

TREATMENT METHOD OF CREATING A NATURAL WEATHERING PATTERN ON NATURAL SOLID WOOD AND IMPLEMENTATION EQUIPMENT THEREOF

5 BACKGROUND OF THE INVENTION

a) Field of the Invention

The present invention relates to a treatment method of creating a natural weathering pattern to spring or autumn wood textures on a cutting surface of natural solid wood and implementation equipment thereof, wherein a freezing removal operation is applied to separate loose fibers on a top layer of the cutting surface by a cryogenic operation, leaving natural weathering textures.

b) Description of the Prior Art

Wood that grows in an environment under different temperature in four seasons is provided with a distribution of annual rings in various densities and has aesthetics in a unique natural style. After being harvested, the wood can be particularly implemented in decorations or apparatuses, and various totems in the profile of annual rings can be seen. In addition, the wood grows and breeds in nature, being affinitive to human spirit and provided with a robust mechanical strength;

therefore, the wood is loved by people.

Visually, the vein lines that go through natural weathering manifest an antique ambiance, but are only provided with natural aesthetics. To build three-dimensional ridges of annual rings on new wood for mimicking a natural weathering pattern, a Taiwanese Patent No. M347269 implements a sand blasting method to break and remove fragile tissue fibers, thereby highlighting a hard profile of the annual rings. On the other hand, in another Taiwanese Patent No. 200736022, the loose and brittle fiber cells in the wood are brushed out by a continuous scrubbing operation with brushes using a machine to reserve a hard profile of the annual rings. Furthermore, there is a Taiwanese Patent No. 200633828, wherein a grain milling method is utilized to squeeze and grind the fiber cells with the grains.

As the abovementioned implementation methods destroy the fiber cells by a brute force, the workpiece to be processed must be thick. If the implementation methods are to be implemented on a surface of thin plate, such as cortex veneer in a thickness of skin, or veneer of paper, they cannot be executed due to a strong dissecting force and impact. Or, the production process is heavily provided with noises or pollution. Moreover, the high pressure during the processing may crack woody

grains longitudinally, forming explicit burrs and a rough surface after completion, which departs from a smooth and soft surface of natural weathering.

SUMMARY OF THE INVENTION

5 A primary object of the present invention is to provide a treatment method that is implemented on a cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering pattern, as well as implementation equipment thereof. The spring or autumn wood with vein lines is chosen, and the cross section is cut to
10 form at least a cutting surface. A freezing removal operation is implemented on the cutting surface cryogenically, carrying out an aggression operation onto the cutting surface based on a vector function of aggression medium. The cracked cellular fibers after being frozen are peeled off by an exclusion operation, which leaves smooth textures
15 of annual rings on the entire cutting surface to simulate the natural weathering effect.

A second object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering
20 pattern as well as the implementation equipment thereof, wherein the

aggression operation in the freezing removal operation enables the aggression medium to form a directional function on the cutting surface based on a working energy, and results in a fluid impulse on the cutting surface.

5 A third object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering pattern as well as the implementation equipment thereof, wherein the energy used by the exclusion operation is a fluid kinetic energy of
10 high-pressure gas, and the energy can do work consubstantially in the aggression medium.

 A fourth object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering
15 pattern as well as the implementation equipment thereof, wherein the operational energy of scrubbing is a mechanical kinetic energy.

 A fifth object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering
20 pattern as well as the implementation equipment thereof, wherein the

aggression medium works directionally on the cutting surface through a directional jet flow device, a front end of the directional jet flow device is connected to the aggression medium through a flexible path, and the directional jet flow device sweeps planarly or curvedly on the cutting surface, with the sweeping being operated repeatedly.

A sixth object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering pattern as well as the implementation equipment thereof, wherein an installation workbench is employed to fix the angular space of processing on the cutting surface, the freezing removal operation utilizes freezing removal equipment, and the freezing removal equipment includes a refrigerant end, a directional dispensing device and a vectorial eradicating device to provide the aggression operation and the exclusion operation.

A seventh object of the present invention is to provide a treatment method that is implemented on the cutting surface of natural solid wood to facilitate the spring or autumn wood textures into a natural weathering pattern as well as the implementation equipment thereof, wherein a tail end of the installation workbench can be equipped with a dust removal

device.

To enable a further understanding of the said objectives and the technological methods of the invention herein, the brief description of the drawings below is followed by the detailed description of the preferred
5 embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a growth density curve of spring or autumn wood, according to the present invention.

FIG. 2 shows a schematic view of a profile of loose and dense annual
10 rings in natural solid wood, according to the present invention.

FIG. 3 shows a schematic view of cross-sectional tissues in summer grains and winter grains, according to the present invention.

FIG. 4 shows a schematic view of a pattern of cutting surface on cut wood in the harvested spring or autumn wood after being subjected to
15 external weathering, according to the present invention.

FIG. 5 shows a schematic view of configuration of method and equipment, according to the present invention.

FIG. 6 shows a schematic view of loose fibers in the summer grains that are frozen by an external force, according to the present invention.

20 FIG. 7 shows another schematic view of the loose fibers in the summer

grains that are frozen by an external force, according to the present invention.

FIG. 8 shows a schematic view of the method that performs an aggression operation onto a cutting surface in gradient, according to the present invention.

FIG. 9 shows a schematic view of a further implementation process of a freezing removal operation in the method, according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 The present invention discloses a treatment method of creating a natural weathering pattern to spring or autumn wood textures on a cutting surface of natural solid wood and implementation equipment thereof. The spring or autumn wood with vein lines is harvested and cut to form a cutting surface, and the cutting surface is implemented with
15 a freezing removal operation cryogenically. The freezing removal operation carries out an aggression operation onto the cutting surface based on a vector function of aggression medium, and cracked cellular fibers after being frozen are peeled off by an exclusion operation, leaving the textures of annual rings that simulate natural weathering. In the
20 aggression operation in the freezing removal procedure, the aggression

medium forms a directional function onto the cutting surface using a working energy, the energy used by the exclusion operation is a fluid kinetic energy of high-pressure gas, and can generate a operational power toward the cutting surface in the aggression medium
5 consubstantially; whereas, the exclusion operation is also provided with a polishing function.

Please refer to the drawings for the description of embodiment in the present invention. First of all, as shown in FIG. 1, the spring or autumn wood that grows in an area with a change of seasons is
10 harvested. The spring or autumn wood is provided with explicit textures in various densities, and the density value D of tissue cells will change according to the growth schedule T . As shown in the drawing, the spring or autumn wood grows in prosperity during spring and summer, where the wood absorbs warm temperature and moisture, and the cells
15 grow rapidly. As the density is lower in the volume, the woody fiber tissues will get loose. In autumn and winter, on the other hand, as temperature drops and there is less moisture, the cells will stop growing, and metabolism will be stopped correspondingly. Therefore, the volume density will increase, forming an intermittent change in density.
20 As the cell wall on harder textures is thicker, a hard volume is formed,

with a density distribution as curve C.

Referring to FIG. 2, the spring or autumn wood that grows as described above is provided with vein lines in various densities. In the present embodiment, the spring or autumn wood is harvested as the cut wood 10 which is provided at least with a cutting surface 11. The spring or autumn wood textures 12 include summer grains 20 and winter grains 30, forming a color pattern in grey level by the change of loose fibers 21 and dense fibers 31. An explicit contour line 13 will be available between the summer grain 20 and the winter grain 30 due to a fast change of season; whereas, in the present invention, the interface between the summer grain 20 and the winter grain 30 is defined as the contour line 13.

Referring to FIG. 3, based on the observation to growth cross-section in the cut wood 10, interior volumes of the formed summer grains 20 and winter grains 30 are provided respectively with the loose fibers 21 and the dense fibers 31. The loose fibers 21 are separated from the dense fibers 31 by the contour lines 13; the dense fibers 31 are high-density tissue cells, whereas the loose fibers 21 are loose tissue cells.

Referring to FIG. 4, the object to be solved by the present method is

to treat the surface of natural solid wood into the same pattern as that of natural weathering, having the summer grains 20 and the winter grains 30.

A top layer on the cutting surface 11 of cut wood 10 is provided with the loose fibers 21 and dense fibers 31 in various densities. Under a natural environment, the top layer will be formed with concaved ring grooves 22 and protruded rib marks 32, due to that the cells are destroyed by ultraviolet and exploited by wind. A potential difference between the ring groove 22 and the rib mark 32 is a setting height S, forming a three-dimensional pattern.

Referring to FIG. 5 (in association with FIG. 9), the present invention implements a freezing removal operation 70 by a cold working method. The aggression operation 71 and the exclusion operation 72 in the procedure of freezing removal operation 70 process the textures of natural solid wood as a natural weathering pattern. From preparing to accomplishment, the present method includes the following procedure. First of all, a cutting and stocking operation 50 is carried out, wherein the spring or autumn wood is harvested, and then the volume is cut into at least a cutting surface 11 before accomplishing the stocking. If roundwood is a complete roundwood, then a cutting machine 500 is

used for cutting, and if the introduced material has been measured with dimension and cut, then the stocking is accomplished. In the stocking process, if the wood is dry and hard, then the humidity is adjusted, where the temperature adjustment 51 is accomplished by soaking, spraying or
5 water compression, so as to change the hydrous state of tissue cells, which facilitates the subsequent processing. After accomplishing the cutting and stocking operation 50, a processing surface positioning and installing operation 60 is conducted, using an installation workbench 600 on which is emplaced with the abovementioned stock. As the
10 foundation of installation workbench 600 is fixed, the stocking angle will also be fixed.

After accomplishing the abovementioned stocking and installing, freezing removal equipment 700 is used to carry out the freezing removal operation 70. The freezing removal equipment 700 is provided
15 with a refrigerant end 7011 and the refrigerant end 7011 can be an ordinary electric freezing device to output a gas in low temperature or a medium which can evaporate in low temperature. The freezing removal equipment 700 is also provided with a directional dispensing device 701 which receives a low-temperature energy at the refrigerant end 7011,
20 acts into a fluid pressure, as well as synthesizes and dispenses a

fluid-like aggression medium 7012. In addition, the freezing removal equipment 700 is further provided with a vectorial eradicating device 702 which results in a mechanical momentum to act onto fluid or operate with a tool, thereby operating sequentially in the freezing removal operation
5 70.

The freezing removal operation 70 first conducts an aggression operation 71 onto the cutting surface 11. The aggression operation 71 utilizes the low-temperature, high-pressure and dry aggression medium 7012 from the freezing removal equipment 700 to spray onto the cutting
10 surface 11 directionally, where the fluid kinetic energy forms an impulse on the cutting surface 11. The energy of aggression medium 7012 works on the loose cell tissues, and the water contents or cellular fiber molecules in the tissues change by low temperature and are frozen by low temperature below the freezing point. After being frozen, the
15 kinetic energy of aggression medium 7012 is directly used in the exclusion operation 72, or a vectorial eradicating device 702 attached to the freezing removal equipment 700 is used to result in a high-pressure fluid energy alone, which conducts the exclusion operation 72 to the cracked cells that are frozen. The vectorial eradicating device 702 is a
20 mechanically operated brushing tool (not shown in the drawing) to scrub

the cracked cellular fibers out of the cutting surface 11. Finally, a dust removal operation 80 can be executed in the procedure, wherein a dust removal device 800 is used to remove dust. The dust removal device 800, such as vacuum cleaner or air jet flow device, cleans fluid in positive or negative pressure, to remove the dust left, thereby forming a clean workpiece. By the allocation of cutting machine 500, installation workbench 600, freezing removal equipment 700 and dust removal device 800, a continuous production can be achieved after the roundwood is online.

10 By the implementation of present invention, one can conduct the simulation of natural weathering to the cutting surface on natural solid wood. The result is the same as the textures of annual rings caused by natural weathering, and the wood to be implemented is not limited to thickness, disregarding the volume of cut wood is thick or is an ordinary thin veneer like skin, such as pine veneer, cedar veneer, cypress veneer, soft wood veneer or semi-soft wood veneer, after harvesting. Based on 15 the output energy of aggression medium 7012, the surface of thin veneer can be treated with weathering correspondingly, and the outcome of overall treatment is that the surface is fine like natural weathering.

20 The target to be implemented by the freezing removal operation 70

in the present method further includes a manufactured object, such as wood box or cabinet.

Referring to FIG. 6, the freezing removal operation 70 implemented by the present invention conducts the aggression operation 71 onto the cutting surface 11 (in association with FIG. 5), and the aggression operation 71 will acquire a vectorial aggression medium 7012 through the directional dispensing device 701. When the aggression medium 7012 works onto the cutting surface 11, a high-pressure cutting force will be created correspondingly due to a reaction force on the top of cutting surface 11 (as the cutting force is relative to a tiny subject like wood fibers, it is very strong). In addition, as there is a gap of combination at the position of a banked caterpillar space 40, the loose fibers 21 on the top layer will be eradicated by a shoving force F which is consubstantial with the aggression medium 7012. Besides, as the loose fibers 21 contain water, they will be swollen by the freezing function of aggression medium 7012, which relatively changes the banked capillary space 40 to separate the cell groups. The cell groups are tangled by the shoving force F and escape in high efficiency.

The abovementioned shoving force F is capable of conducting the exclusion operation 72 and can work on behalf of the exclusion

operation 72 to adjust the procedure of the method flexibly.

In the loose fibers 21 on the top layer, after being swollen by the freezing of aggression medium 7012, the water contained will result in a pushing force P relatively to push away the adjacent loose fibers 21.

5 This push forms a displacement distance L and the displacement distance L forms an empty space, which loses the binding force among the loose fibers 21, so that the loose fibers 21 can escape.

Within an inner surface of the cutting surface 11, including the loose fibers 21, banked capillary space 40 or fatty molecules, there is water.

10 The water contained in the banked capillary space 40 is also swollen by the freezing of aggression medium 7012, and results in a corresponding pressure to squeeze every loose fiber 21, allowing the loose fibers 21 to escape from the cell groups easily and be eradicated by the shoving force F , thereby simulating natural weathering to woody grains as in the
15 natural ecosystem.

Referring to FIG. 7 (in association with FIG. 5), based on the operation in FIG. 6, when the freezing removal operation 70 operates the exclusion operation 72, the loose fibers 21 in the summer grains 20 will be eradicated structurally as the fiber structures are changed by the
20 freezing of aggression medium 7012, and are acted upon by the shoving

force F. On the other hand, as the dense fibers 31 in the winter grains are hard tissues, the impact of the aggression medium 7012 to the surfaces of winter grains 30 is not significant.

Referring to FIG. 8 (in association with FIG. 5), in the freezing
5 removal operation 70 implemented by the present invention, the cutting surface 11 on the cut wood 10 can be processed in gradient, wherein as shown in FIG. 6 and FIG. 7, by the aggression medium 7012 and the associated shoving force F, the loose fibers 21 can be eradicated. On the other hand, as the dense fibers 31 in the winter grain 30 are robust,
10 the impact of the implemented aggression medium 7012 is not significant. Therefore, an aggressive setting height S is formed after completing the processing, forming a difference in height between the winter grains 20 and winter grains 30 on the upper surface. The dimension of setting height S is determined by the speed and times of
15 freezing removal operation 70.

Referring to FIG. 9, the freezing removal operation 70 utilizes freezing removal equipment 700 to work onto the cutting surface 11 of cut wood 10, wherein the freezing removal equipment 700 is provided with a refrigerant end 7011 which synthesizes a high-pressure,
20 low-temperature and dry aggression medium 7012 by a directional

dispensing device 701. The aggression medium 7012 is then provided with a kinetic energy and can deliver the kinetic energy to a directional jet flow device 7013 through a flexible path, such as pneumatic guide tube. The directional jet flow device 7013 can then migrate planarly on the cutting surface 11 of cut wood 10. If the cutting surface 11 of cut wood 10 is a curve, then the output side of directional jet flow device 7013 will also migrate on the curve formed by the change in work on multiple axes. In addition, to migrate repeatedly on the cutting surface 11, the sweeping impulse resulted will work onto the cutting surface 11, which achieves the freezing removal operation 70 in the process.

At the end of operation schedule in the freezing removal operation 70, an exclusion operation 72 can be performed, wherein a vectorial eradicating device 702 results in a power to remove the cracked loose fibers 21 out of the cutting surface 11. The vectorial eradicating device 702 can result in a high-pressure fluid to work onto the cutting surface 11, or the vectorial eradication device 702 is a mechanical device and the power generated will work onto the cutting surface 11. The power generated by that mechanical tool, such as brushes (not shown in the drawing) can scrub the cracked loose fibers 21 out of the cutting surface 11.

The energy generated by the vectorial eradiating device 702 can utilize a scrubbing device 7014 for directional output. The scrubbing device 7014 is an automatic brushing tool which generates a scrubbing power and migrates synchronously with the directional jet flow device
5 7013.

It is of course to be understood that the embodiments described herein is merely illustrative of the principles of the invention and that a wide variety of modifications thereto may be effected by persons skilled in the art without departing from the spirit and scope of the invention as
10 set forth in the following claims.

What is claimed is:

1. A treatment method of creating a natural weathering pattern on natural solid wood, which forms a natural weathering pattern to spring or autumn wood textures on a cutting surface in natural solid wood,
5 comprising:

step 1, which is a cutting and stocking operation to perfect cut wood having a cutting surface;

step 2, which is a processing surface positioning and installing operation to fix the cutting surface of processed wood in a fixed angle;

10 and

step 3, which is a freezing removal operation, with the freezing removal operation further including an aggression operation and an exclusion operation, wherein in the aggression operation, a fluid-like dry aggression medium having a low temperature below the freezing

15 point, high pressure, and kinetic energy works onto the cutting surface to generate an impulse on the cutting surface, wherein the aggression medium outputted in the aggression operation is a high-pressure gas at a freezing temperature, and the exclusion operation utilizes the high-pressure gas to work onto the cutting surface to
20 exclude loose fibers that are frozen.

2. The treatment method of creating a natural weathering pattern on natural solid wood, according to claim 1, wherein the energy generated in the exclusion operation is a fluid kinetic energy of the high-pressure gas, which works onto a top layer of the cutting surface.
- 5 3. The treatment method of creating a natural weathering pattern on natural solid wood, according to claim 1, wherein the energy used by the aggression operation comes from the high-pressure gas, and is outputted into the aggression medium by the aggression operation.
4. The treatment method of creating a natural weathering pattern on
10 natural solid wood, according to claim 1, wherein the aggression medium outputted from the aggression operation works onto the cutting surface directionally through a directional jet flow device.
5. The treatment method of creating a natural weathering pattern on natural solid wood, according to claim 2, wherein the high-pressure
15 gas generated in the exclusion operation works onto the cutting surface through a scrubbing device.
6. The treatment method of creating a natural weathering pattern on natural solid wood, according to claim 1, wherein the freezing removal operation operates repeatedly.
- 20 7. A treatment equipment of creating a natural weathering pattern on

natural solid wood, which forms a natural weathering pattern to spring or autumn wood textures on a cutting surface in natural solid wood, comprising:

an installation workbench; and

5 freezing removal equipment, which further includes a refrigerant end and a directional dispensing device, wherein the refrigerant end generates an aggression medium, wherein the aggression medium is a gas at a freezing temperature, the directional dispensing device receives the gas at a freezing temperature from the refrigerant end
10 and generates a fluid pressure larger than one atmospheric pressure, with the fluid pressure being outputted toward the installation workbench;
wherein the freezing removal equipment works toward the installation workbench through a directional jet flow device.

- 15 8. The treatment equipment of creating a natural weathering pattern on natural solid wood, according to claim 7, wherein the freezing removal equipment is provided with a vectorial eradicating device which generates a power to work toward the installation workbench.
9. The treatment equipment of creating a natural weathering pattern on
20 natural solid wood, according to claim 7, wherein a rear end of the

freezing removal equipment is provided with a dust removal device.

10. The treatment equipment of creating a natural weathering pattern on natural solid wood, according to claim 7, wherein the directional dispensing device provided by the freezing removal equipment is connected to a directional jet flow device through a flexible path.

11. The treatment equipment of creating a natural weathering pattern on natural solid wood, according to claim 10, wherein the directional jet flow device displaces planarly.

12. The treatment equipment of creating a natural weathering pattern on natural solid wood, according to claim 10, wherein the directional jet flow device displaces curvedly.