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(54) **A HEATING PANEL, AS WELL AS A SEAT COMPRISING SUCH A HEATING PANEL**

(57) A heating panel (100) comprising a first main side and a second main side situated parallel thereto, wherein the heating panel (100) comprises a heating element (114). The heating panel (100) is a sandwich panel of at least one first plywood plate (110) that comprises a recess (113) at the second main side in which the heating element (114) is provided, and a second plywood plate

(120) which covers the recess (113) of the first plywood plate (110). The second main side of the first plywood plate (110) is glued to the first main side of the second plywood plate (120).

The invention also relates to a heated seat (300) comprising the heating panel (100).

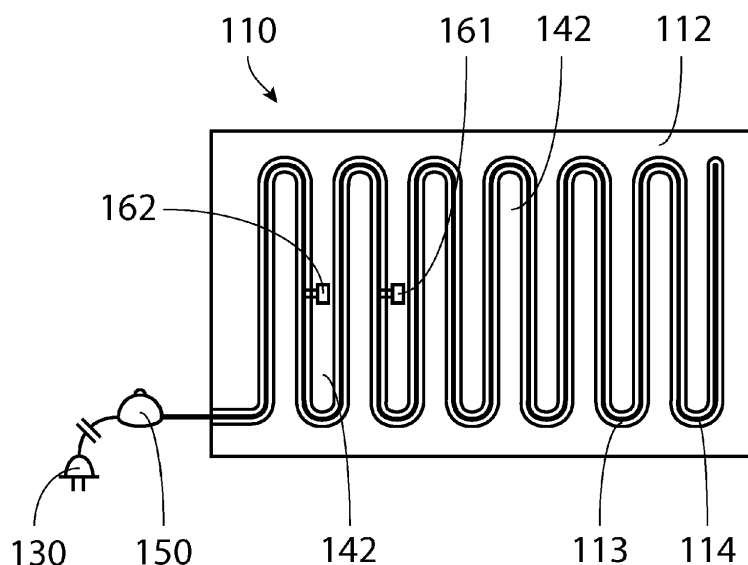


Fig. 1D

Description

[0001] The present invention relates to a heating panel which comprises a first main side and a second main side situated parallel to the first main side, wherein the heating panel between the first main side and the second main side comprises a heating element.

[0002] Heating panels are known in the art, and can be used for various purposes.

[0003] The object of the present invention is to provide a heating panel that comprises wood.

[0004] To this end, a heating panel according to the preamble is characterized in that the heating panel is a sandwich panel, which sandwich panel is a sandwich of at least

- a first plywood plate having a first main side and a second main side situated parallel to the first main side, wherein the first plywood plate comprises a recess at the second main side into which the heating element is provided, which first plywood plate is fashioned out of wood selected from:

- i) Swiss pine,
- ii) oak, with knags, if any, smaller than 8 mm,
- iii) teak,
- iv) bubinga, and
- v) birch plywood;

and

- a second plywood plate comprising a first main side and a second main side situated parallel to the first main side, which first main side covers the recess of the first plywood plate, which second plywood plate is fashioned out of wood selected from

- i) Swiss pine,
- ii) oak, with knags, if any, smaller than 8 mm,
- iii) teak,
- iv) bubinga, and
- v) birch plywood;

wherein the second main side of the first plywood plate is glued to the first main side of the second plywood plate.

[0005] Constructing heated wooden panels is problematic because wood is a poor heat conductor. This means that the heating element has to reach relatively high temperatures (such as over 50°C) in order to be able to radiate heat for use to the main side of the heating panel within a reasonable time. Hereby, within the heating panel stress occurs which can lead to the formation of cracks. In case of wood the problem worsens since the water content can vary with time. It has been found that with a wooden panel according to the invention the likelihood of formation of cracks is reduced considerably.

[0006] In case of birch plywood the thickness of the

layer of the composing layers is preferably less than 2 mm, known in the art as Russian birch plywood.

[0007] The panel will have a connection for a plug or an electricity cable for connecting the heating element to a power source. The electrical heating element is generally arranged for being able to deliver power in the range of 90 to 700 W/m², such as between 120 and 550 W/m². Low power can be useful for wall heating, whereas for usage with furniture a higher value is desired.

[0008] The heating element is distributed evenly along the surface of the second main side of the first plywood plate, wherein the distance of the heating element to the circumference is preferably at least 3 cm, such as at least 5 cm. Exceptions in that respect preferably remain limited to the location where the heating element enters the heating panel and the location of an optional switch with which the current through the heating element can be controlled.

[0009] A panel according to the invention will have a width of at least 15 cm and a surface area of a main side of the heating panel of at least 0,06 m².

[0010] JP2002-221328 describes wooden floor material for floor heating. Floor heating delivers characteristically up to 100 Watt/m².

[0011] This publication does not teach the use of types of material according to the invention for providing panels that are also suitable for delivering considerably higher power.

[0012] WO2010/082130 describes a heating panel that comprises wood and mentions the problem of plates coming loose. The use of types of material according to the invention is not described. According to a favourable embodiment, at least a main side of the heating panel is provided with veneer by glueing, the veneer having a thickness of between 3 and 10 mm, and being selected from

- i) Swiss pine,
- ii) oak, with knags, if any, smaller than 8 mm,
- iii) teak, and
- iv) bubinga.

[0013] Such a panel is suitable for applications wherein the visible side has to be beautifully finished. This application is especially relevant in the case where a plywood plate selected from the first plywood plate and the second plywood plate comprises birch plywood. The layer of veneer itself can also be plywood, where said type of wood in that case at least provides the visible side.

[0014] According to a favourable embodiment, both main sides of the heating panel are provided with veneer by glueing, the veneer having a thickness of between 3 and 10 mm, and being selected from

- i) Swiss pine,
- ii) oak, with knags, if any, smaller than 8 mm,
- iii) teak, and
- iv) bubinga.

[0015] Such a panel provides two sides worthy of being in view. Preferably, also the circumference of the heating panel will be provided with the veneer. This will also contribute to increasing the moisture-resistance.

[0016] According to a favourable embodiment, the heating element is in the shape of heating wire, which heating wire is present in a ratio between the length of the heating wire and the surface area of the second main side of the first plywood plate of at least 7 m/m^2 , and preferably at least 10 m/m^2 .

[0017] Thus, the likelihood that cracks will form, can be further limited, even at relatively high power.

[0018] According to a favourable embodiment, the heating element is arranged for being able to deliver a power in the range of 150 to 400 W/m^2 .

[0019] Such a heating panel is very effective for manufacturing a heated seat such as a chair or a couch.

[0020] According to a favourable embodiment, at least the first plywood plate has a thickness of at least 15 mm and the total thickness of the heating panel is at least 25 mm.

[0021] Such sandwich panels are suitable for construction purposes, such as for manufacturing a seat such as a couch or a chair.

[0022] According to a favourable embodiment, the glueing is done using a polyurethane glue that comprises prepolymers.

[0023] In the presence of moisture the PUR-glue sets and accomplishes a good connection between the plywood plates and/or between a plywood plate and a layer of veneer.

[0024] Finally, the present invention relates to a seat, wherein the seat is a heated seat which comprises a heating panel according to any of the claims 1 to 7.

[0025] Such a seat makes it possible to sit outside for a prolonged time when the evenings are getting colder and/or to sit outside earlier or later in the season.

[0026] The invention also comprises all embodiments of the heating panel as described above such as defined in the subclaims thereof, wherein this referral only serves to avoid repetition.

[0027] According to a favourable embodiment, the heated seat comprises a back panel and a seat panel, both of which are heat panels.

[0028] Thus, a very comfortable seat is provided.

[0029] According to a favourable embodiment, the heating element is in the shape of heating wire, which heating wire is present in the ratio between the length of the heating wire and the surface area of the second main side of the first plywood plate of at least 7 m/m^2 , and preferably at least 10 m/m^2 .

[0030] Thus, the likelihood that cracks will form is further limited, even at relatively high power.

[0031] According to a favourable embodiment, the heating element is arranged for being able to deliver a power in the range of 150 to 400 W/m^2 .

[0032] Such a heating panel is very effective for a heated seat such as a chair or a couch.

[0033] According to a favourable embodiment, at least the first plywood plate has a thickness of at least 15 mm and the total thickness of the heating panel is at least 25 mm.

[0034] Thus, a strong seat is provided.

[0035] The present invention will now be illustrated with reference to the drawing where

Fig. 1A to Fig. 1D show the makeup of a heating panel;

Fig. 2 shows a cross section according to Fig. 1C of an alternative heating panel; and

Fig. 3A and Fig. 3B show a side view and a rear view respectively of a seat according to the invention.

Fig. 1A to Fig. 1D show the makeup of a heating panel 100 according to the invention.

Fig. 1A shows a top view of the heating panel 100. The heating panel 100 has a first main side 101 and a second main side 102.

Fig. 1B and Fig. 1C show a cross section through the heating panel 100, which comprises a first plywood plate 110 which has a first main side 111 and a second main side 112. The heating panel 100 also comprises a second plywood plate 120 which has a first main side 121 and a second main side 122. Fig. 1C corresponds to Fig. 1B, the difference being that here the first wooden panel 110 and the second wooden panel 120 are shown separated from each other.

Fig. 1D shows a top view of the second main side 112 of the first plywood plate 110. At this second main side 112 the first plywood plate 110 comprises a recess 113 in which 17.5 m of heating wire 114 (article number: 694, manufacturer SEDES GROUP; supplier TASSERON, Nootdorp, The Netherlands) is applied as heating element 114 which can supply $437,5 \text{ W/m}^2$ when connected via plug 130 to the mains supply having a voltage of 230 Volt. The recess 113 takes the form of a labyrinth, that is to say that between sections of the heating wire 114 main surface parts 142 of the first plywood plate 110 are present which will be glued to the first main side of the second plywood plate 120. The labyrinth has essentially the same length as the heating wire 114, thus also 17.5 m and a depth of 5 mm for incorporating the heating wire 114 which has a diameter of 4 mm. With the invention it is possible that the heating wire is also incorporated in the second plywood plate, in which case the first main side of the second plywood plate will possess a corresponding recess.

[0036] The first plywood plate 110 and the second plywood plate 120 are fashioned out of Swiss pine, for which it has been found that it will not present any formation of cracks when heating heating panel 100 using the heating wire 114.

[0037] The second main side 112 of the first plywood plate 110 is glued to the first main side 121 of the second

plywood plate 120 using PUR Rapid Construction Adhesive of Würth (Den Bosch, The Netherlands) in accordance with the protocol of the manufacturer.

[0038] A user of the couch can control the power supply by means of a switch 150.

[0039] The temperature of the couch can be limited by a thermostatic limiter 161, which has for instance the form of a bimetal. A suitable thermostatic limiter 161 is for instance available under article number: R28 03EN of Microtherm (Tassaron BV, Nootdorp, The Netherlands).

[0040] Further, a heat fuse 162 may be present. Such a heat fuse is for instance available under article number PTF/80A; EAN: 4016138047677 of Stelvio Kontek S.p.A (Tassaron BV, Nootdorp, The Netherlands).

[0041] Fig. 2 shows a cross sectional view similar to Fig. 1B of an alternative heating panel 100. The first plywood plate 110 and the second plywood plate 120 are fashioned out of Russian birch plywood (plywood made of birch). The wooden plates are each finished having a first layer of veneer 211 and a second layer of veneer 222 respectively. These layers of veneer each have a thickness of 4 mm. Veneer 230 is also applied all around.

[0042] Fig. 3A and Fig. 3B show respectively a side view and a rear view of a seat 300, more specifically a couch 300, according to the invention. The couch 300 comprises a frame 301 which comprises legs 302. The couch 300 further comprises two heat panels 100', 100'' according to the invention.

Claims

1. A heating panel (100) which comprises a first main side (101) and a second main side (102) situated parallel to the first main side (101), wherein the heating panel (100) between the first main side (101) and the second main side (102) comprises a heating element (114), **characterized in that** the heating panel (100) is a sandwich panel (100), which sandwich panel (100) is a sandwich of at least

- a first plywood plate (110) having a first main side (111) and a second main side (112) situated parallel to the first main side (111), wherein the first plywood plate (110) comprises a recess (113) at the second main side (112) into which the heating element (114) is provided, which first plywood plate (110) is fashioned out of wood selected from:

i) Swiss pine,
ii) oak, with knags, if any, smaller than 8 mm,
iii) teak,
iv) bubinga, and
v) birch plywood;
and

- a second plywood plate (120) comprising a first

main side (121) and a second main side (112) situated parallel to the first main side (121), which first main side (121) covers the recess (113) of the first plywood plate (110), which second plywood plate (120) is fashioned out of wood selected from

i) Swiss pine,
ii) oak, with knags, if any, smaller than 8 mm,
iii) teak,
iv) bubinga, and
v) birch plywood;
wherein the second main side (112) of the first plywood plate (110) is glued to the first main side (121) of the second plywood plate (120).

2. The heating panel (100) according to claim 1, at least a main side of the heating panel (100) is provided with veneer by glueing, the veneer having a thickness of between 3 and 10 mm, and being selected from

i) Swiss pine,
ii) oak, with knags, if any, smaller than 8 mm,
iii) teak, and
iv) bubinga.

3. The heating panel (100) according to claim 2, wherein both main sides of the heating panel (100) are provided with veneer (230) by glueing, the veneer (230) having a thickness of between 3 and 10 mm, and being selected from

i) Swiss pine,
ii) oak, with knags, if any, smaller than 8 mm,
iii) teak, and
iv) bubinga.

4. The heating panel (100) according to any of the preceding claims, wherein the heating element (114) is in the shape of heating wire (114), which heating wire (114) is present in a ratio between the length of the heating wire (114) and the surface area of the second main side of the first plywood plate (110) of at least 7 m/m², and preferably at least 10 m/m².

5. The heating panel (100) according to any of the preceding claims, wherein the heating element (114) is arranged for being able to deliver a power in the range of 150 to 400 w/m².

6. The heating panel (100) according to any of the preceding claims, wherein at least the first plywood plate (110) has a thickness of at least 15 mm and the total thickness of the heating panel (100) is at least 25 mm.

7. The heating panel (100) according to any of the preceding claims, wherein the glueing is done using a polyurethane glue that comprises prepolymers.
8. a seat (300), **characterized in that** the seat (300) is a heated seat (300) which comprises a heating panel (100) according to any of the claims 1 to 7. 5
9. Heated seat (300) according to claim 8, wherein the heated seat (300) comprises a back panel and a seat panel, both of which are heat panels (100', 100"). 10
10. Heated seat (300) according to any of the claims 8 or 9, wherein the heating element (114) is in the shape of heating wire (114), which heating wire (114) is present in a ratio between the length of the heating wire (114) and the surface area of the second main side of the first plywood plate (110) of at least 7 m/m², and preferably at least 10 m/m². 15
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11. Heated seat (300) according to any of the claims 8 to 10, wherein the heating element (114) is arranged for being able to deliver a power in the range of 150 to 400 w/m². 25
12. Heated seat (300) according to any of the claims 8 to 11, wherein at least the first plywood plate (110) has a thickness of at least 15 mm and the total thickness of the heating panel (100) is at least 25 mm. 30

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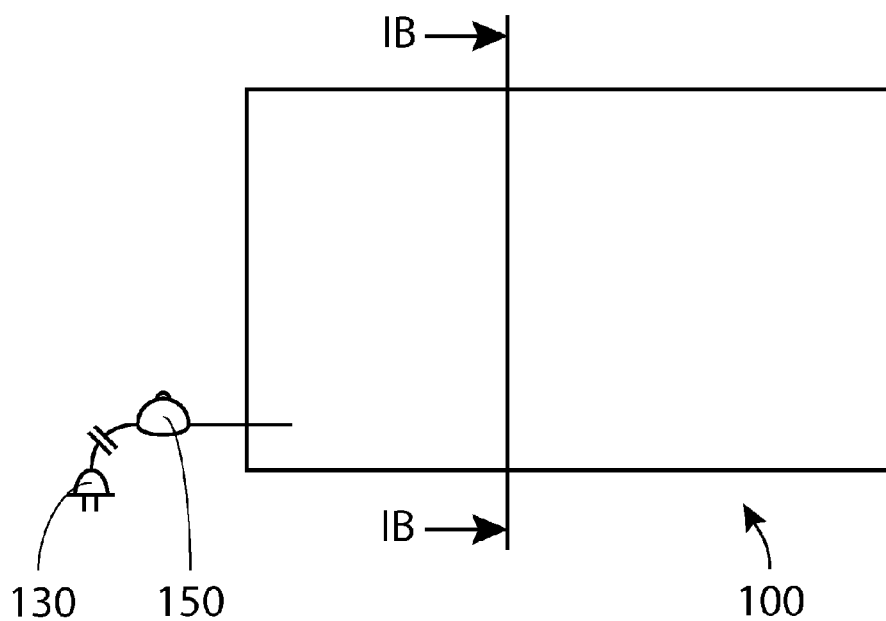


Fig. 1A

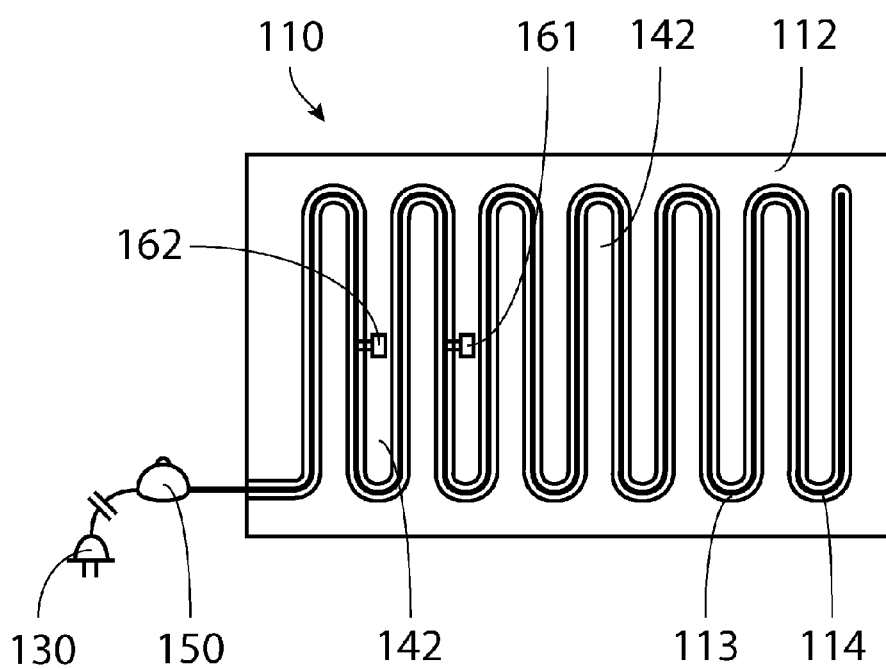


Fig. 1D

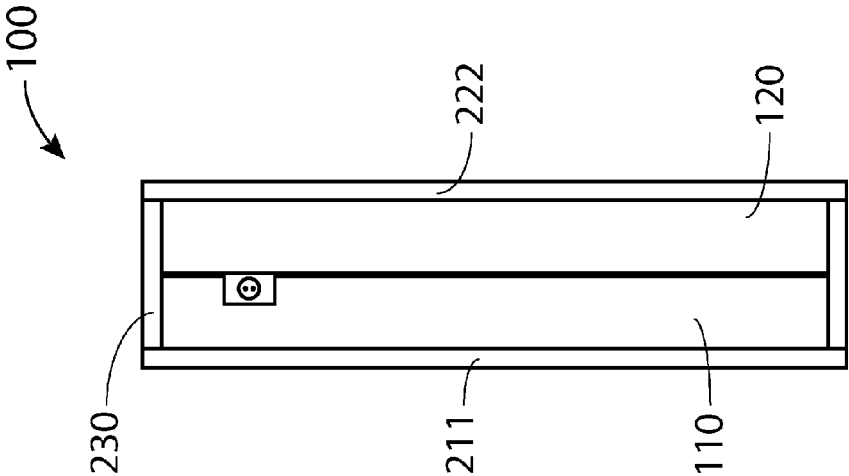


Fig. 2

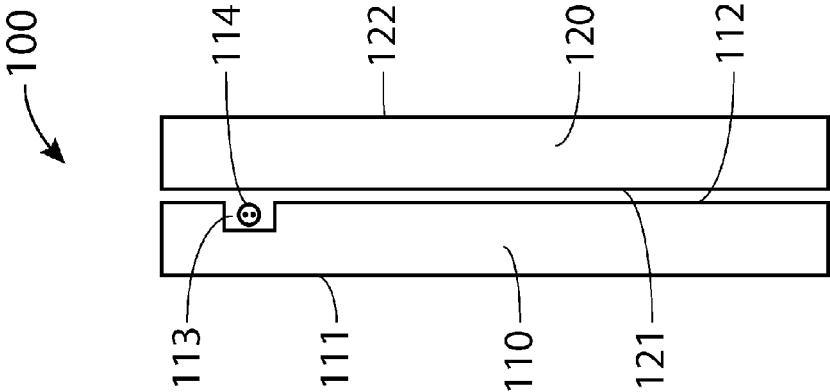


Fig. 1C

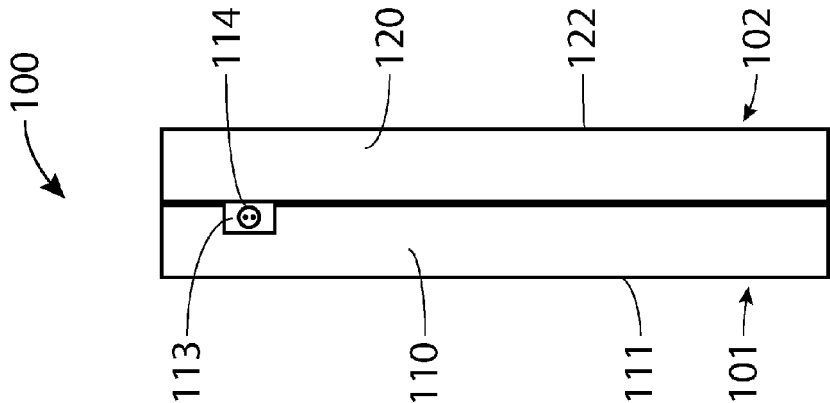


Fig. 1B

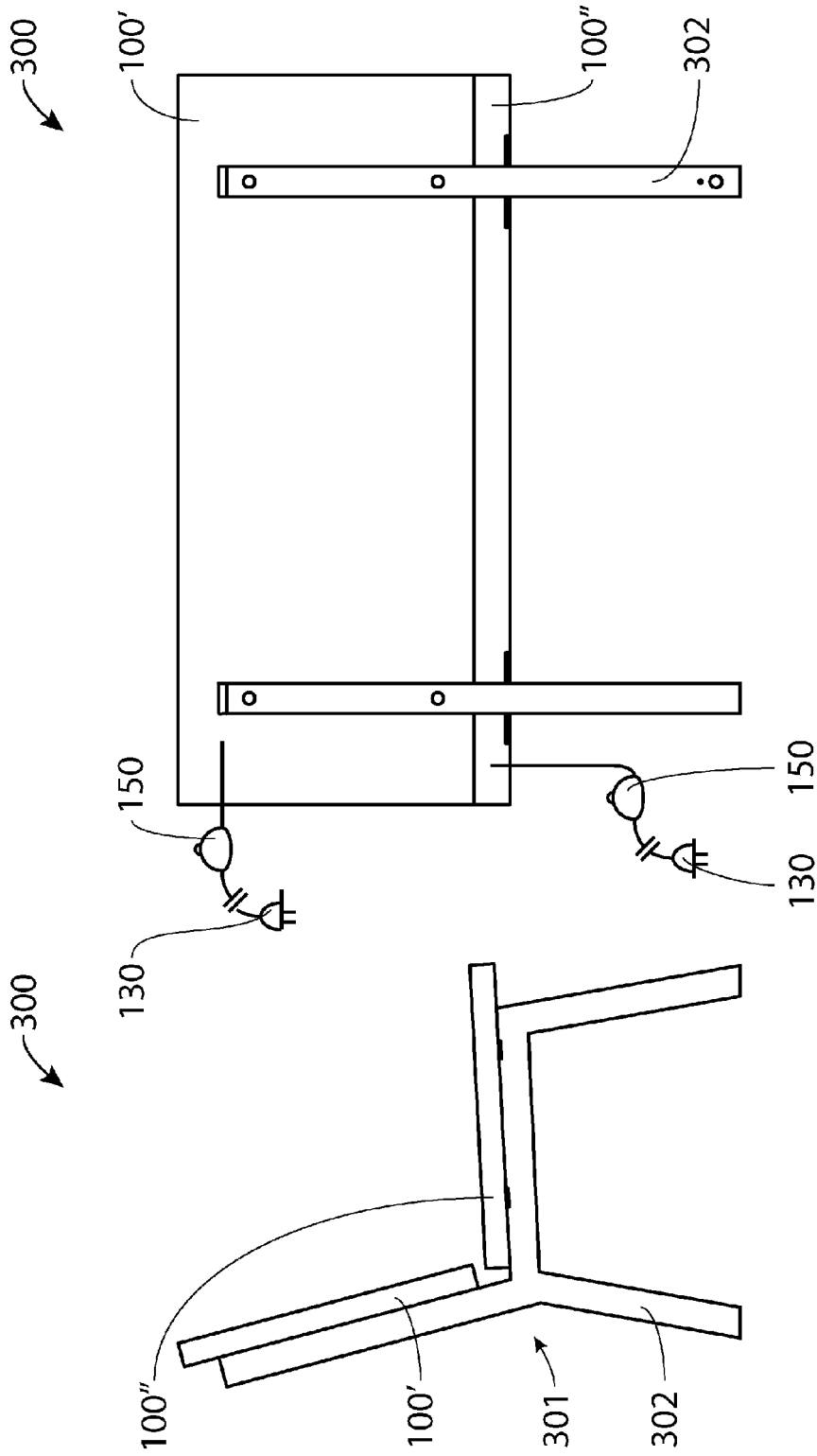


Fig. 3B

Fig. 3A



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 6427

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	CN 2 288 642 Y (WU YINGWEI [CN]) 26 August 1998 (1998-08-26)	1,8	INV.
A	* Machine translation; figures *	2	A47C7/74 A47C21/04
A	----- US 3 973 103 A (TADEWALD THOMAS D) 3 August 1976 (1976-08-03) * claim; figures *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 November 2015	Examiner Amghar, Norddin
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 15 17 6427

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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30-11-2015

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 2288642	Y	26-08-1998	NONE	
US 3973103	A	03-08-1976	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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- WO 2010082130 A [0012]