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(54) METHOD OF SURFACE TREATMENT OF A POLYMER WALL OR FACADE PANEL WITH DIGITAL PRINT

(57) Method of surface treatment of a polymer wall or facade panel with digital print, in which in the first step the surface of an extruded wall or facade panel made of polymer material is cleaned mechanically and then with organic solvent or a mixture of organic solvents - particularly hydrocarbons, alcohols, ketones, esters with boiling temperatures in the range of 50 - 140°C, preferably 70 - 100°C, preferably based on ethyl acetate, butyl acetate, ethanol, isopropanol and/or methyl ethyl ketone - following which, after evaporation of volatile compounds from the panel surface, the panel is subject to deionization and afterwards a layer of primer based on polymer resins is applied - preferably acrylic, with photoinitiators, in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2; next, the primer is cured with mercury, gallium or iron lamps with a power of 80 - 140 W/cm, preferably 100-120 W/cm, for no more than 3 s; then, digital print is applied on the panel prepared in this manner, with the use of industrial oilbased inks or UV-cured inks containing organic and/or inorganic pigments, and protective varnish based on polymer resins is applied - preferably acrylic, with photoinitiators - in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2; finally, the protective varnish layer is cured with mercury, gallium or iron lamps with a power of 80 - 140 W/cm, preferably 100-120 W/cm, for no more than 3 s.

EP 3 950 369 A1

Description

[0001] The subject of the invention is surface treatment of a polymer wall or facade panel with digital print.

[0002] In the field of applying decorative prints to polymer panels - in particular wall panels - the most widely used technology is direct printing. However, more and more often this technology is being substituted by digital printing. Technology-wise, digital printing is more flexible, allowing for unrestricted customization of decorative patterns and production of small quantities, also taking into account economic aspects of manufacturing.

[0003] Various methods are currently known for producing panels with decorative prints. Decorative material that comprises: a substrate; a print layer provided on the substrate; a protective layer provided on the print layer is known from the American description US2003113520 (A1), where the protective layer comprises an ionizing radiation-cured resin; and a primer layer provided between the print layer and the protective layer, for relaxing shrinkage stress caused at the time of curing of an ionizing radiation-curable resin for the formation of the ionizing radiation-cured resin constituting the protective layer.

[0004] A method of applying decorative inkjet prints to the surface of base materials is known from the Japanese description JP2008265229, where the print is applied to a layer of flexible resin and then covered with a hard protective layer.

[0005] A method of coating a building panel with a UV curable layer using a digital print head is known from the patent description WO2014011110 (A1), where the surface is cured afterwards to form a transparent protective surface layer.

[0006] A method of producing building panels is known from another description - US2014144583 (A1) - where digital print is applied in a separate production cycle to a media layer (e.g. film) and then heat and pressure is applied to form a panel with a protective layer.

[0007] A method of producing a substrate for directly printed decorative panels is known from description WO2016124433, where several layers of resin compositions - consisting of melamine resin and urea resin - are applied to the panel, following which the panel is dried.

[0008] The description US2016303867 discloses a method of producing a decorative outer layer by which digital print is applied directly to the panel and before the print is applied the panel surface is primed or sanded.

[0009] In digital printing, the most important problem is the pre-treatment of the panel core. This is due to the fact that the basic problem of printing on PVC profiles or panels using pigmented acrylic resin-based inks is the very low porosity of plastic surfaces, which leads to virtually negligible ink penetration into the substrate. Another important problem is the issue of inadequate surface tension of inks and varnishes as well as low free surface energy of the panel, resulting in the lack of satisfactory print resolution. The essence of the inventive work was to find an optimum solution for permanent connection of the printed layer with the printed surface. This effect was achieved by using the right composition of the primer and adjusting the process to the requirements of its use.

[0010] The essence of the invention is the method of surface treatment of a polymer wall or facade panel with digital print. In the first step the surface of an extruded polymer wall or facade panel is cleaned mechanically - for example with brushes or air stream - and afterwards with organic solvent or a mixture of organic solvents (hydrocarbons, alcohols, ketones, esters) with boiling temperatures in the range of 50 - 140 °C, preferably 70 - 100 °C, preferably based on ethyl acetate, butyl acetate, ethanol, isopropanol and/or methyl ethyl ketone. The aim is to clean the surface from dirt generated during the production process, e.g. waxes, lubricants. After evaporation of volatile compounds from the surface of the profile, electric charges are removed with the use of deionization strips and afterwards a layer of primer based on polymer resins is applied - preferably acrylic, with photoinitiators - in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2. The primer is cured with mercury, gallium or iron lamps with a power of 80 - 140 W/cm, preferably 100-120 W/cm, for no more than 3 s. Next, digital print is applied to such a surface using industrial oil-based inks or UV-cured inks containing organic and/or inorganic pigments. Varnish based on polymer resins - preferably acrylic resins, with photoinitiators - is then applied to the printed surface in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2. The protective varnish layer is cured with mercury, gallium or iron lamps with a power of 80 -140 W/cm, preferably 100-120 W/cm, for no more than 3 s.

[0011] The invention is illustrated by the following embodiment. The surface of an extruded polymer wall panel was cleaned mechanically with brushes and pressured air, followed by a mixture of solvents based on butyl and ethyl acetate with a boiling temperature of 85°C. Next, electrical charges were removed from the cleaned surface using deionization strips.

[0012] Digital print was then applied using UV-cured inks containing organic and inorganic pigments. Afterwards, acrylic resin-based varnish with photoinitiators was applied - 10g/m2, alternatively 15g/m2. Then, the ink layer was UV-cured with 120W/cm mercury lamps. Exposure to the rays lasted for 3 seconds.

[0013] The product created according to the invention can be used in any room, both indoors and outdoors. It is characterized by reduced weight compared with competitive products (e.g. ceramic tiles). The panel is resistant to impacts and other mechanical damage, and improves acoustic insulation properties of a given room. Moreover, such panels are moisture and water resistant. The digital printer used in the process has a modular structure that allows an image of any size to be arranged either vertically or horizontally. The print can be applied on textured surfaces. The materials to be printed (patterns) are submitted to the printing device as digital data.

This ensures precise control of coating thickness and allows for printing high-resolution colour graphics from 320 dpi, using CMYK colour modules.

Claims

1. Method of method of surface treatment of a polymer wall or facade panel with digital print **characterized in that** the surface of an extruded wall or facade panel made of polymer material is cleaned mechanically and then with organic solvent or a mixture of organic solvents - particularly hydrocarbons, alcohols, ketones, esters with boiling temperatures in the range of 50 - 140°C, preferably 70 - 100°C, preferably based on ethyl acetate, butyl acetate, ethanol, isopropanol and/or methyl ethyl ketone - following which, after evaporation of volatile compounds from the panel surface, the panel is subject to deionization and afterwards a layer of primer based on polymer resins is applied - preferably acrylic, with photoinitiators, in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2; next, the primer is cured with mercury, gallium or iron lamps with a power of 80 - 140 W/cm, preferably 100-120 W/cm, for no more than 3 s; then, digital print is applied on the panel prepared in this manner, with the use of industrial oil-based inks or UV-cured inks containing organic and/or inorganic pigments, and protective varnish based on polymer resins is applied - preferably acrylic, with photoinitiators - in the amount of 5 - 30 g/m2, preferably 10 - 20 g/m2; finally, the protective varnish layer is cured with mercury, gallium or iron lamps with a power of 80 - 140 W/cm, preferably 100-120 W/cm, for no more than 3 s.

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EUROPEAN SEARCH REPORT

Application Number
EP 20 02 0351

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 2 700 508 A1 (AKZENTA PANEELE & PROFILE GMBH [DE]) 26 February 2014 (2014-02-26) * the whole document * * especially claim 1-13 and example 1 *	1 1	INV. B41M5/00 B41M7/00
X Y	CN 109 653 465 A (NORTHANN CHANGHZHOU CONSTRUCTION PRODUCTS LTD) 19 April 2019 (2019-04-19) * the whole document * * especially claims 1 and 2 *	1 1	
Y	US 2014/161986 A1 (DE ROSSI UMBERTO [DE] ET AL) 12 June 2014 (2014-06-12) * the whole document * * especially the examples, here especially paragraph 63, and further claims 1-8 *	1	
Y	US 2004/135828 A1 (SCHMITT STEPHEN E [US] ET AL) 15 July 2004 (2004-07-15) * the whole document * * especially claims 33-38, figure 2 and paragraphs 38 and 39 *	1	TECHNICAL FIELDS SEARCHED (IPC) B41M
Y	CN 111 361 321 A (YANGZHOU YUNHAN PLASTIC PACKAGING CO LTD) 3 July 2020 (2020-07-03) * the whole document * * especially claim 1 *	1	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 January 2021	Vogel, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 02 0351

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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