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**Datasheet for the decision
of 30 November 2011**

Case Number: T 0110/07 - 3.3.05
Application Number: 98909123.6
Publication Number: 966409
IPC: C03C 17/245, C03C 17/25,
C03C 17/34
Language of the proceedings: EN

Title of invention:

Photocatalytically-activated self-cleaning article and method
of making same

Patentee:

PPG Industries Ohio, Inc.

Opponents:

Pilkington plc
SAINT-GOBAIN GLASS FRANCE

Headword:

PASC Coatings/PPG INDUSTRIES OHIO, INC.

Relevant legal provisions:

EPC Art. 54, 56, 87, 114(2)
RPBA Art. 13(1) (3)

Keyword:

"Admissibility of a late filed request (no): amendments, even
if deletion, amount to unforeseeable issues"
"Priority validly claimed (yes - feature at issue disclosed in
priority document (reasons 2.4))"
"Novelty (main request, auxiliary request 1): yes"
"Inventive step (main request, auxiliary request 1): no -
obvious alternative"

Decisions cited:

G 0002/98, T 1233/05, T 0230/07, T 1130/09

Catchword:

-



Case Number: T 0110/07 - 3.3.05

DECISION
of the Technical Board of Appeal 3.3.05
of 30 November 2011

Appellant: SAINT-GOBAIN GLASS FRANCE
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
9 January 2007 concerning maintenance of
European patent No. 966409 in amended form.

Composition of the Board:

Chairman: G. Raths
Members: H. Engl
C. Vallet

Summary of Facts and Submissions

I. This appeal is from the interlocutory decision of the opposition division to maintain European patent EP-B-0 966 409 in amended form.

II. The documents cited in the opposition procedure included the following:

D1: WO-A-98/06 675 (published 19 February 1998)
D3: EP-A-0 737 513
D4: EP-A-0 275 662
D5: EP-B-0 309 902
D6: US-A-4 123 244
D7: WO-A-97/10 186 (published 20 March 1997)
D15: EP-A-0 518 755
D16: EP-A-0 650 938
P1: US application no. 60/040,566 (14 March 1997)
P2: US application no. 08/899,257 (23 July 1997)

P1 and P2 are the priority documents of the patent in suit.

III. The European patent was opposed under the grounds of opposition according to Articles 100(a) and 100(b) EPC.

The opposition division rejected the main request under Article 123(2) EPC and the first auxiliary request for anticipation of the subject-matter of its claim 1 by the disclosure of example 1 of D1.

The claimed subject-matter of the second auxiliary request was held to enjoy the priority dates P1 and P2.

Therefore, documents D1 and D7 both belonged to the state of the art under Article 54(3) EPC.

Novelty over D1 was in the opposition division's view established by the removal of the so-called claim alternative B ii) from granted claim 1. (Claim 1 is divided into two parts, both starting with the expression "providing a glass article ..."; the first part defines an alternative (or variant or embodiment) A comprising claim sub-items A(i) and A(ii), the second part comprising sub-items B(i) and B(ii)).

Having regard to D7, novelty resided in the fact that it did not disclose the position in the process line at which the deposition occurred. There was also no hint in D7 that the same arrangement as in D15 should be used. The low temperature of 425°C referred to in D7 suggested a position outside the tin bath. Therefore, D7 did not disclose all the claim features of claim 1 of the second auxiliary request.

D3 was considered to represent the closest prior art as it belonged to the same technical field of forming a PASC layer, preferably of a pyrolytic or CVD layer of TiO₂, on a glass substrate. Furthermore, D3 addressed the problem of degradation of the photocatalytic activity caused by migration of a material from the substrate into the PASC layer. This problem could be overcome either by a sufficient thickness of the PASC layer or by a pre-coat (of SiO₂).

The opposition division decided that neither D3 nor one of the other available documents suggested a method wherein the PASC coating was deposited by a CVD process

on a float glass ribbon while travelling through a tin bath. Therefore, the subject-matter of the claims of the second auxiliary request involved an inventive step. Consequently, the opposition division decided in the contested decision to maintain the European patent in amended form on the basis of the claims of the second auxiliary request.

- IV. The appeal of the opponent Saint-Gobain Glass France (henceforth: the appellant) was filed with letter dated 19 January 2007; the grounds for appeal were submitted with a letter dated 26 April 2007. A new document

D17: EP-A-0 792 687

was submitted.

The opponent Pilkington plc withdrew its opposition (see letter of 11 April 2006). It is therefore no longer a party to these proceedings.

- V. The patentee (respondent) filed its observations with letter dated 26 September 2007. It submitted new claims 1 to 13 as a first auxiliary request.

The independent claims of the said pending requests are worded as follows:

Main request (= second auxiliary request as maintained in the contested decision)

"1. A method for the manufacture of a photocatalytically-activated self-cleaning article of manufacture comprising the steps of:

providing a glass article having at least one surface by a float manufacturing process; and depositing a photocatalytically-activated self-cleaning coating over the surface of the article by chemical vapor deposition during the glass manufacturing process while the glass float ribbon travels through the tin bath,

wherein the photocatalytically-activated self-cleaning coating comprises a metal oxide selected from the group consisting of titanium oxides, iron oxides, silver oxides, copper oxides, tungsten oxides, aluminum oxides, silicon oxides, zinc stannates, molybdenum oxides, zinc oxides, strontium titanate and mixtures thereof

and wherein the photocatalytically-activated self-cleaning coating comprising titanium oxides is obtained from metal-containing precursors selected from the group consisting of titanium tetraisopropoxide and titanium tetraethoxide when using the CVD method

further comprising the step of depositing a sodium ion poisoning prevention layer selected from:

i) sodium ion diffusion barrier layer by chemical vapor deposition having a thickness of at least 10 nm (100 Å) between said surface and the photocatalytically-activated self-cleaning coating, and

ii) a fraction of the overall thickness of the photocatalytically-activated self-cleaning coating

where the photocatalytically activated self-cleaning coating has a thickness that exceeds a minimum thickness so that the sodium ions are able to migrate only through the fraction of the overall thickness of the photocatalytically-activated self-cleaning coating during any time period at which the temperature of substrate exceeds the temperature which permits sodium ion migration so that the thickness of the photocatalytically-activated self-cleaning coating opposite from the substrate surface is able to maintain photocatalytically-activated self-cleaning coating and depositing said photocatalytically-activated self-cleaning article over said sodium ion poisoning prevention layer whereupon said sodium ion diffusion barrier layer inhibits migration of sodium ions from the surface of said article to said photocatalytically-activated self-cleaning coating;

or

providing a glass article having at least one surface by a float manufacturing process; and depositing a photocatalytically-activated self-cleaning coating over the surface of the article by chemical vapor deposition during the glass manufacturing process while the glass float ribbon travels through the tin bath;

further comprising the step of depositing a sodium ion poisoning prevention layer selected from:

i) sodium ion diffusion barrier layer by a chemical vapor deposition having a thickness of at least 10 nm (100 Å) between said surface and the photocatalytically-activated self-cleaning coating, wherein the sodium ion diffusion barrier layer is selected from the group consisting of tin oxides, titanium oxides, zirconium oxides, fluorine-doped tin oxides, aluminum oxides, magnesium oxides, zinc oxides, cobalt oxides chromium oxides, magnesium oxides, iron oxides and mixtures thereof and is selected from the group consisting of a crystalline metal oxide, an amorphous metal oxide and mixtures thereof."

Dependent claims 2 to 13 define preferred embodiments of the process of claim 1.

Auxiliary request 1:

Claim 1 of this auxiliary request differs from claim 1 of the pending main request only in that the term "titanium oxides," is deleted from the last paragraph of the claim (item B i).

Dependent claims 2 to 13 define preferred embodiments of the process of claim 1.

VI. Oral proceedings took place on 30 November 2011. After the debate of the main and first auxiliary requests, the respondent filed a second auxiliary request consisting of 11 claims.

Independent claim 1 thereof is worded as follows:

"1. A method for the manufacture of a photocatalytically-activated self-cleaning article of manufacture comprising the steps of:

providing a glass article having at least one surface by a float manufacturing process; and depositing a photocatalytically-activated self-cleaning coating over the surface of the article by chemical vapor deposition during the glass manufacturing process while the glass float ribbon travels through the tin bath,

wherein the photocatalytically-activated self-cleaning coating comprises a metal oxide selected from the group consisting of [] iron oxides, silver oxides, copper oxides, tungsten oxides, aluminum oxides, silicon oxides, zinc stannates, molybdenum oxides, zinc oxides, strontium titanate and mixtures thereof;

[]

further comprising the step of depositing a sodium ion poisoning prevention layer selected from:

i) sodium ion diffusion barrier layer by chemical vapor deposition having a thickness of at least 10 nm (100 Å) between said surface and the photocatalytically-activated self-cleaning coating, and

ii) a fraction of the overall thickness of the photocatalytically-activated self-cleaning coating where the photocatalytically activated self-cleaning coating has a thickness that exceeds a

minimum thickness so that the sodium ions are able to migrate only through the fraction of the overall thickness of the photocatalytically-activated self-cleaning coating during any time period at which the temperature of substrate exceeds the temperature which permits sodium ion migration so that the thickness of the photocatalytically-activated self-cleaning coating opposite from the substrate surface is able to maintain photocatalytically-activated self-cleaning coating and depositing said photocatalytically-activated self-cleaning coating over said sodium ion poisoning prevention layer whereupon said sodium ion diffusion barrier layer inhibits migration of sodium ions from the surface of said article to said photocatalytically-activated self-cleaning coating []." "

Remarks:

[] denotes a deletion with respect to the wording of claim 1 of the main request.

In this decision, "photocatalytically-activated self-cleaning coating" is abbreviated by "PASC" and sodium ion diffusion barrier" by "SIDB".

VII. The appellant essentially argued as follows:

Late filed request

The second auxiliary request was filed belatedly and should not be admitted. The deletion of the claim

alternative TiO₂ from variant A ran contrary to the whole discussion of the case and came as a surprise.

Novelty

The claimed subject-matter lacked novelty over D1 because the claim alternative B(i) still encompassed the deposition of TiO₂ as a barrier material. The same material was disclosed in D1 (example 6, page 16) for CVD depositing a layer of 68.4 nm of TiO₂ on a float glass ribbon which travelled across a tin bath.

Furthermore, claim 1 of the second auxiliary request upheld by the opposition division lacked novelty having regard to document D5. According to D17, table 1, page 5, tin oxide exhibited photocatalytic properties and was thus one of the possible materials according to claim feature B(i). According to D3, tin oxide was deposited in a thickness of 260 nm on a float glass ribbon (comparative example 1).

Priority rights

The appellant denied that the priorities were validly claimed because the claim feature "*sodium ion diffusion barrier having a layer thickness of at least 10 nm*" was not unambiguously derivable from priority document P1. Consequently, D1 and D7 were relevant for assessing inventive step.

Inventive step

Starting from D3, the appellant argued in writing that the said document strongly suggested deposition of the

TiO₂ layer in an in-line CVD process step. In fact, the other deposition processes disclosed in D3 (sol-gel, dipping, cathode pulverisation) could not be carried out inline, but required a cooling of the glass. Example 20 of D3 was a laboratory example, whereas the part of the description referring to CVD deposition of TiO₂ did not specifically disclose the position of the nozzle. However, the deposition within the float glass bath was just one alternative among others, without any specific technical effect being associated to it. The patent application WO-A-98/41480 underlying the opposed patent indicated that the CVD deposition could be employed out at several points within the float ribbon manufacturing process, for example, as the float ribbon travelled through the tin bath after or before it entered the annealing Lehr, as it travelled through the annealing Lehr, or after it exited the annealing Lehr.

During the oral proceedings, the appellant started from D7 as the closest prior art. This document already revealed the deposition of a SIDB layer (comprising SiOC or fluorinated Al₂O₃) of 50 nm thickness and of a TiO₂ PASC layer of 15 nm thickness (examples 4 and 5). The deposition was carried out by CVD using TiCl₄ or titanium tetraalkoxides as precursors. The deposition was preferably carried out in a float glass environment, i.e. when the glass ribbon was travelling on the tin bath.

As the opposed patent contained no example demonstrating a CVD deposition on the float ribbon, there was no support for the presence of an advantage attributable to this feature. The claimed deposition was thus an arbitrarily selected alternative.

Therefore, the object of the opposed patent consisted in providing an alternative process for the process disclosed in D7.

The claimed alternative was suggested by the prior art (D1, D4, D5, D15 and D16). In particular, D16 suggested that a pre-coat of TiO₂ could be deposited by CVD ("*pyrolyse en phase gazeuse*") in the float glass enclosure (D16, page 4, lines 34 to 40).

VIII. The respondent essentially argued as follows:

Novelty

Example 4 of D7 did not unambiguously disclose to deposit TiO₂ on a glass float ribbon, even when taken in combination with D15. Therefore, the claims were novel over D7.

Example 6 of D1 disclosed a 68.4 nm TiO₂ layer (which was however deposited in one step) and a real SIDB layer of 33.9 nm silica. Thus, D1 disclosed to apply a silica SIDB coating and then to apply a TiO₂ PASC coating, but it did not unambiguously disclose to apply a 10 nm SIDB layer in a first step followed by a PASC coating.

Regarding D5, the respondent requested to disregard D17 (cited in connection with D5) as late filed. D5 failed in any way to disclose that tin oxide had self-cleaning properties; a tin oxide layer as in D5 could therefore not be regarded as a PASC layer. The opposed patent did

not mention tin oxide as a PASC layer, but only zinc/tin oxides.

Validity of priority rights

In this respect, the respondent referred to the contested decision, item 4.3.4, according to which the subject-matter of claim 1 of the second auxiliary request enjoyed the priority dates of P1 and P2.

Inventive step

The appellant's arguments, starting from D3 as the closest prior art, were contested as being based on inadmissible *ex post facto* analysis of D3 and D16.

When starting from example 20 of D3, the skilled person had to transfer the teaching of the example to an industrial scale. The passage at column 16, lines 6 to 13, clearly taught that the pyro-sol method and the spraying methods were preferred because these methods could be applied on an industrial scale. Furthermore, D3 clearly suggested that the deposition could be made at a temperature of 400 to 550°C. This advice taught away from positioning the CVD device at a point where the glass was in the float bath (and hence the temperature was substantially higher).

D16 related to a process where a float glass ribbon was optionally coated with a barrier layer onto which an essential layer of metal nitride was deposited. Thereafter, a TiO₂ protection layer was deposited over the nitride. However, D16 taught to use the method of pyrolysis in liquid phase in case the deposition took

place between the float bath and the dryer. D16 taught away from using the method of pyrolysis in the gaseous phase (CVD). Therefore, the skilled person would either disregard D16 completely because it was related to a different technical field, or he would learn from D16 that it was more preferred and consistent with the teaching of D3 to use the spray pyrolysis method outside the float bath.

Starting from D7 as the closest prior art, the distinguishing feature would be the same as for D3, namely the position of the CVD device in the float glass ribbon during production. Document D15, to which D3 referred, disclosed that a SiO₂ layer may be deposited by CVD at a temperature of 670°C, *i.e.* when the glass ribbon was in the float glass. However, the only reason for choosing this position was that the glass ribbon itself was advantageously used as the oxygen source for the SiO₂. Therefore, a totally different problem was solved in D15. No conclusions could be drawn from D15 as to the position of the deposition nozzle for depositing a TiO₂ layer. Apart from that, the same arguments as for D3 as the closest prior art applied.

IX. Requests:

The appellant requested that the contested decision be set aside and the European patent be revoked.

The respondent requested that the appeal be dismissed and the patent be maintained on the basis of the claims upheld by the opposition division; or, alternatively, that the contested decision be set aside and the patent

be maintained in amended form on the basis of claims 1 to 13 filed with letter dated 26 September 2007 as auxiliary request 1 or on the basis of auxiliary request 2, filed during oral proceedings.

Reasons for the Decision

1. Amendments (Article 123(2) and (3) EPC)

The subject-matter of the claims in accordance with the main request and the first and second auxiliary requests is sufficiently based on the application documents as originally filed and published as WO-A-98/41480.

It is also evident that none of the amendments or deletions increase the extent of protection conferred by the claims, with respect to the claims as granted.

The requirements of Article 123(2) and (3) EPC are thus met.

2. Priority

2.1 The patent in suit claims the priority dates of 14 March 1997 (P1) and of 23 July 1997 (P2).

The earlier priority document P1 discloses, as a thickness for the sodium ion diffusion barrier layer (SIDB), the ranges of 2 to 50 nm (claims 17 and 32) and 2 to 18 nm (page 24, lines 9 to 12). Furthermore, P1 discloses in the examples individual values of SnO₂ CVD-deposited SIDB layer thickness of 101 nm, about 100 nm,

434 nm (example 3), and of 50 nm for SnO₂ layers obtained by spray pyrolysis (Table 6, examples F, G, J and K).

Thus, P1 fails to disclose the range in the claim feature "*sodium diffusion barrier layer ... having a thickness of at least 10 nm*" (claim 1, subitem i). This was not disputed by the respondent.

The question is therefore whether a PASC layer thickness of "at least 10 nm" may be derived from P1.

- 2.2 Opinion G 2/98 (OJ 2001, 413; see Conclusion and Reasons 8.4) - to which the opposition division referred in the contested decision (points 4.3.3. to 4.3.6) - states that "*[t]he requirement for claiming priority of "the same invention", referred to in Article 87(1) EPC, means that priority of a previous application in respect of a claim in a European patent application in accordance with Article 88 EPC is to be acknowledged only if the skilled person can derive the subject-matter of the claim directly and unambiguously, using common general knowledge, from the previous application as a whole.*"

For the board, neither the claimed lower limit of 10 nm nor the open-ended range of ≥ 10 nm is directly and unambiguously derivable from P1, so that the earlier priority date is not valid.

- 2.3 The opposition division came to a different conclusion, upon applying a "novelty test" based on the concept of overlapping ranges.

The board considers the application of this "novelty test" as inappropriate in view of G 2/98 itself, because in the present case there is no overlap, but rather a generalization of ranges. It is true that G 2/98 states (Reasons, point 8.4, last sentence) that "*priority claims should not be acknowledged if the selection inventions in question are considered "novel" according to these criteria*" (i.e. the criteria applied by the EPO with a view to assessing novelty of selection inventions over the prior art). However, it does not automatically follow from the said statement that priority claims should be acknowledged if the selection inventions in question are considered not "novel". (In this context, attention is drawn to decisions T 1233/05 (of 24 April 2008; not published in OJ EPO; see Reasons, point 4.4), T 230/07 (of 5 May 2010; not published in OJ EPO; see Headnote and Reasons 4.1.6) and T 1130/09 (of 5 May 2011; not published in OJ EPO; see Reasons 3.2) according to which the demonstration of a technical effect over a sub-range is not decisive for acknowledging novelty. A sub-range must be novel *per se*.)

2.4 The feature in question relating to the thickness of the SIDB layer is however literally disclosed in P2 (page 17, lines 13 to 28) so that the patent enjoys priority rights of 23 July 1997.

2.5 Consequently, D7 (published on 20 March 1997 and enjoying priority rights of 15 September 1995) belongs to the prior art in the sense of Article 54(2) EPC.

D1 (published on 19 February 1998 with the priority of 13 August 1996) is a document relevant under the

provisions of Article 54(3)(4) EPC [1973], as far as the same Contracting States are designated in D1 and the opposed patent.

3. Admissibility of the second auxiliary request

3.1 The claims of the second auxiliary request were presented by the respondent during the oral proceedings, at a stage where the discussion of the preceding requests was substantially concluded. The appellant requested that this new request be rejected as late-filed and inadmissible.

3.2 The board deems the request inadmissible, for the following reasons:

The new independent claim 1 differs from claim 1 of the first auxiliary request essentially in that:

- the alternative "titanium oxide" as a PASC layer is deleted from embodiment A, paragraph 3, of the claim;
- the entire alternative embodiment B is deleted.

The board has no objections against the second amendment concerning deletion of embodiment B. However, the deletion of the alternative "titanium oxide" as a PASC layer in embodiment A gives rise to severe complications which are not acceptable at this procedural stage, for the following reasons:

Firstly, it is noted that the proposed amendment (deletion of titanium oxide from the list of PASC layers) deprives the claims of all experimental support, since all the examples relate to photocatalytically-

active self-cleaning layers consisting of titanium oxide. Therefore, the respondent's move of abandoning the preferred embodiment of the claimed invention must come as a surprise to the other party.

Secondly, both D7 and D3 (which were hitherto considered to represent the closest prior art) disclose only TiO₂ as a PASC layer. As a consequence, it is evident that the discussion of inventive step would have to be continued starting from an entirely different prior art. To impose the need for such a substantial change in the argumentation is unacceptable for the other party and for the board who have prepared themselves based on the requests and arguments on file.

Thirdly, the board sees no valid reason why the request could not have been filed earlier. It is true that the second auxiliary request could be seen as a motion of last resort. The discussion at the oral proceedings before the board had already led to the conclusion that the earlier priority claim based on P1 was not valid and that consequently document D7 became available for assessing inventive step, with clearly negative perspective for the fate of the main and the first auxiliary requests. However, this course of events cannot have been entirely surprising to the respondent because, firstly, the appellant's objections concerning the validity of the earlier priority had been submitted already with the statement of grounds for appeal and, secondly, the respondent did not present any counter-arguments, neither in its written submissions nor at the oral proceedings.

3.3 For these reasons, the submission of the second auxiliary request is belated and raises unforeseeable issues which the board and the other party cannot reasonably be expected to deal with without adjournment of the oral proceedings. The second auxiliary request is therefore not admitted into the proceedings (Article 114(2) EPC; Article 13(1) and (3) RPBA).

4. Novelty (Main request, auxiliary request 1)

4.1 D7 discloses the deposition of a layer of SiOC as a sodium diffusion barrier layer and of 15 nm TiO₂ as a PASC layer by chemical vapour deposition (CVD), utilizing a "standard nozzle" as described in D15. The deposition temperature for the TiO₂ is reported as 425°C. See page 15, example 3; page 16, examples 4 and 5; claims 1, 17 and 23.

The deposition nozzle of D15 is specifically designed for pyrolytic deposition in-line, i.e. for depositing coatings on a float glass travelling on a metal bath (see Figure 1; page 2, lines 23 to 27; page 3, lines 49 to 53).

In the appellant's argument, the skilled person attempting to put into practice example 5 of D7, was by way of reference to D15 directed to a method in which the substrate was supported by and travelling on a molten tin bath. Therefore, D7 was novelty-destroying.

However, the board considers that example 5 calls for a rather low deposition temperature of about 425°C, which is substantially different from the temperature of the

float glass ribbon which D15 discloses to be about 700 C.

Furthermore, and more importantly, the board considers that D7 refers to the nozzle design disclosed in D15, but not necessarily to the position of the said nozzle in the float glass environment of 700°C.

Therefore, D7 is not novelty-destroying.

- 4.2 D1 discloses the deposition of a silica SIDB coating (33.9 nm) and a PASC TiO₂ coating of 68.4 nm (by CVD from TiCl₄) on a glass substrate travelling on a float bath (see example 6).

However, as silicon dioxide is not among the list of SIDB coatings in accordance with variant B of claim 1 of the main request and the first auxiliary request, D1 is not novelty-destroying.

- 4.3 D5 was also cited as a novelty-destroying document.

D5 concerns the deposition of an infrared-reflecting layer of 250 to 350 nm tin oxide by CVD on a float glass surface while the glass is supported on a tin bath (see column 4, lines 24 to 28; column 6, lines 56 to 59; example 1). D5 does not mention any PASC properties of the tin oxide layer. There is also no separate dedicated SIDB layer.

In this respect, the appellant denied that SnO₂ constituted a PASC layer in the sense of the patent in suit on the ground that D17 (cited in support of D5) disclosed only the fact that SnO₂ was photocatalytically

active, but not that it had self-cleaning properties.

This point needs not be decided, however, as the board is satisfied that novelty of the claimed subject-matter resides at least in the presence of a dedicated separate SIDB layer (of which D5 is silent).

4.4 None of the remaining documents discloses all the claimed features in combination.

4.5 In conclusion, the requirements of Article 54 EPC are met.

5. Inventive step (main request, auxiliary request 1)

5.1 The patent in suit is concerned with methods of manufacturing a photocatalytically-activated self-cleaning glass article by depositing a PASC layer by CVD during the glass manufacturing process while the float glass ribbon travels through the tin bath.

5.2 The board firstly has to identify the closest prior art document. During the opposition procedure D3 had been considered as the closest prior art. This was also the respondent's position at the oral proceedings.

However, since the earliest priority claim is not valid, document D7 is also available for assessing inventive step. The appellant considered D7 closer than D3 because D7 revealed the same deposition process of the SIDB and PASC layers as the opposed patent, but also (unlike D3) the claim feature according to which the coating process is carried out continuously in a float glass process, i.e. while the float glass ribbon

travels through the tin bath (see D7, page 11, third paragraph; page 13, last paragraph, "*Examples 1 to 3*").

Thus, according to D7, a sodium diffusion barrier coating consisting of 50 nm SiOC is firstly deposited by CVD directly onto the glass substrate, followed by a 15 nm layer of TiO₂ deposited by CVD using titanium tetra-isopropoxide, titanium tetrachloride or titanium tetra-ethoxide as precursors, at a deposition temperature of 425°C (see page 16, example 5; page 9, second paragraph). These are also the preferred TiO₂ PASC coating precursors of the opposed patent (see paragraph [0023]). The coatings of D7 are applied by using a standard coating nozzle ("*buse*") as disclosed in D15. Said document D15 concerns a coating method and apparatus for the CVD deposition of thin layers directly on the surface of a glass ribbon while it is supported by and moving on the molten metal bath (see page 2, lines 23 to 27; page 3, lines 49 to 53; Figure 1). However, having regard to the comparatively low deposition temperature of 425°C reported in example 5 according to D7, and having furthermore regard to the description of examples 1 to 3 (D7, page 13, last paragraph), which states that the deposition nozzle is located at the exit of the float bath, it is considered that the CVD deposition in example 5 takes place outside and downstream of the float bath.

The board thus considers that D7 should be taken as representing the closest prior art.

- 5.3 The next step is to determine the problem to be solved in the light of the closest prior art document D7.

The opposed patent contains no experimental comparison data with D7 which could support the achievement of an improvement over the prior art. In fact, the opposed patent does not contain an example relating to the process as now claimed. More specifically, the opposed patent does not reveal any advantages in connection with the claim feature of carrying out the chemical vapour deposition at a point in the float ribbon manufacturing process where the float ribbon travels through the tin bath. On the contrary, the description, paragraph [0028] of the opposed patent, presents the various possible coating positions, namely after the tin bath, in the annealing Lehr or after the annealing Lehr, as equivalent. The respondent itself argued during oral proceedings that the problem underlying the opposed patent, having regard to D7, should be seen as providing an alternative. The board can accept this definition of the problem.

Therefore, starting from D7, the problem underlying the patent in suit can be seen as providing alternative methods of manufacturing a photocatalytically-activated self-cleaning glass article.

- 5.4 As a solution to the above defined problem, the opposed patent proposes as variant A of claim 1 a method of manufacturing a photocatalytically-activated self-cleaning glass article according to claim 1 (main request and auxiliary request 1), characterized in that the PASC layer is deposited during the glass manufacturing process while the float glass ribbon travels through the tin bath.

5.5 It was not disputed that the above defined problem has been successfully solved.

5.6 It remains to be decided whether the claimed solution is obvious having regard to the prior art.

5.6.1 The question is whether the claim feature directed to the chemical vapour deposition at a point during the glass manufacturing process while the float ribbon travels through the tin bath (claim 1, third paragraph) is known in the art.

5.6.2 D7 itself already suggests that the pyrolytic deposition allows a coating layer to be deposited in a continuous manner, directly on the float glass ribbon (see page 11, third paragraph). The pyrolysis may be carried out in the vapour phase (CVD) (see page 11, last paragraph).

5.6.3 In addition, document D15 (referred to in D7) discloses chemical vapour deposition of SiOC layers on the float glass ribbon, on the surface of the moving glass ribbon, at a temperature of approximately 700°C (see page 3, lines 32 to 39, lines 49 to 53; page 2, lines 23 to 27; Figure 1). This temperature is not too far away from the temperature range of 300°C to 650°C indicated in D7 (examples 4 and 5), which is in turn perfectly compatible with the temperature of the float ribbon on the tin bath given in the patent in suit (approx. 1093.3°C to approx. 538°C at the exit of the bath; see paragraph [0027]).

5.6.4 Document D16 describes the deposition of layers of TiO₂ by pyrolytic deposition of TiCl₄ in the gaseous phase on

a moving float glass ribbon, preferably at a position immediately before the glass ribbon exits the tin bath (see page 3, lines 36 to 49; page 4, lines 34 to 40; page 10, lines 38 to 43; claims 1 and 4). Although D16 does not relate to the manufacture of photocatalytically-activated self-cleaning articles and does not disclose the deposition of SIDB layers, the document is admitted into the procedure as relevant because it also relates to the CVD deposition of TiO_2 coatings on continuous glass substrates. Therefore, the skilled person would take D16 into consideration when looking for alternative ways of vapour-depositing TiO_2 on glass substrates.

In summary, there is a clear indication in the cited prior art that the chemical vapour deposition of SIDB and TiO_2 PASC layers known from D7 may be carried out at a point during the glass manufacturing process while the float ribbon travels through the tin bath, thereby arriving at an alternative method as claimed in current claim 1 of the main and the first auxiliary requests.

Therefore, the claimed subject-matter does not involve an inventive step (Article 56 EPC).

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:

C. Vodz

G. Raths