The invention relates to a method of manufacturing a tinted stone coating. The coating contains undyed crushed stone, which is obtained from natural stone by crushing and screening and the grain size of which is over 0.2 mm - 3 mm at the most. In the method, a tinting base that contains an acrylate binder, crushed stone, and water, is tinted by mixing therewith a colourant in such an amount that the coating contains 0.001-0.5% of pigment of the weight of the coating. In this way, a transparent coating can be manufactured, where the pattern of the crushed stone and the colourfulness of natural stone are visible and the colour influences the overall shade.
MANUFACTURING OF STONE COATING

Description

Technical field

The invention relates to the manufacture of construction coatings and concerns the manufacturing method of a stone coating containing natural stone.

Background art

For example, socles, façades or inner walls can be coated with coloured stone coatings that contain crushed stone. In such coatings, a pigment is generally mixed with a binder phase and the coatings are opaque, whereby the pattern or colour of the crushed stone is not visible. It has also been suggested that coatings be used, which comprise a transparent binder, whereby the rock material gives the coating a special colour. In particular, pre-dyed rock material is then used. The specification GB 2 412 377 discloses one such coating. It contains methacrylic ester-acrylic ester binder, thickener, filler, and dyed quartz sand, in particular.

General description of the invention

A method of manufacturing a tinted stone coating, a composition and its use have now been invented, according to the independent claims.

The coating that is manufactured according to the invention contains crushed stone, which is not dyed in advance and which is obtained from natural stone by crushing and screening it into a grain size of over 0.2 mm - 3 mm at the most, an acrylate binder, and water. The coating is tinted by mixing with it one or more colourants that contains one or more pigments. The colourant is used in such an amount that the amount of pigment is 0.001 - 0.5% of the weight of the coating.

According to the invention, a transparent coating can be manufactured, which is tinted with the colourant and, in this way, the pattern of the crushed stone can be made visible, whereby the colour of the crushed stone also influences the overall shade. Because of the diversity of the stone (the colour, surface pattern, and shape of the stone), the appearance of the surface thus deviates from that of an
equally-coloured, covering paint or coating, and of a coating that contains dyed crushed stone. The visual appearance of the coating according to the invention bears a resemblance to the rock material, and yet tinting into desired shades can be achieved.

The coating can be manufactured so that a tinting base is mixed from binder dispersion, crushed stone, possible additives, and water, the base being then tinted with the colourant. The colour and intensity of the tinting base can be controlled to a desired standard. The tinting can be made manually by adding colourants to the tinting base and mixing or, most suitably, by a tinting machine. The tinting bases are preferably manufactured from a few different crushed stone grades.

According to the invention, a limitless number of stone coatings of different colours can be obtained, wherein the pattern of the crushed natural stone is still visible.

**Detailed description of some embodiments of the invention**

The coating that is manufactured according to the invention contains an acrylate binder. The binder is specifically an aqueous dispersion, which the crushed stone is mixed with. The dispersion is generally prepared by an emulsion polymerization method from one or more esters of acrylic acid and/or methacrylic acid with alkanol that contains 1-8 carbons, such as methyl acrylate, ethyl acrylate, n-butyl acrylate, isobutyl acrylate, t-butyl acrylate, or lauryl acrylate, and possibly from other comonomers. As comonomers, for example, styrene, vinyl acetate, vinyl versatate, ethylene, vinyl chloride, vinyl laurate, and vinyl ester can be used.

The aqueous dispersions of polyacrylate or polymethacrylate can be manufactured, for example, according to the processes disclosed in the US patents 2,795,564 and 2,754,280. The polymer dispersions that are manufactured by the emulsion polymerization method of monomers are preferably finely dispersed. The particle size of the polymer in the dispersion may vary within about 0.01 and about 1 micrometers. The practice of the emulsion polymerization is presented in detail, for example, in D.C. Blackley's book *Emulsion Polymerization* (Wiley, 1975).
The amount of binder can be, for example, 2.5-40%, preferably 2.5-20%, most preferably 4-15% of the weight of the coating. In that case, for example the amount of dispersion that contains 50% of dry matter is 5-80%, preferably 5-40%, most preferably 8-30% of the weight of the coating.

The crushed stone used in the coating is manufactured from natural stone by crushing and screening. The crushed stone is screened into a grain size of over 0.2 mm - 3 mm at the most, preferably over 0.6 - 1.4 mm at the most. The crushed stone can contain, for example, limestone, dolomite, granite (such as grey or red granite) or gabbro (such as black gabbro). The content of crushed stone in the stone coating can be, for example, 20-95 weight-%, preferably 40-80 weight-%, most preferably 50-70 weight-%. The crushed stone is not dyed, for example, with an organic or inorganic colouring agent or with an organic or inorganic coating, such as epoxy.

The stone coating can be tinted to thousands of shades by adding colourant by a tinting machine. The pigments in the colourants can be, for example, the following pigments of a colour index, and their mixtures: PW6, PY74, PY42, PR101, PG7, PB15:3, and PBk7. Typical colourants include, for example, universal colourants that are water-thinnable and free of VOC, such as the colourants of the Tikkurila Avatint tinting system. The raw materials of the colourant comprise pigments, solvents, additives and, in some technologies, binders.

Tinting is a controlled colouring method. The accuracy and repeatability of the colour of a coating made by tinting are excellent.

The coating can be tinted in a tinting machine. This can be made in a retail outlet. In the tinting machine, the colourants are dosed into the tinting base in the proportion according to a specific tinting formula and shaken in a shaker to obtain an even shade. By using the colourants, an extremely large selection of coating of different colours can be produced by using a few tinting bases only. By means of the colourants, a wide colour scale of coatings can be managed and the need for storing can be reduced.
The amount of pigment is 0.001-0.5%, preferably 0.002-0.3% of the weight of the coating. Such small portions of pigment can provide a transparent coating, where the patterning of natural stone also becomes visible and the colour of the natural stone contributes to the overall shade. The tinting can be made in the retail outlet by the same tinting machine as the tinting of paints. No more than one tinting base from each crushed stone grade is necessarily needed. The tinting base is preferably one that contains no pigment at all.

In addition to the binder, crushed stone, and colourant, additives can also be used for the manufacture of the stone coating. These include, for example, water, rheological additives, such as thickeners, preservatives, anti-foam agents, solvents, such as film-forming solvents, dry-film biocides, and matting agents. The additives are preferably added as early as in connection with the manufacture of the tinting base. The raw materials of the colourants include pigments, solvents, additives and, in some technologies, binders. The applications of the coating include, for example, socles, mineral façades and the wall and trim surfaces of balconies outdoors and wall and ceiling surfaces and accessories, such as the outer surfaces of fireplaces, and ornaments indoors. The application methods can include, for example, spreading with a (steel) trowel, spraying, and roller application. When needed, the surface can be patterned with a brush, rubber or plasterer's comb after spreading.

Example 1

280.8 g of water and 7.5 g of hydroxyethylcellulose (Natrosol 250 HHBR) were added to 288 grams of the copolymer dispersion of acrylate and methacrylate (dry content 50 weight-%), mixed for 5 minutes. To the mixture thus obtained, 864 g of crushed grey granite stone with a size of 0.6-1.2 mm were slowly added, while mixing constantly. The mixture was transferred to a closable shakeproof container and 0.52 g of the PR101 pigment in the form of a colourant was added thereto by the COROB™ D300 tinting machine. The container was closed and shook by the COROB™ SIMPLEshake 40 device to colour the mixture evenly transparent with the pigment. The final pigment content of the stone coating was 0.28 weight-%.
CLAIMS:

1. A method of manufacturing a tinted stone coating, which contains crushed stone that is obtained from natural stone by crushing and screening, characterized in that a tinting base, which contains an acrylate binder, water, and undyed crushed stone of a grain size of over 0.2 mm - 3 mm at the most, is tinted by mixing with it one or more colourants that contain one or more pigments, in such an amount that the coating contains 0.001-0.5% of pigment of the weight of the coating.

2. A method according to claim 1, characterized in that the amount of pigment is 0.002-0.3%.

3. A method according to claim 1 or 2, characterized in that the crushed stone is screened into a grain size of over 0.6 mm - 1.4 mm at the most.

4. A method according to any of claims 1-3, characterized in that the amount of crushed stone is 20-95% of the weight of the coating.

5. A method according to any of claims 1-4, characterized in that the amount of binder is 2.5-40% of the weight of the coating.

6. A method according to any of claims 1-5, characterized in that the crushed stone contains limestone, dolomite, granite, or gabbro.

7. A method according to any of claims 1-6, characterized in that the tinting is carried out by a tinting machine.

8. A composition that contains crushed stone obtained from natural stone by crushing and screening, a binder, and water, characterized in that the composition contains an acrylate binder, that the crushed stone is undyed and its grain size is over 0.2 mm - 3 mm at the most, and that the composition can be tinted into a coating by mixing therewith one or more colourants that contain one or more pigments, in such an amount that the coating contains 0.001-0.5% of pigment of the weight of the coating.

9. The use of the composition according to claim 8 for the manufacture of a tinted stone coating.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. C09D5/02 C09D133/08 C09D133/10 C09D7/12 E04F13/14

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC.

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

C09D E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, CHEM ABS Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 5 681 639 A (MINAGAWA MITSUO [JP] ET AL) 28 October 1997 (1997-10-28) column 4, lines 62-67; examples 1,2</td>
<td>8,9</td>
</tr>
<tr>
<td>X</td>
<td>US 5 891 948 A (KANO HI ROMICHI [JP]) 6 April 1999 (1999-04-06) column 10, line 24 - column 12, line 58</td>
<td>8,9</td>
</tr>
<tr>
<td></td>
<td>Further documents are listed in the continuation of Box C.</td>
<td>-/-</td>
</tr>
</tbody>
</table>

* Special categories of cited documents:
  *A* document defining the general state of the art which is not considered to be of particular relevance
  *E* earlier document but published on or after the international filing date
  *I* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  *Z* document member of the same patent family

**Date of the actual completion of the international search**

24 August 2011

**Date of mailing of the international search report**

07/09/2011

**Name and mailing address of the ISA**

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV RIJSWIJK
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

**Authorized officer**

Schmit, Johannes

Form PCT/ISA/210 (second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 3 098 053 A (hallonquist earland G) 16 July 1963 (1963-07-16) column 4, lines 17-23; examples 1, 2, 7, 15, 16</td>
<td>1-9</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>US 5681639 A</td>
<td>28-10-1997</td>
<td>CA 2158088 AI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AU 5201096 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2832424 B2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 9003368 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TW 440601 B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2005063899 Al</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 4432907 B2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 20060105876 A</td>
</tr>
<tr>
<td>JP 2003231862 A</td>
<td>19-08-2003</td>
<td>NONE</td>
</tr>
<tr>
<td>US 3098053 A</td>
<td>16-07-1963</td>
<td>NONE</td>
</tr>
</tbody>
</table>