer. With this method a colourless or almost colourless, permanently elastic coating and/or sealing for cracks, joints, defects, and the like in structures or structural parts may be obtained without the optical appearance of the surfaces sealed being modified to any decisive extent, so that the existing structure and colouring are maintained or substantially maintained. On drying the coating is no longer adhesive or is practically non-adhesive.

In a preferred embodiment of the method, a base paint or base coating material based on a polyacrylic ester dispersion having a low plasticiser content and preferably containing no plasticiser, preferably one or more acrylic ester copolymer dispersions, and having a content of solid material of from 40 to 65% by weight, preferably 48 to 65% by weight, more preferably from 50 to 60% by weight (referred to 100% by weight of pure plastics material dispersion) is used.

The top coat painting material or finishing coat painting material used, which is based on one or more polyacrylic ester dispersions, preferably one or more acrylic ester copolymer dispersions, consists of from 92 to 99.2% by weight, preferably from 97.5 to 98% by weight, of one or more polyacrylic ester dispersions and/or one or more acrylic ester copolymer dispersions, the solids contents of which is from 48 to 65% by weight, the minimum film-forming temperature of which is above 10°C, preferably from 15 to 20°C, and of which a dried film after immersion in water for 24 hours shows a water absorption below 12%, preferably from 7 to 0.7% by weight, and more preferably from 2 to 1.0% by weight, of one or more organic solvents which effect incipient swelling or incipient dissolution of the particles of plastics material present in the dispersion and have an evaporation number above 10, preferably above 35, and from 1.0 to 0.1% by weight, preferably from 0.5 to 0.2% by weight, of additives known *per se*, preferably anti-foaming and/or preservation agents.

In one embodiment, the top coat painting medium which is based on one or more polyacrylic ester solutions and/or a polyvinyl acetate solution, preferably one or more acrylic ester copolymer solutions or

one or more vinyl acetate copolymer solutions contains from 12 to 30% by weight, preferably from 14 to 20% by weight (calculated as resin in solid form), of acrylic ester resin, preferably acrylic ester copolymer resin and/or vinyl acetate copolymer resin, which is dissolved in from 87 to 64.5% by weight, preferably from 83.8 to 76% by weight of one or more solvents for acrylic ester resin or vinyl acetate resin, and from 1.0 to 5.5% by weight, preferably from 2.2 to 4% by weight, of additives, preferably plasticisers and/or matting agents. These top coat painting media protect the extensible film applied against the influence of weather and can in addition be adapted to the degree of gloss of the base medium.

In a preferred embodiment, the base coat painting medium is applied in two operations with the aid of working implements known *per se*, the base coat painting medium being applied in the first operation in a layer thickness (measured as dry later thickness) of from 100 to 140 μm and, after dyring, being painted over or coated with the base coat painting medium in a second operation, so that a total layer thickness of the base coat painting medium of from 200 to 280 μm (measured as dry layer thickness) is obtained whereupon after complete drying the resulting base coat has an elongation at rupture of about 160 to 220% at 0°C and of from 750 to 950% at 20°C (test conditions: clamp length 40 mm, film width 4 mm, film thickness 0.2 to 0.28 mm, rate of extension 150 mm/min). In one embodiment, the base coat painting medium contains as additive from 1.0% to 0.1% preferably from 0.5% to 0.2% of anti-foaming agent and from 0.5% to 0.05%, preferably from 0.2% to 0.1% of a preservation agent.

In one embodiment from 0.5% by weight to 0.05% by weight, preferably from 0.3% by weight to 0.10% by weight, of a preservation agent is added as additive to the top coat painting medium in the form of a dispersion. Up to 20% by weight of a matting agent, preferably in the form of a 10 to 30% aqueous dispersion of micronized silica gel, can be added to the mixture of the finished top coat painting medium.

On the other hand, from 0.5% by weight to 2.5% by weight, preferably from 1.2% by weight to 1.5% by weight, of plasticiser and from 0.5% by weight to 3% by weight, preferably from 1.0% by weight to 2.5% by weight of matting agent, preferably pyrogenic silica are contained in the top coat painting medium used in the form of a solution.

The present method is particularly suitable for the sealing of visible masonry, clinker brick or breeze block facings, sandlime bricks, ceramic facings, decorative renderings and washable renderings, and also natural and synthetic stone slabs.

The invention will now be further described with reference to the following Examples of base coating medium and top coat medium.

Example 1

Base coating medium

96.00% by weight of acrylic ester copolymer dispersion having a film-forming temperature of 0°C; and a solids content of 50% by weight; and providing a dried film which, after immersion for 24 hours in water, shows a water absorption of below 12%, the copolymer being formed from more than 70% by weight acrylic ester and less than 30% by weight of monomer copolymerisable therewith;
2.00% by weight of white spirit,
0.50% by weight of diethylene glycol ethyl ether acetate and
1.50% by weight of anti-foaming agent+preservation agent

100.00

Example 2

Base coating medium

99.00% by weight of polyacrylic ester dispersion having a solids content of about 50% by weight; having a film forming temperature of approximately 2°C; and providing a dried film which, after immersion per 24 hours in water, shows a water absorption below 12%;
0.85% by weight of diglycol acetate and
0.15% by weight of anti-foaming agent+preservation agent

100.00

Example 3

Top coat medium, painting material, aqueous dispersion base, gloss

92.00% by weight of acrylic ester copolymer dispersion with a film-forming temperature lower than 15°C and a solids content of about 50% by weight; and providing a dried film which, after immersion in water for 24 hours, shows a water absorption of below 12%;
7.00% by weight of a mixture of white spirit, glycol, and diglycol acetate and
1.00% by weight of anti-foaming agent and preserving agent

100.00

Example 4

Top coating medium with matting agent

100.00 parts by weight of the composition according to Example 3, and
2.00 to 4.00 parts by weight of a 20% dispersion of pyrogenic silica.

Example 5

Top coat medium, solvent-containing

12.00% by weight of polyvinyl acetate copolymer resin (solid),
87.00% by weight of a solvent mixture, consisting of alcohols, aromatics and esters,
0.50% by weight of plasticiser and
0.50% by weight of micronised silica

100.00

Example 6

Top coat medium, solvent-containing

30.00% by weight of polyacrylic ester resin (solid),
64.50% by weight of a solvent mixture consisting of aromatics, white spirit, and esters,
2.50% by weight of plasticisers and
3.0% by weight of pyrogenic silica

100.00

In the preferred practice of the invention a base coat medium as described in Example 1 or 2 can be applied e.g. to a structure of visible masonry, clinker brick or breeze block facings, in one or two operations, using working implements known *per se*; and after drying the resulting film painted over with a top coat medium as described in any of Examples 4 to 6.

WHAT WE CLAIM IS:—

1. A method for the elastic coating or sealing of cracks, joints, defects, and the like in a structure or structural part, wherein there is applied to the structure or structural part a base coat painting or base coating medium which is a slightly thixotropic plastics material dispersion which is of viscous structure and is capable of drying to a colourless, permanently elastic film which is adhesive on its surface, and dispersion comprising 96 to 99% by weight of one or more polyacrylic ester dispersions and/or one or more acrylic ester copolymer dispersions, the solids content of which is at least 48% by weight (based on the weight of the plastics material dispersion), the minimum film-forming temperature of which is from −2° to +5°C, and providing a dried film which after immersion in water for 24 hours shows a water absorption below 12%, and from 4.0 to 1.0% by weight of one or more organic solvents which effect the incipient swelling or incipient dissolution of the plasics particles present in the dispersion and which have an evaporation number above 10, and wherein, after drying, a top coat or finish coat is applied which is based on one or more polyacrylic ester dispersions or solutions or a polyvinyl acetate dispersion or solution, which coat after drying forms a colourless, elastic layer.

2. A method as claimed in claim 1, wherein the polyacrylic ester dispersion of the base medium is an acrylic ester copolymer dispersion having a proportion of copolymer of up to 30% by weight based on the weight of total polymer.

3. A method as claimed in claim 1 or 2, wherein the said dispersion of the base medium comprises 97.5 to 98.5% by weight of one or more polyacrylic ester dispersions and/or one or more acrylic ester copolymer dispersions.

4. A method as claimed in anyone of claims 1 to 3, wherein the base medium comprises from 2.5 to 1.5% by weight of one or more solvents.

5. A method as claimed in anyone of claims 1 to 4, wherein the organic solvents have an evaporation number above 35.

6. A method as claimed in anyone of claims 1 to 5, wherein the base medium comprises one or more anti-foaming and/or preserving agents.

7. A method as claimed in anyone of claims 1 to 6, wherein the top coat is based on one or more acrylic ester copolymer dispersions or solutions and/or one or more vinyl acetate copolymer resin dispersions and solutions.

8. A method as claimed in anyone of claims 1 to 7, wherein the base medium consists of one or more polyacrylic ester dispersions which have a low plasticiser content or contain no plasticiser.

9. A method as claimed in claim 8, wherein the base medium comprises one or more acrylic ester copolymer dispersions having a solids content of 48 to 65% by weight based on the weight of the plastics material dispersion.

10. A method as claimed in claim 9, wherein said solids content is 50 to 60% by weight.

11. A method as claimed in anyone of claims 1 to 10, wherein the top coat comprises (a) 92 to 99.2% by weight of one or more polyacrylic ester dispersions and/or one or more acrylic ester copolymer dispersions, the solids content of which is from 48 to 65% by weight, the minimum film-forming temperature of which is above 10°C and of which the dried film after immersion in water for 24 hours shows a water absorption below 12%; (b) 7 to 0.7% by weight of one or more organic solvents which effect the incipient swelling or

incipient dissolution of the plastics particles present in the dispersion and have an evaporation number above 10, and (c) 1.0 to 0.1% by weight of one or more anti-foaming and/or preserving agents.

12. A method as claimed in claim 11, wherein the top coat comprises 97.5 to 98.8% by weight of (a), 2 to 1.0% by weight of (b) and 0.5 to 0.2% by weight of (c).

13. A method as claimed in claim 11 or 12, wherein the minimum film-forming temperature of (a) is from 15 to 20°C.

14. A method as claimed in anyone of claims 11 to 13, wherein the evaporation number of (b) is above 35.

15. A method as claimed in anyone of claims 1 to 10, wherein the top coat comprises (a) 12 to 30% by weight (calculated as resin in solid form) of acrylic ester resin, which is dissolved in (b) 87 to 64.5% by weight of one or more solvents for the acrylic ester resin or vinyl acetate resin, and (c) 1.0 to 5.5% by weight of plasticisers and/or matting agents.

16. A method as claimed in claim 15, wherein the top coat comprises 14 to 20% by weight of (a), 83.8 to 76% by weight of (b) and 2.2 to 4% by weight of (c).

17. A method as claimed in anyone of claims 1 to 16, wherein the base medium is applied in two operations, the medium being applied in the first operation as a first layer with a thickness (measured as dry layer thickness) of 100 to 140 μm, and wherein, after the first layer has dried, it is coated with the base medium in a second operation so as to form a combined layer with a total thickness of from 200 to 280 μm (measured as dry later thickness), the resulting base coat having, after complete drying, an elongation at rupture of 160 to 220% at 0°C and 750 to 950% at 20°C.

18. A method as claimed in anyone of claims 1 to 17, wherein the base medium contains 1.0% to 0.1% of anti-foaming agent, and 0.5% to 0.05% of a preserving medium.

19. A method as claimed in anyone of claims 1 to 18, wherein the base medium contains 0.5% to 0.2% of anti-foaming agent and 0.2% to 0.1% of a preserving medium.

20. A method as claimed in anyone of claims 1 to 19, wherein 0.5% by weight of 0.05% by weight of a preserving agent is added as additive to the top coat, and wherein up to 20% by weight of a matting agent is added to the top coat.

21. A method as claimed in claim 20, wherein 0.3% to 0.10% by weight of a preserving agent is added to the top coat.

22. A method as claimed in claim 20 or 21, wherein the matting agent is in the form of a 10 to 30% aqueous dispersion of micronised silica gel.

23. A method as claimed in anyone of claims 1 to 22, wherein the top coat contains 0.5% by weight to 2.5% by weight of plasticiser and 0.5% by weight to 3% by weight of matting agent.

24. A method as claimed in claim 23, wherein the top coat contains 1.2% by weight to 1.5% by weight of plasticer and 1.0% by weight to 2.5% by weight of matting agent.

25. A method as claimed in claims 23 or 24, wherein the matting agent is pyrogenic silica.

26. A method according to Claim 1 for the elastic coating or sealing of cracks, joints, defects and the like using a base coating medium and a top coat medium substantially as hereinbefore described in anyone of the foregoing Examples.

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