



HU000030917T2

(19) **HU****MAGYARORSZÁG****Szellemi Tulajdon Nemzeti Hivatala**(11) Lajstromszám: **E 030 917**(13) **T2**

EURÓPAI SZABADALOM SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 13 701407**(22) A bejelentés napja: **2013. 01. 17.**(51) Int. Cl.: **B27N 3/00** (2006.01)**B27N 3/18** (2006.01)

(96) Az európai bejelentés bejelentési száma:

EP 20130701407

(86) A nemzetközi (PCT) bejelentési szám:

PCT/EP 13/050820

(97) Az európai bejelentés közzétételi adatai:

EP 2864087 A1 **2014. 01. 03.**

(87) A nemzetközi közzétételi szám:

WO 14000894

(97) Az európai szabadalom megadásának meghirdetési adatai:

EP 2864087 B1 **2016. 09. 28.**

(30) Elsőbbségi adatok:

102012012408**2012. 06. 25.****DE**

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Fakompozit anyag aerogéllal és a megfelelő gyártási eljárás és használata

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmat az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.



WOOD COMPOSITE MATERIAL WITH AEROGELS AND CORRESPONDING PRODUCTION METHOD AND USE

The present invention relates to a wood composite material according to the preamble of claim 1. The invention also relates to a method for producing a wood composite material as previously defined. Lastly, the invention relates to uses of aerogels in a wood based material panel. A corresponding wood composite material is known for example from EP 2 281 961 A1.

A wood composite material within the context of the present invention is understood to mean a composite material which consists predominantly of wood material, i.e. is produced to an extent of more than 50 % from wood material. The rest of the composite material (less than 50 %) is different material. Wood composite materials can comprise, for example, at least one wood based material panel, in particular at least one chipboard, fibreboard and/or OSB board (OSB = oriented strand board, that is to say a board with oriented strands, i.e. special chips). Examples of wood composite materials also include WPC composite materials (WPC = wood plastic composites), cement-bonded chipboard panels, or the like.

Wood material is understood to mean any form of wood, i.e. both solid wood (uncomminuted wood) or comminuted wood as well as fresh wood or wood that has been obtained from recycling (recycled wood). Comminuted wood comprises, in addition to planks and veneers, also small elements, such as wood chips, wood strands, wood fibres, wood wool, and wood flour. Wood chips are understood in the present case to mean particles of a maximum size (length) of just a few millimetres, for example of at most 10 to 20 mm. Wood chips are used for example in the production of chipboard panels. A distinction must be made from wood strands, which are elongate and relatively large wood particles. Wood strands generally have a length of from 100 to 200 mm and can be up to 1.5 mm thick. Wood strands are used for the production of OSB boards. A further

wood product that is to be distinguished therefrom is wood wool, which is constituted by what are known as fibre chips. Wood wool is generally used as packing cushioning or as insulation material, wherein the fibre chips can be up to 500 mm long. Lastly, wood fibres are known for the production of what are known as fibreboard panels. Wood fibres are elongate, axially arranged wood cells, which are usually obtained from small pieces of wood, such as chips, by evaporation, boiling and chemical or mechanical breaking open (defibration of the wood). High-density fibreboards (HDF boards), medium-density fibreboards (MDF boards) or lightweight fibreboards (LDF boards or low density fibreboard) are produced as a result, by way of example.

Aerogels are highly porous solid bodies in which up to 99.98 % of the volume consists of pores. There are various types of aerogels, those with a silicate base being the most widespread. Other materials, for example with a plastics or carbon base, are used in specific cases. In principle, any metal oxide, polymer, and other materials can be used as a starting base for aerogel synthesis by means of a sol-gel process. Aerogels have a highly dendritic structure, i.e. a branching of particle chains with very many gaps in the form of open pores. These chains have contact points so that the image of a stable, spongy network is ultimately provided. The aggregates thereof have a fractal dimension, i.e. are self-similar to a certain extent. The pore size lies in the nanometre range and the inner surfaces can be extremely large with up to 1000 m² per gram. Aerogels can thus be used, inter alia, as insulation or filter material. In addition, it is possible to incorporate biologically active molecules, proteins, or even entire cells. The fields of use of aerogels will become considerably wider with the discovery of further properties. Aerogels hold 15 records in the Guinness Book of Records for material properties, including "best insulator" and "lightest solid material" or solid material with the lowest density. Since silicate aerogels in particular have been relatively well researched in their various forms, rather accurate details can be given for their spectrum. These properties qualitatively and for the most part also quantitatively equate those of the other aerogels, but with specific inherent characteristics in part. The exact material properties depend on the desired use and can therefore differ quite significantly from one another, depending on the starting material and production process. The high optical

transparency, together with a refractive index of approximately 1.007 to 1.24 and a typical value of 1.02, makes aerogels interesting from an optical viewpoint as well. A silicate aerogel appears milky-blue against a dark background because the silicon dioxide scatters the shorter wavelengths (i.e. the blue components of white light) to a greater extent than the longer-wave radiation.

This effect can also be observed in the form of Rayleigh scattering in daylight in the earth's atmosphere. In spite of its transparent appearance, the aerogel feels like hard plastic foam. Due to this property, it appears matt to transparent (see images on the right) and therefore is also referred to as "frozen smoke" or "blue smoke". The name silica aerogel relates here, however, to the structure and less to the chemical composition of the material. The latter corresponds for example to $\text{SiO}(\text{OH})_y(\text{OR})_z$, with y and z as parameters dependent on the production process (source: <http://de.wikipedia.org/wiki/Aerogel>).

In accordance with DE 197 02 240 A1, aerogels, in particular those that have porosities of more than 60 % and densities below 0.6 g/cm^3 , are transparent, translucent or opaque depending on the production method and have an extremely low thermal conductivity. They are therefore used for example as heat insulation material, as described for example in EP-A-0 171 722. Aerogels in the broader sense, i.e. in the sense of "gel with air as dispersant", are produced by drying a suitable gel. The term "aerogel" in this sense includes aerogels in the narrower sense, i.e. xerogels and cryogels. Here, a dried gel is referred to as an aerogel in the narrower sense when the liquid of the gel is removed to the greatest possible extent at temperatures above the critical temperature and starting from pressures above the critical pressure. If, by contrast, the liquid of the gel is removed sub-critically, for example with formation of a liquid-vapour boundary phase, the resultant gel is also referred to in many cases as a xerogel. Use of the term 'aerogels' in the present application relates to aerogels in the broader sense, i.e. in the sense of "gel with air as dispersant".

Within the sense of the present invention, aerogels are all those as described above.

DE 197 02 240 A1 describes multi-layer composite materials, wherein at least one layer can contain aerogels and this layer can also contain up to 50 vol. % of fillers such as wood flour. Wood flour, in contrast to wood chips, strands and fibres, is constituted by very finely abraded wood having a particle size of less than 0.1 mm (also referred to as wood dust). The aerogels are used to create a heat-insulating composite material which can be produced as easily as possible and in any shape and size.

EP 2 281 961 A1 describes materials in which aerogels are added in the form of particles to form a fibrous material. The fibrous material can also be wood wool. An insulating material is also produced in this way. The produced panels are what are known as wood wool lightweight construction boards (see <http://de.wikipedia.org/wiki/holzwelle-leichtbauplatte>), wherein these differ from chipboards, OSB boards and fibreboards primarily in terms of the geometry of the used wood particles (wood wool). The used binders are also different. Formaldehyde-based binders or those based on PMDI (polymeric diphenylmethane diisocyanate) are used in the case of chipboards, OSB boards and fibreboards, whereas wood wool lightweight construction boards are minerally bonded. No details with regard to the binders used are provided in EP 2 281 961 A1 for the wood-wool-based layers, and the mentioned binders relate exclusively to use in a separate mineral layer.

A wide range of different additives and coating materials are known from the prior art for improving the fire retardant properties of wood based materials, i.e. in particular chipboards, OSB boards and fibreboards, including with auxiliaries and additives. What are known as flame retardants are used in many cases for this purpose. Flame retardants (or fire retardants) are materials that limit, slow down, or prevent the spread of fires (see <http://de.wikipedia.org/wiki/flammschutzmittel>). The known flame retardants are predominantly harmful to health or ecologically harmful or are unsatisfactory in terms of their efficacy. Some of these additives also have a strong colouring capability, such that system parts are exposed to heavy soiling, which increases the maintenance effort disadvantageously, particularly with use of graphite as

fire retardant. The fire protection is of considerable importance in the construction of tall buildings, in interior fittings, and also with the use of wood based materials in vehicle construction.

- 5 On this basis, an object of the present invention is to improve the fire-retardant properties of wood based materials.

10 The problem deduced and presented above is achieved in accordance with a first teaching of the present invention by a wood composite material having the features of claim 1.

Because aerogels are used for the first time in accordance with the invention in a wood based material formed from a wood material in the form of compressed wood chips, strands and/or fibres, specifically either within the compressed wood material and/or
15 in a separate coating on the compressed wood material, which will be explained in greater detail further below, a new material (wood composite material) is created, of which the heat conductivity is heavily reduced. This is advantageous in particular in the case of LDF boards, since these are used in a widespread manner for insulation purposes. The fire-retardant properties of wood based materials are also significantly
20 improved in this way.

The term "compressed" means, here, that a pressed part, for example what is known as a chipboard with use of predominantly wood chips, an OSB board with use of predominantly wood strands, or a fibreboard with use of predominantly wood fibres,
25 preferably an LDF board, is produced in a press from a plurality of wood chips, strands or fibres agglomerated to form what is known as a cake. It should be mentioned that, both in the case that said pressed part has aerogels in its interior and in the case that the pressed part is provided with a coating comprising aerogels, the pressed part is a wood based material body, in particular a wood based material panel, which in the latter case
30 is coated.

The wood material used in accordance with the invention can contain, in addition to the wood chips, strands and/or fibres, also other wood material, as has been mentioned by way of example in the introductory paragraphs, or also cellulose material.

- 5 The wood material is preferably bonded by addition of a binder. However, this is not absolutely necessary. In particular, the previously mentioned formaldehyde-based binders or the binders based on PMDI are used as binder.

10 Various embodiments of the wood composite material body according to the invention will now be defined hereinafter.

In accordance with a further embodiment, it is provided that the aerogels are distributed, in particular uniformly, in the wood material. Here, the proportion of aerogels can increase or reduce towards the surface of the wood composite material or
15 wood based material.

In accordance with one embodiment, it is provided that the aerogels are incorporated in a separate layer (matrix) which is applied to (laminated on) the wood material, in particular to a shaped product produced from the wood material by compression, and
20 which in particular is free from wood particles, wherein the wood material or the shaped product is in particular free from aerogels. In the separate layer or matrix, the aerogels can also be connected to one another by a binder. The binder can be the same binder as in the wood material or shaped product. It should again be mentioned that a shaped product in which a separate layer comprising aerogels has been applied is also
25 considered to be a wood based material, in particular a wood based material panel, specifically a coated wood based material. The wood based material or wood composite material according to the invention can also be provided on both sides with a separate aerogel-containing layer of this type.

In accordance with a further embodiment, it is provided that the thickness of the separate layer containing the aerogels is smaller than the thickness of the compressed wood material or shaped product.

- 5 In accordance with the invention it is provided that the proportion of aerogels in the wood composite material is less than 50 vol. % and lies preferably in a range between 1 and 30 vol. %, particularly preferably in a range between 1 and 20 vol. %.

- 10 Further, provision is made in accordance with the invention so that the wood material of the wood composite material consists to an extent of more than 50 vol. %, preferably more than 75 vol. %, particularly preferably more than 90 vol. %, of wood chips, wherein more than 50 %, preferably more than 75 %, particularly preferably more than 90 %, of the wood chips have a length of less than 50 mm, preferably a length in a range from 1 to 20 mm, particularly preferably a length in a range from 1 to 10 mm. In
- 15 accordance with a further embodiment, it is provided that the wood material of the wood composite material consists to an extent of more than 50 vol. %, preferably more than 75 vol. %, particularly preferably more than 90 vol. %, of wood chips, wherein in particular more than 50 %, preferably more than 75 %, particularly preferably more than 90 %, of the wood chips have a width of less than 10 mm, preferably of less than 5
- 20 mm, particularly preferably of less than 2 mm, and/or a thickness of less than 1.5 mm, preferably of less than 1.0 mm, particularly preferably of less than 0.5 mm.

- Additionally or alternatively, provision is made in accordance with the invention so that the wood material of the wood composite material consists to an extent of more than 50
- 25 vol. %, preferably more than 75 vol. %, particularly preferably more than 90 vol. %, of wood strands, wherein more than 50 %, preferably more than 75 %, particularly preferably more than 90 %, of the wood strands have a width of more than 4.5 mm, particularly preferably a width in a range from 5 to 60 mm, particularly preferably a width in a range from 10 to 50 mm. In accordance with a further embodiment, it is
- 30 provided that the wood material of the wood composite material consists to an extent of more than 50 vol. %, preferably more than 75 vol. %, particularly preferably more than

90 vol. % of wood strands, wherein in particular more than 50 %, preferably more than 75 %, particularly preferably more than 90 %, of the wood strands have a length in a range from 80 to 300 mm, preferably in a range from 90 to 250 mm, particularly preferably in a range from 100 to 200 mm, and/or a thickness of more than 0.5 mm, preferably in a range from 0.6 to 1.8 mm, particularly preferably in a range from 0.6 to 1.5 mm.

In accordance with the invention, provision is made additionally or alternatively so that the wood material of the wood composite material consists to an extent of more than 50 vol. %, preferably more than 75 vol. %, particularly preferably more than 90 vol. %, of wood fibres.

In accordance with a further embodiment, it is provided that the aerogels (in the compressed wood material, i.e. in the pressed part, and/or in the separate layer) are present in the form of granulate, wherein the mean grain size of the aerogels in the wood composite material lies in a range from 0.3 to 4 mm, preferably in a range from 0.5 to 2.5 mm, particularly preferably in a range from 0.8 to 1.8 mm, and/or the mean raw density lies in a range from 0.001 to 0.6 g/cm³, preferably in a range from 0.01 to 0.3 g/cm³, particularly preferably in a range from 0.05 to 0.1 g/cm³. In the case that the aerogels are part of the wood based material or wood composite material in a separate layer, the separate layer can have a thickness that is at least as large as the largest grain size of the aerogels used in the separate layer. If, by way of example, a granulate of aerogels of which the grain size distribution ranges from 0.3 to 4 mm is present in the separate layer, the thickness of the separate layer is preferably at least 4 mm. If, by way of example, a granulate is used in which the maximum grain size of the aerogels is 2 mm, the thickness of the separate layer can thus be at least 2 mm. However, other thicknesses are also conceivable. The thickness of the separate layer can thus lie in a range from 1 to 20 mm, preferably in a range from 1 to 10 mm, particularly preferably in a range from 2 to 8 mm.

In accordance with yet a further embodiment, it is provided that the proportion of the wood material in the form of wood chips, strands and/or fibres (i.e. the proportion of the wood material that is present in the wood composite material in the form of wood chips, strands and/or fibres) is at least 50 % and preferably lies in a range from 50 to 80 vol. %, particularly preferably in a range from 50 to 70 vol. %. In principle, other wood material can also be provided in the wood composite material, but then is not included in the aforementioned proportion.

Lastly, in accordance with yet a further embodiment, it is provided that the wood material of the wood composite material consists to an extent of more than 50 vol. %, preferably more than 75 vol. %, particularly preferably more than 90 vol. %, of wood particles selected from the group containing wood chips, wood strands and wood fibres. In other words, various types of wood particles from the aforementioned group can also occur or be present at the same time in the wood composite material according to the invention. It is thus conceivable that the wood material in the wood composite material is formed both by wood chips and wood strands and/or wood fibres, or both by wood strands and wood fibres. All three specified types of wood particles, specifically wood chips, wood strands and wood fibres, can also occur simultaneously in the wood material or can form the wood material.

If various wood particle types from the previously mentioned group are provided, they can be provided as a mixture and/or in separate layers. This means that, by way of example if both wood chips and wood strands are provided, at least one layer of the wood composite material can comprise a mixture of wood chips and wood strands (wherein other types of wood particles additionally also can be contained in the mixture). Additionally or alternatively, however, it is also conceivable that in the case that the wood composite material comprises both wood chips and wood strands, at least one layer does not comprise any wood chips or wood strands, or that at least one layer does not comprise any wood chips and another layer does not comprise any wood strands. If, by way of example, both wood chips and wood fibres are provided, at least one layer of the wood composite material can comprise a mixture of wood chips and

wood fibres (wherein other types of wood particles can additionally also be contained in the mixture). Additionally or alternatively, however, it is also conceivable that, in the case in which the wood composite material comprises both wood chips and wood fibres, at least one layer does not comprise any wood chips or any wood fibres, or that at least one layer does not comprise any wood chips and another layer does not comprise any wood fibres. If, by way of example, both wood strands and wood fibres are provided, at least one layer of the wood composite material can comprise a mixture of wood strands and wood fibres (wherein other types of wood particles can additionally also be contained in the mixture). Additionally or alternatively, however, it is also conceivable that, in the case in which the wood composite material comprises both wood strands and wood fibres, at least one layer does not comprise any wood strands or any wood fibres, or at least one layer does not comprise any wood strands and another layer does not comprise any wood fibres.

That said in the above paragraphs with regard to the composition of the wood material does not rule out the fact that, in addition to wood chips and/or wood strands and/or wood fibres, other types of wood material are also provided in the wood composite material, for example the types of wood material mentioned in the introduction of the description, such as wood wool, wood flour, etc.

The previously defined wood composite material can also have an additional coating, which is either directly applied or is connected thereto by means of an adhesive. A directly applied coating is a paint, for example. A coating applied by means of an adhesive is a film, for example.

A wood composite material as defined previously can also be used for example as part of a sandwich panel, for example as a cover layer of the sandwich panel.

The previously presented and described problem is solved in accordance with a second teaching of the present invention by a method having the features of claim 10. Here, the aerogels form the wood composite material together with the wood material.

Various embodiments of the method according to the invention will now be defined hereinafter:

5 In accordance with one embodiment it is provided that the aerogels are first blended in a first step with the (as yet uncompressed) wood material and optionally a binder to form a mixture, then, in a second step, the mixture is scattered onto a carrier, and then, in a third step, the (still uncompressed) material disposed on the carrier is compressed. The carrier can be a conveyor belt, for example.

10 In accordance with a further embodiment it is provided that the carrier is scattered with a plurality of layers with (as yet uncompressed) wood material prior to the compression, at least one of said layers containing aerogels. The layer containing the aerogels can be at the bottom, at the top, or in the middle. A plurality of layers
15 containing aerogels can also be provided, which can be adjacent to one another or distanced from one another in the layer construction.

In accordance with a further embodiment it is provided that the wood material is provided as a shaped product, in particular a shaped product in the form of a panel,
20 formed of compressed wood chips, strands and/or fibres, and the aerogels are applied to (laminated on) the shaped product as a separate layer (matrix) in which they are incorporated, wherein the shaped product is in particular free from aerogels. In principle, however, it is also conceivable that the shaped product also comprises
aerogels.

25 In accordance with a further embodiment it is provided that the (as yet uncompressed) wood material is first scattered, in a first step, onto a carrier, in particular without addition of aerogels (wherein, however, the addition of aerogels is also conceivable), and then, in a second step, the aerogels are applied, as a separate layer in which they are
30 incorporated, to the (still uncompressed) material disposed on the carrier.

In accordance with a further embodiment it is provided that one or more layers comprising (as yet uncompressed) wood material is/are scattered onto the carrier prior to compression, at least one of which layers contains aerogels. The layer containing the aerogels can be at the bottom, at the top, or in the middle. A plurality of layers containing aerogels can also be provided, which can be adjacent to one another or distanced from one another in the layer construction.

In accordance with a further embodiment, it is provided that the compression is carried out in a double belt press or calander press. The average pressure during compression can lie in a range from 1 to 50 kg/cm², preferably in a range from 5 to 50 kg/cm², particularly preferably in a range of from 10 to 40 kg/cm². The average pressing temperature during compression can lie in a range from 100 ° to 300 °C, preferably in a range from 150 ° to 250 °C, particularly preferably in a range from 180 ° to 220 °C. Here, the term "average" pressure and "average" pressing temperature means the pressure averaged over the length of the pressing device and, respectively, the pressing temperature averaged over the length of the pressing device. The pressing speed (press factor) can lie in a range from 1 to 20 s/mm, preferably in a range from 2.5 to 15 s/mm, particularly preferably in a range from 3.5 to 10 s/mm (note: because the pressing speed is dependent on the panel thickness, it is based on this and is expressed by what is known as the press factor in seconds per mm panel thickness s/mm).

The present invention also relates to the use of aerogels in (i.e. internally or as a cover layer) a wood based material panel, in particular chipboard or an OSB board or fibreboard, in particular in a wood composite material as previously defined, to improve the fire resistance.

Lastly, the invention also relates to the use of aerogels in (i.e. internally or as a cover layer) a wood based material panel, in particular chipboard, an OSB board, or fibreboard, preferably an LDF board, in particular in a wood composite material as previously defined, to reduce the heat transfer.

There are now a large number of possibilities for embodying and developing the wood composite material according to the invention and the method according to the invention. Reference is made in this regard on the one hand to the claims following Claim 1 and on the other hand to the description of exemplary embodiments in conjunction with the drawings. In the drawings:

Fig. 1a) shows a first exemplary embodiment of a production method according to the invention,

Fig. 1b) shows a second exemplary embodiment of a production method according to the invention,

Fig. 2a) shows a third exemplary embodiment of a production method according to the invention, and

Fig. 2b) shows a fourth exemplary embodiment of a production method according to the invention.

In all methods which are illustrated in Figures 1a), 1b), 2a) and 2b), a wood composite material 1 (a wood based material panel) is produced which comprises wood material 2 in the form of wood chips, strands and/or fibres as well as aerogels 4.

The individual production methods differ in principle from one another, inter alia, as follows.

In accordance with Fig. 1a), it is provided that the aerogels 4 are firstly blended in a first step with the wood material 2 to form a mixture 5, then the mixture 5 is scattered onto a carrier 6 in a second step, and in a third step the material 7 disposed on the carrier 6 is then compressed.

In Fig. 1b) a plurality of layers 7.1, 7.2 and 7.3 are scattered onto the carrier 6 prior to the compression, the lower layer 7.1 and the upper layer 7.3 comprising aerogels 4. The middle layer 7.2 is free from aerogels.

- 5 In the production method according to Fig. 2a), it is provided that the wood material 2 is provided as a shaped product 3 in the form of a panel formed of compressed wood chips, strands and/or fibres, and the aerogels 4 are applied to the shaped product 3 as a separate layer 1.1 in which they are incorporated, wherein the shaped product 3 is in particular free from aerogels 4. Here, the thickness d of the separate layer 1.1 is less than
10 the thickness D of the wood material 2.

- Lastly, provision is made in the embodiment in Fig. 2b) so that the wood material 2 is firstly scattered onto a carrier 6 in a first step, in particular without addition of aerogels 4, and the aerogels 4 are then applied in a second step as a separate layer 1.1, in which
15 they are incorporated, to the material 7 disposed on the carrier 6. Here too, the thickness d of the separate layer 1.1 is less than the thickness D of the wood material 2.

- In the exemplary embodiments in figures 1a), 1b) and 2b), a double belt press is provided as pressing device 8. Alternatively, a calander press can also be used. In the
20 exemplary embodiment in Fig. 2a) the shaped product 3 has been produced in a comparable way, but this is not shown here. The shown roller 9 in Fig. 2a) does not serve as part of a pressing device, but serves merely to press on (lamine on) the separate layer 1.1.

- 25 The aforementioned separate layer 1.1 is a matrix, for example in the form of a plastics film or mat, in which aerogels are embedded in the form of granulate.

FAKOMPOZIT ANYAG AEROGÉLEL ÉS A MEGFELELŐ GYÁRTÁSI ELJÁRÁS ÉS
HASZNÁLATA

SZABADALMI IGÉNYPONTOK

- 1.) Fa kompozit anyag (1), különösen a faanyagot tartalmazó lapszerű fa kompozit anyag (1), ahol faanyag alatt a fa valamennyi formáját értjük, ahol a fa kompozit anyagban (1) az aerogélek aránya (4) kevesebb mint 50 térfogat %, **azzal jellemezve**, hogy a faanyag (2) egymással összepréselt faforgácsok, szálforgácsok és/vagy farostokból készül, és a fa kompozit anyag (1) faanyaga (2) több mint 50 térfogat %-ban olyan faforgácsból tevődik össze, amelynek több mint 50 %-nak a hosszúsága nem éri el az 50 mm-t, és/vagy szálforgácsokból áll, amelyeknek több mint 50 %-nál a szélesség meghaladja a 4,5 mm-t, és/vagy farostokból áll.
- 2.) Az 1. igénypont szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy az aerogélek (4) a faanyagban (2) különösképp egyenletesen oszlanak el, vagy az aerogélek (4) külön rétegben kerülnek megkötésre, amelyet felvisznek a faanyagra (2), ahol a faanyag (2) kifejezetten mentes az aerogélektől (4), ahol az aerogéleket (4) tartalmazó különálló réteg (1.1.) vastagsága (d) kisebb, mint a préselt faanyag (2) vagy a idomtest (3) vastagsága (D).
- 3.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy az aerogélek (4) aránya a fa kompozit anyagban (1) 1 és 30 térfogat % között, előnyösen 1 és 20 térfogat % között van.
- 4.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve** a faforgácsok több mint 75%-ának, előnyösen 90 %-ának hossza nem éri el az 50 mm-t, előnyösen 1-20 mm közötti, különösen előnyösen 1-10 mm közötti.
- 5.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy a szálforgácsok 75 %-ának, előnyösen 90 %-ának a szélessége 4,5 mm, előnyösen 5-60 mm, különösen előnyösen 10-50 mm közötti.
- 6.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy a fa kompozit anyag (1) faanyaga (2) több mint 75 térfogat %-ban, előnyösen több mint 90 térfogat %-ban faforgácsból és/vagy szálforgácsokból, és/vagy farostból tevődik össze.

- 7.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy az aerogélek (4) szemcsés formában vannak jelen, úgy hogy az aerogélek közepes szemcsemérete a fa kompozit anyagban (1) 0,3 és 0,4 mm közötti nagyságú, előnyösen 0,5 és 2,5 mm, és a különösen előnyösen 0,8 és 1,8 mm; és/vagy a közepes térfogatsűrűség 0,001-0,6 g/cm³ közötti, előnyösen 0,01-0,3 g/cm³, a különösen előnyösen térfogatsűrűség értéke pedig 0,05-0,1 g/cm³ közötti.
- 8.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy a farostok, szálforgácsok és/vagy farostok aránya a faanyagban (2) legalább 50 %, előnyösen 50-80 térfogat %, a különösen előnyösen pedig 50-70 térfogat % közötti.
- 9.) Az előző igénypontok bármelyike szerinti fa kompozit anyag (1), **azzal jellemezve**, hogy a fa kompozit anyag (1) faanyaga (2) több mint 50 térfogat %-ban, előnyösen több mint 75 térfogat %-ban, legelőnyösebben több mint 90 térfogat %-ban farészecskékből áll, amelyeket a faforgácsot, szálforgácsot és farostokat tartalmazó csoportból választottak.
- 10.) Eljárás az előző igénypontok bármelyike szerinti fa kompozit anyag (1) faanyag felhasználásával történő előállítására, ahol a faanyag alatt a fa valamennyi formáját értjük, ahol az aerogéleket (4) faanyaggal, mint faforgács, szálforgács és/vagy farostok kötjük meg és az aerogélek (4) arányát úgy választjuk meg, hogy a fa kompozit anyagban kevesebb mint 50 térfogat %-ban legyen jelen.
- 11.) A 10. igénypont szerinti eljárás, **azzal jellemezve**, hogy az aerogéleket (4) első lépésben a faanyaggal (2) keverékké (5) elegyítjük, majd egy második lépésben a keveréket (5) rászórjuk egy hordozóra (6), ezt követően pedig egy harmadik lépésben a hordozóra (6) felvitt anyagot (7) összepréseljük, ahol különösképp a hordozót (6) a több réteggel való összepréselést (7.1., 7.2., 7.3.) megelőzően faanyaggal (2) rétegeljük, amely rétegek közül legalább egy aerogéleket (4) tartalmaz.
- 12.) A 10. igénypont szerinti eljárás, **azzal jellemezve**, hogy a faanyag (2) mint idomtestként (3), különösen lapszerű idomtestként (3) egymással összepréselt faforgácsokból, szálforgácsokból és/vagy farostokból készülnek, és az aerogélek (4) külön réteggént (1.1.)- kötött formában – kerülnek felvitelre az idomtestre (3), ahol az idomtest (3) mentes az aerogélektől (4).
- 13.) A 10. igénypont szerinti eljárás, **azzal jellemezve**, hogy a faanyagot (2) első lépésben aerogélek (4) hozzáadása nélkül rászórjuk egy hordozóra (6), majd egy második lépésben a hordozóra (6) felhordott anyagra (7) külön réteggént (1.1.)

14.) Aerogélek (4) préselt falapban történő, az 1-9. igénypont bármelyike szerinti felhasználása, különösen faforgács- és OSB-lapokban, a tűzállóságának javítására.

15.) Aerogélek (4) préselt falapban történő, az 1-9. igénypont bármelyike szerinti felhasználása, különösen farostlemezekben, lehetőség szerint LDF-lapokban, a hőátteresztés csökkentésére.

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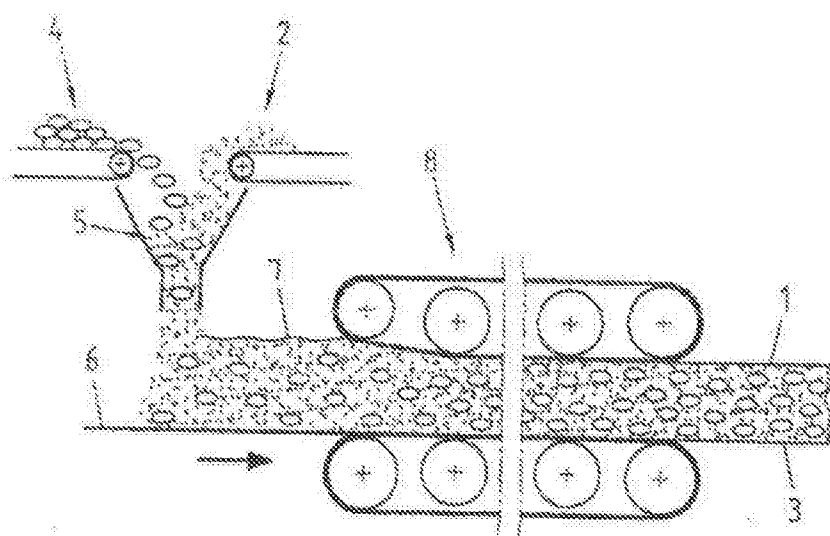


Fig.1a

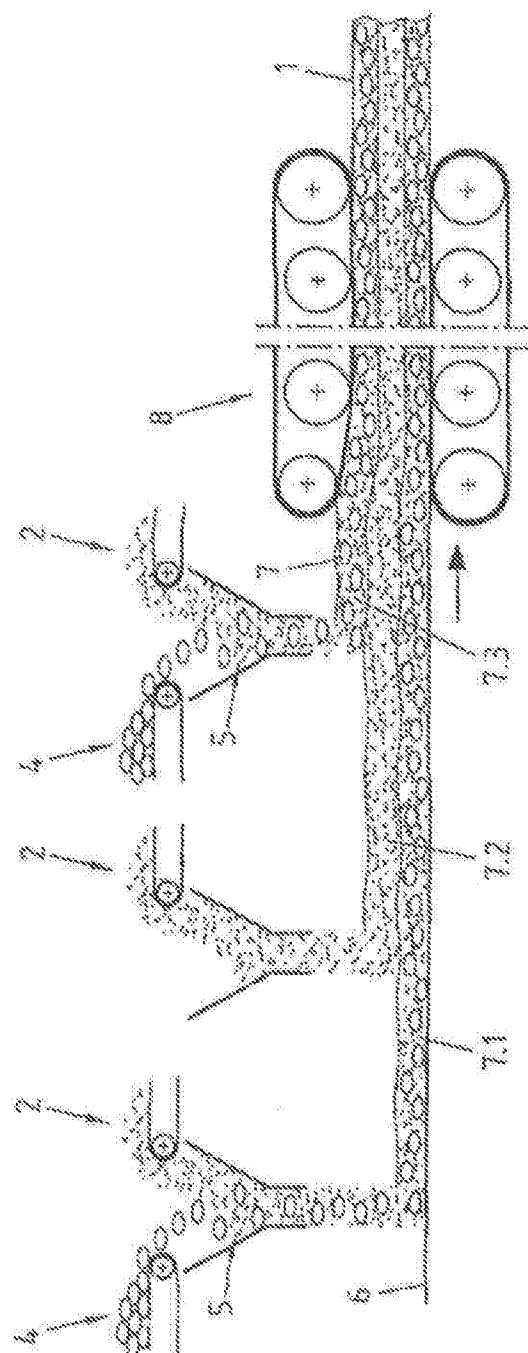


Fig. 1b

