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(54) **A process for manufacturing pliable decorative paper sheets and a paper laminate material obtained through such a process**

(57) The invention relates to a process for manufacturing pliable decorative paper sheets comprising a first step in which a paper substrate is impregnated with urea-acrylic resins, a second step in which said paper substrate is impregnated with a melamine-formaldehyde resin, and a third step in which said substrate is hot pressed.

As an alternative, the process according to the invention provides for the use of a paper substrate pre-impregnated with urea-acrylic resins during the manufacturing of said paper substrate. The so obtained decorative paper is used for covering flat or curved surfaces.

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Description

The present invention refers to a process for manufacturing pliable decorative or ornamental paper sheets suitable for covering surfaces and profiles, as well as the paper laminate material obtained through such a process.

There are presently known two processes for manufacturing pliable decorative paper sheets suitable for being applied over both flat and curved surfaces, used for covering furniture pieces.

A first process provides a first manufacturing step in which a decorative paper substrate of pure cellulose, weighing between 50 and 100 g/m², in case printed with rotogravured patterns reproducing the wood grains or other fancy designs, is impregnated with urea-acrylic resins, a second step in which melamine-polyester resins of the acid-setting type are spread over the so impregnated substrate, and a third step in which the substrate is kiln-dried.

Through this process one can obtain decorative papers with a thickness comprised between 0.08 and 0.15 mm and a weight comprised between 120 and 160 g/m², that are known as "finish foils".

A second known process provides for manufacturing a continuous thin laminate, usually named "CPL" or "thin laminate", through a first step in which a decorative paper similar to that disclosed with reference to the above process is impregnated with a properly plasticized melamine-formaldehyde resin, and a second step in which the impregnated paper is joined through hot pressing and under pressure to a sheet of vegetable fibers acting as a substrate.

Therefore the so obtained article is constituted by a layer of paper impregnated with melamine-formaldehyde resin imparting hardness and surface strength to the laminate, and by a layer of vegetable fibres that imparts pliability to the laminate and makes easier the subsequent glueing to the surface to be covered.

The so obtained laminate has a thickness comprised between 0.15 and 0.30 mm, a weight comprised between 220 and 300 g/m² and can be hot post-formed to be adjusted to the surfaces to be coated.

However the articles obtained through the above illustrated processes exhibit rather poor pliability characteristics when applied to cover surfaces having a small bending radius.

This is due to the fact that the article obtained through the first process, although rather thin, tends to crack when is bent beyond a given limit; whereas the article obtained through the second process, being formed by plural layers, has a considerable thickness and is therefore difficult to be applied to curved profiles with a small bending radius.

It is therefore a first object of the present invention to solve the technical problem of covering surfaces with small bending radius by providing a simple and inexpensive process for manufacturing decorative papers, and

without the above discussed shortcomings of the prior art decorative papers.

A further problem of both the "finish foils" articles obtained through the first known process, and of the articles of the "CPL" or "thin laminate" type obtained through the second known process derives from the thickness of such articles.

Therefore a second object of the present invention is to realize decorative paper sheets that are much thinner than those obtained through the known processes.

The above and other objects are achieved through a process as claimed in claim 1. Further advantageous characteristics of the invention are recited in the depending claims.

In accordance with the invention, the decorative paper sheets are obtained by firstly applying a layer of melamine-formaldehyde resin over a paper substrate that has been treated in advance with a urea-acrylic resin.

The so obtained supporting sheet or substrate is then finished by means of a hot pressing, in which the layer of melamine-formaldehyde resin is cross-linked.

Contrarily to what occurs in the first above disclosed known process providing the use of melamine-polyester resins and their subsequent drying in a kiln, the process of the present invention provides the application of melamine-formaldehyde resins over lightweight paper substrates and their subsequent hot pressing. This way one obtains decorative papers having a considerable pliability that are very suitable for covering surfaces and profiles having strong curvatures.

The invention will now be disclosed in details, with reference to the attached Figure showing a block diagram of the steps provided by an embodiment of the process according to the invention.

With reference to the Figure, a process for manufacturing pliable decorative paper sheets in accordance with the invention comprises a first step 1 in which it is provided a paper substrate of pure cellulose, having a weight comprised between 40 and 80 g/m², a second step 2 in which said paper substrate is impregnated (e.g. by dipping the substrate) with a urea-acrylic resin, in case modified, and a third step 3 in which said paper substrate is kiln-dried.

In an embodiment of the process according to the invention, for the step 2 in which the paper substrate is impregnated, a urea resin is used that has been obtained by condensing at a temperatures comprised between 90 and 100°C urea and formaldehyde that react while being in a molar ratio comprised between 1-1.1 and 1-2, preferably between 1-1.3 and 1-1.5; either during or after the reaction, it is added a water dispersion of acrylic thermoplastic self-crosslinking polymers in an amount of 5-50 parts by weight, preferably 10-25 parts for 100 parts of urea resin with 55% of dried product.

At the end of step 3 said substrate has reached a weight that is comprised between 60 and 100 g/m²

depending on the amount of the impregnating urea-acrylic resin.

Then the process of the invention provides a step 4 for preparing the paper substrate to be printed, and a step 5 for printing decorative or decor patterns on the paper substrate.

With reference to the step 4 preparatory to the print, the paper substrate is treated with products based on acrylic resins in order to further increase its pliability before being printed.

As shown in the Figure by a dashed line, the steps 4 and 5 could be omitted when no particular design is required on the decorative papers and the initial coloring of the paper is satisfactory.

Thereafter, at step 6, a layer of melamine-formaldehyde resin in amount between 5 and 25 g/m², preferably between 5 and 10 g/m², is applied over at least one face of the dried substrate.

In an embodiment of the process according to the invention the melamine resin applied to the paper substrate at step 6 is obtained by condensing - at a temperatures between 90 and 100°C - melamine and formaldehyde that react while being in a molar ratio comprised between 1-1.5 and 1-2, with the addition of modifiers and plasticizers, in a percentage between 1 and 10% by weight, such as triethanol-amine, glycols and paratoluol-sulphonamide, and the addition of 0.1-1% of surfactants, 0.1-1% of cross-linking agents having an acid nature, and 0.1-0.5% of release agents.

At the end of the step in which a layer of melamine-formaldehyde resin is applied, the substrate is kiln-dried, step 7, and then finished by being subjected to a cross-linking step 8 through a continuous hot pressing between a pair of steel bands at a pressure comprised between 10 and 50 kg/cm², preferably between 20 and 30 kg/cm², and at a temperature between 140 and 220 °C, preferably between 160 and 200 °C.

The decorative paper obtained through the disclosed process has a perfectly uniform surface reproducing the finish of the band, and high hardness and resistance to chemical agents.

The decorative paper obtained through the disclosed process has a thickness comprised between 0.06 and 0.10 mm and a weight comprised between 65 and 125 g/m².

As a results of tests, the article obtained through the disclosed process has an increased pliability with respect to the known articles, and can therefore be applied over surfaces and profiles that are remarkably curved.

These features allow to apply the decorative paper obtained through the process of the invention at a speed of 50-60 m/min, which is a much higher speed than that usually allowed by the currently available articles.

According to another embodiment of the invention, the process provides for the use of a paper substrate previously impregnated with urea-acrylic resin in a man-

ufacturing step at the paper mill, and the layer of melamine-formaldehyde resin is applied over such pre-preg material.

The impregnation with a urea-acrylic resin during the manufacturing of the paper substrate always allows to get a pre-impregnated sheet that is very thin and light-weight, with a weight comprised between 60 and 100 g/m².

In accordance with this embodiment of the invention, step 1 of the process according to the invention provides for arranging in advance a pre-impregnated paper substrate that is already adapted to be directly subjected to step 4 preparatory to the print, and then subjected to steps 5 to 8 as already discussed.

The article obtained through this embodiment of the process has a thickness comprised between 0.06 and 0.10 mm and a weight comprised between 65 and 125 g/m².

By starting from a substrate that has been pre-impregnated during the substrate manufacturing in the paper mill, the final article exhibits improved qualities of pliability and capability of adjusting to surfaces and profiles that are markedly curved.

The use of pre-impregnated substrates is further of advantage when the paper substrate is very light and thin. In fact the impregnation of light paper substrates, e.g. 40 g/m², is difficult and the results are not always satisfactory. On the contrary, the substrate that was pre-impregnated during its manufacture has very good impregnating properties and provides a finished article with improved characteristics of pliability.

Claims

1. A process for manufacturing pliable decorative paper sheets comprising the steps of:
 - providing a paper substrate;
 - impregnating said paper substrate with urea-acrylic resins;
 - drying said impregnated paper substrate;
 - applying to at least one face of said substrate a layer of melamine-formaldehyde resin;
 - drying said layer of melamine-formaldehyde resin;
 - cross-linking said substrate by hot pressing.
2. A process as claimed in claim 1, wherein said paper substrate has a weight comprised between 40 and 80 g/m² before being subjected to said step of impregnation with urea-acrylic resins.
3. A process for manufacturing pliable decorative paper sheets comprising the steps of:
 - providing a paper substrate pre-impregnated with urea-acrylic resins;
 - applying to at least one face of said substrate a

layer of melamine-formaldehyde resin;

- drying said layer of melamine-formaldehyde resin;
- cross-linking said substrate by hot pressing.

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4. A process as claimed in claim 2 or 3, wherein said paper substrate has a weight comprised between 60 and 100 g/m² before the application of said layer of melamine-formaldehyde resin.

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5. A process as claimed in claim 4, wherein said step of applying a layer of melamine-formaldehyde resin comprises the application of a layer of melamine-formaldehyde resin in an amount between 5 and 25 g/m², preferably between 5 and 10 g/m².

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6. A process as claimed in claim 5, in which said hot pressing step occurs in a continuous manner between two steel bands at a pressure between 10 and 50 kg/cm², preferably between 20 and 30 kg/cm² and at a temperature between 140 and 220 °C, preferably between 160 and 200 °C.

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7. A process as claimed in any of the preceding claims wherein a step for preparing the substrate to the print and a step in which ornamental patterns are printed on said paper substrate are further carried out before said step of applying said layer of melamine-formaldehyde resin.

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8. A pliable decorative paper obtained through a process as claimed in any of the preceding claims wherein said paper has a thickness comprised between 0.06 mm and 0.10 mm and a weight comprised between 65 and 125 g/m².

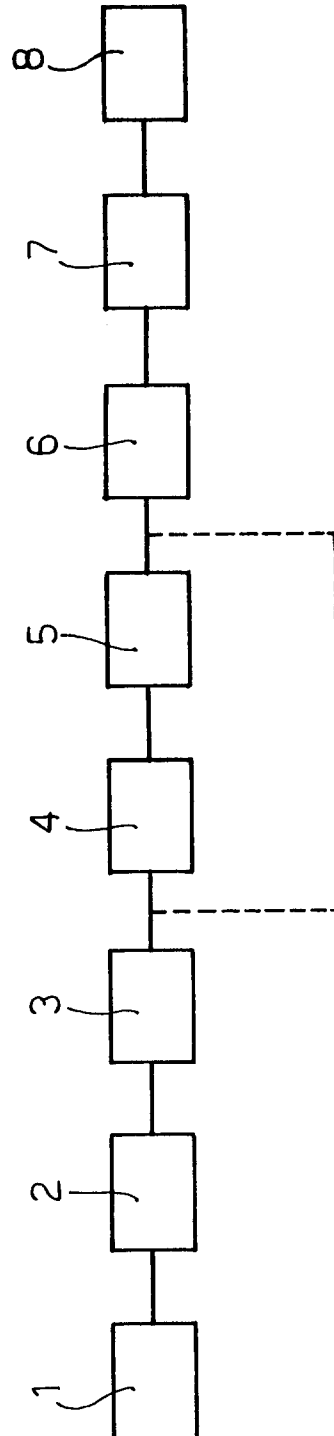
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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 3328

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DATABASE WPI Section Ch, Week 8133 Derwent Publications Ltd., London, GB; Class A14, AN 81-59261D XP002065760 & JP 56 077 114 A (NISSAN CHEM IND LTD) , 25 June 1981 * abstract *	1,3,8	D21H23/72 D21H27/18 //D21H17:51, 17:57
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) D21H
Place of search MUNICH		Date of completion of the search 25 May 1998	Examiner Naeslund, P
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