

(19)



(11)

EP 4 520 495 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.03.2025 Bulletin 2025/11

(51) International Patent Classification (IPC):
B27D 1/04 ^(2006.01) **B27D 1/06** ^(2006.01)

(21) Application number: **23382919.1**

(52) Cooperative Patent Classification (CPC):
B27D 1/06; B27D 1/04

(22) Date of filing: **08.09.2023**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **GARRIDO FUERTES, Izaskun**
26007 LOGROÑO (La Rioja) (ES)
• **PASCUAL GARCÍA, David**
26007 LOGROÑO (La Rioja) (ES)
• **FERNANDEZ RUIZ DE LARRINAGA, Roberto**
26007 LOGROÑO (La Rioja) (ES)
• **ALBIÑANA GARCIA-DIHINX, Juan**
26007 LOGROÑO (La Rioja) (ES)

(71) Applicant: **Grupo Garnica Plywood, S.A.**
26007 Logroño (La Rioja) (ES)

(74) Representative: **Herrero & Asociados, S.L.**
Edificio Aqua - Agustín de Foxá, 4-10
28036 Madrid (ES)

(54) **PROCEDURE FOR MANUFACTURING A PLYWOOD BOARD, AND PLYWOOD BOARD OBTAINED BY SUCH PROCEDURE**

(57) It allows obtaining a high-quality, lightweight, ultra-light, plywood board, in a simple and economical way, wherein the manufacturing procedure includes at least the following stages: stacking an even number of wooden veneers (10, 20), and a veneer of material foam (30) making the central core of the plywood board (1); gluing the set of wooden veneers (10, 20) and veneer of

foamed material (30) using an adhesive; and pressing the set of wooden veneers (10, 20) and veneer of foamed material (30) so that they are joined together; wherein the veneer of foamed material (30) is located between the two even wooden veneers (20), and wherein the even wooden veneers (20) have a grain perpendicular to the odd wooden veneers (10).

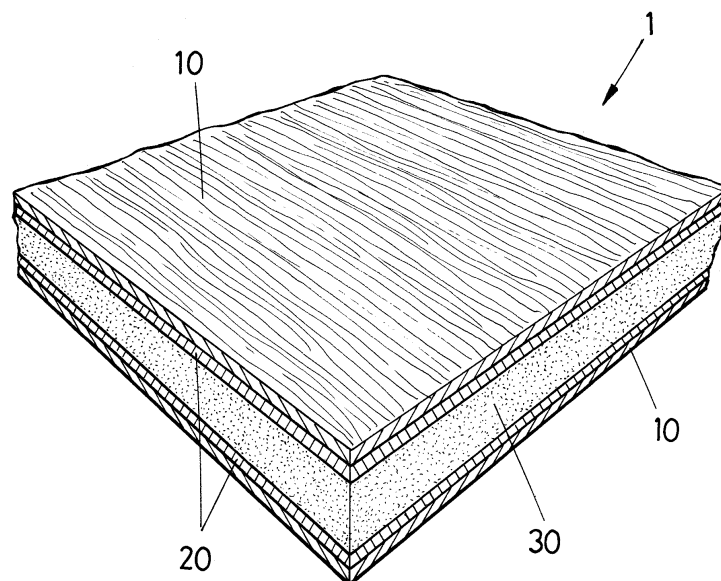


FIG. 1

Description

OBJECT OF THE INVENTION

[0001] The present invention refers to the wood sector, and more specifically to wood veneer and plywood work.

[0002] The main object of the present invention is a manufacturing procedure by which an ultra-light and high-quality plywood board, suitable for the manufacture of furniture, and especially furniture for vehicles and recreational boats, such as caravans, yachts or similar, is obtained in a simple and economical way.

BACKGROUND OF THE INVENTION

[0003] Currently, it is known that the furniture of vehicles and recreational boats, such as caravans and yachts, is conventionally manufactured from boards derived from wood, among them the most used is poplar plywood, due to its optimal weight/resistance ratio.

[0004] The plywood board is formed by a stack of an odd number of poplar "unrolling" veneers, in which the even veneers (counters) are the ones that receive the adhesive on both sides and have the grain perpendicular to the odd veneers (web). This stacking of veneers forms the core of the board, which is complemented by an upper and lower veneer, making the face and the other side of the board, finishing the board by applying heat and pressing the set of veneers.

[0005] In the unrolling process, the "logs" of wood (trunks delimbed and cut according to specific dimensions) are grabbed at their ends by means of telescopic claws to which a rotating movement is applied and the log of wood faces against a blade applying pressure. In this way, a continuous veneer of wood of millimeter thickness is obtained. Later, on the production line, the wooden veneers are cut and sized so that they can be used in the manufacture of other products such as plywood panels. The even veneers of a total of odd numbered veneers are glued, orienting the fiber of said wooden veneers so that each one forms a 90° angle with respect to its neighbor(s). In more detail, the traditional process of obtaining a plywood board includes the following stages:

- Transportation of the wood logs to the factory;
- Debarking of wood logs;
- Unrolling of the wood logs, rotating the wood logs on a blade, to obtain the respective veneers;
- Drying of the veneers;
- Gluing of the even plates (counters) of the board to be obtained;
- Stacking of veneers, including face and back;
- Hot pressing of the set of veneers;
- Repair and application of plaster (repair putty) on defects on the face and back;
- Notching and calibration of the board.

[0006] In this way, the plywood boards thus obtained

have great dimensional stability, compared to a solid wood board, and are the type of board that has the best weight/performance ratio (dimensional stability, mechanical resistance, resistance to humidity) compared to panels made of other materials or other wood-derived panels. Furthermore, these structural boards are suitable for use outdoors, being used in environments as aggressive and demanding as, for example, the nautical sector.

[0007] Furthermore, the plywood board for special applications such as caravans or yachts must be a light and very stable board, which is achieved by the use of very light poplar clones, selecting the veneers after very careful drying to obtain whole and unblemished veneers without defects. At the same time, this type of board needs faces that allow a very good surface finish, suitable for covering with decorative wallpapers, whether made of paper, vinyl, polypropylene, etc., without surface defects.

[0008] The plywood boards already covered with the decorative coating, once finished, are supplied to the manufacturer of the recreational vehicles, which introduces the panels into a computerized numerical control (CNC) machine to be able to carry out the corresponding cutting of the different parts that make up the furniture of the recreational vehicle, making the most of the board to make the furniture.

[0009] Computer numerical control (CNC) machines require a very flat board, since if it were twisted, the cutting could not be carried out correctly. A perfect surface finish is also required, so that all the resulting pieces are valid and no rejections occur that would entail a high replacement cost, since this piece would have to be made manually.

[0010] Finally, optimal lightness is essential in this type of boards, along with good mechanical resistance, since the more the recreational vehicle (caravan, yacht, etc.) weighs, the greater the fuel consumption will be to transport them, being the lightweight clones of poplar those that manage to combine both characteristics.

[0011] Therefore, the main requirements for this type of plywood for vehicle and recreational boat furniture are:

- Surface hardness, so that the board, once laminated, resists any blows and impacts, thus avoiding rapid deterioration of the components installed in the recreational vehicle.
- Lightness, which results in a lower weight of the recreational vehicle, thus contributing to lower fuel consumption during its use and enjoyment.
- High resistance to screw removal, which prevents deterioration of the areas of the board subject to the stress of moving parts or hinges.
- Faces of the board with not very pronounced colorations that avoid possible appreciation of changes in tone when decorative papers of low weight and opacity are used.

- Consistent thickness of the board, since there should be no differences in thickness within the same board, and between the different boards in a batch, since the adhesive used to glue the decorative coating would generate adhesion defects due to not being able to provide adhesive homogeneously.

[0012] Therefore, there is a need in the sector for manufacturing furniture for recreational vehicles, such as caravans or yachts, for a procedure that allows manufacturing plywood panels with excellent mechanical properties, low weight, consistent thickness, great resistance to humidity, and low manufacturing cost. Likewise, high quality is required in the surface finish of the boards, compatible with demanding coatings and gloss, and that all this is also done using sustainable and recyclable materials.

DESCRIPTION OF THE INVENTION

[0013] By means of the present invention, the previously mentioned drawbacks are solved by providing a manufacturing procedure by which a high-quality, ultra-light plywood board is obtained in a simple and economical way, suitable for the manufacture of furniture for recreational vehicles, such as caravans, yachts or similar. Likewise, the plywood board obtained by said procedure is also described.

[0014] More particularly, the procedure of the invention stands out for using a central layer of foamed material, preferably extruded polystyrene foam (XPS), which constitutes a material with great resistance to compression, which allows precise lamination using cutting technology by hot wire, being a 100% recyclable material and through which it is possible to reduce the weight of the plywood board by up to 30-50% compared to the weight of current boards produced entirely from wood.

[0015] According to a first aspect of the invention, the procedure for manufacturing a plywood board for furniture recreational vehicles, such as caravans or yachts, is described, wherein said procedure comprises at least the following steps: stacking an even number of wooden veneers, and a veneer of foamed material making the central core of the plywood board; gluing the set of wooden veneers and veneer of foamed material using an adhesive; and pressing the set of wooden veneers and veneer of foamed material so that they are joined together.

[0016] More particularly, the veneer of foamed material is strategically placed between the two paired wooden veneers, thus providing optimal rigidity, stability and structural strength to the plywood.

[0017] Furthermore, the even-numbered veneers are arranged so that they have a grain perpendicular to the odd-numbered veneers. In this way, it is possible to minimize the deformations of the different wooden veneers of the board as a result of changes in humidity or temperature.

[0018] More preferably, in the gluing stage, it is provided that the paired veneers will receive the adhesive on both sides, thus guaranteeing maximum adhesion and joining between the different veneers of the board. However, it is provided that said gluing stage can be carried out using a curtain system, wherein all the veneers except one receive adhesive on only one side.

[0019] According to a preferred embodiment, the visible faces of odd-numbered wooden veneers, which define the face and reverse side of the plywood board, are subjected to a calibration stage and a sanding stage, thus obtaining a plywood board with an optimal final finish, both from a dimensional and aesthetic point of view. Specifically, with these additional stages of calibration and sanding, it is possible to unify the thickness along the entire surface of the board, since the sum of tolerances of the thicknesses of the different veneers means that the board leaves the press with "mountain areas" (mountains and valleys), creating differences in thickness within the board. Specifically, the calibration stage manages to eliminate or reduce these differences, reducing the thickness of the bulk of the last faces, especially in the mountain areas mentioned above. For its part, sanding reduces the roughness of the last veneer.

[0020] Regarding the material of the central core of the plywood board, it is provided that the veneer of foamed material can be made of a material selected from:

- extruded polystyrene foam (XPS);
- expanded polystyrene foam (EPS);
- polyurethane foam (PU); and
- polyethylene terephthalate (PET) foam.

[0021] This selection of materials is not trivial or random, but rather they have been specially chosen for their excellent properties in terms of lightness (very low weight), great resistance to compression, zero absorption of moisture, thermal insulation, great durability and for being 100% recyclable.

[0022] Thus, the plywood board obtained by the procedure of the present invention also stands out because it is manufactured in a single pressing stage, obtaining a board that preferably combines four veneers of wood and a veneer of foamed material (two veneers of wood on each side of the foamed veneer). As already mentioned, according to a preferred embodiment, said veneer of foamed material is a veneer of extruded polystyrene (XPS).

[0023] Preferably, the pressing stage is carried out at room temperature or low temperature (<80°C), for which it is necessary to work with glue recipes specifically designed to achieve optimal gluing (compatible for both wood-wood and wood-thermoplastic material XPS joints) respecting the assembly and pressing times within the open and pressing time ranges of the adhesive recipe. In this way, packages of pre-boards (between 20 cm and 100 cm) are formed without separation between them, pressing in blocks at room temperature. At this point it is

worth clarifying that, typically, plywood pressing temperatures are usually in the range of 110-130°C.

[0024] According to another aspect of the invention, a plywood board suitable for the manufacture of furniture of recreational vehicles (caravans, yachts or similar) is described, preferably obtained by the previously described procedure, and comprising: an even number of wooden veneers, and a veneer of foamed material making the central core of the plywood board; wherein the veneer of foamed material is located between the two even wooden veneers; and wherein the even-numbered veneers have a grain perpendicular to the odd-numbered veneers.

[0025] Until now, the manufacture of panels with a plastic material core (whether XPS, EPS, PU, with hexagonal cell core, or "*Honeycomb*", etc.) commonly known as sandwich panel, was carried out by superimposing (gluing and pressing) of three or more previously manufactured layers, for example, a sandwich panel formed by two plywood boards previously manufactured with three wooden veneers and a core of thermoplastic material. In this traditional process, the plywood "skins" were manufactured in a previous step (gluing - pressing - repairing - calibration), and subsequently the sandwich panel was manufactured, which was subsequently re-tested.

[0026] In this sense, the manufacturing procedure of the present invention makes it possible to considerably increase the manufacturing efficiency of an ultra-light board, which combines these two materials (wood and foamed material, such as XPS), obtaining a mixed board (plywood - sandwich) in a single step.

[0027] Therefore, the board of the invention constitutes an optimal board for its application as a laminated product in the manufacture of furniture components for recreational vehicles, such as caravans or yachts, having multiple advantages such as:

- Great lightness, reducing the weight of the board by up to 30-50% compared to the weight of boards produced entirely with wood material;
- Great mechanical resistance;
- Availability in variable thicknesses, which allows the cost/performance ratio to be adjusted depending on the location/use of the furniture component in the recreational vehicle in question.
- Use of recyclable and sustainable materials.

DESCRIPTION OF THE DRAWINGS

[0028] To complement the description being made and in order to help a better understanding of the characteristics of the invention, in accordance with a preferred example of its practical implementation, a set of drawings is attached as an integral part of said description, where-

in, for illustrative and non-limiting purposes, the following has been represented:

Figure 1.- Shows a perspective view of a portion of the board according to the present invention.

Figure 2.- Shows a sectional view of the board of the invention, where its different internal veneers can be seen.

PREFERRED EMBODIMENT OF THE INVENTION

[0029] An example of a preferred embodiment is described below, making reference to the figures cited above, without limiting or reducing the scope of protection of the present invention.

[0030] Figures 1 and 2 show a preferred embodiment of a plywood board (1) according to the present invention, which is formed by five veneers, namely:

- four veneers of wood (10, 20), and
- a veneer of foamed material (30) which constitutes the central core of the plywood board (1).

[0031] As can be seen in said figures 1 and 2, the veneer of foamed material (30) is located between the two even wooden veneers (20).

[0032] Furthermore, in said figures 1 and 2 it is observed that the even wooden veneers (20) are arranged in such a way that they have a grain perpendicular to the odd wooden veneers (10), thus minimizing the possible deformations of the wooden veneers of the board, due to changes in temperature or humidity.

[0033] Preferably, the odd-numbered wooden veneers (10), which make up the face and reverse side of the plywood board (1), have a thickness of less than 1.9 mm; while the even wooden veneers (20) have a thickness of less than 3.5 mm. The veneer of foamed material (30) has a thickness between 4 - 20 mm.

[0034] It should be noted at this point that the wooden veneers (10, 20) come from the unrolling of sustainable wood logs, and more specifically manufactured from wood of sustainable origin with certification.

[0035] Therefore, the plywood board (1) of the present invention allows combining wooden veneers (10, 20) with veneers of foamed material (30), such as extruded polystyrene foam (XPS), cut by hot wire to the thickness required by each specific composition. Extruded polystyrene foam (XPS) comes in a block of 10 cm or more, and is laminated with hot wire to a thickness of 4 mm or more. This XPS veneer constitutes the core or central layer of the board, replacing the conventional internal wood veneer, called "web". Thus, according to this preferred example of embodiment, as shown in Figures 1 and 2, the resulting product is a board of five veneers composed of (from the upper veneer to the lower veneer):

- a side (first veneer) and a reverse side (fifth veneer),

which are the odd wooden veneers (10);

- some counters (second and fourth veneers), which are the even-numbered wooden veneers (20) with their grains arranged at 90°C with respect to the odd-numbered wooden veneers (10); and
- a veneer of XPS extruded polystyrene foam (third veneer), which constitutes the core of the plywood board (1)

[0036] For the manufacture of this plywood-sandwich board, the manufacturing procedure has been adapted to

- making a cut on demand from thermoplastic material (XPS) to the thickness required by each composition;
- gluing with a modified adhesive recipe to guarantee compatibility between two materials that are different from each other in terms of hydrophilicity, porosity, and roughness;
- pressing; due to the limitation of compressive strength of the thermoplastic material (XPS) lower than the strength of wood, it is necessary to use a lower pressure than usual, a reduced temperature and an adjustment of the pressing time, and also due to the softening temperature of the XPS. These variables also influence the adhesive recipe, which must compensate for the limitations of the thermoplastic material (XPS) and its differences with respect to wood;
- calibrating and sanding, modified to include a pre-calibrated calender, wherein to avoid having to sand the faces too much, the areas are smoothed with a thick surface prior to sanding.
- Notching the board only once (in the sawing process).

[0037] Preferably, the adhesive used in the gluing stage for the paired wooden veneers (20) is polyvinyl acetate (PVAc), acrylic glue or polyurethane adhesive with isocyanate. These materials constitute modified adhesive recipes to guarantee the simultaneous compatibility of the wood-wood and wood-XPS joint, allowing pressing at room temperature, and the pressing of a block of boards (board one on top of the other) of between 20 and 100 cm high without intermediate separations once the formulations of the adhesive recipes have been adjusted to match assembly times and open time with curing and pressing times.

[0038] Finally, it should be noted that the cost per m² of this product-process is substantially lower than the cost of the conventional two-step process, in which each component has been glued-pressed-repaired-calibrated before assembling each component on the sandwich manufacturing production line, and which also requires additional notching.

Claims

1. Procedure for manufacturing a plywood board (1) for furniture of recreational vehicles, **characterized in that** it includes at least the following stages:

- stacking an even number of wooden veneers (10, 20), and a veneer of foamed material (30) making the central core of the plywood board (1);
 - gluing the set of wooden veneers (10, 20) and veneer of foamed material (30) using an adhesive; and
 - pressing the set of wooden veneers (10, 20) and veneer of foamed material (30) so that they are joined together;
- wherein the veneer of foamed material (30) is located between the two even wooden veneers (20), and wherein the even-numbered wooden veneers (20) have a grain perpendicular to the odd-numbered wooden veneers (10).

2. Procedure according to claim 1, wherein in the gluing stage, the even wooden veneers (20) receive the adhesive on both sides.

3. Procedure according to claim 2, wherein the adhesive used in the paired wooden veneers (20) is polyvinyl acetate (PVAc), acrylic glue or polyurethane adhesive with isocyanate.

4. Procedure according to claim 1, wherein in the gluing stage, the gluing is carried out using a curtain system, wherein all the veneers (10, 20, 30) except one, receive adhesive only on one side.

5. Procedure according to any one of the preceding claims, wherein the visible faces of odd-numbered wooden veneers (10), which define the face and reverse face of the plywood board (1), are subjected to a step of calibration and a sanding stage.

6. Procedure according to claim 1, wherein the veneer of foamed material (30) is made of a material selected from:

- extruded polystyrene foam (XPS);
- expanded polystyrene foam (EPS);
- polyurethane foam (PU); and
- polyethylene terephthalate (PET) foam.

7. Procedure according to claim 1, wherein the odd-numbered wooden veneers (10), which make up the face and reverse side of the plywood board (1), have a thickness of less than 1.9 mm; while the even wooden veneers (20) have a thickness of less than 3.5 mm.

8. Procedure according to claim 1, wherein the veneer of foamed material (30) has a thickness between 4 - 20 mm.
9. Procedure according to claim 1, wherein the wooden veneers (10, 20) come from the unrolling of sustainable wood logs. 5
10. Procedure according to claim 1, wherein the plywood board (1) is formed by five veneers, four veneers of wood (10, 20) and a veneer of foamed material (30). 10
11. Plywood board (1) suitable for the manufacture of recreational vehicle furniture, **characterized in that** it comprises: 15
- an even number of wooden veneers (10, 20), and
 - a veneer of foamed material (30) making the central core of the plywood board (1); 20
- wherein the veneer of foamed material (30) is located between the two even wooden veneers (20),
- and wherein the even-numbered wooden veneers (20) have a grain perpendicular to the odd-numbered wooden veneers (10). 25
12. Plywood board (1) according to claim 11, wherein the wooden veneers (10, 20) are manufactured from wood of sustainable origin with certification. 30

35

40

45

50

55

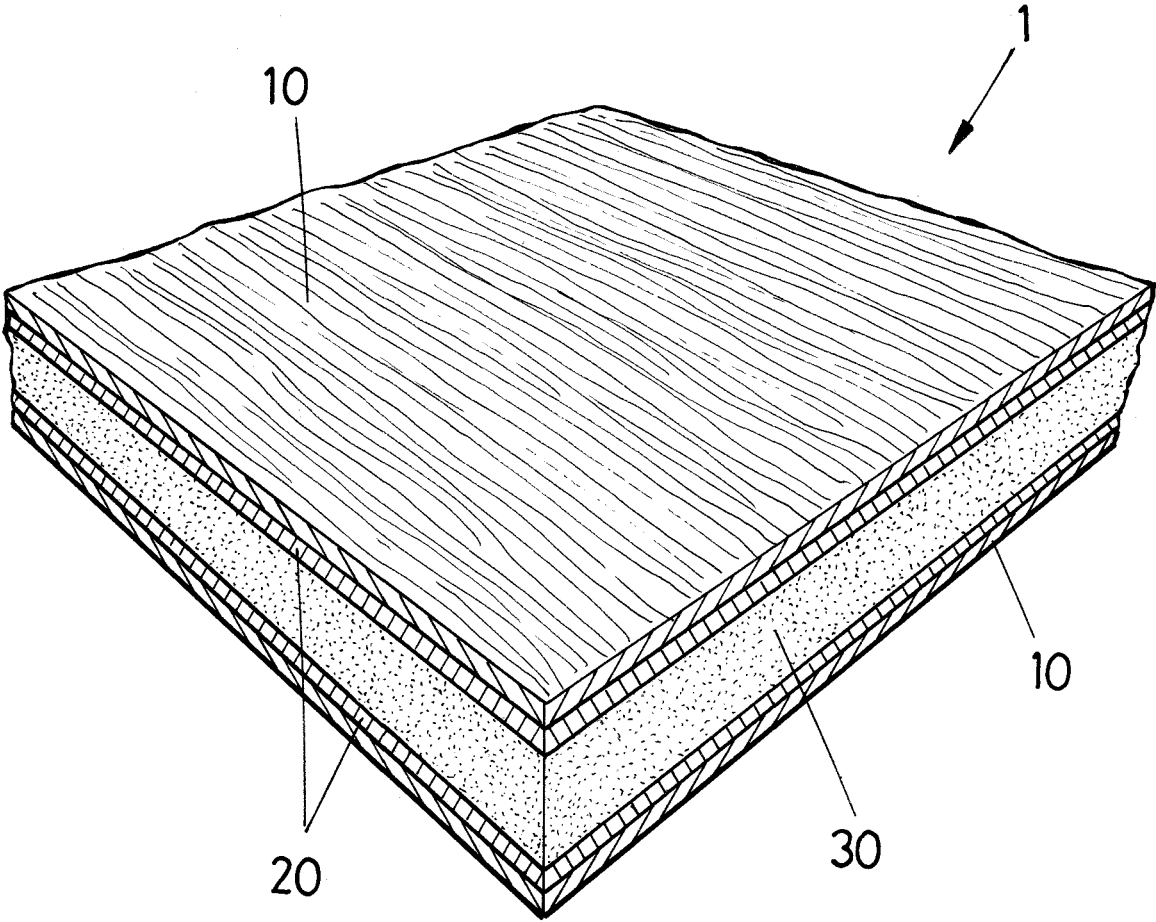


FIG.1

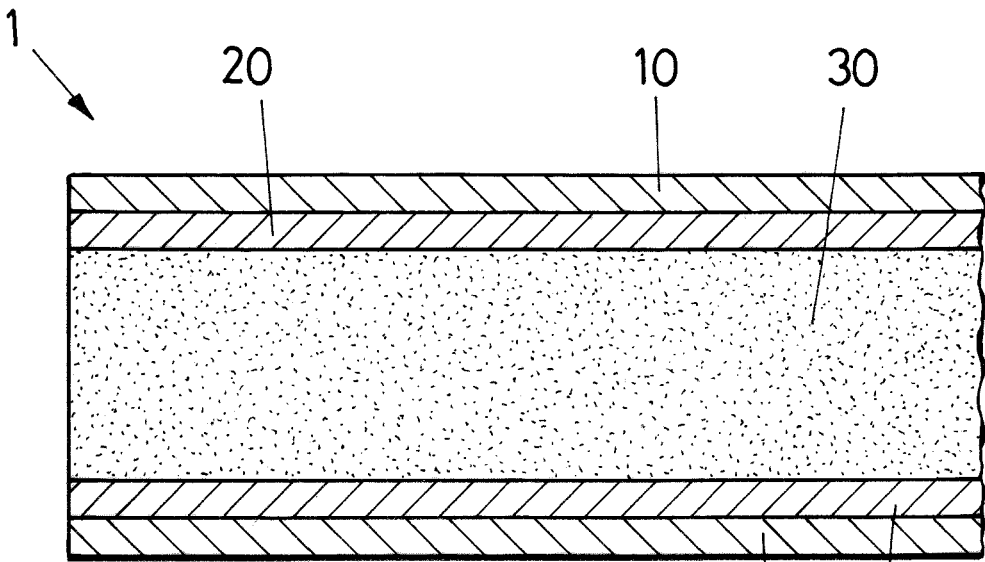


FIG.2



EUROPEAN SEARCH REPORT

Application Number

EP 23 38 2919

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	JP 2001 058301 A (DAIKEN TRADE & INDUSTRY) 6 March 2001 (2001-03-06) * paragraphs [0002], [0013], [0014], [0016], [0017], [0018] * -----	1-12	INV. B27D1/04 B27D1/06
X	EP 3 913 160 A2 (HON A S [CZ]) 24 November 2021 (2021-11-24) * claims; figures * -----	1, 11	
X	JP 2014 097597 A (RENGO CO LTD) 29 May 2014 (2014-05-29) * claims; figures * -----	1, 11	
X	GB 607 213 A (BRUNO JABLONSKY) 26 August 1948 (1948-08-26) * claims; figures * -----	1, 11	
X	GB 2 074 939 A (E A R CORP) 11 November 1981 (1981-11-11) * claims; figures * -----	1, 11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B27D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		26 February 2024	Hamel, Pascal
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 03.82 (P04C01)

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

EP 23 38 2919

5

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-02-2024

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001058301 A	06-03-2001	NONE	

EP 3913160 A2	24-11-2021	CZ 34494 U1	03-11-2020
		EP 3913160 A2	24-11-2021

JP 2014097597 A	29-05-2014	JP 6007073 B2	12-10-2016
		JP 2014097597 A	29-05-2014

GB 607213 A	26-08-1948	NONE	

GB 2074939 A	11-11-1981	CA 1166139 A	24-04-1984
		DE 3117368 A1	27-05-1982
		FR 2481645 A1	06-11-1981
		GB 2074939 A	11-11-1981
		JP S5724244 A	08-02-1982
		NL 8101949 A	01-12-1981
		US 4340129 A	20-07-1982

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82