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Datasheet for the decision of 13 December 2013

Case Number: T 0210/12 - 3.3.09

Application Number: 02795997.2

Publication Number: 1458564

IPC: B32B17/10, C03C27/12

Language of the proceedings: EN

Title of invention:
GLASS LAMINATION PROCESS AND APPARATUS

Patent Proprietor:
Solutia Inc.

Opponent:
E.I. DU PONT DE NEMOURS AND COMPANY

Headword:

Relevant legal provisions:
EPC Art. 56
RPBA Art. 12(4), 13(1)

Keyword:
Inventive step - (no) (main and auxiliary request III)
Late-filed request - admitted (no) (auxiliary request IV)

Decisions cited:

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It can be changed at any time and without notice.

Catchword:

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Case Number: T 0210/12 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 13 December 2013

Appellant: (Opponent)	E.I. DU PONT DE NEMOURS AND COMPANY 1007 Market Street Wilmington DE 19898 (US)
Representative:	Heinemann, Monica Abitz & Partner Patentanwälte Postfach 86 01 09 81628 München (DE)
Respondent: (Patent Proprietor)	Solutia Inc. 575 Maryville Centre Drive St. Louis, Missouri 63141 (US)
Representative:	Rupp, Christian Mitscherlich & Partner Patent- und Rechtsanwälte Postfach 33 06 09 80066 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 17 November 2011 concerning maintenance of the European Patent No. 1458564 in amended form.**

Composition of the Board:

Chairman: W. Sieber
Members: J. Jardón Álvarez
K. Garnett

Summary of Facts and Submissions

I. This decision concerns the appeal filed by the opponent against the interlocutory decision of the opposition division that European patent No. 1 458 564 in the name of Solutia Inc. as amended meets the requirements of the EPC.

II. The opponent, E. I. du Pont de Nemours and Company, had requested revocation of the patent in its entirety on the grounds that the claimed subject-matter did not involve an inventive step (Article 100(a) EPC), that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC) and that the patent contained subject-matter which extended beyond the content of the application as filed (Article 100(c) EPC).

III. The documents cited during the opposition proceedings included:

D1: GB 2 236 277 A;

D2: US 4,341,576 A;

D3: US 2,156,680 A;

D4: US 3,234,062 A;

D5: DE 196 43 404 A1; and

D6: English translation of JP 2001-226153 A.

IV. The opposition division's decision, announced orally on 15 September 2011 and issued in writing on 17 November

2011, acknowledged the allowability of the set of claims 1 to 15 of auxiliary request 2 filed during the oral proceedings.

Claim 1 as maintained by the opposition division read as follows:

"1. A process for making a laminate comprising:

interposing a plastic material selected from polyvinyl butyral having a moisture content below 0.30 percent by weight of the plastic material, between two rigid glass substrates:

pre-heating at least one rigid glass substrate, or the plastic material, or any combination thereof, to a tacking temperature at a temperature of 40°C to 130°C;

tacking the plastic material and substrates through a short term pressure application using a nip-roll without vacuum de-airing to form a pre-laminate;

heating the pre-laminate at a temperature of 125°C to 220°C and for a time effective to bond the plastic material to the substrates,

wherein said heating is conducted at a pressure of about 1 atmosphere wherein said pre-laminate is not subjected to de-airing with vacuum treatment; and wherein said process does not include an autoclave step."

Claims 2 to 15 were dependent claims.

V. The opposition division's position can be summarized as follows.

The opposition division found that the amendments made to the claims complied with the requirements of Article 123(2) EPC, the amendments in relation to the

absence of an autoclave step being supported by paragraphs [0010] and [0033] of the application as filed.

Starting from D1 as closest prior art document the opposition division saw the problem to be solved by the patent in suit in the provision of a process for making a laminate avoiding the creation of bubbles in the interlayer. It concluded that the claimed process, including (a) a moisture content of the plastic material below 0.30 percent by weight; (b) a pre-heating step at a temperature of 40°C to 130°C, and (c) a tacking step to form a pre-laminate, was not disclosed or suggested by the available prior art, the reason being essentially that the problem of moisture was always disclosed in combination with specific process conditions.

VI. On 25 January 2012 the opponent (in the following: the appellant) lodged an appeal and on the same day paid the prescribed fee. The statement setting out the grounds of appeal was filed on 26 March 2012 together with the following further document:

D11: EP 0 331 648 A2.

The appellant requested that the decision under appeal be set aside and the patent be revoked on the grounds that the claims as maintained by the opposition division contravened the provisions of Article 123(2) EPC and Article 56 EPC.

VII. With its reply dated 12 July 2012 the patent proprietor (in the following: the respondent) disputed the arguments submitted by the appellant and requested that the appeal be dismissed as unfounded (main request) or,

alternatively, that the patent be maintained in amended form with the sets of claims according to the newly filed auxiliary requests I to V. The respondent further requested that document D11 be not admitted into the proceedings as being late-filed and not *prima facie* relevant.

VIII. On 12 July 2013 the board dispatched a summons to oral proceedings. In the attached communication the board indicated the points to be discussed during the oral proceedings.

IX. On 13 November 2013 further submissions in preparation for oral proceedings were filed by both parties. The respondent also filed amended versions of its previous requests in order to correct a clerical error in the dependency of claims 10 and 11.

X. On 13 December 2013 oral proceedings were held before the board. During the oral proceedings the respondent withdrew its auxiliary requests I, II, IV and V and file a new auxiliary request IV.

a) The claims of the main request are the claims before the opposition division (see point IV above).

b) Claim 1 of auxiliary request III is based on claim 1 of the main request wherein the temperature of the pre-heating step has been amended to read "at a temperature of 70°C to 100°C".

c) Claim 1 of auxiliary request IV is based on claim 1 of auxiliary request III with the further limitation that the moisture content of the

polyvinyl butyral is now "between about 0.03 and about 0.18 percent by weight".

XI. The arguments presented by the appellant in its written submissions and at the oral proceedings, insofar as they are relevant for the present decision, may be summarised as follows:

- The amendments to the claims of all requests were not supported by the application as originally filed. In particular, the combination of features of claim 1 of all requests was not clearly and unambiguously disclosed in the application as filed.

- The subject-matter of claim 1 of the main request lacked inventive step starting from document D1 as closest prior-art document. The reason being essentially, that D1 disclosed all the features of the claimed process, except the moisture content. This distinguishing feature, however, could not justify an inventive step because it was the constant teaching of the prior art, for instance of documents D2 to D6, that a low moisture content of the polyvinyl butyral interlayer would reduce the occurrence of bubbles.

- The subject-matter of claim 1 of auxiliary request III also lacked an inventive step. The selection of a narrow temperature range was not associated with any unexpected effect.

- Concerning auxiliary request IV, the appellant noted that the very late filing of the request did not result from the discussion in the oral proceedings. The request should have been filed at

an earlier stage of the proceedings. The restriction to the now-claimed moisture range could make a search for further documents necessary. The claims were clearly not allowable and the request should not be admitted into the proceedings.

XII. The relevant arguments of the respondent may be summarised as follows:

- The respondent agreed that document D1 qualified as closest prior-art. However, D1 did not disclose the moisture content of the interlayer, it did not require a separate pre-heating step and it did not include a tacking step to form a pre-laminate. Moreover D1 was a single-stage continuous process. The problem to be solved by the patent was to provide a glass laminate of high quality. The solution according to claim 1, namely the use of a PVB with a moisture content as claimed was not obvious in view of the prior art. In fact, the arguments of the appellant had been provided on basis of hindsight because all documents cited required the mandatory use of an autoclave or a vacuum de-airing step, which steps were not necessary in the process now claimed.

- The subject-matter of claim 1 of auxiliary request III was further limited by carrying out the pre-heating at a lower temperature, a temperature not hinted at all in D1. The examples in the patent showed that working under the claimed conditions resulted in an unexpected improvement of the glass laminates, in particular the process could produce glass laminates with a

extremely high bake fail temperature which could not be achieved by the prior-art processes.

- Auxiliary request IV should be admitted into the proceedings as the claims had been limited merely by the introduction of a feature already present in the dependent claims. The preferred moisture content which occasioned the technical effect had been introduced into claim 1, the claim being now further limited to inventive subject-matter.

XIII. The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed (main request) or, alternatively, that the decision under appeal be set aside and the patent be maintained on the basis of auxiliary request III filed with letter dated 13 November 2013 or on the basis of auxiliary request IV filed on 13 December 2013 during the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. Admissibility of D11

2.1 Document D11 was filed by the appellant with its statement of grounds of appeal to further corroborate that controlling the moisture content of the polyvinyl butyral (hereinafter: PVB) sheet is important because it determines the formation of air bubbles. However, D11 is not more relevant than other prior art documents already on file, namely D2 to D6.

2.2 Thus the board, exercising its discretion under Article 12(4) RPBA, did not admit D11 into the appeal proceedings.

MAIN REQUEST (claims maintained by the opposition division)

3. Amendments

3.1 As stated above under point XI, the appellant maintained that the subject-matter of the claims of all requests extended beyond the content of the application as filed.

3.2 The board was not convinced by the arguments of the appellant and concluded during the oral proceedings that the claims of the main request do not extend beyond the content of the application as filed and therefore satisfy the requirements of Article 123(2) EPC. There is, however, no need to give detailed reasons for this issue since, as set out below, the patent is to be revoked for lack of inventive step.

4. Inventive step

4.1 The invention relates to glass laminates comprising a PVB sheet sandwiched between two panes of glass. The patent aims to provide a process for preparing a glass laminate meeting desired laminate quality and safety specifications, in which de-airing with vacuum treatment of the pre-laminate assembly and autoclave finishing treatment are not required (see paragraph [0012] of the patent specification).

4.2 Closest prior art

4.2.1 The parties agreed that document D1 represents the closest prior art. It discloses a process for producing a laminated glass sheet in which a suitable interlayer disposed between two sheets of glass material is fed through one or more sets of pinch rollers and heated, as it moves, to cause the interlayer to bond to each sheet of glass. In this process (a) both sheets of glass and the interlayer are initially unbonded to one another and rolled simultaneously throughout the process, and (b) the interlayer is heated at least to and preferably above its plastic temperature (claim 1). Preferably the interlayer is heated to between 100°C and 180°C (page 4, line 1). The plastic material of the interlayer (also referred to as hot melt adhesive) is preferably PVB (page 9, lines 1 to 2). As apparent from figure 1, the unbonded assembly of glass sheet and interlayer is fed to the laminating apparatus where infrared heaters (34) heat the assembly before reaching a first set of pinch rollers (12, 16). Short term pressure is applied by the pinch rollers. After passing the first set of pinch roller the laminate is further heated by infrared heaters and passes further sets of pinch rollers (see also page 5, last paragraph, page 6, last paragraph to page 7, second paragraph, and page 9, last paragraph). Finally, the process includes neither autoclaving (page 3, lines 22 to 24), nor a vacuum de-airing step (implicit from the figure and the description of the preferred embodiment on pages 5 to 10).

4.2.2 However, D1 is silent about the moisture content of the PVB interlayer therein used.

4.3 Problem to be solved and its solution

4.3.1 According to the respondent, the technical problem underlying the patent in suit in view of D1 is to provide a process for the preparation of a glass laminate of high quality wherein the formation of bubbles in the interlayer is avoided.

4.3.2 As a solution to this problem the patent proposes the process of claim 1 essentially characterized by the use of a PVB layer having a moisture content below 0.30 percent by weight.

4.3.3 Although a direct comparison with the glass laminates of D1 is not possible because this document is silent about the moisture content of the PVB therein used, the experimental evidence in the patent in suit shows that only when working within the claimed moisture range is bubble formation prevented.

Thus, in example 1, case 2, a laminate prepared from a PVB layer containing 0.36% water by weight (outside the claimed range) exhibited small bubbles over the entire surface of the laminate, and failed all visual and high temperature failure tests. On the contrary, the laminates of example 1, cases 4 and 5, using a PVB layer containing 0.20% water and 0.11% water respectively, and thus within the claimed moisture range, were completely clear with no visible defects and also passed high temperature failure tests (table 1).

4.3.4 The board is therefore satisfied that the above problem has been credibly solved by the taken measure. This finding was not contested by the appellant.

4.4 Obviousness

4.4.1 It remains to be decided whether, in view of the available prior art documents, it would have been obvious for the skilled person to solve the above defined technical problem by the means claimed. In the present case it is to be considered whether the skilled person would have chosen a PVB interlayer having a low moisture content in order to avoid bubble formation.

4.4.2 This would be indeed the case in view of the disclosures of documents D2 to D6. As pointed out by the appellant, there is a clear teaching in the prior-art that, in order to reduce the occurrence of bubbles in PVB interlayers, a PVB with low moisture content should be used:

- Document D6, which discloses a process including a vacuum degassing step, clearly teaches the advantages of using a moisture content of the intermediate film of 0.3% by weight or less in order to suppress the incidence of bubbling (see [0019]);

- Document D3 discloses, in a process using an autoclave, the advantage of using low moisture content resin interlayers with a moisture content of 0.25% to 0.40% to reduce bubble formation (page 1, left column, lines 11 to 20);

- D2 discloses that the occurrence of water bubbles in the laminate can be avoided by reducing the moisture content of the interlayer sheets (column 8, lines 13 to 22);

- Document D4 uses a PVB interlayer with a moisture content of less than 0.2% by weight in an

autoclave-free lamination process (column 2, lines 61 to 66 and column 3, lines 47 to 50); and

- Document D5 uses a PVB interlayer with a water content of below 0.35% weight for reducing bubble formation, also in an autoclave-free lamination process (page 2, lines 64 to 66).

4.4.3 In summary, there is a constant teaching in the prior-art to the use of PVB interlayers with a low moisture content in order to reduce bubble formation when preparing a glass laminate comprising a PVB sheet.

The skilled person carrying out the process of D1 and faced with the problem of reducing bubble formation in the glass laminate would therefore reduce the moisture content in the PVB layer in order to obtain an optically clear laminate. By applying this measure, the skilled person would arrive in an obvious manner at the claimed process.

4.4.4 The respondent argued essentially that the prior art processes of D2 to D6 included either a vacuum de-airing step or an autoclave step and that the skilled person would always consider that such steps, in well-established processes, were essential and could not be dispensed with. The respondent argued further that the process of D1 did not include a pre-heating separate step and that the claimed process was more versatile as it allowed the storage of the pre-laminate.

The board disagrees. It is correct that in the prior art processes disclosed in documents D2 to D6 either an autoclave step or a de-airing vacuum step is carried out. Contrary to the argument of the respondent, there

is no mandatary link between such steps and the use of a low moisture content.

There is no teaching in the prior-art that the beneficial use of a PVB layer with low moisture would only work when applied to a process including an autoclave step or a vacuum de-airing step. On the contrary, the fact that this low moisture content is mentioned in several prior-art documents would indicate that it would generally apply to all lamination processes, with or without vacuum and with or without autoclave. The skilled person starting from D1 and seeking to provide laminates with reduced risk of bubble formation would have used a PVB interlayer sheet with a reduced moisture content in view of the teaching derivable from D2 to D6.

4.4.5 Also the further arguments relied upon by the respondent cannot justify an inventive step.

According to the respondent the claimed process includes a separate pre-heating step and allows the storage of the laminate. However, the board notes that these features are not distinguishing features of the subject-matter of claim 1. There can be no doubt that the ranges for the pre-heating step and the bonding step in claim 1 of the main request overlap, and therefore claim 1 embraces an embodiment wherein the same temperature is used for the pre-heating step and the bonding step, e.g. at a temperature of 125°C. Such an embodiment on the one hand falls under claim 1, and on the other hand uses a temperature regime as described in document D1.

Claim 1 is also not limited to a discontinuous process as suggested by the respondent (e.g. with storage of

the pre-laminate). In fact, the process of claim 1 can be implemented continuously as explained in paragraph [0038] of the specification.

4.5 In view of the above, the board concludes that the person skilled in the art would have arrived in an obvious manner at the subject-matter of claim 1. Consequently, the subject-matter of claim 1 of the main request lacks an inventive step.

AUXILIARY REQUEST III

5. Inventive step

5.1 Claim 1 of auxiliary request III differs from claim 1 of the main request in that the temperature of the pre-heating step has been limited to a value of 70°C to 100°C. By this amendment the process now mandatorily requires that the temperature of the pre-heating step is lower than temperature of the heating of the pre-laminate.

5.2 There is, however, no information in the patent in suit indicating that the use of two different temperatures for the laminating process has any unexpected effect in the obtained laminate. As indicated above for the main request, the patent in suit always associates the improvement in the quality of the laminate with the use of a PVB layer with a low moisture content, a feature which, as discussed above, was already known from the prior art.

5.3 Furthermore, the patent specification itself acknowledges in its introduction (see paragraph [0003]) that glass laminates are typically formed by first forming a pre-laminate which is then finished into a

laminate. In these known processes the finishing step is typically carried out at high temperature and pressure.

5.4 Consequently, in the absence of any unexpected effect, the use of different temperatures for the two heating steps merely further distinguishes the claimed process from the disclosure of D1. However, it cannot justify the presence of an inventive step.

5.5 On these grounds, the reasoning above for the main request applies *mutatis mutandis* for the subject-mater of claim 1 of auxiliary request III, which therefore lacks an inventive step.

AUXILIARY REQUEST IV

6. Admissibility

6.1 Auxiliary request IV was filed towards the end of the oral proceedings, after the board had deliberated upon the allowability of the main request and the discussion of inventive step regarding auxiliary request III had taken place , *i.e.*, at the very last moment. Auxiliary requests filed at such a late stage of the proceedings are usually only admitted into the appeal proceedings under exceptional circumstances.

6.2 The respondent justified the late filing of auxiliary request IV, which represents a further limitation of the definition of the moisture content of the polyvinyl butyral, as being a result of the negative finding of the board concerning the main request and the discussion of inventive step of auxiliary request III. The request limits the subject-matter to the most preferred embodiment of the invention resulting in

laminates exhibiting an extremely high bake failure temperature of 230°C, a temperature well above the bake failure temperature of the laminates produced according to the prior art. Moreover, the limitation was already the subject-matter of a dependent claim and the appellant should have been in a situation to deal with the amendment.

6.3 The board cannot agree with this. It was the argument of the appellant during the whole proceedings that the moisture content of the polyvinyl butyral could not justify an inventive step. However, none of the auxiliary requests on file prior to the oral proceedings focused on this feature and there was therefore no reason for the appellant in advance of the oral proceedings to prepare for an argument in which this feature became the essential feature of the invention. Moreover, it is doubtful that the amendment would overcome the inventive step objection. As pointed out by the appellant, the process of preparation of the laminate of case 5 of example 1 of the patent on which the respondent mainly relied, differs from the process of preparation of the laminates of cases 3 and 4 not only by the moisture content but also by other process parameters (pre-heating temperature and soaking time). Thus, the relevance of the moisture content for inventive step is highly questionable.

6.4 Consequently, the board exercised its discretion not to admit auxiliary request IV because it was filed at an extremely late stage and there were no exceptional circumstances justifying such late filing (Article 13(1) RPBA).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

M. Cañueto Carbajo W. Sieber

Decision electronically authenticated