

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 897 759 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.02.1999 Bulletin 1999/08

(51) Int. Cl.⁶: **B05D 5/06, C23C 18/44**

(21) Application number: **98114713.5**

(22) Date of filing: **05.08.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **20.08.1997 CH 1945/97**

(71) Applicant:
**Tradition Establishment
9493 Mauren (LI)**

(72) Inventor: **Biginelli, Pier Carlo
10127 Turin (IT)**

(74) Representative: **Pozzi, Andrea
Via Pioda 12,
P.O. Box 3205
6901 Lugano (CH)**

(54) **Process for imparing a metal appearance to articles**

(57) Process for metal coating articles through the silver reduction reaction known as Tollens test, comprising the steps of:

- a) applying, preferably spraying, over said article a layer of a preparative paint;
- b) applying, preferably spraying, a gripping primer resin layer;
- c) drying said primer layer;
- d) forming a metal mirror over the article surface through the silver reduction reaction known as Tollens test;
- e) washing with water the surface of the so treated article;
- f) applying over the article surface a first transparent resin layer to form a first protection layer;
- g) drying said first protection resin layer;
- h) applying a second transparent resin layer to form a second film or layer as a protection against chemical agents;

Alternatively there is provided a step (f) of applying a single transparent protection layer by using a two-components acrylic-urethane resin.

EP 0 897 759 A2

Description

[0001] The present invention concerns a process for metal painting or spraying of articles.

[0002] In several fields there are increasingly required articles made of materials that are inexpensive, light-weight and easy to be worked, such as wood, plastic materials, foamed resins, plaster and so on, that are to be superficially finished so as to impart them a satisfactory metal appearance (metalized).

[0003] For example many stage components or furnishings of shows and exhibitions, as well as many car prototypes and industrial articles can advantageously be made of plastics or wood due their low cost, light weight and easiness of transport features - which features are quite relevant for use in stage settings - or due to their better workability in comparison to metals, which is quite convenient in making industrial patterns. It is of particular interest to make such patterns of foamed plastic (or plastic foam) because of their light weight, their easy availability and the low cost of such materials.

[0004] Moreover in many industrial manufacturings it is increasingly frequent the request of metal articles having their surfaces mirror-polished, such as for example in the motorcar industry: wheel rims, moldings, accessories, etc., that are to show both particular aesthetic features and a long-range strong resistance to chemical agents.

[0005] The above desired features are commonly imparted to the articles through metal paintings or coatings.

[0006] However it is well-known that when using conventional paints including pigments difficulties are encountered and the results are rather poor, mainly when the aim is to achieve highly polished surfaces capable of reflecting like a mirror.

[0007] When painting small size objects, such as reduced scale models of motor cars and similar articles, in case made of plastics, a metal painting process is known that comprises forming a thin film of metal silver similar to that used in mirror manufacturing, where an ammoniacal solution of silver nitrate is reduced with a solution of formic aldehyde or another organic reducer such as glucose, to obtain a thin reflecting film of metal silver imparting to the object a desired appearance.

[0008] However this technique cannot be used to form films imparting a metalizing appearance to large size objects or to complex shape three-dimensional objects, where problems are encountered concerning the silver film adherence to the object surface, the film uniformity and the time stability resulting in a deterioration of the article appearance.

[0009] A process for metal coating articles capable to overcome the difficulties of the prior art processes is disclosed in EP-A-0 346 954.

[0010] In accordance with the teachings of EP-A-0 346 954, a process for metal coating metal, wood or plastics articles, even articles of large size and with

complex shape, in order to impart them a metallic appearance, comprises the following steps, in the specified order:

- a) applying over the article surface a primer layer of an alkyd resin, in case with one or more pigments of the desired color added;
- b) drying said alkyd resin primer layer;
- c) applying over said primer layer an acid water solution comprising from 0.05 to 2% by volume of stannous chloride;
- d) washing with water the surface of the so treated article;
- e) simultaneously spraying over the article surface a water solution comprising from 5 to 15% by volume of silver nitrate in an ammoniacal complex and a water solution from 1 to 5% by volume of a reducing sugar;
- f) washing with water the surface of the so treated article;
- g) applying over the article surface a varnish to form a protection layer;
- h) drying the varnished surface.

[0011] The primer layer is applied to obtain a surface that is more suitable to allow a strong grip of the metalizing layer to the article.

[0012] To this aim the resins used in the primer layer must be adapted to be firmly adhered to the materials forming the article and capable of covering the porous surface of the article to form a smooth and even surface over which a uniform metallic layer can be coated.

[0013] The disclosed process is not completely satisfactory since the types of alkyd resins to be directly applied over the article in step "a" are limited by the compatibility of the solvents and diluents conveying the resins with the materials over which they are applied.

[0014] A first object of the present invention is therefore to solve the problem of firmly anchoring the primer layer through a process that is devoid of the above mentioned drawbacks of the prior art.

[0015] Another drawback of the process in accordance with the process disclosed in EP-A-0 346 954 derives from the fact that the varnishes based on an organic solvent used for the final transparent protection layer, do not exhibit a sufficient adhesion to the metalized surface and therefore tend to peel off in the time, thus causing a scaling of the metalizing film.

[0016] Moreover because of the atmospheric agents said protection layer tends to yellow resulting in a deterioration of the article appearance.

[0017] Therefore the above previous process could prove to be unsuitable for coating industrial articles to be used outdoors and subjected to wear.

[0018] A second object of the present invention is to achieve a much improved adherence between the protection layer and the metalizing film by providing a transparent protection layer that is highly resistant to the

action of chemical agents to scratches and to wear.

[0019] This and other objects of the present invention are achieved through a process for metal coating articles as claimed in the attached claims.

[0020] In the following a detailed description of the invention will be given.

[0021] The process of the invention allows to obtain a metalization of articles formed of metall, wood, plastics, foamed resins, plaster, concrete, glass, etc.

[0022] The first step of the process provides for applying a layer of a preparative paint over the article surface, said paint being adapted to improve the grip of the primer resin that will be applied to the article in the next step.

[0023] Due to the wide variety of painting products available in the market, it is possible to select a paint exhibiting a better compatibility with the material of the article to be treated, so that a well adhering layer is formed over the article and this layer is better suited for gripping the primer layer to be applied next.

[0024] The step of depositing such preparative layer is followed by the application of a primer layer of a gripping alkyd resin of a type compatible with the paint employed in the previous step of preparing the article.

[0025] Such step of applying a primer layer is followed by a step in which such primer layer is dried in a drying oven for 1 hour at a temperature of 50°C or alternatively in air for a time interval comprised between 12 and 24 hours.

[0026] In the subsequent step a silver mirror is formed over the article to impart a metal appearance to this latter, through a chemical reaction used in qualitative analytical chemistry for detecting aldehydes or aldoses and known as "Tollens test".

[0027] The following operations are carried out in order that such reaction takes place over the surface of the article:

- applying over said primer layer an acid water solution of 0.05 - 2 % by volume of stannous chloride;
- washing with water the surface of the so treated article while simultaneously spraying over the article surface a water solution containing from 5 to 15% by volume of silver nitrate in an ammoniacal complex and a water solution from 1 to 5% by volume of a reducing sugar.

[0028] The so obtained metalized article is then subjected to a washing step that in turn is followed by a step in which a layer of protecting resin formed by a water soluble polyurethane resin is applied to the article surface.

[0029] Then the article is finished by being subjected to a drying step in an oven for 1 hour at a temperature of 50°C or alternatively in air for a time interval comprised between 12 and 24 hours.

[0030] When it is desired to achieve an improved resistance to chemical agents, an article that has been

metalized through the above disclosed process is subjected to a further step of forming a protection layer by applying a transparent acrylic resin that is soluble in an organic solvent.

[0031] Thanks to this further protection layer the metalized article will be more resistant to the action of chemical agents and will remain glossy for a long time without exhibiting yellowing phenomena.

[0032] Moreover since this layer of transparent acrylic resin that is soluble in an organic solvent is applied over the existing layer formed by the polyurethane resin soluble in water, it does not cause problems of peeling and yellowing as it might happen in the articles obtained through a process in accordance with EP-A-0-346 954.

[0033] After the step of applying the second protection layer the article is subjected to a drying step.

[0034] An article obtained through the process of the invention has a uniformly metalized surface that is moreover resistant to the chemical agents and does not show yellowing phenomena of the protection layer as time goes by.

[0035] According to a different embodiment of the invention, after the step of washing the metalized layer, a layer of a transparent protective resin formed by a two-components acrylic-urethane resin is then applied over the metalized article.

[0036] Such two-components acrylic-urethane resin imparts to the article a very high resistance against chemical agents.

[0037] Therefore, after the step of drying the two-components acrylic-urethane resin layer, carried out in an oven for 1 hour at a temperature of 60°C or alternatively in air for a time comprised between 16 and 24 hours, it is no longer required the application of a second layer of protective resin and the article is ready for use.

[0038] Tests carried out on articles disposed in a salty fog, showed that the surface protected by the two-components acrylic-urethane resin can resist for more than 250 hours.

[0039] The article obtained in accordance with this embodiment of the process has very good properties of resistance to the chemical agents, to scratches and wear.

Claims

1. Process for metal coating articles through the silver reduction reaction known as Tollens test, characterized in that it comprises the steps of:

- a) applying, preferably spraying, over said article a layer of a preparative paint;
- b) applying, preferably spraying, a gripping primer resin layer;
- c) drying said primer layer;
- d) forming a metal mirror over the article surface through the silver reduction reaction known as Tollens test;

- e) washing with water the surface of the so treated article;
- f) applying over the article surface a first transparent resin layer to form a first protection layer; 5
- g) drying said first protection resin layer;
- h) applying a second transparent resin layer to form a second film or layer as a protection against chemical agents;
- i) drying said second resin. 10
2. Process for metal coating articles through the silver reduction reaction known as Tollens test, characterized in that it comprises the steps di: 15
- a) applying, preferably spraying, onto said article a layer of a preparative paint;
- b) applying, preferably spraying, a gripping primer resin layer;
- c) drying said primer layer; 20
- d) forming a metal mirror over the article surface through the silver reduction reaction known as Tollens test;
- e) washing with water the surface of the so treated article; 25
- f) applying over the article surface a layer of a two-components acrylic-urethane resin to form a transparent protection layer;
- g) drying said two-components acrylic-urethane resin layer. 30
3. Process as claimed in claim 2, wherein said step (g) providing for drying said layer of two-components acrylic-urethane resin is accomplished in an oven for 1 hour at a temperature of 60°C or alternatively in air for a time interval comprised between 12 and 24 hours. 35
4. Process as claimed in claim 1, wherein said step (f) of applying a first resin over the article surface to form a protection film provides for using a polyurethane resin in a water solvent. 40
5. Process as claimed in claim 4, wherein said step (g) of drying said layer of polyurethane resin is accomplished in an oven for 1 hour at a temperature of 50°C or alternatively in air for a time interval comprised between 12 and 24 hours. 45
6. Process as claimed in claim 1, wherein said step (h) of applying a second resin over the article surface to form a second protection film provides for using a transparent acrylic resin in an organic solvent. 50
7. Process as claimed in claim 6, wherein said step (i) of drying said layer of acrylic resin is accomplished in an oven for 1 hour at a temperature of 50°C or alternatively in air for a time interval comprised 55
8. Process as claimed in claim 1 or 2, wherein said step (a) of applying a first resin layer over the article surface provides for using a paint compatible with the material of which said article is formed.
9. Process as claimed in claim 1 or 2, wherein said step (b) of applying a primer resin layer provides for using an alkyd resin compatible with the paint used in said preparative step (a).