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(54) **METHOD FOR COATING AND DECORATING SURFACES IN GENERAL**

VERFAHREN ZUM BESCHICHTEN UND DEKORIEREN VON OBERFLÄCHEN IM ALLGEMEINEN
PROCEDE POUR ENDUIRE ET DECORER DES SURFACES EN GENERAL

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(72) Inventor: **FLAMINIO, Mariaromano
I-73020 Cavallino (IT)**

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(74) Representative: **Piovesana, Paolo et al
Corso del Popolo, 70
30172 Venezia-Mestre (IT)**

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(73) Proprietor: **MIDA S.R.L.
73100 Lecce (IT)**

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Description

[0001] This invention relates to a method for coating surfaces in general and decorating them with powders of various colours.

[0002] The surfaces of natural materials, such as wood and marble, have an outer appearance which is very pleasing to the view. These natural materials have however numerous drawbacks such as high cost, an increasingly more limited availability due to environmental problems and often poor resistance to atmospheric agents.

[0003] In addition marble has the added drawbacks of considerable weight, as it can be formed only into slabs of a certain minimum thickness, and with only flat surfaces, unless further costly surface machining is undertaken.

[0004] To combine the aesthetic merits of these natural materials with low cost and a large variety of shapes and dimensions, it has already been proposed to decorate metal, plastic, ceramic and other surfaces to imitate these natural materials.

[0005] A known method of decoration is photofilming, in which a powder or liquid coating forming the background colour is applied to the surface to be decorated, followed by the application thereon of a film reproducing the required decoration. This method has various drawbacks, including:

- high cost due both to the intrinsic cost of the materials and the cost of adapting a traditional coating plant,
- an unsatisfactory result from the aesthetic viewpoint due to the excessive uniformity of the decoration,
- limited resistance to atmospheric agents.

[0006] Another known decoration method is to apply a PVC covering to the surface concerned, and in particular to form by traditional methods a PVC film reproducing the desired decorations, in imitation of wood or marble, and to glue this film to the surface to be decorated.

[0007] This method has also proved unsatisfactory in that it also has numerous drawbacks, including:

- an aesthetic result which is not natural,
- a high final cost of the product obtained,
- limited resistance to atmospheric agents.

[0008] FR-A- 2 340 140 discloses a method of coating a surface comprising:

- applying a first coating powder
- partially melting the powder and maintaining the temperature lower than the temperature at which a second powder melts completely
- applying a second powder
- melting the whole of applied powder.

[0009] GB-A-1558464 relates to a painting process that uses two or more layers, wherein at least the first layer is made of a curable material.

[0010] All these drawbacks are overcome by a method for coating and decorating with powders of various colours surfaces in general as described in claim 1.

[0011] A preferred embodiment of the present invention is described in greater detail hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a surface to be subjected to the treatment according to the invention;

Figure 2 shows it after the initial heating stage; and Figure 3 shows it after final baking.

[0012] The method of the invention is applicable to any metal, ceramic, plastic, wood or glass surface to be decorated, in such a manner as to assume the typical appearance of a natural surface, such as wood or marble.

[0013] The surface 2 is firstly subjected to specific treatment depending on the nature of the surface to be decorated, but which in itself does not form part of the invention.

[0014] To the surface 2 treated in this manner there is then electrostatically applied a layer of powdered coating material 4, in particular of polyester, epoxy or epoxy-polyester resins, of colour corresponding to the desired background colour for the decoration to be obtained. Polyesterhydroxyalkylamide resins, polyurethane resins, acrylic resins, epoxyacrylic resins, acryloxyurethane resins or acryloxyester resins can also be applied. After the powdered coating material 4 has been applied to the surface, it is heated to a temperature less than the baking temperature of said coating, but sufficient to cause it to fix to the surface to be decorated. Indicatively the heating temperature is about 75-90°C and can be achieved by providing, in a traditional powder coating line, pairs of catalytic heating panels, heating lamps, ultraviolet lamps, etc., between which the surface to be decorated is passed.

[0015] In the case of particular decorations for which one application stage and one heating stage for the coating layer are found to be insufficient, these two stages can be repeated.

[0016] After the heating stage, the purpose of which is to fix a layer of powdered coating material 4 to the surface to be decorated, a second powdered coating material 6 of colour corresponding to the coloured motif to be reproduced is applied to the surface prepared in this manner.

[0017] This second powdered coating material also preferably consists of the aforesaid resins.

[0018] The second powdered coating material 6 can be applied either as a suspension of the powder 6 in a slow-drying liquid vehicle, or can be applied in the dry state. In the first case a liquid of slow evaporation or a

slow-drying acrylic liquid is preferably used, the powdered coating material 6 being mixed into this liquid to form a suspension. The suspension is then spread over the surface to be decorated with automatic or manual applicators which arrange the powdered coating material 6 in the required decorative pattern. In particular in reproducing the pattern of wood grains, because of the slow drying of the acrylic liquid, the decoration can also be modified by direct intervention of the operator, who can even produce the characteristic form of wood knots.

[0019] To solve special problems, intermediate treatments other than the application of powders and their heating can be provided.

[0020] If the powdered coating material 6 is applied dry, its application can be by various methods.

[0021] A first method consists of applying to the surface to be decorated a uniform layer of powder 6 and then removing the excessive portion so as to form the desired graining. This removal can be achieved either by suction or by a process of coordinated wiping by mechanically or manually operated tools, such as brushes, blades, pads, sponges etc.

[0022] In particular, a tool can consist of an automatic applicator formed from a pair of cylindrical rotary pads with the surface worked according to the motif to be reproduced or rotary brushes sprayed with liquids and used for partially removing the excess quantity of powder, previously applied to the piece to be treated, to leave on its surface the particular decoration to be obtained.

[0023] A different method of applying the powder 6 is to use a sort of silkscreen stencil reproducing the required decorative pattern.

[0024] On termination of this stage, the entire assembly is baked, indicatively at 180°C for 20 minutes.

[0025] The result of this treatment is a surface having an outer appearance totally similar to the surfaces of natural materials, but with decidedly better characteristics than those obtainable by traditional methods.

[0026] Coating tearing tests, chequering tests and acetic salt-spray tests were carried out on samples of surfaces obtained in this manner and gave positive results. In particular, these latter tests exceeded more than 1000 hours without any formation of bubbles or blisters.

[0027] From the foregoing it is apparent that the method of the invention has numerous advantages, and in particular:

- it enables existing coating plants to be used, with only simple modifications,
- it achieves an aesthetically satisfying result to the extent of not revealing the artificial nature of the support,
- it presents optimum resistance to atmospheric agents,
- it is of low cost because of the use of low-cost materials,

- it enables surfaces of any geometry and area to be decorated,
- it enables the surfaces of small-thickness and hence low-weight supports to be decorated.

[0028] The method of the invention can be used for forming a large number of products, including:

- metal section bars for window frames with a wooden or marble outer appearance,
- metal plates for household electrical appliances with a wooden or marble outer appearance,
- chipboard or MDF panels for kitchens with a wooden or marble outer appearance,
- metal urban furniture elements with a wooden or marble outer appearance,
- metal sheets and section bars for use in the automobile, naval and aeronautical sectors.

[0029] It should be noted that in addition to the wooden or marble outer appearance, other appearances are possible comprising multiple coloration.

Claims

1. A method for coating a metal stiff surface comprising:

- electrostatically applying a layer of a first coloured powdered material to the surface to create a background on the whole surface;
- heating said coated surface in a first heating step to a temperature of about 90°C for about 20 minutes that is below the polymerization temperature of this powder thus to fix the first powder to said surface;
- applying a second coloured powder to said coated surface in a pattern, said second coloured powder having a different colour than said first coloured powder; and
- heating said twice coated surface by second heating step to a temperature of 180° C for about 20 minutes to fix the second powder to said surface coated with said first powder and to obtain the complete polymerization of said first and second powders.

2. A method as claimed in claim 1 **characterised in that** before applying the second coloured powder, a further layer of first coloured powdered material is applied and the surface treated in this manner is heated, said two stages being able to be repeated several times.

3. A method as claimed in claim 1, **characterised by** passing the surface to be decorated, covered with the first layer of coloured powdered material, in front

of a heat source provided in a powder coating line.

4. A method as claimed in claim 3, **characterised by** passing the surface to be decorated in front of an ultraviolet source. 5
5. A method as claimed in claim 3, **characterised by** passing the surface to be decorated in front of heating panels. 10
6. A method as claimed in claim 3, **characterised by** passing the surface to be decorated in front of heat lamps.
7. A method as claimed in claim 1 **characterised in that** said second coloured powder is applied as a suspension in a drying liquid. 15
8. A method as claimed in claim 7, **characterised in that** the drying liquid is an acrylic compound. 20
9. A method as claimed in claim 1, **characterised in that** the second coloured powder is applied in the form of a uniform dry powder. 25
10. A method as claimed in claim 9 **characterised by** removing a part of this uniform dry powder, so that the remaining part forms the required decoration.
11. A method as claimed in claim 10, **characterised by** removing, by suction, part of the powder previously deposited on the surface to be decorated. 30
12. A method as claimed in claim 10, **characterised by** removing, by wiping, part of the powder previously deposited on the surface to be decorated. 35
13. A method as claimed in claim 10, **characterised in that** the wiping is effected under moist conditions. 40
14. A method as claimed in claim 10, **characterised in that** the removal of the powder by wiping is effected with a manually operated tool.
15. A method as claimed in claim 10, **characterised in that** the removal of the powder by wiping is effected with a mechanically operated tool. 45
16. A method as claimed in claim 10, **characterised by** applying the powdered coating material using a silk-screen stencil reproducing the pattern of the desired decorations. 50
17. A method as claimed in claim 1, **characterised by** using powdered coating materials in the form of polyester resins, epoxy resins, epoxy polyester resins, polyester-hydroxyalkylamide resins. 55

Patentansprüche

1. Verfahren zum Beschichten einer steifen metallischen Oberfläche, umfassend:
 - Elektrostatisches Aufbringen einer Schicht eines ersten farbigen pulverförmigen Materials auf die Oberfläche, um einen Hintergrund auf der gesamten Oberfläche zu bilden;
 - Erwärmen der besagten Oberfläche in einem ersten Erwärmungsschritt auf eine Temperatur von etwa 90° Celsius, etwa 20 Minuten, welche unter der Polymerisationstemperatur des Pulvers liegt, um das erste Pulver an der besagten Oberfläche zu fixieren;
 - Aufbringen eines zweiten farbigen Pulvers auf die besagte beschichtete Oberfläche in einem Muster, wobei das besagte zweite farbige Pulver eine andere Farbe aufweist als das besagte erste farbige Pulver; und
 - Erwärmen der besagten zweifach beschichteten Oberfläche mit einem zweiten Erwärmungsschritt auf eine Temperatur von 180° Celsius etwa 20 Minuten, um das zweite Pulver an der besagten Oberfläche, die mit dem besagten ersten Pulver beschichtet ist, zu fixieren und eine vollständige Polymerisation der besagten ersten und zweiten Pulver zu erreichen.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** vor dem Aufbringen des zweiten farbigen Pulvers eine weitere Schicht des ersten farbigen pulverförmigen Materials aufgebracht wird und die so behandelte Oberfläche erwärmt wird, wobei die beiden Stufen mehrmals wiederholt werden können.
3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die zu dekorierende Oberfläche, die mit der ersten Schicht des farbigen pulverförmigen Materials beschichtet ist, an einer Wärmequelle, die in einer Pulverbeschichtungslinie vorgesehen ist, vorbeigeführt wird.
4. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** die zu dekorierende Oberfläche an einer Ultraviolettquelle vorbeigeführt wird.
5. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** die zu dekorierende Oberfläche an Heizpanelen vorbeigeführt wird.
6. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** die zu dekorierende Oberfläche an Heizlampen vorbeigeführt wird.
7. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das besagte zweite farbige Pulver

- als Suspension in einer trocknenden Flüssigkeit aufgebracht werden.
8. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, dass** die trocknende Flüssigkeit eine Acrylverbindung ist. 5
9. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das zweite farbige Pulver in Form eines gleichmäßigen trockenen Pulvers aufgebracht wird. 10
10. Verfahren nach Anspruch 9, **dadurch gekennzeichnet, dass** ein Teil dieses gleichmäßigen trockenen Pulvers entfernt wird, um aus dem verbleibenden Teil die gewünschte Dekoration zu bilden. 15
11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** durch Absaugen ein Teil des vorher an der zu dekorierenden Oberfläche abgelagerten Pulvers entfernt wird. 20
12. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** durch Wischen ein Teil des vorher auf der zu dekorierenden Oberfläche abgelagerten Pulvers entfernt wird. 25
13. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** das Abwischen unter feuchten Bedingungen durchgeführt wird. 30
14. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** das Entfernen des Pulvers durch Abwischen mit einem manuell betriebenen Werkzeug durchgeführt wird. 35
15. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** das Entfernen des Pulvers durch Abwischen mit einem mechanisch betriebenen Werkzeug durchgeführt wird. 40
16. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** zum Aufbringen des pulverförmigen Beschichtungsmaterials eine Siebdruckschablone zur Reproduktion des Musters der gewünschten Dekorationen verwendet wird. 45
17. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** pulverförmige Beschichtungsmaterialien in Form von Polyesterharzen, Epoxydharzen, Epoxypolyesterharzen und Polyester-Hydroxyalkylamid-Harzen verwendet werden. 50
- Revendications** 55
1. Procédé pour revêtir la surface rigide d'un métal comprenant :
- l'application d'une couche d'une première matière pulvérulente colorée sur la surface pour créer un fond sur toute la surface ;
 - le chauffage de ladite surface revêtue dans une première étape de chauffage jusqu'à une température de l'ordre de 90°C pendant environ 20 minutes qui est inférieure à la température de polymérisation de cette poudre afin de fixer la première poudre à ladite surface ;
 - l'application d'une seconde poudre colorée à ladite surface revêtue selon un modèle, ladite seconde poudre colorée ayant une couleur différente de celle de la première poudre colorée ; et
 - le chauffage de ladite surface deux fois revêtue par une seconde étape de chauffage jusqu'à une température de 180°C pendant environ 20 minutes pour fixer la seconde poudre à ladite surface revêtue par ladite première poudre et pour obtenir la polymérisation complète desdites première et secondes poudres.
2. Un procédé tel que revendiqué dans la revendication 1, **caractérisé en ce qu'**avant d'appliquer la seconde poudre colorée, une couche supplémentaire de la première matière pulvérulente colorée est appliquée et la surface traitée de cette façon est chauffée, lesdites deux étapes étant susceptibles d'être répétées plusieurs fois.
3. Un procédé tel que revendiqué dans la revendication 1, **caractérisé par** le passage de la surface destinée à être décorée, recouverte avec la première couche de matière pulvérulente colorée, devant une source de chaleur pourvue d'une ligne de revêtement de poudre.
4. Un procédé tel que revendiqué dans la revendication 1, **caractérisé par** le passage de la surface à décorer devant une source d'ultra-violet.
5. Un procédé tel que revendiqué dans la revendication 3, **caractérisé par** le passage de la surface à décorer devant des panneaux chauffants.
6. Un procédé tel que revendiqué dans la revendication 3, **caractérisé par** le passage de la surface à décorer devant des lampes chauffantes.
7. Un procédé tel que revendiqué dans la revendication 1, **caractérisé en ce que** ladite seconde poudre colorée est appliquée sous la forme d'une suspension dans un liquide pouvant être évaporé.
8. Un procédé tel que revendiqué dans la revendication 7, **caractérisé en ce que** le liquide pouvant être évaporé est un composé acrylique.

9. Un procédé tel que revendiqué dans la revendication 1, **caractérisé en ce que** la seconde poudre colorée est appliquée sous la forme d'une poudre uniforme sèche. 5
10. Un procédé tel que revendiqué dans la revendication 9, **caractérisé par** l'enlèvement d'une partie de cette poudre uniforme sèche, de telle sorte que la partie restante forme la décoration requise. 10
11. Un procédé tel que revendiqué dans la revendication 10, **caractérisé par** l'enlèvement, par succion, d'une partie de la poudre préalablement déposée sur la surface à décorer. 15
12. Un procédé tel que revendiqué dans la revendication 10, **caractérisé par** l'enlèvement par essuyage d'une partie de la poudre préalablement déposée sur la surface à décorer. 20
13. Un procédé tel que revendiqué dans la revendication 10, **caractérisé en ce que** l'essuyage est effectué dans des conditions humides. 25
14. Un procédé tel que revendiqué dans la revendication 10, **caractérisé en ce que** l'enlèvement de la poudre par essuyage est effectué au moyen d'un outil mis en oeuvre manuellement. 30
15. Un procédé tel que revendiqué dans la revendication 10, **caractérisé en ce que** l'enlèvement de la poudre par essuyage est effectué au moyen d'un outil mis en oeuvre mécaniquement. 35
16. Un procédé tel que revendiqué dans la revendication 10, **caractérisé par** l'application de la matière de revêtement pulvérulente par l'utilisation d'un écran sérigraphique reproduisant le modèle des décorations désirées. 40
17. Un procédé tel que revendiqué dans la revendication 1, **caractérisé par** l'utilisation de matières pulvérulentes de revêtement sous la forme de résines polyester, résines époxy, résines époxypolyester, résines polyester-hydroxyalkylamide. 45

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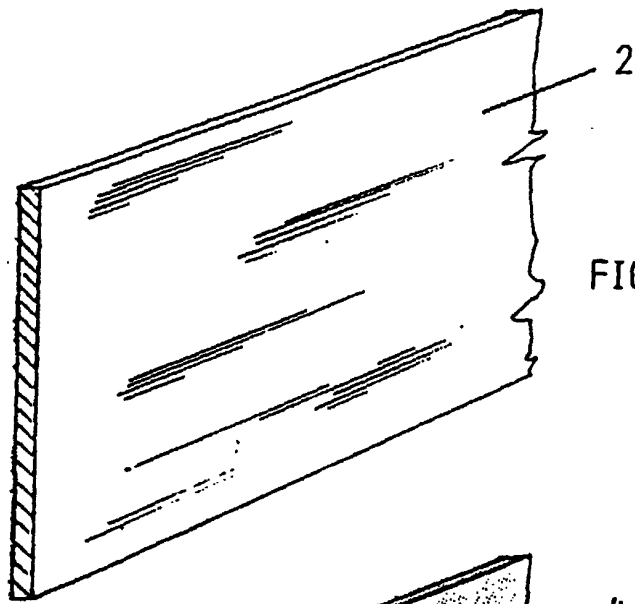


FIG. 1

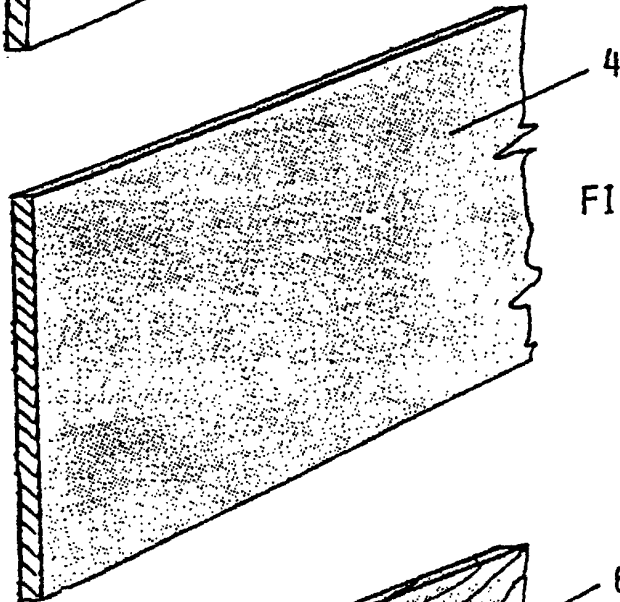


FIG. 2

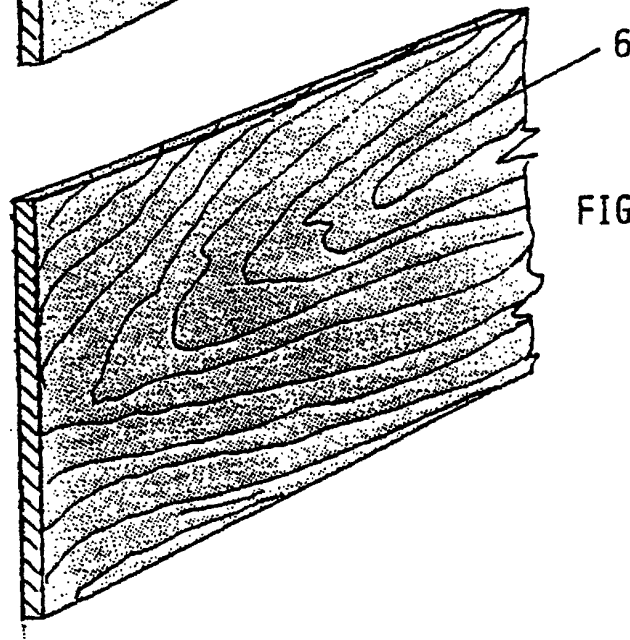


FIG. 3