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(54)

METHOD FOR PROVIDING A CURVED PANEL WITH AIR GAP FOR GLAZING UNITS, AND CURVED PANEL PROVIDED BY THE METHOD

(57)

A method for providing a curved panel (10) with an air gap for glazing units (11), comprising the following steps:

- applying a perimetric profile (13) on at least one face (12) of an already-curved component (11) that is made of glass and is sheet-like,
- placing spacers (15) on the already-curved component (11), at its curved edges (14), which are equal in height to the thickness of the interspace provided by design for the curved panel (10),
- placing a flat component (16), made of glass, so that it rests on the perimetric profile (13),

- curving the flat component (16) by actuation of curving means (17) at the spacers (15) until a constant distance, equal to the air gap, is reached between the two mutually opposite faces (12, 18) respectively of the already-curved component (11) and of the component being curved (19),
- sealing the already-curved component (11) to the component being curved (19) by the application, around the perimetric profile (13), of plastic material in the fluid state, which is adapted to crosslink, providing a joint (20) between the two,
- releasing the curving means (17) at the end of the crosslinking of the plastic material.

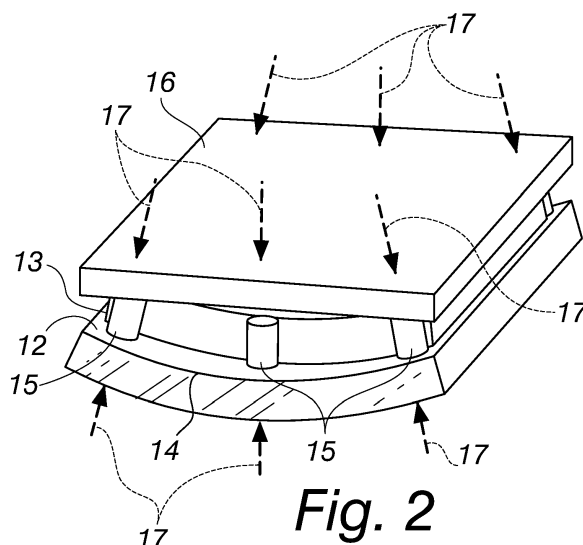


Fig. 2

Description

[0001] The present invention relates to a method for providing a curved panel with air gap for glazing units and to a curved panel provided by the method.

[0002] Panels for providing curved glazing units of facades or roofs of buildings are currently known which are made of plastic material, for example of the type of polycarbonate, which is easy to bend and sturdy but is subject to dirtying and loss of transparency over time.

[0003] As an alternative, there is widespread use of panels made of glass, due to the inherent ability of the material to maintain its characteristics unchanged over time. This type of panel is often laminated, constituted by a sandwich-like structure of structural layers made of glass with interlayers made of plastic material, in order to reduce the likelihood of release of fragments of material following an impact. It is known that a panel of this type must be bent at relatively high temperatures with the application of significant forces. This method requires the use of adapted systems and is notoriously expensive.

[0004] However, as is known, so far it is difficult to provide the cold bending of sandwich panels constituted by layers of glass with interlayers made of plastic material, due to the possible delamination of the interlayer as a consequence of the different elongation of two layers of glass at the point of contact with the interlayer.

[0005] A possible solution provides for curving the panel at the time of installation.

[0006] The panel is rested on a curved structure and is bent over it until the edges of the panel also are in contact with said surface. Finally, locking means are applied to maintain the curvature of the panel. This method has the advantage that it is performed at ambient temperature, without softening the interlayers, but extends considerably the installation times of the panels on buildings.

[0007] The aim of the present invention is to devise a method for providing a curved panel by overcoming the drawbacks of the methods known so far.

[0008] Within this aim, an object of the invention is to devise a method for providing curved panels that can be performed easily with known technologies.

[0009] Another object of the invention is to curve the panels at relatively low temperatures that are close to the ambient temperature.

[0010] Another object of the invention is to obtain a product that is ready for installation and is easy and quick to install.

[0011] Another object of the invention is to devise a panel that is structurally simple and easy to use and can be manufactured at low costs.

[0012] This aim, as well as these and other objects which will become better apparent hereinafter, are achieved by a method for providing a curved panel with an air gap for glazing units, comprising the following steps:

- applying a perimetric profile on at least one face of an already-curved component that is made of glass and is sheet-like,
- placing spacers on said already-curved component, at its curved edges, which are equal in height to the thickness of the interspace provided by design for said curved panel,
- placing a flat component, made of glass and sheet-like, so that it rests on said perimetric profile,
- curving said flat component by actuation of curving means at said spacers until a constant distance, equal to said interspace, is reached between the two mutually opposite faces respectively of said already-curved component and of the component being curved,
- sealing said already-curved component to said component being curved by the application, around said perimetric profile, of plastic material in the fluid state, which is adapted to crosslink, providing a joint between the two,
- releasing said curving means at the end of the crosslinking of said plastic material.

[0013] The present invention also relates to a curved panel, provided by means of the method, characterized in that it comprises at least two plate-like components, which are curved and coupled in a parallel arrangement at a distance that is equal to the interspace provided by design for said curved panel, with the interposition of a said perimetric profile, and are sealed by means of said joint between the two that surrounds said perimetric profile.

[0014] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the method according to the invention and from the description of a preferred but not exclusive embodiment of the curved panel according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a view of some first steps of a method according to the invention;

Figure 2 is a view of other subsequent steps of the method according to the invention;

Figure 3 is a perspective view of an example of a curved panel according to the invention;

Figures 4 and 5 are sectional views of variations of the curved panel according to the invention.

[0015] With reference to the first three figures, the method according to the invention is devised to provide a curved panel, of the type with an air gap for glazing units, generally designated in the subsequent figures by the reference numeral 10.

[0016] The method comprises a series of steps described hereinafter.

[0017] An already-curved sheet-like component 11 is

arranged, with respect to what is shown, with its concavity directed upwardly to provide the first version of curved panel 10 and with its concavity directed downwardly for the second version.

[0018] A perimetric profile 13 is applied on an upper face 12 thereof and its adhesion is produced by means of a slight pressure.

[0019] The perimetric profile 13 is in fact advantageously made of plastic material, which makes it adaptable to the curvature of the already-curved component 11, and has, on the side for association with the already-curved component 11 and on the opposite side, a self-adhesive material, preferably made of butyl.

[0020] It is possible to use curved components made of monolithic or laminated glass of the toughened or thermally or chemically tempered or annealed type.

[0021] Spacers 15, equal in height to the thickness of the air gap provided by design to provide the curved panel 10, are placed appropriately on the already-curved component 11, proximate to its curved edges 14 and outside the perimetric profile 13.

[0022] In the subsequent step of the method, a flat component 16, made of glass and sheet-like, is rested on the perimetric profile 13.

[0023] These steps of the method are shown in Figure 2.

[0024] The type of flat component can be selected among the ones indicated for curved components or, preferably, it is possible to use a Saint-Gobain product made of glass identified by the trademark Contraflam®, or an equivalent fire-resistant product.

[0025] In particular, the Contraflam® product is a fire-resistant glazing unit composed of two or more tempered or toughened safety glass sheets, separated by interlayers made of gel which, in case of fire, forms a heat insulation barrier, reducing heat conduction and radiation.

[0026] During placement, the flat component 16 is guided correctly to obtain a perfect match with the curved component 11.

[0027] Means 17, shown schematically by arrows in Figure 2, for curving the flat component 16 are then applied and actuated.

[0028] In particular, the curving means 17 consist substantially of a system of pressers or clamps that are actuated on the outer surfaces of the flat component 16 and of the already-curved component 11, substantially in a clamp-like manner, at the spacers 15, until a constant distance is reached which is equal to the thickness of the air gap provided for the curved panel 10, between the two mutually opposite faces 12 and 18 respectively of the already-curved component 11 and of the component 19 being curved. Therefore, the end of the curving step is set by the spacers 15. These spacers are then removed, since retention of the curvature is ensured by the pressers that are still active.

[0029] The component being curved 19 is sealed to the already-curved component 11 by means of the application, around the perimetric profile 13, of plastic ma-

terial in the fluid state, which is adapted to cross-link, forming a joint 20 between the two. The joint 20 is obtained by extrusion of silicone and is shown in Figure 3. After the time required for cross-linking of the plastic material (approximately 24 hours), the curved panel 10 is released from the curving means 17.

[0030] The operations for curving the flat component 16 and the assembly of the curved panel 10 are performed at temperatures comprised between approximately 30°C and approximately 40°C, depending on the material, and are such as to facilitate the deformation of the flat component 16 without causing its structural modification or its breakage.

[0031] In the particular case of Contraflam®, as an initially flat component, this temperature is preferable in order to facilitate the disengagement of the glass sheets from the interlayers made of gel, thus allowing curving.

[0032] The curved panel 10 is shown in a perspective view in Figure 3 and is shown in a sectional view in Figure 4.

[0033] The curved panel 10 according to the invention thus comprises two sheet-like curved components that are coupled in a parallel arrangement at a distance equal to the air gap provided by design for the curved panel 10, with the interposition of a perimetric profile 13, and are sealed by means of a joint 20 between the two which surrounds the perimetric profile 13. The two flat components consist of an already-curved component 11 and a component being curved 19, the curving of which is obtained during the method according to the invention.

[0034] In the first variation of the curved panel 10, the component being curved 19 is coupled to the curved component 11, facing its concave face 12, while in the second variation, shown in Figure 5, the face 12 is the convex one.

[0035] It should be noted that the joint 20 that keeps the two components joined at the end of the method prevents, once the curving means 17 have been released, modification of the shape of the curved panel 10; therefore, during its installation, in the provision of glazing units, it undergoes no deformation and therefore no forcing.

[0036] The curved panel 10 can therefore be installed and fixed easily to a supporting structure, and any disassembly from the structure does not entail a return of the component being curved 19 to its original shape of flat component 16.

[0037] Furthermore, the method can be performed at ambient temperature or at temperatures that are in any case relatively low, containing production costs.

[0038] Furthermore, the curved panel 10 is provided in adapted production facilities and transferred to the installation site as a finished product, ready for assembly with other similar curved panels 10 so as to provide the glazing of buildings.

[0039] It should also be noted that the described method allows to provide curved panels for insulating glazing units the components of which, of the cited types, can

have been subjected beforehand to surface coating treatments or to screen printing.

[0040] In practice it has been found that the invention achieves the intended aim and objects, devising a method that is easy to perform to provide curved panels that are structurally simple and can be provided at temperatures that are close to the ambient temperature or higher but in any case low.

[0041] The curved panels, furthermore, are ready for installation, facilitating and speeding up the provision of curved glazing and of roofs of buildings.

[0042] Furthermore, the use of a component of the type of Contraflam® or equivalents, to provide the curved panel according to the invention, ensures a high level of protection in case of fire with respect to curved panels that are not fire-resistant.

[0043] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0044] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements and to the state of the art.

[0045] Where the characteristics and methods mentioned in any claim are followed by reference signs, those reference signs have been applied for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

[0046] The disclosures in Italian Patent Application PD2014A000105, from which this application claims priority, are incorporated herein by reference.

[0047] Where technical features mentioned in the claims are followed by numeric references and/or acronyms, said numeric references and/or acronyms reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such numeric references and/or acronyms do not have any limiting effect on the scope of each element identified merely by way of example by such numeric references and/or acronyms.

Claims

1. A method for providing a curved panel (10) with an air gap for glazing units (11), comprising the following steps:

- applying a perimetric profile (13) on at least one face (12) of an already-curved component (11) that is made of glass and is sheet-like,
- placing spacers (15) on said already-curved component (11), at its curved edges (14), which are equal in height to the thickness of the inter-

space provided by design for said curved panel (10),

- placing a flat component (16), made of glass and sheet-like, so that it rests on said perimetric profile (13),

- curving said flat component (16) by actuation of curving means (17) at said spacers (15) until a constant distance, equal to said interspace, is reached between the two mutually opposite faces (12, 18) respectively of said already-curved component (11) and of the component being curved (19),

- sealing said already-curved component (11) to said component being curved (19) by the application, around said perimetric profile (13), of plastic material in the fluid state, which is adapted to crosslink, providing a joint (20) between the two,

- releasing said curving means (17) at the end of the cross-linking of said plastic material.

2. The method according to claim 1, **characterized in that** it performs the curving of a said flat component (16), which is a Saint-Gobain product made of glass of the Contraflam® type or an equivalent fire-resistant product.

3. The method according to claim 1, **characterized in that** the curving of said flat component (16) and the assembly of said curved panel (10) are performed at temperatures substantially higher than approximately 30°C.

4. The method according to claim 3, **characterized in that** the curving of the flat component (16) and the assembly of the curved panel (10) are performed at temperatures comprised substantially between 30°C and 50°C.

5. The method according to claim 1, **characterized in that** said spacers (15) are removed prior to said sealing.

6. The method according to claim 1, **characterized in that** said curving means (17) consist of a set of pressers.

7. The method according to claim 1, **characterized in that** the application of said perimetric profile (13) is performed with a pressure that causes its adhesion to said already-curved component (11) on which it is applied.

8. A curved panel (10), provided by means of the method according to one or more of the preceding claims, **characterized in that** it comprises at least two plate-like components, which are curved and coupled in a parallel arrangement at a distance that is equal to

the interspace provided by design for said curved panel (10), with the interposition of a said perimetric profile (13), and are sealed by means of said joint (20) between the two that surrounds said perimetric profile (13).

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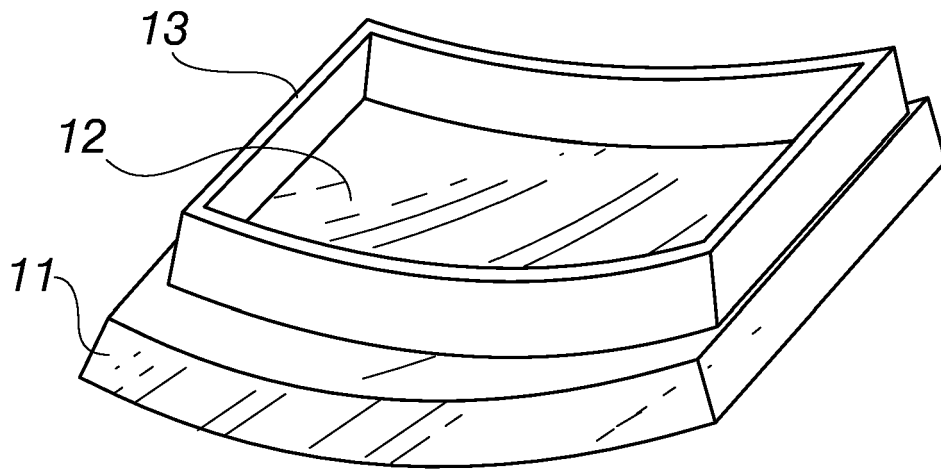


Fig. 1

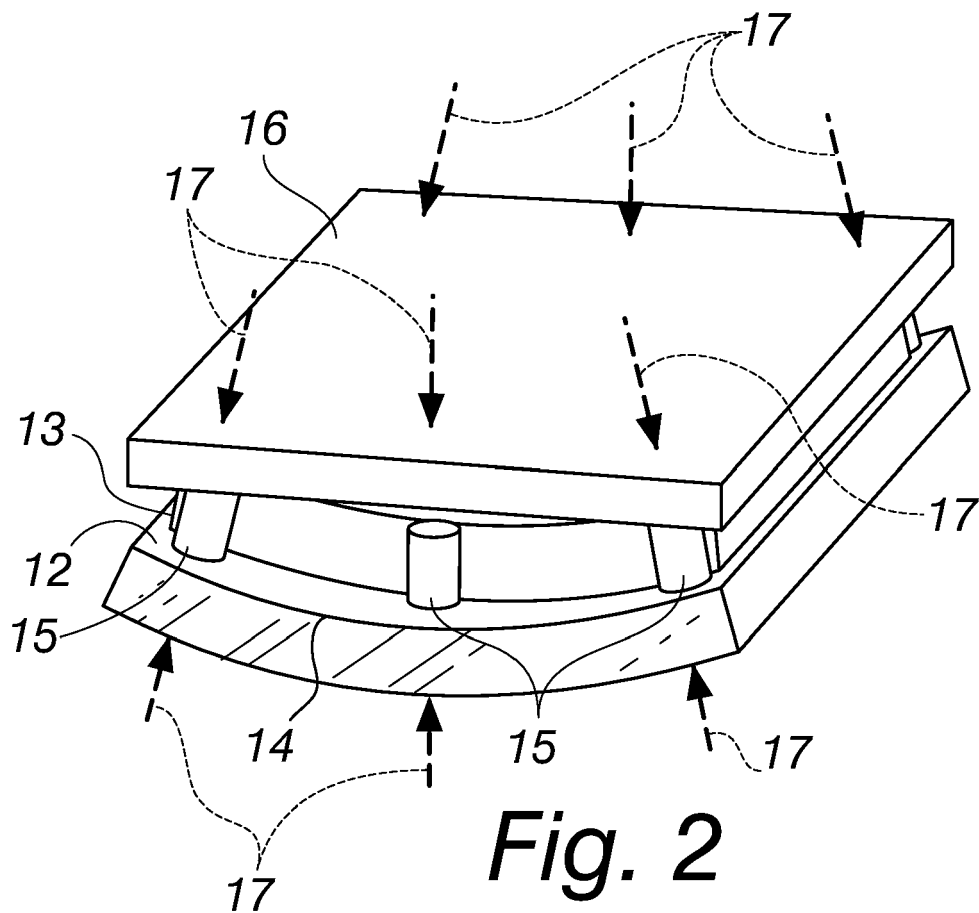


Fig. 2

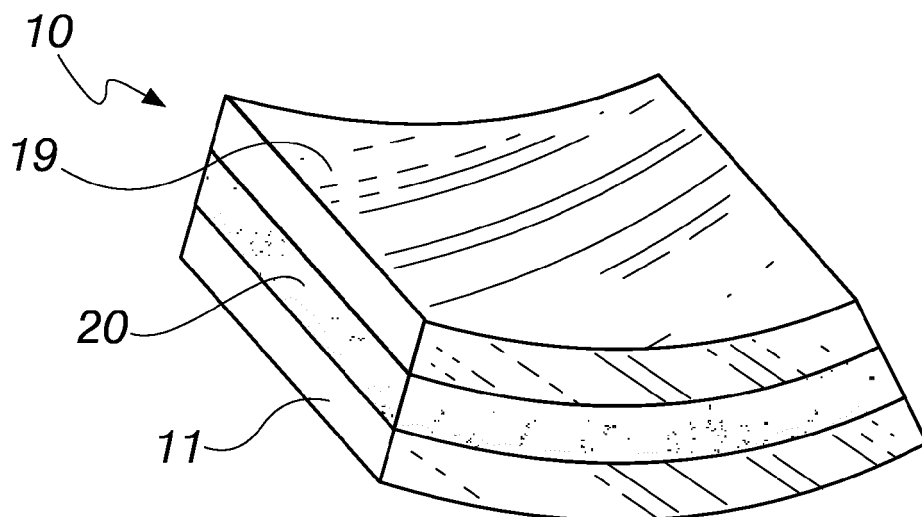


Fig. 3

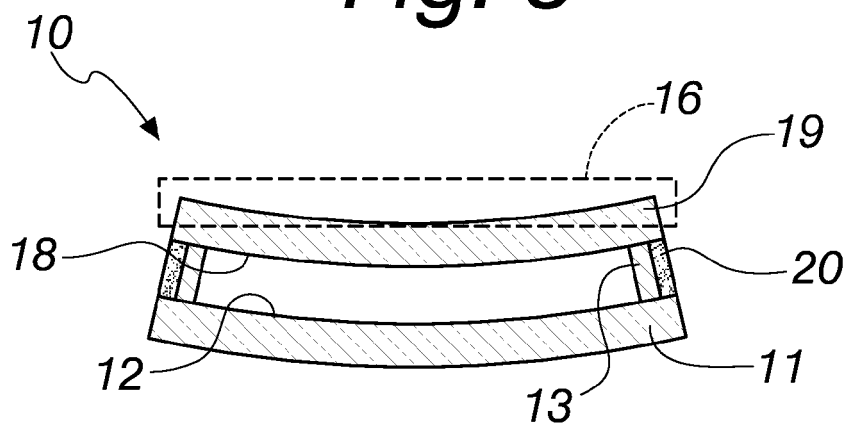


Fig. 4

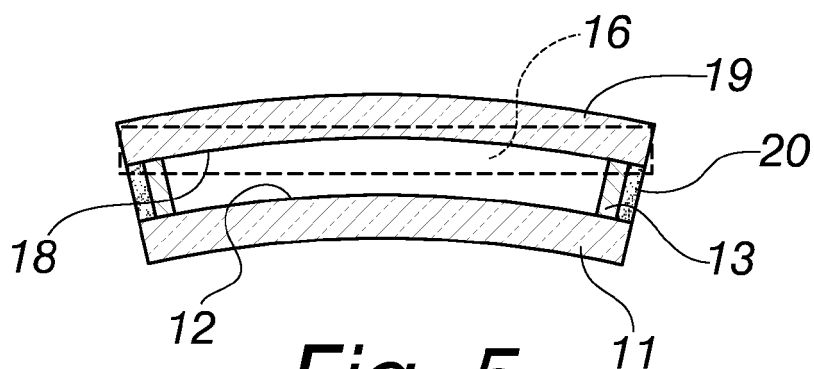


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 15 16 3458

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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	DE 38 18 631 A1 (LENHARDT MASCHINENBAU [DE]) 14 December 1989 (1989-12-14) * the whole document * -----	1-8	INV. E06B3/673
			TECHNICAL FIELDS SEARCHED (IPC)
			E06B B32B E04D C03B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 July 2015	Examiner Cobusneanu, D
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			

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

EP 15 16 3458

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07-07-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3818631	A1	14-12-1989	NONE

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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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Patent documents cited in the description

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