United States Patent

[11] 3,621,897

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[21] Appl. No. 15,149
[22] Filed Feb. 27, 1970
[45] Patented Nov. 23, 1971

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a part interest

[32] Priorities Mar. 6, 1969
[33] Italy
[31] 13748-A/69;
June 11, 1969, Italy, No. 18070-A/69

[54] PROCESS FOR THE IMPROVEMENT OF NATURAL WOOD, PARTICULARLY FOR THE PRODUCTION OF COMPRESSED WOODEN COMPONENTS PROVIDED IF REQUIRED WITH ORNAMENTATION

10 Claims, 3 Drawing Figs.

[52] U.S. Cl. 144/327, 144/328
[51] Int. Cl. B27h 1/00
[50] Field of Search 144/327, 328, 309; 117/147, 57

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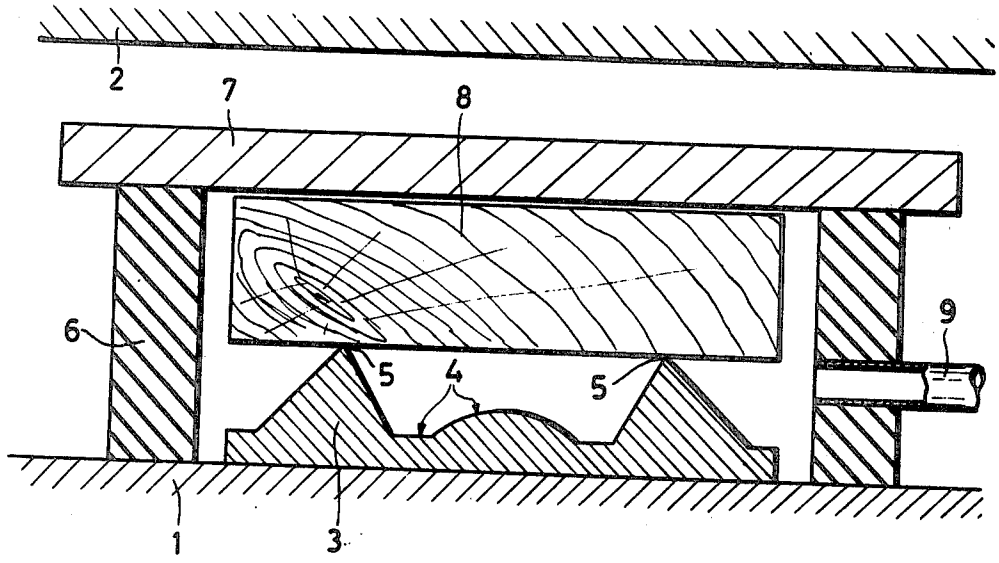
ABSTRACT: A process for producing compressed wooden components provided if required with ornamentation, comprising the operations of immersing the natural initial wood in an aqueous bath containing pyridene, then drying the wood to a residual moisture content of 12–16 percent and finally compressing the pretreated wood under the simultaneous action of heat at a temperature of about 180° C. During hot compression the desired ornamentation may be impressed by means of a mold corresponding to the negative of the ornamentation. Vacuum may be applied during this operation. Alternatively the wood pretreated by the water-pyridene bath may be first compressed into a panel with plane faces and this panel may be successively further compressed in a mold for impressing the ornamentation.



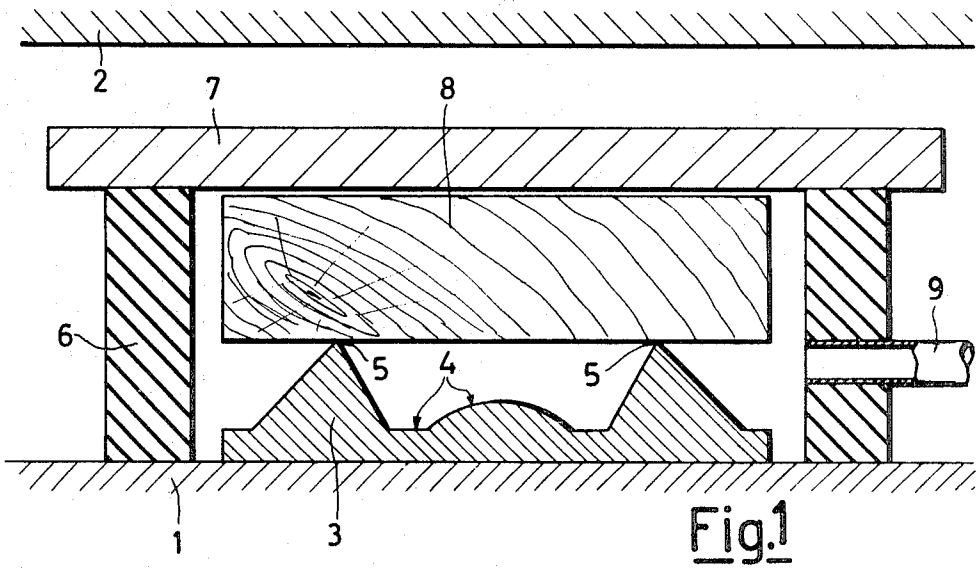


Fig.1

Fig.2

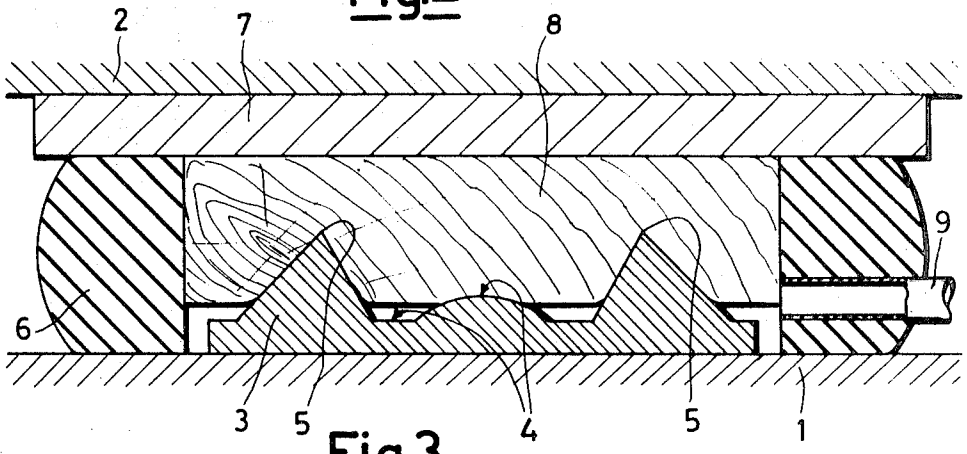
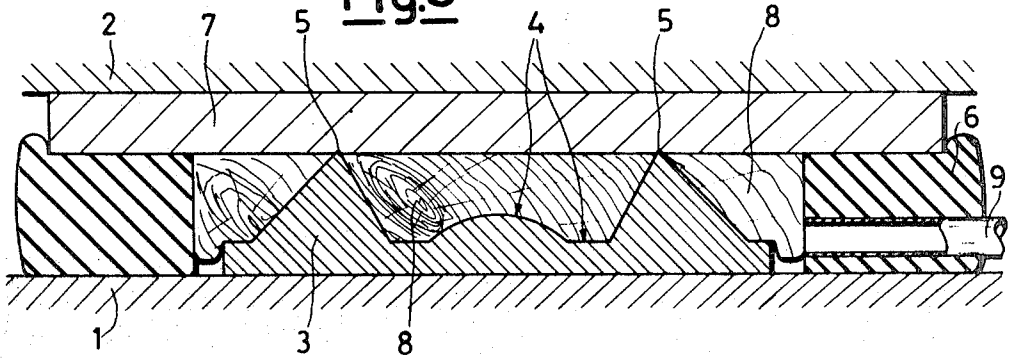


Fig.3



PROCESS FOR THE IMPROVEMENT OF NATURAL WOOD, PARTICULARLY FOR THE PRODUCTION OF COMPRESSED WOODEN COMPONENTS PROVIDED IF REQUIRED WITH ORNAMENTATION

The present invention relates to a process for the improvement of natural wood, particularly for the production of compressed wooden components provided if required with ornamentation on at least one side.

In the present description the term "natural wood" means wood which presents its natural graining. Hence it does not include wooden fibers, shavings or chips.

However it should be noted that the natural wood used for obtaining the components according to the process of the invention may comprise a single piece or a number of pieces or layers which present their natural graining and which have a moisture content of about 16 percent. The term "improvement" means a treatment for natural wood which leads to an increased density and higher specific gravity of the wood and a greater surface resistance to wear.

The wooden components produced according to the invention are particularly suitable for flooring (parquet) and in general as a material which because of its use requires a high specific gravity with excellent surface resistance to wear. In the case of shaped decorative wooden components provided with a determined ornamentation on at least one side, these components may be usefully employed in the manufacture of furniture.

It is well known that natural wood possesses a very low plasticity and compressibility.

The obtaining of shaped decorative components has already been tried by exploiting the deformability of wood under the simultaneous action of heat, pressure and humidity. According to this known method the natural humidified wood is placed in an open die and subjected to compression and the simultaneous action of heat. However this method does not give the desired results and does not lead to an improvement in the wood. Only small depths of deformation can be obtained (maximum 5 mm.) for creating the decorative ornamentation and even with these small deformations cracks are formed in the wood. The temperatures used in this method are relatively low and compression times relatively long. The deformations obtained are not perfectly irreversible and have edges which are smooth and round rather than sharp, and the wood darkens because of the heat applied during compression. Shaped decorative wooden components have consequently been produced up to now mainly by curving pieces of solid natural wood by exploiting its flexibility or by machining with the removal of shavings (carving, turning, milling the solid wood, etc.) or by compressing a plurality of veneer sheets in molds, or by applying a combination of these various working methods.

On the other hand in the production of wooden fiber panels from wooden fiber it is known that by heating the fibrous mass in the presence of determined quantities of water and simultaneously applying strong compression in a closed mold, a hot plasticization is obtained because of a series of chemical processes, and practically a new material is created. Initiation of the chemical reactions is however strongly hindered and sometimes prevented by the presence of air in the pores of the fibrous mass. The chemical reactions which take place in the course of this process comprise substantially a first phase mainly of hydrolysis and a successive phase mainly of condensation during which resinous bodies are formed with hydrophobe and adhesive characteristics which make strong irreversible deformations possible, because of their thermoplasticity.

The object of the invention is that of permitting the production of improved wooden components provided if required with ornamentation, from pieces of wood which present their natural grain in order to obtain wooden components with a high specific gravity and excellent surface resistance to wear, comprising, if required,, irreversible decorative deformations even of considerable depth and a large degree of edge definition.

This object is attained according to the invention by a method which comprises a hot compression treatment of the humidified initial natural wood in which the initial wood, before being subjected to said hot compression treatment, is immersed in a water bath containing pyridine and is successively dried to a residual moisture content of approximately 12–16 percent, after which it undergoes compression at a temperature of about 180° C.

The water bath used for immersion of the natural wood consists preferably of 3 parts by weight of water and 1 part by weight of pyridine (C_5H_5N). The time of immersion of the wood in this bath may vary and it is in the order of some minutes, for example about 5 minutes. The impregnated wood is then removed from the bath and introduced into a drying chamber in which hot air circulates at a temperature of about 60°–80 C. This circulating air is made to pass through a condenser in order to condense any excess water-pyridine mixture. The wood remains in the drying chamber for that time necessary to reduce its moisture content to about 12–16 percent. In this condition the wood is without odor.

This pretreatment of the wood with the water-pyridine mixture has been found to be very efficient in the sense of favoring priming and progress of the hydrolysis phase which the wood undergoes during the successive compression treatment at the temperatures used (about 180° C). It is found in fact that because of the presence of the pyridine in the pretreated wood, the hydrolysis phase begins almost immediately when the wood is subjected to compression and the simultaneous action of heat. Compression of the wood can be carried out in successive stages. In a first compression phase the hydrolysis begins. After a certain time, which depends upon the thickness of the wood, further compression is carried out and the polycondensation phase of the already hydrolyzed wood begins. Even if cracks or breakages in the wood are formed following compression, these are completely eliminated in this phase in which a resinous homogeneous body is formed with hydrophobe characteristics on which the natural grain of the piece or pieces of wood initially used remains visible. Because of the short duration of hot compression treatment, the wood does not undergo strong coloring.

If the hot compression of the pretreated wood is carried out simply between the faces of a press, wooden panels with plane faces are obtained which after planing the face which will remain in view, can be directly used, for example for flooring. These panels have an excellent surface resistance to wear and a high specific gravity. The process can thus be used to considerably improve the characteristics of the initial natural wood, and makes the use of less valuable woods possible for those uses for which these woods would not otherwise be suitable.

The hot compression of the pretreated wood can also be carried out in a press in which at least one face carries a mold with the profile corresponding to the negative of an ornamentation which it is required to impress on the wood. In this manner it is possible to directly obtain shaped decorative components provided on at least one side with ornamentation having well-defined edges, with irreversible deformations even of considerable depth and presenting the natural grain of the initial wood. In order to diminish the coloring which the wood undergoes under hot compression and to further favor the initiation of the chemical reactions which take place during this process, it may be advisable to carry out the hot compression under vacuum (about 650 mm. Hg) so as to eliminate the air contained in the mold and the pores of the wood.

Another method provided by the invention for producing decorative-shaped components and which has been found particularly convenient in the case in which it is required to obtain particularly deep and well-defined ornamentations, consists of first forming precompressed panels with flat faces as described above, then introducing these panels after suitable planing on the side or sides which will be visible, between the faces of a press, at least one of whose faces carries a mold whose profile corresponds to the negative of the ornamentation required, and to carry out a further compression under

the simultaneous action of heat. Proceeding in this manner it is found that it is possible to impress decorative ornamentations of greater depth on the wood, having perfectly defined edges.

It should be noted that according to the process described it is also possible to build up the compressed or decorative component from a number of layers of wood superimposed horizontally, for example using for the face in view a type of wood more valuable than for the internal layers. Said layers can also be side by side vertically. Even if the component is made from a number of horizontal or vertical layers, a perfect and durable joining together of the various layers is nevertheless obtained.

The practical execution of the process according to the invention for directly producing in a single hot compression operation the decorative-shaped components is described hereinafter, by way of example, with reference to the accompanying drawing in which:

FIGS. 1–3 show very diagrammatically a mold in three successive phases of the process.

The drawing shows two faces of a press which are heated (in any conventional method, not illustrated), namely a lower face 1 and an upper face 2. On the lower face 1 rests a base plate 3 of steel which comprises a raised ornamentation 4 opposite the resting side, corresponding to the negative of the ornamentation which it is required to impress on the wood. The plate 3 further comprises a raised edge 5 which surrounds the zone containing the ornamentation 4.

A silicone ring 6 rests on the face 1 and surrounds the entire plate 3. Finally, the mold comprises an upper plate 7 of aluminum resting on the ring 6 and on which the upper face 2 of the press will rest.

As seen in FIG. 1 the piece of wood 8 prepared as described above (immersed in the water-pyridine mixture and dried to a residual moisture content of about 12—16 percent) is placed on the edge 5 of the plate 3 before resting the upper plate 7 on the silicone ring 6.

This latter is provided with a connection 9 for connecting the space formed by the plates 3 and 7 and the ring 6 to a vacuum pump which is not illustrated. When the mold is prepared as illustrated in FIG. 1, the vacuum is created (about 650 mm. Hg) in order to eliminate the air from said space and from the pores in the wood 8.

Following this, a first compression phase is carried out by making the faces 1 and 2 of the press approach each other (see FIG. 2) and causing partial copenetration of the piece of wood 8 and the baseplate 3. In this phase the vacuum previously created inside the mold is maintained and hydrolysis of the wood begins. After a certain time further compression is carried out and at the end of it (see FIG. 3) the upper plate 7 of aluminum is brought to rest on the edge 5 of the lower plate 3 so arresting the path of approach of the faces of the press and hermetically closing the inside of the mold. At this point the vacuum pump may be stopped. By this operation the complete isolation of the already hydrolyzed wood from the atmosphere is obtained and the polycondensation phase begins.

As clearly seen in FIG. 3, by completely closing the mold the piece of wood becomes perfectly adapted to the baseplate, thus taking its shape. The part of the wood outside the edge 5 constitutes scrap in this case, while the decorative-shaped component is formed from the piece of wood which is inside said edge.

It should be observed that the wood undergoes no sensible coloring during said treatment because of the short time in the heated mold. This time of residence is, for example, in the order of 60—80 seconds for a depth of ornamentation up to about 12 mm. and heating to 185° C.

It should be noted that in the process according to the invention neither binder nor adhesive additives are used on the wood.

As has been stated previously, the application of vacuum during the hot compression operation is not indispensable Thus, in the apparatus shown in the drawing, the silicone ring 6 and the connection 9 for connecting to the vacuum pump can be dispensed with.

The same apparatus can be used for the production of shaped decorative components starting from already precompressed panels which in their turn can be prepared using the press with its lower face 1 and upper face 2 without the mold constituted by the plates 3 and 7.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A process for the improvement of natural wood, particularly for the production of compressed wooden components provided if required with ornamentation, comprising hot compression treatment of the humidified initial natural wood, in which the initial wood, before being subjected to said hot compression treatment, is immersed in an aqueous bath containing pyridine, and is successively dried to a residual moisture content of about 12–16 percent, after which it is compressed at a temperature of about 180° C.

2. A process as claimed in claim 1, in which the natural wood is immersed for some minutes in a bath consisting of 3 parts by weight of water and 1 part by weight of pyridine.

3. A process as claimed in claim 1, in which the wood impregnated by the aqueous bath containing pyridine is dried by means of hot air at a temperature of about 60°–80 ° C., from which the excess water-pyridine mixture is continually eliminated.

4. A process as claimed in claim 1, in which the wood prepared with the water-pyridine mixture which is subjected to hot compression comprises a single piece.

5. A process as claimed in claim 1, in which the wood prepared with the water-pyridine mixture which is subjected to hot compression comprises a number of pieces, preferably disposed as layers, superimposed horizontally or side by side vertically.

6. A process as claimed in claim 1, in which the hot compression of the wood prepared with the water-pyridine mixture is carried out in a number of successive stages with intermediate intervals.

7. A process as claimed in claim 1, in which the wood prepared with the water-pyridine mixture is hot compressed between the faces of a press and the compressed panel obtained is planed on that face of it which will be in view.

8. A process as claimed in claim 7, in which the compressed panel planed on the face or faces which will be in view is introduced between the faces of a press, at least one of which faces carries a mold whose profile corresponds to the negative of an ornamentation to be impressed on the compressed panel, and a further compression is carried out in said press under the simultaneous action of heat.

9. A process as claimed in claim 1, in which the wood prepared with the water-pyridine mixture is hot compressed in a mold of which at least one internal surface has a profile corresponding to the negative of an ornamentation to be impressed on the wood.

10. A process as claimed in claim 9, in which during the hot compression of the wood prepared with the water-pyridine mixture, the inside of the mold is put under vacuum.

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