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(54) **INSULATING UNIT, DOOR, SIDEWALL AND CHILLER OR FREEZER DEVICE**

(57) An insulating unit for a chiller or a freezer device, comprising a transparent glass pane (2) and a transparent polymer pane (3), wherein said transparent glass pane (2) and said transparent polymer pane (3) are spaced apart from each other. Further, a door and/or sidewall and a chiller or freezer device are described.

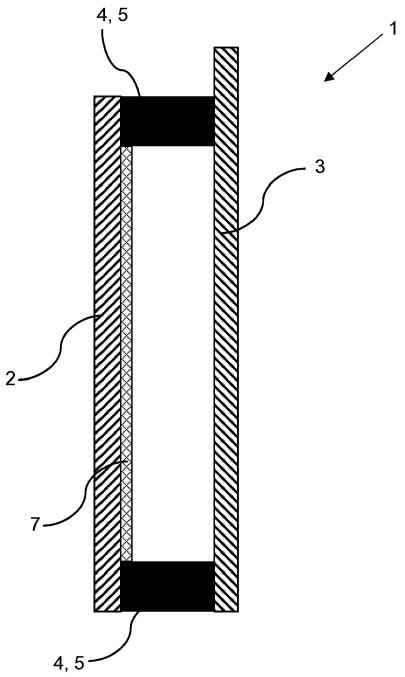

Fig. 1

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Description

[0001] The present invention relates to an insulating unit for a chiller or a freezer device.

[0002] Further, the present invention relates to a door and/or a sidewall for a chiller or a freezer device.

[0003] Furthermore, the present invention relates to a chiller or a freezer device.

[0004] Chiller or freezer devices are used for example in super markets or grocery stores for presenting cooled or frozen goods to the shoppers. Typically all freezer devices are closed by doors and for chiller more and more devices are covered with doors, both to decrease the energy consumption of the devices and to support the compliance with food storage requirements. The doors of such devices typically comprise an insulating unit with at least two transparent panes, which are spaced apart from each other. Hence, the shoppers can see the goods through the transparent panes.

[0005] Conventional insulating units either entirely consist of transparent polymer panes (see for example EP 3 194 870 B1) or entirely of transparent glass panes (see for example EP 2 878 233 B1).

[0006] Insulating units consisting of polymer panes show a higher impact resistance in certain scenarios and are lightweight. However, polymer panes have the disadvantage that they bend at lower temperatures, which has to be compensated by pre-bending the polymer pane. The pre-bending has the disadvantage that the view through the polymer panes is disturbed by distortion. In addition, the manufacturing of pre-bent polymer insulating units is complicated, which increases manufacturing costs. Further, insulating units consisting of polymer panes comprise a high thermal transmittance (U-value) compared to glass panes where at least one sheet in an insulating unit is typically arranged with heat reflective coatings and therefore lead to a higher energy consumption of the devices and face problems with regard to condensation on the polymer panes.

[0007] Insulating units consisting of glass panes do not have to be pre-bent because of the low coefficient of thermal expansion. However, the glass panes are heavy and can be damaged in certain constellations, for example by a shopping trolley hitting the edges of the glass pane.

[0008] Embodiments of the present invention therefore address the problem of improving and further developing an insulating unit such that is robust, of lightweight and can be easily manufactured.

[0009] In a first aspect, the present invention provides an insulating unit for a chiller or a freezer device, comprising a transparent glass pane and a transparent polymer pane, wherein said transparent glass pane and said transparent polymer pane are spaced apart from each other.

[0010] In a second aspect, the present invention provides a door and/or sidewall for a chiller or a freezer device comprising an insulating unit according to the first aspect, preferably the door is a swing door or a sliding door such that the vertical spacer sections are in a vertical orientation and the horizontal spacer sections are in a horizontal orientation.

[0011] In a third aspect, the present invention provides a chiller or freezer device comprising a door and/or a sidewall having an insulating unit according to the first aspect, preferably wherein when the chiller or freezer device is in its operating position said door and/or said sidewall are arranged at least essentially vertical.

[0012] An advantage of the invention is that the insulating unit comprises a lower weight compared to a full glass insulating unit because of the arrangement of the polymer pane. Furthermore, the polymer pane provides a shock resistance such that the insulating unit also resists tough handling in a store. Surprisingly the bending of such an insulating unit under non-isothermal conditions can be strongly reduced in comparison with an insulating unit with two polymer panes, even if the panes of the insulating unit consist of two different materials with two different coefficients of thermal expansion. While the person skilled in the art would expect a strong bending behavior like a bi-metal.

[0013] It is noted that the transparent glass pane and the polymer pane can be entirely spaced apart from each other. Alternatively, the polymer pane and the glass pane can be spaced apart from each other at least in a "main display area", for example the polymer pane can be bent in its edge region towards the glass pane for connecting this edge region of the polymer pane to the glass pane.

[0014] The term "inner pane" refers in particular in the claims, preferably in the description to the pane of the insulting unit that is facing the cold inside of the chiller or freezer device.

[0015] The term "outer pane" refers in particular in the claims, preferably in the description to the pane of the insulting unit that is outside of the refrigerated compartment of the chiller or freezer device.

[0016] The term "vertical spacer section" refers in particular in the claims, preferably in the description, to the spacer section that extends vertical or at least essentially vertical when the insulating unit as part of a door or wall for a chiller or cooler device is in its operating position.

[0017] The term "horizontal spacer section" refers in particular in the claims, preferably in the description, to the spacer section that extends horizontal or at least essentially horizontal when the chiller or cooler device is in its operating position.

[0018] A chiller or freezer device having a door and/or sidewall that is/are "arranged at least essentially vertical" when the chiller or freezer device is in its operating position refers in particular in the claims, preferably in the description, to a so called vertical or semi-vertical chiller (i.e. doors and/or sidewalls being inclined more than 55° with respect to the horizontal) or freezer device, i.e. not a horizontal chiller or freezer device.

[0019] In a further embodiment, said transparent glass pane is an inner pane and/or said transparent polymer pane is an outer pane. Arranging the glass pane as an

inner pane has the advantage that it surprisingly leads to a reduced bending. Further, arranging the polymer pane as an outer pane is advantageous because it provides a good mechanical robustness and therefore protects the insulating unit from being damaged for example by trolleys or by being slammed against an adjacent door.

[0020] Preferably, the insulating unit comprises a thermal transmittance (U-value) in the range of 1.0 W/(m^2·K) to 1.8 W/(m^2·K). This has the advantage that the energy consumption of a chiller or freezer device comprising such an insulating unit is relatively low.

[0021] According to an embodiment, said transparent polymer pane comprises polyethylene terephthalate (PET), for example PET G, and/or polymethylmethacrylate (PMMA) and/or polycarbonate (PC) and/or styrene-acrylonitrile resin (SAN). PMMA has beneficial mechanical and chemical properties (for example good chemical resistance, good light transmission, low coefficient of thermal expansion, very flexible, high scratch resistance) and is inexpensive. PC is advantageous because of its high temperature stability. An advantage of PET G is that it is harmless with regard to food safety. SAN has a good light transmission and low coefficient of thermal expansion. Additionally or alternatively and/or said transparent glass pane can be a soda-lime glass pane.

[0022] In a further embodiment, said transparent glass pane has a thickness in the range of 3 mm to 5 mm. Such a glass pane provides a sufficient mechanical robustness and thermal insulation. Alternatively or additionally said transparent polymer pane comprises a thickness in the range of 3 mm to 8 mm. This has the advantage that the polymer pane is thick enough to prevent the insulating unit from being damaged under typical conditions for supermarkets and at the same time it is relatively light.

[0023] According to an embodiment, a low-emission layer, preferably comprising a metal or a metal oxide, for example indium tin oxide, is arranged on said transparent glass pane and/or on said transparent polymer pane. A low-emission layer improves the thermal insulation and reduces the risk of condensation. An indium tin oxide layer is further transparent and does not block a customer's view through the insulating unit.

[0024] In a further embodiment, an antireflective layer and/or an anti-scratch coating is arranged on said transparent glass pane and/or on said transparent polymer pane. By arranging an antireflective layer, the view through the insulating unit is improved. Further, the anti-scratch coating improves the robustness of the insulating unit, for example against trolleys hitting the polymer pane.

[0025] According to an embodiment, said transparent glass pane and said transparent polymer pane are spaced apart by a spacer assembly. Providing a spacer assembly has the advantage that the polymer pane does not have to be bent towards to the glass pane for arranging both panes spaced apart from each other. Alternatively or additionally, the transparent glass pane can be entirely flat and/or the transparent polymer pane can be entirely flat. A flat glass pane and a flat polymer pane, i.e. planar panes, have the advantage that the manufacturing is easy and that the view through the panes is not distorted since no bent regions exist. With other words, the glass pane extends at least essentially along a plane and the polymer extends at least essentially along a plane.

[0026] In a further embodiment, said spacer assembly comprises two horizontal spacer sections and two vertical spacer sections. As indicated above, the terms "horizontal" and "vertical" are used with respect to the operating position of the insulating unit or the cooler/freezer device. Since semi-vertical cooler or freezer device are known, the "vertical spacer section" has to be at least essentially vertical in its operating position. Preferably, the vertical spacer sections can be longer than the horizontal spacer sections. The spacer assembly can be designed as described in WO 2017/036832 A1 and/or in WO 2014/198549 A1, which are incorporated herein by reference.

[0027] Further, at least one of said vertical spacer sections can be translucent, more preferably at least partially transparent. A translucent or a transparent spacer section has the advantage that a person's view through the insulating unit onto the products is not blocked.

[0028] According to a further embodiment, at least one of said vertical spacer sections comprises a glass or a polymer, preferably a massive rod. Thereby a translucent or transparent spacer section can be provided. Alternatively or additionally, at least one of said horizontal second spacer sections can comprise a desiccant, such that the risk of condensation is reduced.

[0029] In a further embodiment, said horizontal and said vertical spacer sections are joined to said transparent glass pane and to said transparent polymer pane with an adhesive layer, for example an adhesive tape or a resin or a glue. An easy and cost efficient assembling of the insulating unit is thereby achieved. Preferably, said adhesive layer can be at least translucent, preferably at least partially transparent. Hence, the view through the insulating device is not blocked by the adhesive layer.

[0030] In a further embodiment, the ratio of the coefficient of thermal expansion of the transparent polymer pane to the coefficient of thermal expansion of the transparent glass pane is in the range of 2 to 12, preferably 2 to 8, more 4 to 6. An advantage of this design is the low bending of the polymer pane under non-isothermal conditions.

[0031] According to a further embodiment, said adhesive layer comprises a thickness of 0.05 mm to 4 mm, preferably 1.0 mm to 3 mm, more preferably 2 mm. With an adhesive layer of the before-mentioned thickness, it is possible to securely join the spacer sections with the polymer pane and the glass pane, wherein the overall thickness of the insulating unit is relatively low. Especially for the combination of a spacer section comprising a polymer with a transparent polymer pane due to the lower difference in the coefficient of thermal expansion a thin

adhesive layer (for example approximately 0.05 mm of a UV curable glue) can be used. This reduces water permeability and allows a more simple application of liquid glues in the production. The same applies to the combination of a spacer section comprising a glass with a transparent glass pane.

[0032] Preferably, a print can be arranged on a part of the outer pane, preferably on the lower and/or upper horizontal part of the outer pane such that the horizontal spacer sections are covered.

[0033] In a further embodiment, the transparent glass pane and/or the transparent polymer pane can comprise a coating that can be used to raise the surface temperature of the pane(s) towards the shop and therefor prevent fogging of the pane(s) in challenging climate conditions as they are typically found in regions with high temperatures and high humidity. To achieve this the rear side of the front pane or the front side of the rear pane can comprise a heatable coating. Such a coating can be produced for example by using glasses with metall oxid layer (like typical low-e glasses) and connecting them to an electricity source.

[0034] In a further embodiment, under operating conditions (i.e non-isothermal conditions) a maximal convex bending of said transparent polymer pane an/or of said transparent glass pane is in the range of 0 mm to +8 mm, preferably 0 mm to +5 mm, more preferably 0 mm to +3 mm and/or a maximal concave bending of said transparent polymer pane and/or of said transparent glass pane is in the range of 0 mm to -8 mm, preferably 0 mm to -5 mm, more preferably 0 mm to -3 mm. Preferably, a bending in this range is achieved for an insulating unit comprising a height in the range of 1500 mm to 1900 mm (i.e. the height when the insulating unit is standing in its operating position) and a transparent glass pane as an inner pane and a transparent polymer pane as an outer pane and when the inner pane has a temperature of 4°C and the outer pane has a temperature of 25°C. An advantage of a bending in this range is that it is almost not viewable for a person. It was found that, for an insulating unit having a width of 613 mm, a height of 1630 mm (i.e. the width and height when the insulating unit is standing in its operating position) and comprising a transparent glass pane as an inner pane and a transparent polycarbonate pane as an outer pane, the maximal concave bending is about 3 mm (bending direction towards the glass pane, i.e. "into the insulating unit") when the temperature of the glass pane is 1°C to 10°C, the temperature of the polycarbonate pane is 25°C and the air moisture is 60%. Under the same conditions an insulating unit comprising two polymer panes has a maximal bending of 10 mm (bending direction "out of the cabinet"). Hence, the bending caused by temperature shrinking effect is minimal for a door comprising a polymer pane and a glass pane. It is noted that the measurement of the maximal bending is conducted when the insulating unit is arranged in a cooler or freezer device, i.e. in its vertical operating position. Further, the pressure between the polymer pane and the transparent pane equals the environmental pressure during the measurement. For example, a hole in a spacer assembly can be arranged for providing a pressure equalization. For measuring the bending a linear rail is brought into contact with the polymer pane, whereas the maximal bending, as illustrated in fig. 5, is defined by the perpendicular point of the polymer pane furthest from the linear rail. Therefore, the maximal concave/convex bending describes the maximal distance between the real surface of the transparent pane and the ideal plane. If the pane is bended away from the insulating unit, the pane comprises a convex bending. If the pane is bending towards the insulating unit, the pane comprises a concave bending. Hence, if both panes at least essentially comprise the same amount of bending in the same direction, the bending is measured at the pane that comprises a concave bending because it can be easily measured with a linear rail as explained above.

[0035] According to a further embodiment under isothermal conditions at about 23°C a maximal convex bending of said transparent polymer pane and/or of said transparent glass pane is in the range of 0 mm to +8 mm, preferably 0 mm to +5, more preferably 0 mm to +3 mm and/or a maximal concave bending of said transparent polymer pane and/or of said transparent glass pane is in the range of 0 mm to -8 mm, preferably 0 mm to -5, more preferably 0 mm to -3 mm. The maximal bending is measured as explained before. Hence, no optical distortions by the bending of the polymer pane are viewable. An advantage of an insulating unit comprising a transparent glass pane and a transparent polymer pane is that the maximal bending of the polymer pane changes only slightly between the isothermal and non-isothermal conditions. Therefore, the transparent polymer pane and the transparent glass pane can be simultaneously optimized for isothermal and for non-isothermal conditions.

[0036] In a further embodiment, said door and/or said freezer or chiller device can comprise a hinge system like the one disclosed in WO 2017/036832 A1 and/or in WO 2014/198549 A1, which are incorporated herein by reference.

[0037] A rod drop test of a transparent polymer pane with the dimension of 613 mm x 1630 mm (i.e. the height and width when the pane is in its operating position) was performed. For this test an iron bar of 1,78 kg guided in a hole inside of an aluminum profile was fallen from different heights under the angle of 45° onto the edge of the polymer pane. It was found that the edge of the polymer pane was destroyed even at low values, i.e. the material was deformed, but there was no breakage or rupture of the polymer material. At increased force, i.e. not a simple fall of the iron bar, material deformation was visible, but still no breakage or rupture of the polymer pane was observed. These results show that a transparent polymer pane provides very good shock resistance in case it is hit on his edge, for example with a trolley.

[0038] There are several ways how to design and further develop the disclosure of the present invention in an

advantageous way. To this end, it is to be referred to the patent claims subordinate to the independent claims on the one hand and to the following explanation of preferred examples of embodiments of the invention, illustrated by the drawing on the other hand. In connection with the explanation of the preferred embodiments of the invention by the aid of the drawing, generally preferred embodiments and further developments of the teaching will be explained. In the drawing

Fig. 1 shows a side view of an insulating unit according to an embodiment of the present invention,

Fig. 2 shows a top view of the insulating unit of fig. 1,

Fig. 3 shows a front view of the insulating unit of fig. 1,

Fig. 4 shows a front view of an insulating unit according to a further embodiment of the present invention, and

Fig. 5 shows the maximum bending of an insulating glass unit.

[0039] Fig. 1 to 3 show different views of an embodiment of an insulating unit 1 for a chiller or freezer device. The insulating unit 1 comprises a transparent glass pane 2 and a transparent polymer pane 3. In this embodiment, the transparent glass pane 2 is the inner pane, i.e. the pane that is facing towards the cooled inside of the freezer or chiller. Hence, the transparent polymer pane 3 is the outer pane, which is facing towards the warmer store environment. The polymer pane 3 is extended on the upper section so that parts of the cabinet can be covered, for example by arranging a print onto this section. A skilled person will understand the transparent polymer pane 3 can also be flush with the transparent glass pane 2.

[0040] Fig. 2 and 3 also show that the transparent glass pane 2 and the transparent polymer pane 3 are entirely flat, such that the view through the insulating unit 1 is not disturbed by optical distortions.

[0041] The transparent panes 2, 3 are spaced apart from each other by a spacer assembly 4. The spacer assembly 4 comprises two horizontal spacer sections 5 and two vertical spacer sections 6. Typically, the horizontal spacer sections 5 are shorter than the vertical spacer sections 6. Preferably, the vertical spacer section 6 can be a massive rod comprising glass or polymer, which can be at least translucent, preferably transparent. Further, at least one of the horizontal spacer sections 5 can comprise a desiccant.

[0042] Further, a low-emission layer 7 can be arranged on the transparent glass pane 2, preferably on the side of the transparent glass pane 2, which is facing towards the transparent polymer pane 3. Furthermore, an antireflective layer and/or an anti-scratch coating can be arranged on the side of the transparent polymer pane 3, which is facing towards the shop environment.

[0043] Fig. 4 shows a front view of further embodiment of an insulating unit 1, which corresponds to the embodiment of the fig. 1 to 3 with the difference that a print 8 is arranged on the transparent polymer pane 3. Hence, the horizontal spacer sections 5 are covered by the print 8.

[0044] Fig. 5 shows a side view of an insulating unit 1 and illustrates the maximal bending of the glass pane 2 and the polymer pane 3. The dotted line 9 shows a concave bending ("towards the insulating unit"), for example under non-isothermal, operating conditions. The maximal concave bending is depicted by the arrow 10 and is defined by the perpendicular point of the transparent glass pane 2 or of the transparent polymer pane 3 furthest from a (not-shown) linear rail, which is brought into contact with the transparent glass pane 2 or with the transparent polymer pane 3. With other words, the maximal concave bending 10 describes the maximal distance between the real surface 9 of the transparent pane and the ideal plane 2, 3. Analogue, the dotted line 9' shows a convex bending, whereas the arrow 10' depicts the maximal convex bending. In this disclosure, a numerical value less than zero describes a concave bending and a numerical value higher than zero describes a convex bending.

[0045] Many modifications and other embodiments of the invention set forth herein will come to mind to the one skilled in the art to which the invention pertains having the benefit of the teachings presented in the foregoing description and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

List of reference signs

[0046]

1	insulating unit
2	glass pane
3	polymer pane
4	spacer assembly
5	horizontal spacer section
6	vertical spacer section
7	low-emission layer
8	print
9, 9'	dotted line
10, 10'	arrow (maximal bending)

Claims

1. Insulating unit (1) for a chiller or a freezer device, comprising a transparent glass pane (2) and a trans-

parent polymer pane (3), wherein said transparent glass pane (2) and said transparent polymer pane (3) are spaced apart from each other.

2. Insulating unit (1) according to claim 1, wherein said transparent glass pane (2) is an inner pane and/or wherein said transparent polymer pane (3) is an outer pane.

3. Insulating unit (1) according to claim 1 or 2, wherein said transparent polymer pane (3) comprises polyethylene terephthalate (PET) and/or polymethylmethacrylate (PMMA) and/or polycarbonate (PC), and/or styrene-acrylonitrile resin (SAN) and/or wherein said transparent glass pane (2) is a soda-lime glass pane (2).

4. Insulating unit (1) according to any one of claims 1 to 3, wherein said transparent glass pane (2) has a thickness in the range of 3 mm to 5 mm and/or wherein said transparent polymer pane (3) comprises a thickness in the range of 3 mm to 8 mm,

and/or wherein a low-emission layer, preferably comprising a metal or a metal oxide, for example indium tin oxide, is arranged on said transparent glass pane (2) and/or on said transparent polymer pane (3),
and/or wherein an antireflective layer and/or an anti-scratch coating is arranged on said transparent glass pane (2) and/or on said transparent polymer pane (3).

5. Insulating unit (1) according to any one of claims 1 to 4, wherein said transparent glass pane (2) and said transparent polymer pane (3) are spaced apart by a spacer assembly (4),

preferably wherein said transparent glass pane (2) is entirely flat and wherein said transparent polymer pane (3) is entirely flat,
preferably wherein said spacer assembly (4) comprises two horizontal spacer sections (5) and two vertical spacer sections (6), preferably wherein at least one of said vertical spacer sections (6) is translucent, more preferably at least partially transparent.

6. Insulating unit (1) according to claim 5, wherein at least one of said vertical spacer sections (6) comprises a glass or a polymer, preferably a massive rod, and/or wherein at least one of said horizontal second spacer sections (5) comprises a desiccant.

7. Insulating unit (1) according to any one of claims 1 to 6, wherein the ratio of the coefficient of thermal expansion of the transparent polymer pane (3) to the coefficient of thermal expansion of the transparent glass pane (2) is in the range of 2 to 12, preferably 2 to 8, more preferably 4 to 6.

8. Insulating unit (1) according to claim 6 or 7, wherein said horizontal and said vertical spacer sections (5, 6) are joined to said transparent glass pane (2) and to said transparent polymer pane (3) with an adhesive layer, for example an adhesive tape or a resin, preferably wherein said adhesive layer is at least translucent, preferably at least partially transparent.

9. Insulating unit (1) according to claim 8, wherein said adhesive layer has a thickness of 0.05 mm to 4 mm, preferably 1.0 mm to 3 mm, more preferably 2 mm.

10. Insulating unit (1) according to any one of claims 1 to 9, wherein under operating conditions (i.e non-isothermal conditions) a maximal convex bending of said transparent polymer pane (3) and/or of said transparent glass pane (2) is in the range of 0 mm to +8 mm, preferably 0 mm to +5, more preferably 0 mm to +3 mm,
and/or wherein under operating conditions (i.e non-isothermal conditions) a maximal concave bending of said transparent polymer pane (3) and/or of said transparent glass pane (2) is in the range of 0 mm to -8 mm, preferably 0 mm to -5, more preferably 0 mm to -3 mm.

11. Insulating unit (1) according to any one of claims 1 to 10, wherein under isothermal conditions at about 23°C a maximal convex bending of said transparent polymer pane (3) and/or of said transparent glass pane (2) is in the range of 0 mm to +8 mm, preferably 0 mm to +5 mm, more preferably 0 mm to +4 mm,
and/or wherein under isothermal conditions at about 23°C a maximal concave bending of said transparent polymer pane (3) and/or of said transparent glass pane (2) is in the range of 0 mm to -8 mm, preferably 0 mm to -5 mm, more preferably 0 mm to -4 mm.

12. Door and/or sidewall for a chiller or a freezer device comprising an insulating unit (1) according to any one of claims 1 to 11, preferably the door is a swing door or a sliding door such that the vertical spacer sections (6) are in a vertical orientation and the horizontal spacer sections (5) are in a horizontal orientation.

13. Chiller or freezer device comprising a door and/or a sidewall having an insulating unit (1) according to any one of claims 1 to 11, preferably wherein when the chiller or freezer device is in its operating position said door and/or said sidewall are arranged at least essentially vertical.

Fig. 1

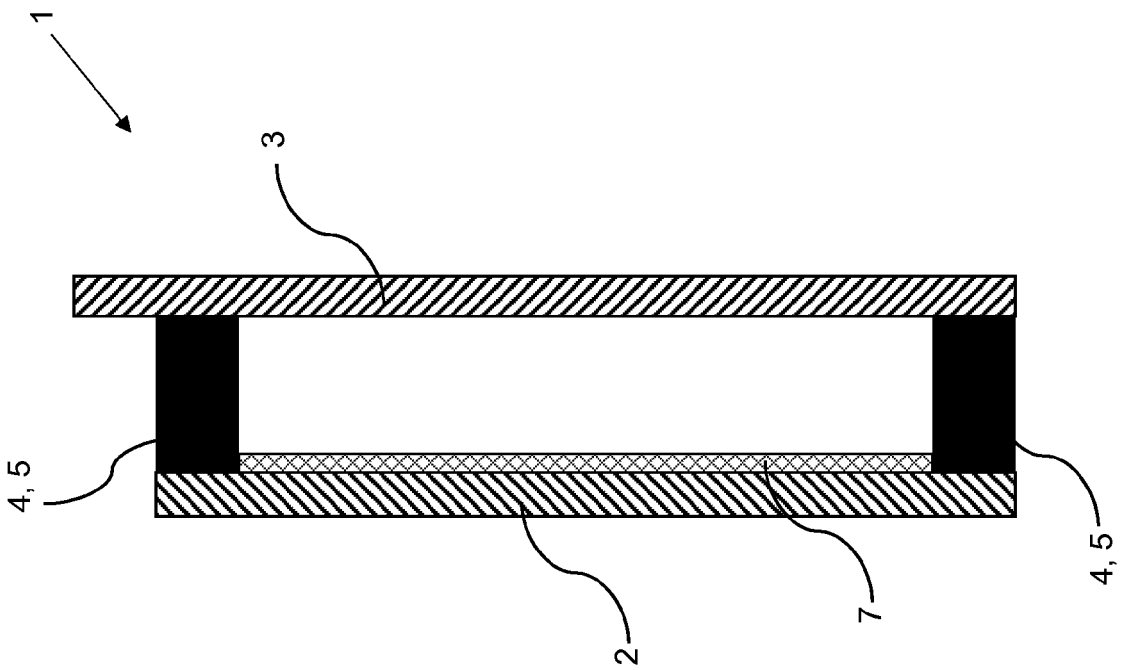
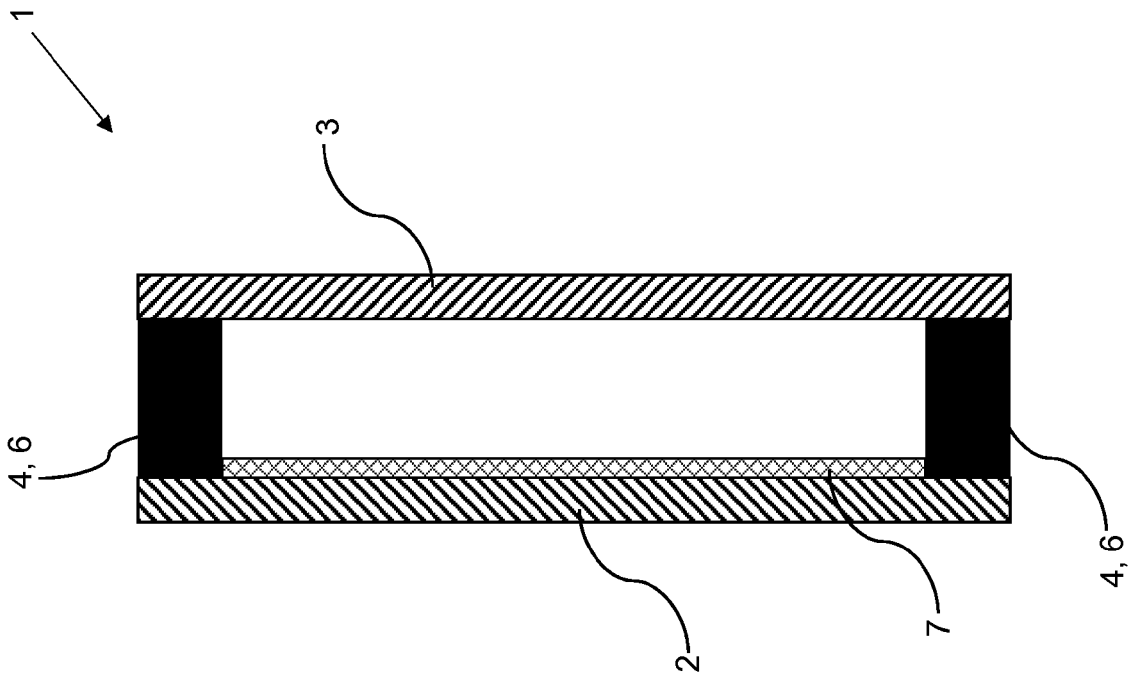


Fig. 2



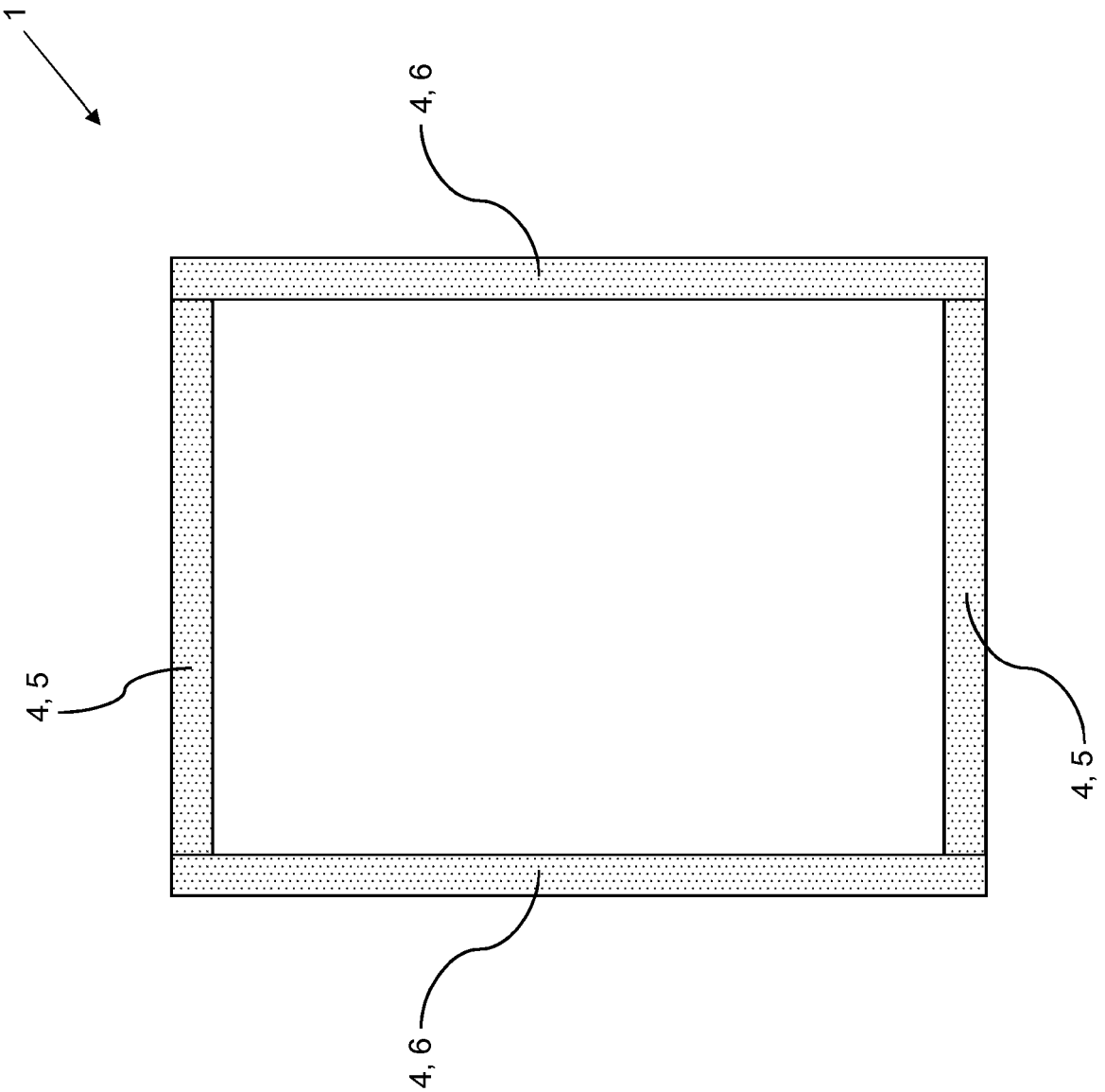


Fig. 3

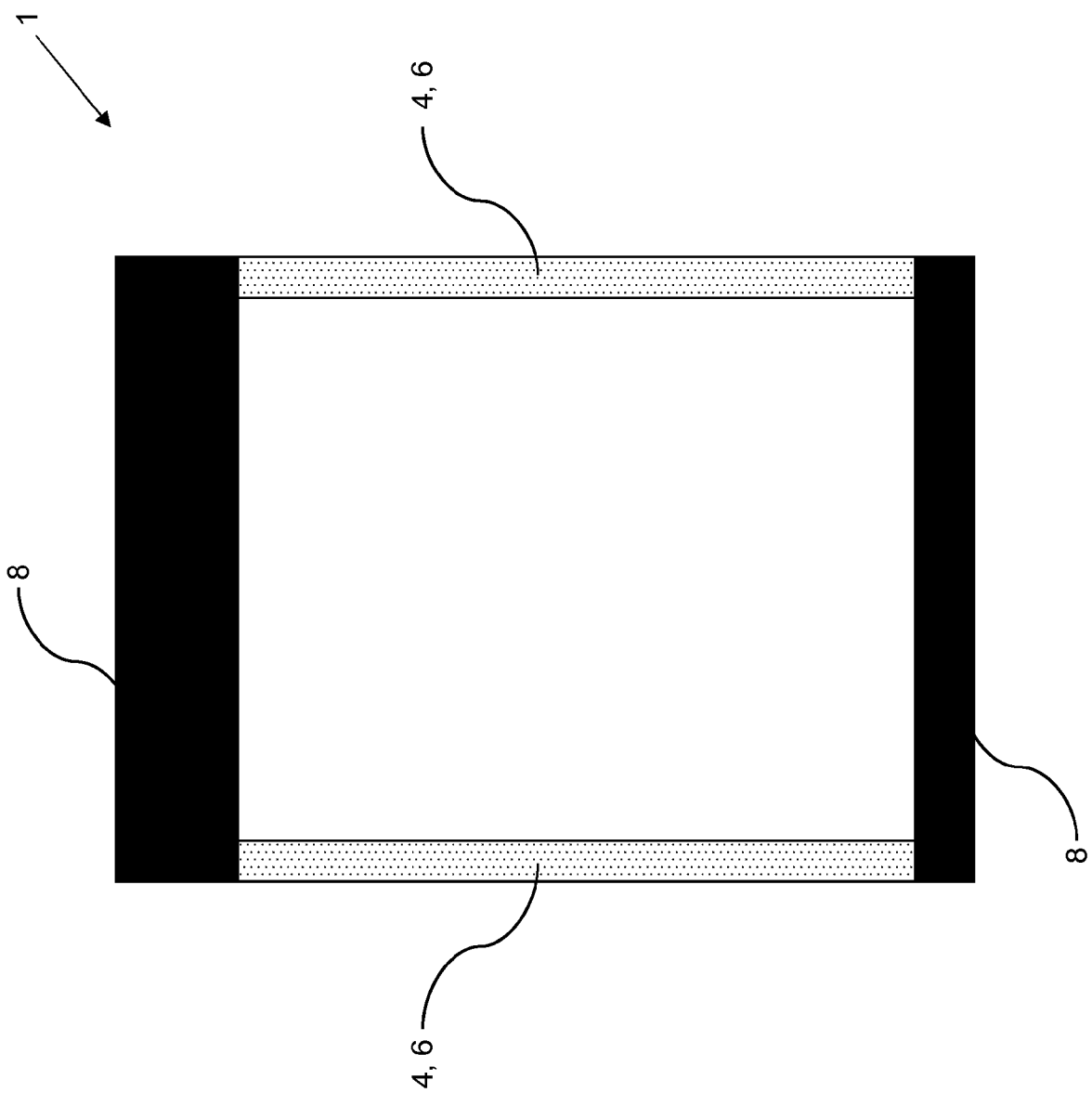


Fig. 4

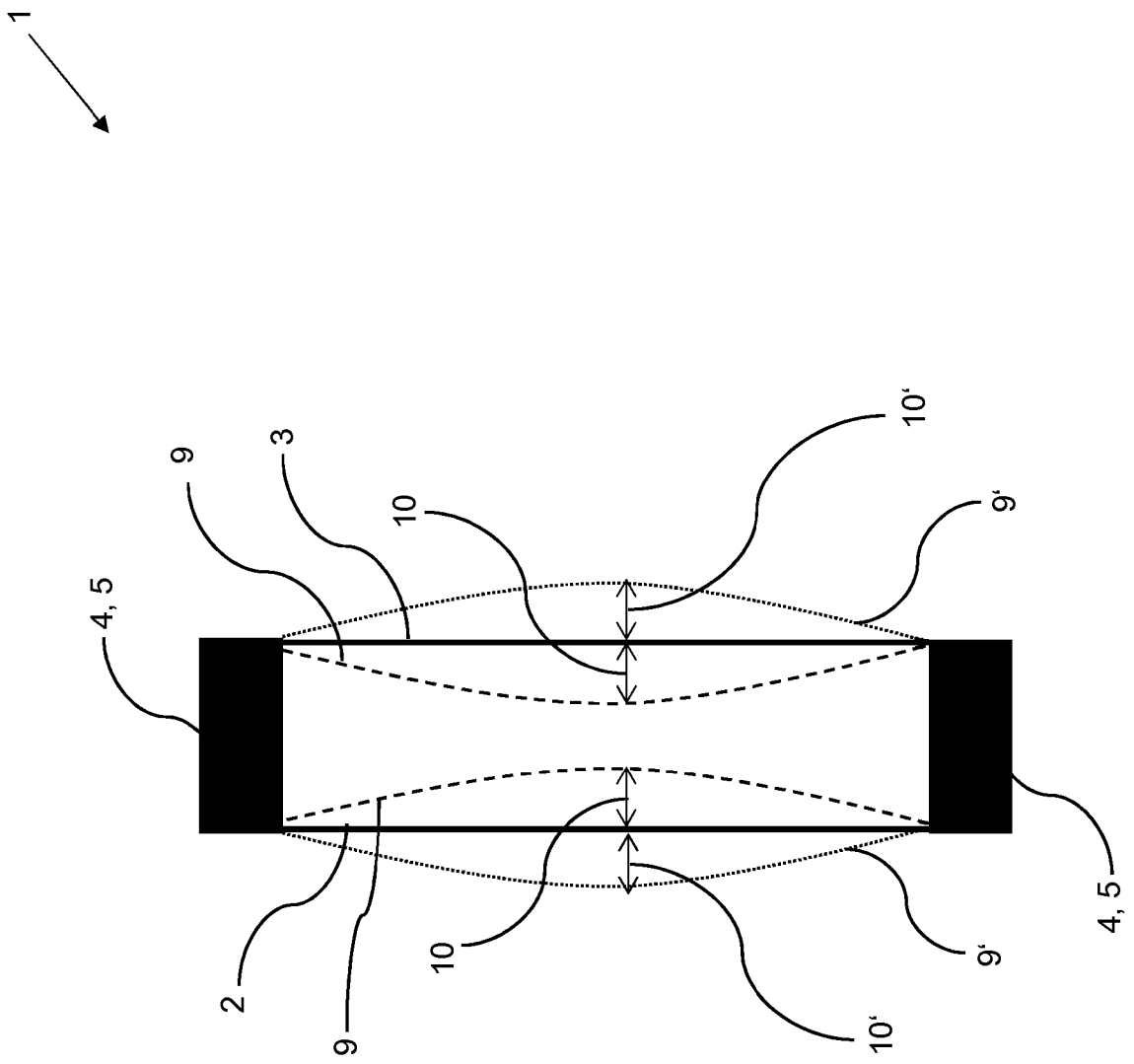


Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 6262

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	US 4 206 615 A (CHIBA KIYOSHI [JP] ET AL) 10 June 1980 (1980-06-10)	1-5,7-13	INV. A47F3/04
Y	* column 4, line 65 - column 5, line 10; figures 1A-1C, 4 *	6	E06B3/66 E06B3/663 E06B3/67
X	DE 42 41 125 A1 (KUNERT HEINZ [DE]) 9 June 1994 (1994-06-09)	1-5,7-12	E06B3/02 E06B3/677
Y	* figures 1, 7 *	6	
Y	DE 10 2019 114660 A1 (PFALTZ DIETER [DE]) 5 December 2019 (2019-12-05) * figures 1-5 *	6	
X	WO 00/73613 A1 (OLSSON LARS TORBJOERN [SE]) 7 December 2000 (2000-12-07) * page 1, line 23 - page 2, line 4; figure 1 *	1-12	
A	EP 1 795 688 A2 (ADVANCED GLAZING TECHNOLOGIES [CA]) 13 June 2007 (2007-06-13) * figures 1A-1C *	10,11	

TECHNICAL FIELDS SEARCHED (IPC)
A47F
E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 June 2022	Crespo Vallejo, D

CATEGORY OF CITED DOCUMENTS

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