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(54) **A method for producing plywood having a coating**

(57) The invention relates to a method for producing plywood comprising a number of veneers, which are glued together with a binder composition, and having a coating on at least one surface of the plywood, wherein the method comprises:

- applying an aqueous composition comprising at most 60 weight-% of hydrophobic agent on at least one surface of the plywood in an amount of at least 70 g/m²;
- drying the applied aqueous composition comprising hy-

drophobic agent for reducing the amount of the aqueous composition with at least 10 weight-%; and

- applying a film containing coating agent, wherein the coating agent comprises resin, in an amount of 20-300 g/m² on the dried aqueous composition comprising hydrophobic agent for forming a coating comprising hydrophobic agent and a film containing coating agent, on the at least one surface of the plywood.

EP 2 957 351 A1

Description**FIELD OF THE INVENTION**

[0001] The invention relates to a method for producing a plywood comprising a number of veneers and a coating on at least one surface of the plywood. The invention further relates to a plywood comprising a number of veneers and a coating on at least one surface of the plywood.

BACKGROUND OF THE INVENTION

[0002] Plywood is a wood based product that comprises multiple layers of thin wood assembled with adhesives or binder compositions. These plywood layers or veneers are glued together with adjacent veneers having a grain direction rotated in a specific angle relative to adjacent layers. The inventors have recognized a need for a method for producing coated plywood with reduced rippling and/or blistering tendency.

PURPOSE OF THE INVENTION

[0003] The purpose of the invention is to provide a new type of method for producing plywood comprising a number of veneers and a coating on at least one surface of the plywood. The purpose of the invention is further to provide a new type of plywood comprising a number of veneers and a coating on at least one surface of the plywood.

SUMMARY

[0004] The method according to the present invention is characterized by what is presented in claim 1.

[0005] The plywood according to the present invention is characterized by what is presented in claim 19.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The accompanying drawings, which are included to provide a further understanding of the invention and constitute a part of this specification, illustrate embodiments of the invention and together with the description help to explain the principles of the invention. In the drawings:

Fig. 1 and Fig. 2 illustrate the results from test carried out in accordance with standard ASTM E308; and
Fig. 3 illustrates the surface roughness variation results.

DETAILED DESCRIPTION OF THE INVENTION

[0007] The present invention relates to a method for producing plywood comprising a number of veneers, which are glued together with a binder composition, and having a coating on at least one surface of the plywood, wherein the method comprises:

- applying an aqueous composition comprising at most 60 weight-% of hydrophobic agent on at least one surface of the plywood in an amount of at least 70 g/m²;
- drying the applied aqueous composition comprising hydrophobic agent for reducing the amount of the aqueous composition with at least 10 weight-%; and
- applying a film containing coating agent, wherein the coating agent comprises resin, in an amount of 20 - 300 g/m² on the dried aqueous composition comprising hydrophobic agent for forming a coating comprising hydrophobic agent and a film containing coating agent, on the at least one surface of the plywood.

[0008] The present invention relates further to a plywood comprising a number of veneers, which are glued together with a binder composition, and have a coating on at least one surface of the plywood, wherein the coating comprises a hydrophobic agent and a film containing coating agent, which coating agent comprises resin, obtainable by the method according to the present invention.

[0009] The plywood can be treated or coated for protecting its veneers from e.g. humidity, water and the adverse effects of the surrounding atmosphere. The service value of such coated plywood is reduced if holes appear in the coating. In such a case, the outermost or top veneer would easily absorb moisture from the air or water. Also, plywood is commonly used as a material for concrete forming or casting. In connection with casting moisture from wet concrete may penetrate through holes appearing in the coating into the veneer. From the holes in the coating, the moisture easily

spreads in the direction of the wood grains and cause local swelling of the grains, i.e. rippling, and thereby blistering of the surface of the wood board. Also the coating process itself can generate moisture in the wood grains that adversely affects the properties of the formed coated plywood.

[0010] The coating agent is provided on the plywood in the form of a film or overlay, i.e. a film containing coating agent is applied. Providing the coating agent on the plywood in the form of a film in solid form results in less water being provided to the plywood surface with the coating agent compared to the situation where the coating agent would be used in liquid form.

[0011] The inventors of the present invention surprisingly found out that by drying the aqueous composition comprising hydrophobic agent applied on the at least one surface of the plywood to a certain extent before applying the film containing coating agent thereon, beneficially affects the adhesion of the film containing coating agent to the plywood. It was noted that the water contained in the aqueous composition comprising hydrophobic agent may result in swelling of the grains in the wood material of the veneers, which affects the appearance of the plywood and thus also the appearance of concrete in case the plywood is used for casting. The inventors of the present invention surprisingly found out that drying of the applied aqueous composition comprising hydrophobic agent beneficially affects both the adhesion of the film containing coating agent to the plywood surface and the appearance of the formed coating.

[0012] In one embodiment of the present invention an aqueous composition comprising at most 50 weight-% of hydrophobic agent is applied on at least one surface of the plywood.

[0013] In one embodiment of the present invention an aqueous composition comprising at least 10 weight-%, and preferably at least 20 weight-%, of hydrophobic agent is applied on at least one surface of the plywood.

[0014] The use of an aqueous composition comprising hydrophobic agent has the added utility of being safe to handle during the processing. Also, the use of the aqueous composition enables the use of a rather small amount of hydrophobic agent for covering a rather large area in a uniform manner. Also, the inventors found out that the use of an aqueous composition beneficially affected the choice of application methods for applying the composition on the surface of the plywood.

[0015] In one embodiment of the present invention the aqueous composition comprising hydrophobic agent further contains at least one additive and/or at least one filler.

[0016] In one embodiment of the present invention the aqueous composition comprising hydrophobic agent is applied on the at least one surface of the plywood in an amount of at least 100 g/m², and preferably at least 110 g/m². In one embodiment of the present invention the aqueous composition comprising hydrophobic agent is applied on the at least one surface of the plywood in an amount of 70 - 150 g/m², and preferably in an amount of 105 - 130 g/m².

[0017] In one embodiment of the present invention drying of the applied aqueous composition comprising hydrophobic agent is carried out until the amount of water in the aqueous composition comprising hydrophobic agent is at most 60 g/m². In one embodiment of the present invention drying of the applied aqueous composition comprising hydrophobic agent is carried out until the amount of water in the aqueous composition comprising hydrophobic agent is at most 80 g/m², preferably at most 70 g/m², and more preferably at most 60 g/m². The inventors of the present invention surprisingly found out that these values result in a beneficial appearance of the coating.

[0018] In one embodiment of the present invention drying of the applied aqueous composition comprising hydrophobic agent is carried out by at least one of air drying, accelerated air drying, kiln drying, contact drying and IR-radiation. In one embodiment of the present invention the drying of the applied aqueous composition comprising hydrophobic agent is carried out by air drying and/or kiln drying, and preferably by air drying and kiln drying.

[0019] By the expression "air drying" is to be understood in this specification, unless otherwise stated, a process of removing moisture by exposure to atmospheric conditions. By the expression "accelerated air drying" is to be understood, in this specification, unless otherwise stated, a process where the drying is carried out using at least one fan to force the air through the object to be dried. By the expression "kiln drying" is to be understood, in this specification, unless otherwise stated, drying taking place at higher temperatures and under faster air circulation for significantly increasing the drying rate. By the expression "contact drying" is to be understood, in this specification, unless otherwise stated, heat transfer taking place between solid objects in thermal contact, such as in hot-pressing.

[0020] The coating comprising a hydrophobic agent and a film containing coating agent is situated on at least one surface of the plywood facing the exterior. In one embodiment of the present invention the coating comprising a hydrophobic agent and a film containing coating agent is situated on at least one side of the plywood. The coating comprising a hydrophobic agent and a film containing coating agent provided on the at least one surface of the plywood has the advantage of preventing swelling of the outermost veneer when contacting e.g. water or moisture. The use of the hydrophobic agent has the added utility that it is able to penetrate into the wood grains of the veneer. As a result of this effect spreading of water through possible holes formed in the coating of the plywood and swelling of the grains of the top veneer can be reduced or prevented.

[0021] In one embodiment of the present invention the plywood is surrounded by a coating. In one embodiment of the present invention, the method comprises forming a coating on the surfaces of both of the outermost veneers of the plywood. In one embodiment of the present invention, the method comprises forming a coating comprising a film con-

taining coating agent, which coating agent comprises resin, on the surfaces of both of the outermost veneers of the plywood. In one embodiment of the present invention, the method comprises forming a coating comprising hydrophobic agent and a film containing coating agent, which coating agent comprises resin, on the surfaces of both of the outermost veneers of the plywood.

[0022] In one embodiment of the present invention the aqueous composition comprising hydrophobic agent is an aqueous emulsion comprising hydrophobic agent.

[0023] In one embodiment of the present invention the hydrophobic agent is selected from a group consisting of waxes, oils, alkyl ketene dimer (AKD), silicone, silicone oil, and their combinations. In one embodiment of the present invention the hydrophobic agent is paraffin wax, microcrystalline wax, natural wax, and/or slack wax. In one embodiment of the present invention the hydrophobic agent is natural oil. In one embodiment of the present invention the hydrophobic agent is paraffin wax, microcrystalline wax, or alkyl ketene dimer. Alkyl ketene dimer is a waxy solid material dispersed as small particles in a solution. In one embodiment, the hydrophobic agent is tall oil fatty acid. In one embodiment the hydrophobic agent is stearine.

[0024] The coating agent comprises resin. In one embodiment of the present invention the resin is a phenolic resin, an amino resin or a combination of phenolic resin and amino resin. In one embodiment of the present invention the resin is a phenolic resin. In one embodiment of the present invention, the coating agent consists of phenolic resin.

[0025] The phenolic resin can be prepared by using at least polymerizable substance and crosslinking agent, wherein at least part of the polymerizable substance is phenol. In one embodiment of the present invention at least 50 weight-% of the polymerizable substance is phenol. In one embodiment of the present invention the polymerizable substance comprises lignin. In one embodiment the crosslinking agent is formaldehyde. In one embodiment of the present invention catalyst and water are used for preparing the phenolic resin. In one embodiment of the present invention the phenolic resin is a phenol-formaldehyde resin. In one embodiment of the present invention the phenolic resin is modified by urea, melamine, lignin, tannin resorcinol, modified phenols, cresols, bisphenols or by any combination thereof.

[0026] In one embodiment of the present invention at least 50 weight-%, and preferably at least 90 weight-% of the resin is phenolic resin.

[0027] In one embodiment of the present invention 115 - 240 g/m², and preferably 200 - 230 g/m², of film containing coating agent is applied on the dried aqueous composition comprising hydrophobic agent.

[0028] In one embodiment of the present invention the veneers are glued together with a binder composition. In one embodiment of the present invention the veneers are glued together with an aqueous binder composition. In one embodiment of the present invention the veneers are glued together with a binder composition under the influence of pressing. The use of pressing has the added utility of allowing direction of the binder composition into the veneers. In one embodiment of the present invention, pressing comprises cold-pressing followed by hot-pressing. Cold-pressing has the effect of directing the binder composition into the veneers already before the curing process is started. Especially, the cold-pressing assists in allowing smaller molecules to penetrate deeper into the veneer whereby the amount of binder composition can be increased.

[0029] In one embodiment of the present invention the aqueous binder composition is an aqueous phenolic resin.

[0030] In one embodiment of the present invention wherein the outermost veneer of the plywood, on which the coating comprising the hydrophobic agent and the film containing coating agent is formed, is a birch veneer and fulfills the quality class III, and preferably the quality class II, according to standard EN-635.

[0031] In one embodiment of the present invention the veneers following said outermost veneer of the plywood are birch veneers and they fulfill the quality class of K2, K3, or K4 according to the below table:

	Knothole maximum diameter	Maximum crack (width*length)	firm rot	Peeling defect
K1	6	3*300	not allowed	not allowed
K2	15	5*600	allowed	not allowed
K3	25	7*600	allowed	not allowed
K4	50	10*600	allowed	allowed as broad

[0032] The peeling defect, which may result from the rotary peeling or rotary cutting process, is considered to be an elongated scratch having a transverse direction in relation to the grain direction of the veneer. The terms "hard rot" or "sound rot" could be equally well used instead of the term "firm rot".

[0033] In one embodiment of the present invention the veneers of the plywood are made of softwood. In one embodiment of the present invention the veneers of the plywood are made of hardwood.

[0034] In one embodiment of the present invention, the density of the wood material from which the veneer is formed is 320 - 750 kg/m³, and preferably 390 - 650 kg/m³. In one embodiment of the present invention the density of the wood

material from which the veneer is formed is 390 - 550 kg/m³ or 520 - 650 kg/m³. In one embodiment of the present invention the density of the wood material from which the veneer is formed is 450 - 570 kg/m³. The above density values are measured in accordance with standards SFS-EN 384 and ISO 3131 (SFS-EN 384 - Structural timber - Determination of characteristic values of mechanical properties and density (2010), and ISO 3131 - Wood - Determination of density

for physical and mechanical tests (1975)).

[0035] In one embodiment of the present invention the veneers of the plywood are selected from a group consisting of pine veneer, poplar veneer, beech veneer, aspen veneer, spruce veneer, and birch veneer.

[0036] In one embodiment of the present invention at least the first veneer of the plywood, as calculated from the surface on which the coating is formed, is a birch veneer, preferably at least the four, five, or six first veneers of the plywood, as calculated from the surface on which the coating is formed, are birch veneers, and preferably all the veneers of the plywood are birch veneers.

[0037] In one embodiment of the present invention at least one veneer is manufactured by one of rotary cutting, flat slicing, quarter slicing, half-round slicing, and rift cutting. These methods are known as such in plywood manufacturing, and different methods result in a slightly different visual appearance of the veneer. Rotary cutting may also be referred to as rotary peeling, turning or rotary turning. In one embodiment of the present invention, the at least one veneer is manufactured by rotary cutting. In one embodiment of the present invention, all the veneers of the plywood, are manufactured by rotary cutting. In one embodiment of the present invention, at least 80 %, and preferably 100 %, of the veneers of the plywood are manufactured by rotary cutting.

[0038] In one embodiment of the present invention the thickness of at least one veneer of the plywood is 0.5 - 4 mm, preferably 1 - 3.6 mm, and more preferably 1.3 - 3.0 mm. In one embodiment of the present invention the thickness of at least one veneer of the plywood is 1.3 - 3.0 mm. The thicknesses of the veneers of the plywood can be the same for each veneer or can vary from one veneer to another. In one embodiment of the present invention, the veneers of plywood have one and the same thickness. In one embodiment of the present invention, the veneers of the plywood have different thicknesses. In one embodiment of the present invention at least 20 % of the veneers of the plywood have a thickness which is at least 0.2 mm, and preferably at least 0.5 mm less or more than the thickness of the rest of the veneers of the plywood. In one embodiment of the present invention at least 20 % of the veneers of the plywood have a thickness of 0.2 - 3.5 mm, and preferably 0.5 - 2 mm, less or more than the thickness of the rest of the veneers in plywood. In one embodiment of the present invention all the veneers of the plywood are equally thick, with the precision of 0.2 mm.

[0039] The moisture percentage of the different veneers used for producing the plywood can vary. In one embodiment of the present invention the average moisture percentage of the veneers to be used for producing plywood before being glued together is 1 - 9, and preferably 2 - 6. The above moisture values are measured in accordance with standard SFS-EN 322 (Wood-based panels. Determination of moisture content (1993)).

[0040] In one embodiment of the present invention at least one veneer is modified by heat treatment, chemical treatment, mechanical treatment, or by a combination thereof. In one embodiment of the present invention at least one veneer is modified by chemical treatment. When the veneers are modified or pretreated the dimensional stability thereof can be increased.

[0041] In one embodiment of the present invention the coating comprises one or more layers.

[0042] The embodiments of the invention described hereinbefore may be used in any combination with each other. Several of the embodiments may be combined together to form a further embodiment of the invention. The method and the plywood, to which the invention is related, may comprise at least one of the embodiments of the invention described hereinbefore.

[0043] An advantage of the method according to the present invention is that it results in plywood having a coating, the adhesion of which to the surface of the plywood is strong.

[0044] An advantage of the method according to the present invention is that it allows forming a uniform and even coating on the plywood surface, as the amount of water penetrating into wood grains of the veneer and causing swelling, is reduced.

[0045] An advantage of the plywood according to the present invention is that the coating on the at least one surface of the plywood prevents e.g. moisture and water from penetrating into the wood material of the veneers. Especially the use of the hydrophobic agent provides protection of the veneers even in case of holes being formed in the layer of coating agent.

[0046] An advantage of using the coating on at least one surface of the plywood is that the durability or the life-time of the plywood is increased.

EXAMPLES

[0047] Reference will now be made in detail to the embodiments of the present invention.

[0048] The description below discloses some embodiments of the invention in such a detail that a person skilled in the art is able to utilize the invention based on the disclosure. Not all steps of the embodiments are discussed in detail,

as many of the steps will be obvious for the person skilled in the art based on this specification.

EXAMPLE 1 - Producing plywood having a coating on one surface thereof

[0049] In this example plywood comprising a number of veneers and having a coating on one surface thereof was formed. A plywood comprising thirteen birch veneers was formed by gluing the veneers together with a binder composition by a hot-pressing procedure. The surface of the other of the two outermost veneers of the plywood was coated in the following manner.

[0050] Firstly an aqueous emulsion of paraffin wax was applied on said outermost veneers in an amount of 110 g/m². The aqueous emulsion contained 30 weight-% of paraffin wax. The aqueous emulsion of paraffin wax that was applied on the surface of the outermost veneer was then dried by keeping the plywood with the applied aqueous emulsion of paraffin at room temperature for two (2) days until the amount of applied aqueous emulsion of paraffin on the surface of the outermost veneer was 64 g/m². Then a film containing coating agent (220 g/m²), formed by impregnating phenolic resin (phenol-formaldehyde resin) in a piece of paper sheet, was applied on the aqueous emulsion to form a coating on the outermost veneer of the plywood. The film containing coating agent was applied at a temperature of 138 °C under a maximum pressure of 1.8 MPa for 5 minutes.

Examples 2 - Producing plywood having a coating on one surface thereof

[0051] The procedure described for Example 1 was repeated by varying the parameters of the used amount of aqueous emulsion of paraffin wax and the applied amount of the aqueous emulsion as well as the drying time. The below samples were prepared and tested with the below test results.

[0052] The amount of drying was determined by weighting the samples directly after having applied the hydrophobic agent and after the drying procedure. The drying procedure was carried out directly after having applied the hydrophobic agent. The drying procedure was carried out in a drying oven consisting of three adjustable drying zones of 40°C, 60°C and 60°C, respectively, and the total drying time was 2 minutes.

Surface treatment	Weight after application of hydrophobic agent (g/m ²)	Weight after the drying procedure (g/m ²)	Amount of water evaporation (g/m ²)
Wax emulsion (wax dry content 30 %)	103	79	24
Wax emulsion (wax dry content 30 %)	106	81	25
Wax emulsion (wax dry content 30 %)	119	80	39
Wax emulsion (wax dry content 45 %)	107	76	31
Wax emulsion (wax dry content 45 %)	107	76	31

COMPARATIVE EXAMPLE 1 - Producing plywood having a coating on one surface thereof

[0053] The procedure described above for Example 1 was repeated with the exception that no drying of the applied aqueous emulsion of paraffin wax was carried out before the film containing coating agent was applied thereon.

[0054] The plywoods produced according to Example 1 and Comparative example 1, respectively, were tested according to standard ASTM E308 (Standard Practice for Computing the Colors of Objects by Using the CIE System). The results can be seen in Fig. 1 and Fig. 2.

[0055] From the results it can be seen that the ΔE -value, L-value and a-value are higher for the plywood that has not been dried before applying the film containing coating agent. This means that the color of the plywood looks lighter and redder, and this color difference is clearly visible to the eye.

[0056] The plywoods produced according to Example 1 and Comparative example 1 were also analyzed for their surface smoothness variation or surface roughness. The surface roughness was measured with a dial gauge at one millimeter intervals. The results are presented in Fig. 3. From the results it can be seen that the variation in surface roughness is about double in samples, which were not dried before applying the film containing coating agent. When the film containing coating agent is applied in wet condition as in the case of Comparative example 1, the wood grains

and lathe checks can be seen and felt through the film faced surface. So wet coating has an effect on the visual properties and also on the technical properties. This unevenness in plywood surface is mirrored on the concrete surface in case of casting.

[0057] From the received results it can be summarized that the emulsion of paraffin wax easily penetrates into the wood cell walls of the plywood and thus swells the wood. The adhesion of the film containing coating agent to the wet and swelled wood surface results in uneven plywood surface. When the aqueous composition of hydrophobic agent is dried before the film containing coating agent is applied thereon, the resulting surface is uniform and even.

[0058] It is obvious to a person skilled in the art that with the advancement of technology, the basic idea of the invention may be implemented in various ways. The invention and its embodiments are thus not limited to the examples described above; instead they may vary within the scope of the claims.

Claims

1. A method for producing plywood comprising a number of veneers, which are glued together with a binder composition, and having a coating on at least one surface of the plywood, wherein the method comprises:
 - applying an aqueous composition comprising at most 60 weight-% of hydrophobic agent on at least one surface of the plywood in an amount of at least 70 g/m²;
 - drying the applied aqueous composition comprising hydrophobic agent for reducing the amount of the aqueous composition with at least 10 weight-%; and
 - applying a film containing coating agent, wherein the coating agent comprises resin, in an amount of 20 - 300 g/m² on the dried aqueous composition comprising hydrophobic agent for forming a coating comprising hydrophobic agent and a film containing coating agent, on the at least one surface of the plywood.
2. The method of claim 1, wherein an aqueous composition comprising at most 50 weight-% of hydrophobic agent is applied on at least one surface of the plywood.
3. The method of any one of claims 1 - 2, wherein the aqueous composition comprising hydrophobic agent is applied on the at least one surface of the plywood in an amount of at least 100 g/m², and preferably at least 110 g/m².
4. The method of any one of claims 1 - 2, wherein the aqueous composition comprising hydrophobic agent is applied on the at least one surface of the plywood in an amount of 70 - 150 g/m², and preferably in an amount of 105 - 130 g/m².
5. The method of any one of claims 1 - 4, wherein drying of the applied aqueous composition comprising hydrophobic agent is carried out until the amount of water in the aqueous composition comprising hydrophobic agent is at most 60 g/m².
6. The method of any one of claims 3 - 4, wherein drying of the applied aqueous composition comprising hydrophobic agent is carried out until the amount of water in the aqueous composition comprising hydrophobic agent is at most 80 g/m², preferably at most 70 g/m², and more preferably at most 60 g/m².
7. The method of any one of claims 1 - 6, wherein drying of the applied aqueous composition comprising hydrophobic agent is carried out by at least one of air drying, accelerated air drying, kiln drying, contact drying and IR-radiation.
8. The method of any one of claims 1 - 7, wherein the method comprises forming a coating on the surfaces of both of the outermost veneers of the plywood.
9. The method of any one of claims 1 - 8, wherein the method comprises forming a coating comprising a film containing coating agent, which coating agent comprises resin, on the surfaces of both of the outermost veneers of the plywood.
10. The method of any one of claims 1 - 9, wherein the method comprises forming a coating comprising hydrophobic agent and a film containing coating agent, which coating agent comprises resin, on the surfaces of both of the outermost veneers of the plywood.
11. The method of any one of claims 1 - 10 wherein the aqueous composition comprising hydrophobic agent is an aqueous emulsion comprising hydrophobic agent.

EP 2 957 351 A1

12. The plywood of any one of claims 1 - 11, wherein the hydrophobic agent is selected from a group consisting of waxes, oils, alkyl ketene dimer, silicone, silicone oil, and their combinations.
- 5 13. The plywood of any one of claims 1 - 12, wherein the hydrophobic agent is paraffin wax, microcrystalline wax, natural wax, and/or slack wax.
14. The plywood of any one of claims 1 - 13, wherein the hydrophobic agent is paraffin wax, microcrystalline wax, or alkyl ketene dimer.
- 10 15. The method of any one of claims 1 - 14, wherein at least 50 weight-%, and preferably at least 90 weight-% of the resin is phenolic resin.
16. The method of any one of claims 1 - 15, wherein 115 - 240 g/m², and preferably 200 - 230 g/m², of film containing coating agent is applied on the dried aqueous composition comprising hydrophobic agent.
- 15 17. The plywood of any one of claims 1 - 16, wherein the resin is a phenolic resin, an amino resin or a combination of phenolic resin and amino resin.
18. The plywood of any one of claims 1 - 17, wherein the resin is a phenolic resin.
- 20 19. A plywood comprising a number of veneers, which are glued together with a binder composition, and having a coating on at least one surface of the plywood, wherein the coating comprises a hydrophobic agent and a film containing coating agent, which coating agent comprises resin, obtainable by the method of any one of claims 1 - 18.

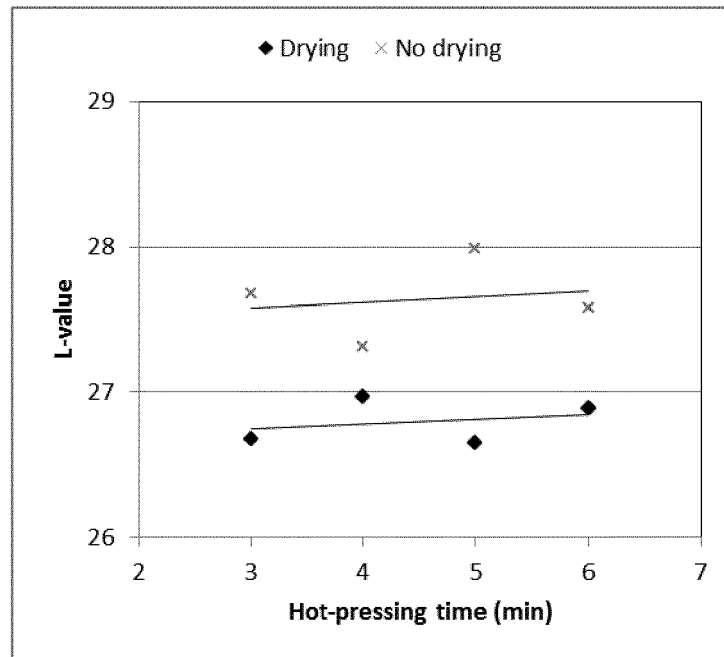


Fig. 1

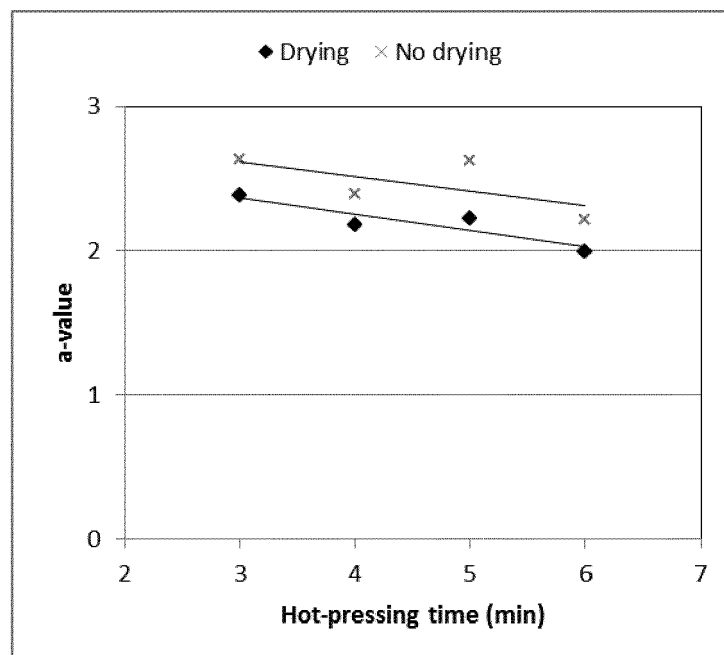


Fig. 2

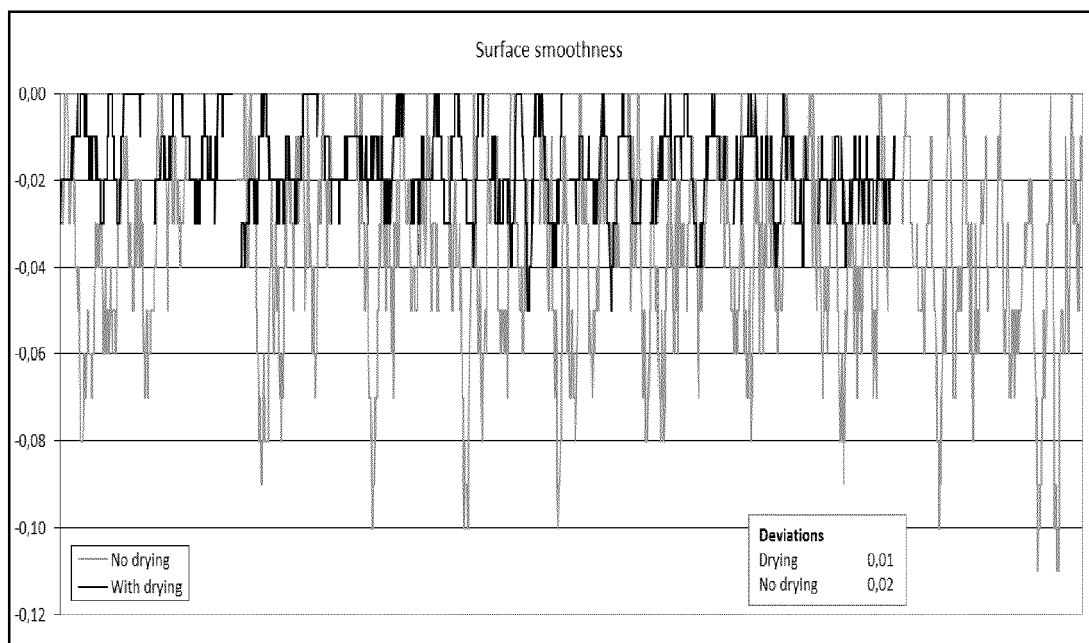


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2862

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2007/088245 A1 (UPM KYMMENE WOOD OY [FI]; HANNUKAINEN JOUKO [FI]; TIUSANEN GATJA [FI]) 9 August 2007 (2007-08-09) * page 3, line 31 - page 5, line 22 * * examples 1-3 * * claims *	1-19	INV. B05D5/00 B05D7/00 B05D3/00 B27N7/00
A	WO 2009/156594 A1 (DYNEA OY [FI]; METSAELIITTO OSUUSKUNTA [FI]; SILVENTOINEN ILPO [FI]; S) 30 December 2009 (2009-12-30) * page 1, line 8 - line 24 * * page 2, line 4 - page 3, line 14 * * page 4, line 3 - page 5, line 19 * * page 6, line 11 - line 30 * * examples 1,2 * * claims *	1-19	
A	WO 02/090069 A1 (WACKER CHEMIE GMBH [DE]; LAUBENDER THOMAS [DE]; KILLERMANN MICHAEL [AT]) 14 November 2002 (2002-11-14) * page 3, line 21 - line 35 * * page 10, line 33 - page 11, line 33 * * page 16, line 10 - line 11 * * page 19, line 14 - line 15 * * claims 1,6,7 *	1-19	TECHNICAL FIELDS SEARCHED (IPC) B05D B27N
A	EP 2 730 382 A1 (METSAELIITTO OSUUSKUNTA [FI]) 14 May 2014 (2014-05-14) * paragraphs [0018], [0028], [0029], [0030], [0044], [0045], [0052]; claims *	1-19	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 January 2015	Examiner Mazet, Jean-François
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 17 2862

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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