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(54) **Lignocellulosic-material-based product and manufacturing method thereof**

Produkt auf der Basis von lignozellulosehaltigen Materialien und Verfahren zu seiner Herstellung

Produit à base de matériaux lignocellulosiques et son procédé de fabrication

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(56) References cited:
EP-A- 0 312 512
EP-A- 0 484 101
US-A- 1 718 096
US-A- 5 147 505

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Description

The present invention relates to a method in accordance with the preamble of claim 1 and a lignocellulosic-material based product according to the preamble of Claim 7.

Multi-ply products belong to the well-known prior art. For instance, EP-A-0484101 discloses a paper towel having two outer layers of chemical fiber blend of chemical softwood and hardwood fiber and a center layer of an anfractuous high bulk softwood fiber blend of anfractuous fiber and long mechanical pulp fiber.

Multi-ply products such as multi-ply paper, board or cardboard comprise more than two plies. Typically, multi-ply board comprises three different plies so that the top-liner plies may have identical composition. Correspondingly, the center web ply may typically be formed by a web comprising one or more plies of identical composition which are couched together. As known, a multi-ply board acts as a hollow-core beam structure in which the maximum stiffness is attained by a composition having its center ply from a material of maximally high bulk and the outer plies of a liner material of maximally high Young's modulus. Optimally this concept can be utilized by forming the liner and center plies from entirely different types of pulps. A board having the maximum possible bulk is achieved by using mechanical or chemimechanical pulp in the center ply (conventional folding boxboard).

However, mechanical pulps do not offer as high brightness and strength as chemical pulps. Hence, foodstuff packaging and graphic art principally uses board grades made from groundwood-free pulp and having their center ply also made from chemical pulp. Resultingly, the manufacture of foodstuff packaging and graphic art boards have involved product lines requiring a high degree of conversion and special skills.

The manufacture of mechanical pulps uses softwood almost exclusively. In the pulping process, particularly in the grinding step, long softwood fibers are cut and shortened so that the formation of the center ply made thereof takes place in a satisfactory manner. By contrast, long softwood fibers undergoing the chemical pulping process are not subjected to such severe cutting, whereby the formation properties of the produced pulp are extremely unfavourable. To achieve proper formation, the center ply of board made from chemical pulp is formed from hardwood pulp although its bulk (particularly that of deciduous wood pulp) is generally inferior and thus adverse to the goal of achieving an advantageous structure for the beam structure of the board center ply.

Softwood pulp, particularly pinewood pulp, contains fibers which give advantageous properties to the outer and center plies of a three-ply board. However, softwood pulp at the fiber level is not a homogeneous raw material, but rather, comprises two entirely different fiber types: thick-walled summerwood fibers and thin-walled springwood fibers. With the exception of the fiber length, summerwood fibers of softwood pulp are an ideal raw material for the center ply of a board made from chemical pulp. The bulk of a sheet made therefrom is approx. 40 % better than that of a sheet made from birch pulp. Again with the exception of the fiber length, springwood fibers of softwood pulp are an extremely advantageous raw material for the liner ply of a board, particularly if the board will be coated. Such band-shaped fibers form a well closed surface, do not increase the roughness of the surface texture in the same manner as conventional softwood pulp (relative to birch pulp), and additionally, improve the Young's modulus of the liner ply thus contributing to the achievement of maximum stiffness.

According to the invention is has recently been discovered that the different properties required for the liner and center plies of a multi-ply board can be achieved by utilizing the characteristics of the extremely different fiber types contained in the annual growth of softwood. Although currently known industrial-scale processes fail to achieve completely pure fractions, it is possible to prove on the basis of properties offered by fractions purified through a fractionation process that the stiffness of, e.g., a three-ply board made from chemical pulp can be improved by approx. 30 % relative to conventional board grades. The fibers of softwood pulp can be cut so effectively through refining that a multi-ply product according to the invention can be made using very high proportions of softwood pulp without impairing the properties of the board. It is an object of the invention to improve the fractionation techniques suited for essentially improving the properties of softwood pulp as a raw material of a multi-ply product such as three-ply board made from chemical pulp.

The production of a multi-ply product according to the invention aims at maximally effective fractionation summerwood and springwood fibers. For the liner plies, such fractionated pulp is used which is enriched maximally pure in springwood fibers. The characterizing properties of the method and product structure according to the invention are disclosed in the appended claims.

The invention is characterized by having the at least one center ply of the multi-ply product enriched with thick-walled summerwood fibers of softwood, further advantageously having the liner plies of the multi-ply product enriched with thinwalled and/or band-shaped springwood fibers of softwood. A particularly advantageous embodiment of the method and product structure according to the invention is characterized by having the liner plies of a multi-ply product, most preferably a multi-ply board, formed from softwood pulp or a mixture of softwood and hardwood pulp, whereby the softwood pulp fraction is enriched with thin-walled springwood fibers, and further having the at least one center ply of a multi-ply board formed from a reject fraction of softwood pulp or a mixture of a reject fraction of softwood pulp and hardwood pulp, said reject fraction resulting from

the separation of the springwood fibers and thus being enriched with thick-walled summerwood fibers.

To one skilled in the art it is obvious that the different embodiments of the invention are not limited by the exemplifying embodiments described above, but rather, can be varied within the scope of the annexed claims.

Claims

1. A method for manufacturing a lignocellulosic-material-based product, in which method the product is formed from multiple plies of cellulosic fibers into a multi-ply product comprising liner plies and at least one center ply interleaved between the liner plies, **characterized**in that said at least one center ply of the multi-ply product is enriched with thick-walled summerwood fibers of softwood.

2. A method as defined in claim 1, **characterized**in that the liner plies of the multi-ply product are enriched with thin-walled and/or band-shaped springwood fibers of softwood.

3. A method as defined in claim 1 or 2, **characterized** in that the fractions of summerwood and springwood fibers are obtained from softwood pulp, advantageously pinewood pulp.

4. A method as defined in any foregoing claim, **characterized**in that said multi-ply product is multi-ply board, cardboard or paper.

5. A method as defined in any foregoing claim, **characterized** in that the liner plies of the multi-ply product, advantageously multi-ply board, are formed from a softwood fraction enriched with thin-walled springwood fibers and that the at least one center ply of the multi-ply board is formed from the reject fraction resulting from the separation of springwood fibers, said reject fraction being enriched with thick-walled summerwood fibers.

6. A method as defined in any of claims 1-4, **characterized**in that the liner plies of the multi-ply product, advantageously multi-ply board, are formed from a mixture of softwood and hardwood pulps having the softwood fraction enriched with thin-walled springwood fibers and that the at least one center ply of the multi-ply board is formed from a mixture of a reject fraction of softwood pulp and hardwood pulp, said reject fraction of softwood pulp resulting from the separation of springwood fibers and thus being enriched with thick-walled summerwood fibers.

7. Lignocellulosic material based product formed from multiple plies of cellulosic fibers into a multi-ply product comprising liner plies and at least one center ply interleaved between said liner plies, **characterized** in that said at least one center ply of the multi-ply product is enriched with thick-walled summerwood fibers of softwood.

8. Lignocellulosic material based product as defined in claim 7, **characterized** in that the liner plies of said multi-ply product are enriched with thin-walled and/or band-shaped springwood fibers of softwood.

9. Lignocellulosic material based product as defined in claim 7 - 8, **characterized**in that said multi-ply product is multi-ply board, cardboard or paper.

10. Lignocellulosic material based product as defined in claims 7 - 9, **characterized** in that the liner plies of the multi-ply product, advantageously multi-ply board, are formed from a softwood fraction enriched with thin-walled springwood fibers and that the at least one center ply of the multi-ply board is formed from the reject fraction resulting from the separation of the springwood fibers, said fraction being enriched with thick-walled summerwood fibers.

11. Lignocellulosic material based product as defined in claims 7 - 9 **characterized** in that the liner plies of the multi-ply product, advantageously multi-ply board, are formed from a mixture of softwood and hardwood pulps having the softwood fraction enriched with thin-walled springwood fibers and that the at least one center ply of the multi-ply board is formed from a mixture of a reject fraction of softwood pulp and hardwood pulp, said reject fraction of softwood pulp resulting from the separation of springwood fibers and thus being enriched with thick-walled summerwood fibers.

Patentansprüche

1. Verfahren zur Herstellung eines Produkts auf der Basis von lignocellulosehaltigem Material, wobei in dem Verfahren das Produkt aus Mehrfachlagen von Cellulosefasern zu einem Multiplexprodukt, umfassend Decklagen und mindestens eine mittige Schicht zwischen den Decklagen, gebildet wird, dadurch gekennzeichnet, daß die mindestens eine mittige Schicht des Multiplexprodukts mit dickwandigen Sommerholzfasern von Nadelholz angereichert ist.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts mit dünnwandigen und/oder bandförmigen Frühholzfasern von Nadelholz angereichert sind.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Fraktionen von Sommerholz

und Frühholzfasern aus Nadelholzzellstoff, vorzugsweise Kiefernholzzellstoff, erhalten werden.

4. Verfahren nach einem vorangehenden Anspruch, dadurch gekennzeichnet, daß das Multiplexprodukt Multiplexpappe, Karton oder Papier ist.

5. Verfahren nach einem vorangehenden Anspruch, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts, vorzugsweise Multiplexpappe, aus einer Nadelholzfraktion, angereichert mit dünnwandigen Frühholzfasern, gebildet wird und daß die mindestens eine mittige Schicht der Multiplexpappe aus der Spuckstofffraktion gebildet wird, die aus der Abtrennung von Frühholzfasern stammt, wobei die Spuckstofffraktion mit dickwandigen Sommerholzfasern angereichert ist.

6. Verfahren nach einem der Ansprüche 1-4, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts, vorzugsweise Multiplexpappe, aus einem Gemisch von Nadelholz- und Laubholzzellstoffen gebildet wird, wobei die Nadelholzfraktion mit dünnwandigen Frühholzfasern angereichert ist, und daß die mindestens eine mittige Schicht der Multiplexpappe aus einem Gemisch einer Spuckstofffraktion von Nadelholzzellstoff und Laubholzzellstoff gebildet wird, wobei die Spuckstofffraktion des Nadelholzzellstoffs aus der Abtrennung von Frühholzfasern stammt und somit mit dickwandigen Sommerholzfasern angereichert ist.

7. Produkt auf der Basis von lignocellulosehaltigem Material, gebildet aus Mehrfachlagen von Cellulosefasern zu einem Multiplexprodukt, umfassend Decklagen und mindestens eine mittige Schicht zwischen den Decklagen gelagert, dadurch gekennzeichnet, daß die mindestens eine mittige Schicht des Multiplexprodukts mit dickwandigen Sommerholzfasern von Nadelholz angereichert ist.

8. Produkt auf der Basis von lignocellulosehaltigem Material nach Anspruch 7, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts mit dünnwandigen und/oder bandförmigen Frühholzfasern von Nadelholz angereichert sind.

9. Produkt auf der Basis von lignocellulosehaltigem Material nach Anspruch 7-8, dadurch gekennzeichnet, daß das Multiplexprodukt Multiplexpappe, Karton oder Papier ist.

10. Produkt auf der Basis von lignocellulosehaltigem Material nach Ansprüchen 7-9, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts, vorzugsweise Multiplexpappe, aus einer Nadelholzfraktion, angereichert mit dünnwandigen Frühholzfasern, gebildet wird und daß die mindestens eine mittige Schicht der Multiplexpappe aus der Spuckstofffraktion gebildet wird, die aus der Abtrennung von Frühholzfasern stammt, wobei die Fraktion mit dickwandigen Sommerholzfasern angereichert ist.

11. Produkt auf der Basis von lignocellulosehaltigem Material nach Ansprüchen 7-9, dadurch gekennzeichnet, daß die Decklagen des Multiplexprodukts, vorzugsweise Multiplexpappe, aus einem Gemisch von Nadelholz- und Laubholzzellstoffen gebildet wird, wobei die Nadelholzfraktion mit dünnwandigen Frühholzfasern angereichert ist, und daß die mindestens eine mittige Schicht der Multiplexpappe aus einem Gemisch einer Spuckstofffraktion von Nadelholzzellstoff und Laubholzzellstoff gebildet wird, wobei die Spuckstofffraktion des Nadelholzzellstoffs aus der Abtrennung von Frühholzfasern stammt und somit mit dickwandigen Sommerholzfasern angereichert ist.

Revendications

1. Méthode de fabrication d'un produit à base de matériau lignocellulosique, méthode dans laquelle le produit est formé de couches multiples de fibres cellulosiques en un produit multicouche comprenant des couches extérieures et au moins une couche centrale intercalée entre les couches extérieures caractérisée en ce que ladite au moins une couche centrale du produit multicouche est enrichie de fibres de bois d'été à paroi épaisse en un bois tendre.

2. Méthode selon la revendication 1, caractérisée en ce que les nappes externes du produit multicouches sont enrichies de fibres de bois de printemps à paroi mince et/ou en forme de bandes en un bois tendre.

3. Méthode selon la revendication 1 ou 2, caractérisée en ce que les fractions de fibres de bois d'été et de bois de printemps sont obtenues à partir d'une pâte de bois tendre, avantageusement de pâte de pin.

4. Méthode selon l'une quelconque des revendications précédentes, caractérisée en ce que ledit produit multicouche est un panneau, du carton ou du papier multicouche.

5. Méthode selon l'une quelconque des revendications précédentes, caractérisée en ce que les couches extérieures du produit multicouche avantageusement un panneau multicouche, sont formées d'une fraction de bois tendre enrichie de fibres de bois de printemps à paroi mince et en ce que la au moins une couche centrale du panneau multicouche est formée de la fraction de rejet résultant de

la séparation des fibres de bois de printemps, ladite fraction de rejet étant enrichie en fibres de bois d'été à paroi épaisse.

6. Méthode selon l'une quelconque des revendications 1 à 4, caractérisée en ce que les couches extérieures du produit multicouche, avantageusement un panneau multicouche, sont formées d'une mélange de pâtes de bois tendre et de bois dur ayant la fraction de bois tendre enrichie de bois de printemps à paroi mince et en ce que la au moins une couche centrale du panneau multicouche est formé d'un mélange d'une fraction de rejet de pâte de bois tendre et de pâte de bois dur, ladite fraction de rejet de pâte de bois tendre résultant de la séparation des fibres de bois de printemps et étant ainsi enrichie en fibres de bois d'été à paroi épaisse.

7. Produit à base de matériau lignocellulosique formé de couches multiples de fibres cellulosiques en un produit multicouche comprenant des couches extérieures et au moins une couche centrale intercalée entre lesdites couches extérieures, caractérisé en ce que ladite au moins une couche centrale du produit multicouche est enrichie en fibres de bois d'été à paroi épaisse en un bois tendre.

8. Produit à base de matériau lignocellulosique selon la revendication 7, caractérisé en ce que les couches extérieures dudit produit multicouche sont enrichies en fibres de bois de printemps à paroi mince et/ou en forme de bandes en un bois tendre.

9. Produit à base de matériau lignocellulosique selon l'une quelconque des revendications 7 à 8, caractérisé en ce que ledit produit multicouche est un panneau, du carton ou du papier multicouche.

10. Produit à base de matériau lignocellulosique selon l'une quelconque des revendications 7 à 9, caractérisé en ce que les couches extérieures du produit multicouche, avantageusement un panneau multicouche, sont formées d'une fraction de bois tendre enrichie de fibres de bois de printemps à paroi mince et en ce que la au moins une couche centrale du panneau multicouche est formée de la fraction de rejet résultant de la séparation des fibres de bois de printemps, ladite fraction étant enrichie en fibres de bois d'été à paroi épaisse.

11. Produit à base de matériau lignocellulosique selon l'une quelconque des revendications 7 à 9, caractérisé en ce que les couches extérieures du produit multicouche, avantageusement un panneau multicouche, sont formées d'un mélange de pâtes de bois tendre et de bois dur ayant la fraction de bois tendre enrichie en fibres de bois de printemps à paroi mince et en ce que la au moins une couche centrale du panneau multicouche est formée d'un mélange d'une fraction de rejet de pâte de bois tendre et de pâte de bois dur, ladite fraction de rejet de pâte de bois tendre résultant de la séparation des fibres de bois de printemps et étant ainsi enrichie de fibres de bois d'été à paroi épaisse.