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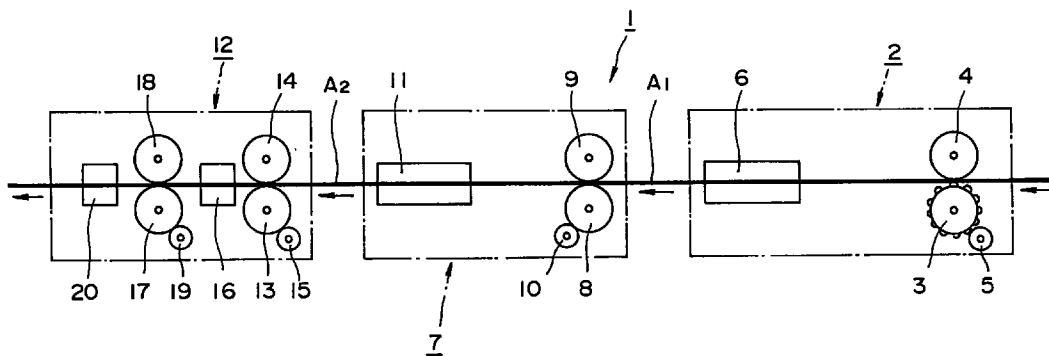
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(54) Method and apparatus for manufacturing woody plate material having appearance of wood

(57) To obtain a woody plate material having an impression of high quality material easily and at a low cost by processing a surface of a woody material, such as a veneer, plywood or a plate material obtained by lumbering, to have a grain pattern and touch which closely resemble a desired natural wood. When embossing a xylem surface pattern such as conduit pipes, and printing a grain pattern such as a cross grain, simultaneously on a surface of a plate-like woody material A1, an embossing roller 3 having a xylem surface

pattern which matches a desired grain pattern projected on its surface is used for embossing a concave xylem surface pattern on a surface of the woody material A1 and, simultaneously, the embossed portion is supplied with ink by an ink feeding device, and then, a grain pattern which matches the xylem surface pattern embossed on the surface is printed by a printing roller 8 so as to obtain a woody plate material having a desired grain pattern.



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method of manufacturing a woody plate material in which a desired grain pattern is significantly formed on a surface of various woody materials such as a veneer, a roll of sliced veneer in which ends of the veneers are finger-jointed in a direction of length, plywood such as an LVL (laminated veneer lumber) formed with laminated sliced veneer, and a plate material having a predetermined thickness obtained by lumbering wood, and an apparatus used for the manufacturing.

2. Description of Related Art

As a method for printing a grain pattern which imitates a grain of a luxury natural wood on a surface of a woody material such as a veneer, plywood or a plate material obtained by lumbering, there is known a method for manufacturing fancy plywood in which, as disclosed in Japanese Patent Application Publication Laid-Open (KOKAI) Hei 3-218801, a xylem surface pattern such as conduit pipes is embossed on a surface of a woody plate having relatively few xylem surface patterns such as conduit pipes and pith rays or no xylem surface pattern, as a concave portion by an embossing roller or the like, coloring base coating is coated and dried so as to permeate the concave portion of the xylem surface pattern, transparent sanding sealer is coated and dried, and the surface is made flat so as to have a grain pattern printed thereon.

The above-mentioned method for manufacturing a fancy plywood is advantageous in that it is possible to manufacture a luxury fancy plywood by applying the method to a veneer or a sliced veneer, for example, ramin or ayous, having a whitish surface and no grain patterns of conduit pipes.

However, as is apparent from the embodiment described in the above-mentioned Patent Application publication, according to the manufacturing method, such extremely complicated steps are required to produce a fancy plywood, as follows: adjusting the base of a surface of a woody plate on which a grain pattern is to be printed; coating and drying a transparent coating on the surface after the adjustment; forming a conduit pipe pattern which matches a desired grain pattern by embossing as a concave portion; pressing base coloring coating on the entire surface and the concave portion so as to permeate and coat, and then drying it; coating and drying a further transparent coating on the surface of the base coloring coating; performing sanding to adjust the base completely; printing the grain pattern by photogravure offset printing; and finishing by finally coating a transparent coating.

SUMMARY OF THE INVENTION

The present invention is to provide a method and apparatus for manufacturing a woody plate material according to which a desired grain pattern on a surface of various woody plates can be printed extremely simply and easily.

To accomplish the object described above, the invention of Claim 1 provides a method for fabricating a woody plate material, comprising the steps of: (when embossing a xylem surface pattern such as conduit pipes on a surface of a plate-like woody material,) embossing the xylem surface pattern on the surface of the woody material using an embossing roller having a xylem surface pattern, suitable for a grain pattern to be provided, projecting therefrom; and supplying ink to the embossed portion so that a grain pattern matching the xylem surface pattern is printed on the surface of the woody material using a transfer roller.

In addition, the invention of Claim 3 provides an apparatus for manufacturing a woody plate material, comprising: an embossing roller having a xylem surface pattern which matches a desired grain pattern, which is projected from a surface thereof; an embossing mechanism which comprises an ink supplying device for embossing a woody material using the embossing roller and for supplying ink to be the xylem surface pattern, and a pressing roller for pressing a woody material to be embossed onto the embossing roller, being paired with the embossing roller; and a printing mechanism for printing a grain pattern which matches the xylem surface pattern on a surface of the woody material which has been embossed and supplied with ink on embossed portions thereof.

In the present invention, woody materials include imported wood, such as ramin, melapi, ayous, and sandy, which are considered to be low-quality because of their unclear grain patterns, despite being natural wood, but, precious woods such as oak, ash, teak, rosewood, bubinga, which have clear grain patterns, may be also included.

These wood materials are used as a veneer having a thickness of 0.2-1.0 mm, which can be rolled by processing a sliced veneer which is formed with the veneer jointed in a direction of its fiber (vertical finger joint) or its cross direction (horizontal splice), a sliced veneer lined with paper or non woven fabric, a plywood such as LVL having a thickness of approximately 2-30 mm, and a plate material of sawn wood having a thickness of approximately 3-50 mm.

These woody material are not identical in color since they are natural wood even though the wood material is the same. Therefore, it is preferable to make them uniform in color by base coating with solvent or water soluble pigment and dyes before use.

A xylem surface pattern to be printed on a surface of the woody material means, in the present invention, conduit pipes, pith rays, nodular patterns or the like, and a grain pattern means an appearance of a surface of the

woody material, such as cross grain or straight grain.

The grain pattern to be printed on a surface of the woody material is the straight grain or cross grain of a high-quality precious wood, such as oak or ash, having a very clear grain pattern, and the xylem surface pattern to be printed is made to match the xylem surface pattern of such oak or ash.

The xylem surface pattern is formed on the woody material by an embossing roller.

The embossing roller is formed by transferring a grain pattern to be printed to the roller and convexly projecting portions corresponding to a xylem surface pattern which the grain pattern has by nature. The woody material is conveyed between the embossing roller and a press roll which is paired with the embossing roller to emboss the woody material with the concave xylem surface pattern.

According to the present invention, the woody material is embossed to have a xylem surface pattern and, simultaneously, the embossed portion of the woody material is supplied with ink. The supplying of ink can be performed by two methods. Specifically, one method comprises the steps of providing each of the projected portions formed on the embossing roller with an ink feeding hole, embossing a xylem surface pattern on the woody material, and simultaneously feeding ink from the ink feeding hole to the embossed portion, while the other method comprises the steps of arranging an ink roller on an outer periphery of the embossing roller, coating the projected portion formed on the embossing roller with ink using the ink roller and transferring the ink to the embossed portion.

The woody material having the concave xylem surface pattern embossed on its surface and supplied with ink on the embossed portion is conveyed to a dryer by an appropriate means, for example, a pair of conveying rollers. After the supplied ink is dried, the grain pattern is printed on the surface by photogravure offset printing.

A photograph of a grain pattern which matches the above-mentioned xylem surface pattern is taken to be transferred onto a printing roll. The printing roller and a printing mechanism which is paired with the printing roller perform the grain pattern printing.

At that time, it is preferable to have the printing roller displays a printing pattern on a surface thereof which does not break off at the end of one rotation but is continuous through to the next rotation.

On the woody material on which the grain pattern printing has been finished, the printing ink is dried and the printed surface is color coated in a desired color using a coating mechanism which comprises a color-coating roller and a press roll. Once the color coating is dried, the woody material is conveyed into a clear-coating mechanism which comprises a clear-coating roller and a press roll. The color-coated surface is coated with a clear coating and dried to have a woody plate material having a significantly clear grain pattern thereon.

According to the method of manufacturing a woody plate material of the present invention, when forming a

xylem surface pattern of conduit pipes or the like on a surface of a woody material using an embossing roller, since ink of a desired color is supplied, simultaneously with the formation of a concave portion which is to be the xylem surface pattern, on the concave portion, it is possible to simply and easily obtain a woody plate material having a desired grain pattern from a woody material having an unclear grain pattern.

On the other hand, since the apparatus for manufacturing a woody plate material of the present invention is provided with an embossing mechanism which embosses a surface of a woody material with a concave xylem surface pattern which matches a desired grain pattern and, simultaneously, supplies a desired ink onto the embossed portion formed thereon, it is possible to supply ink to be the grain pattern simultaneously with the formation of the grain pattern on the surface of the woody material, and thus, woody plate materials of excellent quality having a desired grain pattern can be mass-produced at a low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flow sheet showing an example of the manufacturing method of a woody plate material of the present invention.

PREFERRED EMBODIMENTS OF THE INVENTION

A method for manufacturing a woody plate material of the present invention and a manufacturing apparatus used in the method will now be described with reference to the attached drawings.

Fig. 1 shows an embodiment of a manufacturing apparatus 1 used in the method for manufacturing a woody plate material of the present invention. The manufacturing apparatus 1 comprises an embossing mechanism 2 capable of forming a concave xylem surface pattern on a surface of a woody material and supplying ink onto the concave portion; a printing mechanism 7 for printing woodgrain on an embossed woody material A1; and a coating mechanism 12 for coating a printed woody material A2 so as to have a target woody plate material.

The embossing mechanism 2 comprises an embossing roller 3 arranged horizontally at a lower position and provided with a convex xylem surface pattern which matches a desired grain pattern to be formed on the woody material; a press roll 4 arranged above the embossing roller 3 to allow free adjustment of the interval therebetween; an ink roller for feeding ink to the convex xylem surface pattern formed on the embossing roller 3; and a drier 6 for drying the ink printed on a woody material.

Supplying ink onto a concave portion (embossed portion) being a xylem surface pattern formed on the woody material A1 may, alternatively, be carried out in such a way that ink is fed from the embossing roller 3 through an ink feeding hole (not shown) provided at a

convex portion of the embossing roller 3, to the concave portion being the xylem surface pattern.

The drier 6 has a heating means such as a heater therein, and the embossed woody material is conveyed through the drier so as to dry the ink printed to be the xylem surface pattern on the surface of the woody material.

A printing mechanism 7 comprises a printing roller 8 for printing a grain pattern on the embossed woody material A1; a press roll 9 arranged above the printing roller 8 to freely adjust the interval therebetween; and a drier 11 arranged at a lower stream. The drier 11 is similar to the drier 6 and is for drying the ink used for printing the grain pattern.

The printing roller 8 has a printing form plate formed by photomechanically processing a grain pattern such as a straight grain and a cross grain existing on a surface of a plate of a natural wood, which matches the xylem surface pattern, on a peripheral surface thereof, and the ink is fed to the printing roller 8 by an ink roller 10.

A coating mechanism 12 comprises a color-coating roller 13 which is peripherally in contact with an ink roller 15; a press roll 14 which is arranged above the color-coating roller to freely adjust the interval therebetween; a drier 16 arranged at a lower stream position therefrom; a clear-coating roller 17; a press roll 18 arranged above the clear roller 17; and a drier 20 arranged at a lower stream position therefrom.

In the figure, reference numeral 19 is an ink roller which is in peripheral contact with the clear-coating roller 17.

Next, a method for printing a grain pattern on a woody material using the manufacturing apparatus 1 having the structure described above will be described.

In the present invention, a roll of sliced veneer which was made of ramie wood whose grain pattern is faint and whitish as a whole, which was sliced to be a veneer and horizontally jointed to have a predetermined width, and is alternately finger jointed at the butt end to have a predetermined length, and lined with non-woven fabric as the woody material to be a size of approximately 0.5 mm in thickness x 500 mm in width, was used for the woody material.

A surface of the embossing roller 3 was formed to have a concave xylem surface pattern of oak, which is a high-quality wood, and the printing roller 8 had a grain pattern which matches the xylem surface pattern of oak printed by photomechanically processing.

First, an interval between the embossing roller 3 and the press roll 4 of the manufacturing apparatus 1 is set to fit a thickness of the roll-like sliced veneer A1. Then, the embossing mechanism is driven to convey the sliced veneer A1 with its surface facing down and feed it between the embossing roller 3 and the press roll 4. A concave portion is formed on the sliced veneer A1 by the convex grain pattern formed on the embossing roller 3, while the roll-like sliced veneer A1 is conveyed to the left side by rotating the embossing roller 3 and

press roll 4. Simultaneously, since the embossing roller 3 is in peripheral contact with the ink roller 5, ink is supplied on the concave grain pattern formed on the roll-like sliced veneer A1 to print the grain pattern such as conduit pipes.

The sliced veneer A1 on which the grain pattern is formed by the embossing roller 3, and which is supplied with ink, is sequentially conveyed to the drier 6, and is conveyed between the printing roller 8 and the press roll 9 which constitute the printing mechanism 7 after the supplied ink is dried.

The sliced veneer A1 is dried for approximately one minute at 60° C.

The sliced veneer A1 conveyed between the printing roller 8 and the press roll 9 of the printing mechanism 7 is conveyed to the drier 11 after the grain pattern which matches the xylem surface pattern is printed thereon, to be dried for approximately 5 minutes at 60°C, and is thereafter conveyed to the coating mechanism 12.

The sliced veneer A2 having the xylem surface pattern and the grain pattern printed thereon, which is conveyed to the coating mechanism 12, is conveyed between the color-coating roller 13 and the press roll 14 to be color-coated with a paint of the same color as the color of the oak on the printing surface. After the coated surface is dried through the drier 16, the sliced veneer A2 is conveyed between the clear-coating roller 17 and the press roll 18 to be clear-coated with a transparent clear-coating on the coated surface.

The roll-like sliced veneer A2 having the transparent clear-coating thereon is dried through the drier 20 so that a woody plate material, on which is provided a grain pattern which is the same as the oak, is manufactured.

The thus obtained sliced veneer looks like a high quality wood having the grain pattern and color of oak, while it originally had an unclear grain pattern and a light color. Accordingly, it is cut to be a desired size for wrapping surfaces of a furniture so as to obtain high-quality furniture having a grain pattern of oak on its surface.

In the embodiment, it is described that a roll-like sliced veneer is used as a woody material and the steps from embossing to clear-coating are integrately performed. However, each step may be batch processed, and the woody material may be a veneer or plywood such as LVL having a desired size.

The method of supplying ink is not limited to the one in the embodiment insofar as the ink is supplied onto the concave portion to be the xylem surface pattern simultaneously with the embossing process.

Further, in the embodiment, the embossing roller 3, the printing roller 8, the color-coating roller 13 and the clear-coating roller 17 are arranged at the lower portions of the apparatus. This is effective for preventing excess ink coated on each roller from being coated on the surface of the woody material. However, if it is possible to control the amount of ink to be coated on the

woody material, the press rolls may be arranged at the lower portions and the above cited rolls may be arranged at the upper portions.

According to the method of manufacturing a woody plate material of the present invention, when forming a xylem surface pattern on a woody material by embossing, since the embossing process and a process of supplying ink onto the embossed portion is simultaneously performed, the grain pattern can be effectively printed on the woody material.

Further, since each embossed portion formed on the woody material is definitely supplied with ink, the obtained woody plate material can have a distinct xylem surface pattern and wood xylem surface pattern which closely resemble a predetermined natural wood so as to have a high quality.

On the other hand, according to an apparatus for manufacturing a woody plate material of the present invention, when embossing a xylem surface pattern on a woody material, since the embossing roller is attached with the ink feeding device so as to emboss the woody material and supply ink to the embossed portion simultaneously, it is possible to form a clearer xylem surface pattern on the woody material and to print a grain pattern which matches the xylem surface pattern so that a woody plate material of excellent quality having a clear grain pattern which closely resembles a predetermined natural wood can be mass-produced at a low cost.

(Descriptions of the Numerals)

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|----------------|--|----|
| 1: | manufacturing apparatus of a woody plate material | |
| 2: | embossing mechanism | |
| 3: | embossing roller | 35 |
| 4, 9, 14, 18: | press roll | |
| 5, 10, 15, 19: | ink roller | |
| 6, 11, 16, 20: | drier | |
| 7: | printing mechanism | |
| 8: | printing roller | 40 |
| 12: | coating mechanism | |
| 13: | color-coating roller | |
| 17: | clear-coating roller | |
| A1: | roll-like sliced veneer | |
| A2: | roll-like sliced veneer having xylem surface patterns and grain patterns printed thereon | 45 |

Claims

1. A method for fabricating a woody plate material having appearance of wood, comprising the steps of:

embossing a xylem surface pattern on a surface of a woody material using an embossing roller having a xylem surface pattern, suitable for a grain pattern to be provided, projecting therefrom; and

supplying ink to the embossed portion so that a grain pattern matching the xylem surface pattern is printed on the surface of the woody material using a transfer roll.

2. A method for fabricating a woody plate material having appearance of wood, comprising the steps of:

embossing a xylem surface pattern on a surface of a woody material using an embossing roller having a xylem surface pattern, suitable for a grain pattern to be provided, projecting therefrom;

supplying ink to the embossed portion so that a grain pattern matching the xylem surface pattern is printed on the surface of the woody material using a transfer roll; and forming a finishing coat of a clear coating on the surface thereof.

3. An apparatus for manufacturing a woody plate material having appearance of wood, comprising:

an embossing roller having a xylem surface pattern which matches a desired grain pattern, which is projected from a surface thereof; an embossing mechanism which comprises an ink supplying device for embossing a woody material using said embossing roller and for supplying ink to be said xylem surface pattern, and a pressing roller for pressing a woody material to be embossed onto said embossing roll, being paired with the embossing roll; and a printing mechanism for printing a grain pattern which matches said xylem surface pattern on a surface of the woody material which has been embossed and supplied with ink on embossed portions thereof.

4. An apparatus for manufacturing a woody plate material having appearance of wood comprising:

an embossing roller having a xylem surface pattern which matches a desired grain pattern, which is projected from a surface thereof; an embossing mechanism which comprises an ink supplying device for embossing a woody material using said embossing roller and for supplying ink to be said xylem surface pattern; a pressing roller being paired with said embossing roll, for pressing a woody material to be embossed onto the embossing roll; a printing mechanism comprising a printing roller for printing a grain pattern which matches said xylem surface pattern on a surface of the woody material which has been embossed and supplied with ink on embossed portions thereof, and a pressing roller being paired with

the printing roll; and
 a coating mechanism comprising a coating roller for color-coating on a printed face of the woody material which has been printed and forming a finishing coat of a clear coating on a surface of the color-coated woody material, in order, and a press roll.

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5. An apparatus for manufacturing a woody plate material having appearance of wood as defined in Claim 3 or 4, wherein said printing roller is constituted to have a print pattern formed on a surface thereof, which exhibits a continuous grain pattern by rotation of the printing roller whose one rotation is set to be a print unit.

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6. An apparatus for manufacturing a woody plate material having appearance of wood as defined in Claim 3 or 4, wherein said ink supplying device for supplying ink to said xylem surface pattern embossed on said surface of said woody material by embossing supplies the ink from an ink tank arranged in said embossing roller to a surface of the embossing roll.

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7. An apparatus for manufacturing a woody plate material having appearance of wood as defined in Claim 3 or 4, wherein said ink supplying device for supplying ink to said xylem surface pattern embossed on said surface of said woody material by embossing rotates in contact with said embossing roller at a peripheral edge thereof, and comprises an ink roller capable of supplying ink only on the xylem surface pattern projected from the embossing roll, and an ink tank for supplying ink to the ink roller.

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