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(54) **METHOD OF DECORATING METAL PARTS THROUGH THE APPLICATION OF A POWDER PAINT**

(57) The present invention comprises a procedure for the decoration of metallic pieces in general, and in a preferred manner of aluminium profiles to which it is sought to apply a decorative coat imitating a natural finish such as marble, wood, etc. It is the object of the present invention to provide a procedure for decoration in which the decorative motif can be reproduced with great precision and therefore offer a finish of very high

quality, and at the same time permit the pieces to be treated to be manipulated during the decoration stage without this affecting the final quality of the decorative effect. The present invention has its application in the field of decorating metallic pieces, and in particular in the decoration of aluminium or iron profiles by means of the application of powder paints.

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Description

OBJECT OF THE INVENTION

[0001] The present invention comprises a procedure for the decoration of metallic pieces in general, and preferably of aluminium or iron profiles to which it is desired to apply a decorative coat imitating a natural finish such as marble, wood, etc.

[0002] The object of the present invention is to provide a procedure for decoration in which the decorative motif can be reproduced with great precision offering therefore a very high quality finish, and at the same time permitting that the pieces to be treated can be manipulated during the decoration stage without this affecting the final quality of the decorative effect.

[0003] The present invention is of application in the field of decorating metallic pieces, and in particular in the decoration of aluminium or iron profiles by means of the application of powder paints.

BACKGROUND OF THE INVENTION

[0004] The use of aluminium profiles for the production of windows, doors and other enclosures, has to a great extent replaced the employment of wood due to their lower cost and to their structural and manufacturing advantages.

[0005] There have been multiple attempts to achieve a decorative finish of aluminium as similar as possible to wood, however none of these attempts has produced a satisfactory result.

[0006] One of these first attempts is that described in the Japanese patent JP-4318195 which presents an electrolytic procedure for the decoration of aluminium, by means of which the final finish obtained is very resistant to weather conditions, however the quality of the decorative effect is very far from being acceptable.

[0007] Other known systems are based on the employment of the technique known as "sublimation" widely employed in the textile industry, which has allowed the quality of the decorative appearance to be perfected considerably, but the resistance of their colours to light and their high cost have resulted in a limitation of their application.

[0008] Other known techniques of decoration are those described in the European patents EP-0.843.598 and EP-0.656.231, based on the application of paint on paint, wherein the problems of cost and of resistance to light have been resolved, but they have not achieved a decorative appearance with sufficient precision to reproduce satisfactorily the appearance of wood.

[0009] Another example of this type of procedure is that disclosed in the European patent EP-0.818.248 based on the application of screen printing with powder paint, but which has not resolved the design accuracy either because the grain size of the second coat of powder paint, is very similar or identical to that of the first

base coat of powder paint.

[0010] The procedure described in the European patent EP-0.818.248, comprises the following stages:

5 application of a first powder paint electrostatically charged for the adherence thereof to the metallic surface to be treated,

10 subjecting this profile to a first temperature of between 170° C and 200° C during an appropriate time in order to start the process of polymerisation of said paint with the object of fusing it and extending it homogeneously on the surface of said profile,

15 cooling this profile to halt the polymerisation process,

20 applying by screen printing a second powder paint of the same type of resin but with a hue or colour different to that of the first paint,

taking said profile to a final temperature for a certain time to obtain the complete polymerisation of this first and second coat of paint.

25 [0011] Conventionally the commercial paints applied in these procedures for protecting and decorating aluminium destined for the manufacture of doors and enclosures in general, are paints of polyester powder with a distribution in the size of particles of the powder that depends on each manufacturer, but which conventionally lies between 40 and 150 microns.

30 [0012] The experts in these techniques are aware that the size of the powder particles has a direct influence on the electrostatic deposition of the paint. During the decoration process it is necessary to manipulate the metallic piece, for example in a change of position of the piece to apply paint to another of its faces, whereby during said manipulation the particles of very small grain size suffer displacements which deform the decorative motif and impair the quality of the final result.

DESCRIPTION OF THE INVENTION

45 [0013] The procedure for decoration disclosed in the present invention, resolves satisfactorily the shortcomings of the procedures known at the present time, since it allows the decoration of metallic pieces with an extremely high degree of accuracy in the reproduction of decorative designs, and therefore it provides a finish of a quality much superior to the procedures for decoration known in the state of the art.

50 [0014] The procedure object of the invention starts from a first conventional stage, wherein a first polyester-based powder paint is deposited electrostatically on a metallic piece to be decorated, such as for example an aluminium or iron piece. Likewise in a conventional manner, this first powder paint is subjected to a heat

treatment.

[0015] The innovation of the invention resides in the application by means of screen printing of a second powder paint with a particle size less than 40 microns, in contrast to habitual practice in these techniques, and all this with the object of achieving a very high definition in the reproduction of the decorative motif through the use of a very fine powder. In this way it is possible to reproduce details, like for example the grain of wood, with a precision that would not be possible with the procedures known at the present time.

[0016] Subsequently this second powder paint with a selected grain size, is subjected to a heat treatment in localised areas to fix it on the first paint. The heat treatment consists of the application of radiation, preferably an infrared radiation, with the object of heating the second paint until the same reaches a gelled state which produces its adherence on the first coat of base paint, and which in this way allows the manipulation of the metallic piece to be decorated without the risk of the particles of the second paint moving and deforming the decorative design.

[0017] Finally the metallic piece with the first base paint and the second paint, is subjected to a final and joint heat treatment whereby the first and the second coat of paint are polymerised together, the final decoration of the product being obtained.

[0018] The procedure object of the invention achieves in this way levels of definition in the reproduction of a decorative motif much superior to those obtained by means of conventional decoration techniques.

DESCRIPTION OF THE DRAWINGS

[0019] To complete the description that is being made and with the object of assisting in a better understanding of the characteristics of the invention, in accordance with a preferred example of practical embodiment thereof, attached as an integral part of said description, is a set of drawings wherein by way of illustration and not restrictively, the following has been represented:

Figure 1 shows schematically the elliptic reflector employed preferably in the heat treatment of the second paint participant in the procedure.

PREFERRED EMBODIMENT OF THE INVENTION

[0020] According to that explained above, the procedure for decoration object of the present invention comprises the following stages:

1. - Application of a first base paint of powdered polyester which is deposited electrostatically on the aluminium or iron piece which it is desired to decorate.

2. - Heat treatment of said first base paint by con-

ventional means during a period of time lasting between 4 and 6 minutes at a temperature of 130° C.

3. - Application by means of screen printing of a second powder paint on said first base paint, forming a distribution of this second paint in accordance with the decorative motif it is desired to obtain, like for example wood, marble or any other design. With the object of obtaining a high degree of accuracy in the reproduction of the decorative design, the application of this second paint is carried out by means of a screen printing mesh of 40 microns mesh pitch, and the particles of this second powder paint are selected with a size less than 40 microns, since particles of greater size would not pass through the mesh and would block the pores thereof, losing definition therefore in the reproduction of the decorative motif. In a preferred embodiment of the invention the grain size of the particles of this second paint is of between 5 and 30 microns.

4. - Thereafter a heat treatment is carried out localised in the areas (A) where said second paint has been deposited, with the object that the same acquires a gelled state which allows its adherence on the first base paint. This heat treatment consists of the application of an infrared radiation with a short wavelength having its maximum energy located between 1000 and 1200 nm, being focussed and directed by an elliptic reflector (2), with which, according to the arrangement shown in figure 1, the maximum concentration of radiation is obtained at a distance (C) lying at between 10 and 30 mm from the surface of the metal (1). In a preferred embodiment this distance is of between 15 and 17 mm.

The short wavelength is obtained by means of a quartz lamp working at 2400° C, and the time of application of maximum radiation is of between 1 and 10 seconds, preferably between 2 and 4 seconds. With these working parameters it is achieved that the time necessary to complete this heat treatment by application of infrared radiation, is very short, and therefore does not influence the total time in which the decoration of a metallic piece is completed.

The object of applying the infrared radiation in a localised form in the areas where the second paint has been applied, is in order not to affect the first base paint, so that the state is not altered which this base paint has reached during its heat treatment described in point 2.

This second paint can have a different hue or colour to that of the first base paint, with the object of obtaining the desired decorative design.

At this point, the metallic piece to be treated can be manipulated, for example its position can be changed in order to apply paint on another of its faces, without risk that the particles of the second paint

applied by screen printing move from the precise point in which they have been deposited by means of the screen printing mesh.

The working parameters described for this stage of the procedure, were selected to attain, in a certain time, a particular gelled state of the second paint, which without delaying excessively the time necessary to complete the heat treatment, allow that the gelled state reached is sufficient to impede the displacement of the particles of the second paint.

5. - Finally after the application of the first and the second coat of paint with their respective heat treatments, that is, the lacquering of the first base paint and the adherence of the second paint, the whole undergoes a final heat treatment for polymerising jointly the two coats of paint. This final treatment is carried out at a temperature of between 160° C and 220° C (temperature of the metal) during a period of 8 to 20 minutes.

Claims

1. Procedure for decoration of metallic pieces by means of the application of powder paint, intended to achieve a high degree of definition in the reproduction of the decorative design, in which the following stages intervene: application of a first powder paint by means of electrostatic deposition on the metallic surface to be decorated, heat treatment of said first paint, application in selected areas of the first paint by means of a screen printing mesh of a second powder paint to obtain a decorative design, and a final heat treatment of said first and second paint to achieve the joint polymerisation of both paints, **characterised in that** the size of the particles which constitute the second powder paint is less than 40 microns, and **in that** said second paint after its application by means of the screen printing mesh, is subjected to a heat treatment by means of the application of infrared radiation in localised areas, with the object of bringing this second powder paint to a gelled state which results in its adherence on the first paint, with the object of facilitating the manipulation of the metallic piece without a displacement of the particles of the second paint taking place.
2. Procedure for decoration of metallic pieces, according to claim 1, **characterised in that** the size of the particles of the second powder paint is of between 5 and 30 microns.
3. Procedure for decoration of metallic pieces, according to claim 1, **characterised in that** the heat treatment to which the first paint is subjected initially is

carried out at a temperature of 130° C during a period of time of between 4 and 6 minutes.

4. Procedure for decoration of metallic pieces, according to claims 1 and 2, **characterised in that** the screen printing mesh only allows the passage of powder particles of less than 40 microns.
5. Procedure for decoration of metallic pieces, according to claim 1, **characterised in that** the infrared radiation is of a short wavelength with its maximum energy at between 1000 and 1200 nm.
6. Procedure for decoration of metallic pieces, according to claims 1 and 5, **characterised in that** the infrared radiation is focussed by means of an elliptic reflector, located in such a way that the maximum concentration of radiation is obtained at a distance of between 10 and 30 mm from the surface of the metal piece.
7. Procedure for decoration of metallic pieces, according to claim 6, **characterised in that** the distance at which the maximum radiation is obtained is at between 15 and 17 mm.
8. Procedure for decoration of metallic pieces, according to claims 1, 5, 6 or 7, **characterised in that** the time of application of the infrared radiation is of between 1 and 10 seconds, preferably between 2 and 4 seconds.
9. Procedure for decoration of metallic pieces, according to claim 1, **characterised in that** the final and joint heat treatment of the first and the second paint is carried out at a temperature of between 160° and 220° C of metal temperature and during a time of between 8 and 20 minutes.

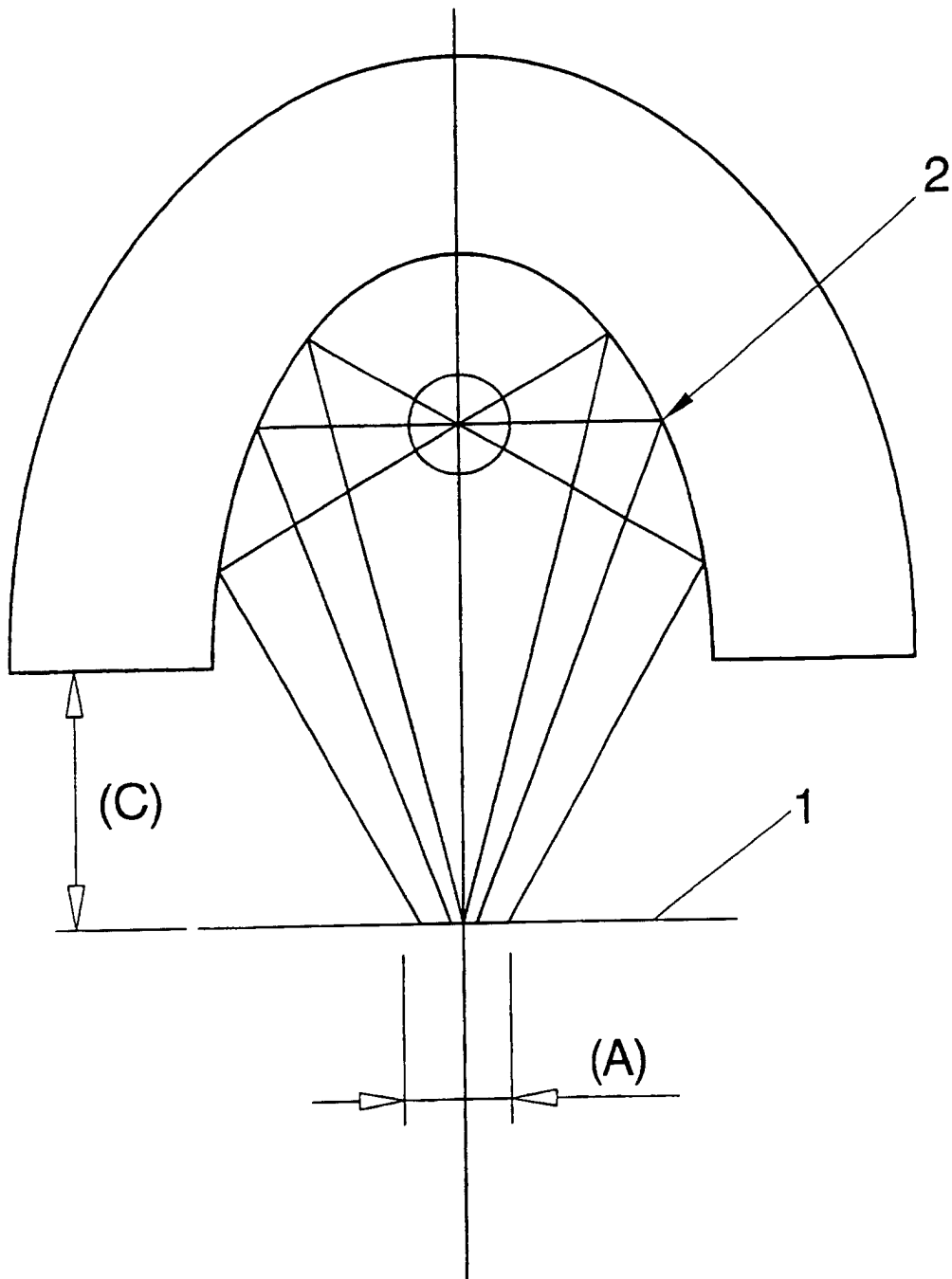


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7 B05D3/02; 3/06; 5/00; B44F9/02; 9/04		
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)		
IPC 7 B05D; B44F		
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 practicable, search terms used)		
WPI, EPODOC		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 6287487 A (KIKUSUI KAGAKU KOGYO KK) 11.10.1994; Abstract	1,5-8
A	EP 0818248 A (VERGANI, ESTERINA) 14.01.1998; The all document	1-2, 4-5
A	WO 9705965 A (MIDA S.R.L.) 20.02.1997; The all document	1-9
A	FR 2685351 A (SAUVEGRAIN, CHRISTIAN) 25.06.1993; The all document	1
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* 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 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" 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 taken alone "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 "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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