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Datasheet for the decision of 6 November 2014

Case Number: T 1012/10 - 3.3.05

Application Number: 00969518.0

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Language of the proceedings: EN

Title of invention:
GLAZING

Patent Proprietor:
AGC Glass Europe

Opponents:
SAINT-GOBAIN GLASS FRANCE
Pilkington Deutschland AG

Headword:
Glazing/ AGC Glass Europe

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - all requests - no

Decisions cited:
T 0197/86, T 0939/92

Catchword:

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Case Number: T 1012/10 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 6 November 2014

Appellant: (Opponent 1)	SAINT-GOBAIN GLASS FRANCE 18, avenue d'Alsace 92400 Courbevoie (FR)
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Appellant: (Opponent 2)	Pilkington Deutschland AG Haydnstrasse 19 45884 Gelsenkirchen (DE)
Respondent: (Patent Proprietor)	AGC Glass Europe Avenue Jean Monnet 4 1348 Louvain-la-Neuve (BE)
Representative:	Bayot, Daisy AGC Glass Europe Technovation Centre IP Department Rue Louis Blériot, 12 6041 Gosselies (BE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 3 March 2010 concerning maintenance of the European Patent No. 1230189 in amended form.**

Composition of the Board:

Chairman G. Raths
Members: G. Glod
P. Guntz

Summary of Facts and Submissions

I. The decision lies from the appeals filed by the two opponents (hereinafter "the appellants") against the decision of the opposition division that European patent No. 1 230 189 as amended (auxiliary request) met the requirements of the EPC.

II. The documents cited in the decision of the opposition division included the following:

S4: EP-A-0 803 481
S8: EP-A-751 099

III. The opposition division found that claim 1 of the main request lacked an inventive step, while the auxiliary request was found to meet the requirements of the EPC.

IV. In reply to the statements setting out the grounds of appeal, the patent proprietor (hereinafter "the respondent") submitted a new main request based on the auxiliary request maintained during opposition proceedings. Claims 11 to 14 of that request were deleted.

V. In its communication under Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA), the Board expressed its preliminary non-binding opinion that the requirements of Articles 83 and 84 EPC were met. The subject-matter of claim 1 was found to lack an inventive step in view of S4 alone. It was indicated that S8 was also relevant for the question of inventive step.

VI. By letter dated 6 October 2014, the respondent filed a new main and three auxiliary requests.

Claim 1 of the **main request** reads:

"*1. A heat treatable or substantially haze free heat treated glazing panel comprising in sequence at least:*
a glass substrate
a base antireflective layer comprising at least a base antireflective lower layer and a base antireflective upper layer which is of a different composition to that of the base antireflective lower layer, the base antireflective upper layer comprising a mixed oxide of Zn and one additional material X, in which the ratio X/Zn in the base antireflective upper layer is between 0.02 and 0.5 by weight and in which X is one of the materials selected from the group comprising Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti
a first infra-red reflecting layer
a first barrier layer
a central antireflective layer comprising at least a central antireflective lower layer and a central antireflective upper layer which is of a different composition to that of the central antireflective lower layer, the central antireflective lower layer being in direct contact with the first barrier layer and comprising a mixed oxide of Zn and one additional material W, in which the ratio W/Zn in the central antireflective lower layer is between 0.5 and 2 by weight and in which W is one of the materials selected from the group comprising Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti, and the central antireflective upper layer comprising a mixed oxide of Zn and one additional material Y, in which the ratio Y/Zn in the base antireflective upper layer is between 0.02 and 0.5 by weight and in which Y is one of the materials selected from the group comprising Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti

a second infra-red reflecting layer
a second barrier layer
a top antireflective layer."

In claim 1 of the **first auxiliary request** the following changes (underlined by the board) were made:

"*1. [...] in which the ratio X/Zn in the base antireflective upper layer is between 0.03 and 0.3 by weight [...] a first infra-red reflecting silver layer [...] in which the ratio Y/Zn in the base antireflective upper layer is between 0.03 and 0.3 by weight [...] a second infra-red reflecting silver layer [...].*"

Claim 1 of the **second auxiliary request** differs in essence from claim 1 of the first auxiliary request in that Al was deleted from the list of materials of X and Y.

Claim 1 of the **third auxiliary request** differs in essence from claim 1 of the second auxiliary request in that X and Y were limited to Sn.

VII. Oral proceedings before the board took place on 6 November 2014.

VIII. The arguments that are relevant for the present decision provided by **the appellants** can be summarized as follows:

S4 was considered to be the closest prior art document. It disclosed an example of a coated article of the following sequence: glass sheet substrate; oxide of zinc-tin (Sn) alloy (Zn_2SnO_4); oxide of zinc (ZnO); silver (Ag); titanium (Ti); oxide of zinc-tin alloy;

oxide of zinc; silver; titanium; oxide of zinc-tin alloy; an exterior protective film of oxide of titanium (S4: column 16, lines 48 to 52 and column 11, lines 23 to 36). The composition of zinc-tin alloy (zinc stannate) was expressed as: Zn:Sn weight ratio of 0.93+-0.12; Zn:Sn atom ratio of 1.7+-0.2; or compound formula of approximately $Zn_{1.7x}Sn_xO_{3.7x}$ (S4: column 14, line 49 to column 15, line 5).

The only difference of claim 1 with the example of D4 was the amount of dopants introduced in the upper layers of the base and central antireflective layer, respectively.

It could not be accepted that the problem of avoiding excessive haze was solved with respect to S4, since there were no data to support this allegation. Furthermore, it was not credible that the problem was solved over the whole range claimed. In that respect it was to be noted that claim 1 was formulated as an open claim allowing for the presence of an additional layer as set out in paragraph [0012] of the patent in suit. It was not even clear what was meant by "avoiding excessive haze". Therefore, the objective problem was to find an alternative panel.

The solution to this problem was obvious since it was banal to dope ZnO with a metal such as aluminum (Al) or Sn in the amount claimed. S4 suggested zinc-aluminum-oxide as an alternative to ZnO (S4: column 6, lines 20 to 25). The ratio of Al/Zn was obvious in view of S8 that taught that doped ZnO had better properties than ZnO (S4: page 3, lines 20 to 33). Besides aluminum, S8 taught other metals that could be used as dopants (S8: page 3, lines 18 and 19).

The skilled person had a clear incentive to look into S8 when starting from S4, since S8 taught the positive effect of the dopant in ZnO on adhesion of Ag to ZnO. The presence of palladium (Pd) in the layer of Ag in S8 was to be seen independently from the presence of a dopant in ZnO, since they related to different effects.

IX. **The respondent** essentially argued as follows:

Starting from S4, the problem to be solved was to avoid excessive haze in all cases. The example of the patent-in-suit showed that the glazing panel according to claim 1 was substantially haze free within the meaning given in paragraph [0025] of the patent-in-suit. S4 taught to adapt the thickness of the titanium primer layer in order to improve haze (column 18, lines 4 to 12) and was silent about the role of the ZnO layer in that respect. In addition, the goal of S4 was maximal crystallisation of the Ag layer, while the invention aimed at avoiding excessive crystallization (patent in suit: page 3, lines 37 to 42).

S8 was completely silent about haze, so that the skilled person did not find any guidance there to reduce haze.

Even if the problem was only to find an alternative glazing panel, the solution was still not obvious.

S4 taught many possible alternatives. Besides the change of the metal-contact film-part, other changes such as the change of the support film part (S4: column 6, lines 36 and 37) or the change of the primer layer (S4: column 8, lines 40 and 41) were envisaged.

The reasoning of the opposition division was correct,

since there was no pointer towards the multiple selections needed to arrive at the claimed subject-matter when starting from S4. To favour a change of the composition of the ZnO layer was based on an ex post facto analysis.

Zinc aluminum oxide and indium oxide were considered as alternative to ZnO in S4, but it was not indicated what was meant by appropriate compositions. Even if the skilled person would have replaced ZnO, he would not have replaced it twice by zinc aluminum oxide i.e. in two different layers. In addition, there was no incentive in S4 to choose a ratio of Al/Zn in the range of 0.02 to 0.5 by weight.

S4 did not teach any of the materials used as X or Y in auxiliary requests 2 and 3. There was no pointer in S4 to turn towards S8. In any case the general teaching of S8 was not in line with S4. S8 did not disclose Ag layers, but only Pd-Ag layers. The teaching for such a layer could not be transferred to Ag layers.

X. Requests:

The **appellants** requested that the decision under appeal be set aside and that the European patent be revoked.

The **respondent** requested that the patent be maintained in amended form on the basis of the main request or, alternatively, on the basis of one of the auxiliary requests 1 to 3, all requests having been submitted with letter of 6 October 2014

Reasons for the Decision

Main request

1. Article 56 EPC.

1.1 Invention

The invention of the patent in suit concerns a heat treatable or substantially haze free heat treated glazing panel comprising several layers in sequence (see claim 1).

1.2 Closest prior art

S4 (EP-A-803481) is considered as closest prior art, since it also discloses a high transmittance, low emissivity coated article suitable for heat treatment (column 10, lines 45 and 46). One embodiment explicitly disclosed the following sequence: a glass substrate, zinc stannate, zinc oxide, silver, titanium, zinc stannate, zinc oxide, silver, titanium, zinc stannate and titanium oxide (column 11, lines 23 to 36 and column 16, lines 48 to 52). The zinc stannate had a Zn/Sn weight ratio of 0.93+-0.12 and a Zn/Sn atomic ratio of 1.7+-0.2; or, in other words, the compound formula is approximately $Zn_{1.7x}Sn_xO_{3.7x}$ (see column 14, line 55 to column 15, line 5). The ratio of Sn/Zn is 1.07 by weight.

1.3 Problem

(1) The patent in suit does not explicitly address a specific technical problem to be solved. It refers however to advantageous properties or advantageous

combinations of properties such as thermal stability (page 3, line 19 and lines 25 to 30), luminous transmittance, ease and controllability of deposition, mechanical resistance, compatibility with silver, avoidance of haze, a sufficient degree of crystallisation of the silver layers, production cycle time, refractive index, emissivity, electrical resistance (page 3, lines 24 to 55).

(2) The respondent during oral proceedings before the board focused on one of these properties, namely haze, and defined the problem underlying the patent in suit in the light of document S4 as being to reduce haze in the glazing panel.

1.4 Solution

As a solution to this problem the patent in suit proposes a glazing panel according to claim 1, characterized in that the upper layer of the base antireflective layer and of the central antireflective layer, respectively comprise a mixed oxide of Zn and at least one additional material X or Y, in which the ratio X/Zn or Y/Zn is between 0.02 and 0.5 by weight and in which X or Y are independently one of the materials selected from the group comprising Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti.

1.5 Success of the solution

It needs to be established whether this problem has been solved over the whole range claimed.

(1) It has to be seen whether the patent in suit discloses evidence for the success of the solution, in other words, whether there is a reduction of haze in

comparison to glazing panels according to document S4.

The patent in suit contains one specific example of a heat treatable glazing panel which has haze of 0.1 prior to heat treatment and 0.25 following heat treatment (paragraph [0035]).

The question is whether this value can be compared to values to be found in S4.

S4 discloses that a one silver layer coating has no measurable haze, as measured with a haze meter (column 16, lines 7 to 8). A different haze test, giving values of 5 to 60, whereby lower haze corresponds to higher numerical values, shows that the one silver layer coating having a zinc oxide film over the zinc stannate film before the deposition of silver, has lowest haze when the titanium primer layer has a thickness of about 24 to 28 Angstroms (column 17, lines 30 to 36; column 18, lines 6 to 12 and Figure 3). No data are given for the multiple silver film coating disclosed in column 16, lines 48 to 52.

The value of 0.1 prior to heat treatment and 0.25 following heat treatment (patent in suit, paragraph [0035]) cannot be compared to the values obtained in S4 in view of the different methods used for determining haze.

So, there is no comparison of a glazing panel according to the invention with a glazing panel according to S4 available. It cannot be concluded that the glazing panel according to the example of the patent in suit has reduced haze compared to a glazing panel according to the embodiment of S4.

(2) If no evidence for the success of the solution can be obtained from the patent in suit, comparative tests may adduce evidence.

According to the established jurisprudence, where comparative tests are chosen to demonstrate an inventive step with an improved effect over a claimed area, the nature of the comparison with the closest state of the art must be such that the effect is convincingly shown to have its origin in the distinguishing feature of the invention (T 197/86, Reasons 6.1.3).

This means that in the present case a comparative test would have been necessary in order to show that the addition of a material selected from Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti to ZnO in the specified ratio would reduce haze independently of the thickness of the other layers present in the embodiment of S4.

However, no such test has been submitted by the respondent. The alleged reduction of haze in the glazing panel which has only been brought forward during oral proceedings before the board has not been convincingly shown. Therefore, it cannot be accepted that the problem has been solved.

(3) As a last resort, in the absence of explicit evidence in the patent in suit or in the absence of comparative tests, it can be verified whether there is implicit evidence for an improvement, in this case evidence for improved haze values.

According to the patent in suit, a pure ZnO layer adjacent to the Ag layer **can** lead to excessive crystallization of the Ag and to problems of haze (page

3, lines 37 and 38). This means that the problem of haze is not always present and is possibly dependent on the other layers present on the glass.

The skilled person, who is a skilled person in the field of coated glass, learns from S4 that glazing panels with a titanium primer layer of a specified thickness have low haze.

So, the statement in the patent in suit ("a pure ZnO layer ... *can* lead to ... problems of haze") is in line with the observations made in S4 wherein it is shown that haze may be reduced by a change in the thickness of one layer, namely the Ti layer.

As to the doping of ZnO with a material selected from the group comprising Sn, Al, Ga, In, Zr, Sb, Bi, Mg, Nb, Ta and Ti, it is doubtful that in comparison to S4 a further reduction of haze is always possible.

(4) All in all, it cannot be concluded that the problem defined under 1.3 (2) has been solved over the whole scope of the claim, independently of the thickness of the layers of the embodiment disclosed in S4.

1.6 Reformulation of problem

The problem has to be reformulated in a less ambitious way and can be seen in providing an alternative glazing panel or coated article as it is called in S4 (S4: column 16, lines 48 to 52).

1.7 Obviousness

Although it seems doubtful that all the mixed oxides falling within the definition given in claim 1 are real

alternatives to ZnO and lead to the same properties with respect to transmittance and emissivity, it is accepted, for the sake of the following considerations and due to the lack of evidence to the contrary, that this less ambitious problem is solved.

S4 discloses that the metal contact film part can be changed (S4: column 6, lines 20 to 25); the support film part can be changed (S4: column 6, lines 36 and 37) and the primer layer may be changed (S4: column 8, lines 40 and 41). Since the problem is only to be seen in obtaining alternative coated articles, all alternatives are equally suitable, and no inventive skill needs to be exercised in selecting, for instance, the coated article having an alternative ZnO layer. A mere arbitrary choice from the possible solutions cannot involve an inventive step (T 939/92, Reasons 2.5.3).

Therefore, it has to be determined whether the change of composition of the metal contact film from ZnO (S4) into doped ZnO (patent in suit) is an obvious alternative that the skilled person would consider and whether there have been hints in the prior art to such alternative.

(a) S4 teaches that (besides zinc oxide) zinc aluminum oxide is another example of a suitable material for the metal-contact part of the base film (S4: column 6, lines 20 to 23). S4 also teaches that the zinc aluminum oxide should be of an appropriate composition (S4: column 6, lines 22 to 23). Appropriate composition means that the material should favorably affect the deposition of the silver atoms (S4: column 6, line 16).

(b) To find such an appropriate composition, the

skilled person would consider the teaching of S8, since S8 also relates to low emissivity glass and the influence of ZnO on the Ag layer (S8: page 2, lines 40 to 45). S8 teaches that the adhesion of ZnO to the Ag layer can be improved by the addition of a material selected from the group consisting of Sn, Al, Cr, Ti, Si, B, Mg and Ga at 1-10 at%. This amount of material added to ZnO ensures that the crystallizability of ZnO and the compatibility with Ag is as desired (S8: page 3, lines 18 to 28). Therefore, the skilled person learns from S8 that the doping of ZnO with Al already indicated in S4 has a positive effect on the adhesive properties of ZnO to Ag in the given range (1 to 10 at %)(S8: page 3, lines 29 to 31 and page 2, lines 43 and 44). Besides Al, other materials such as Sn, Cr, Ti, Si, B, Mg and Ga are taught to have the same effect.

The Ag layer disclosed in S8 contains 0.3 to 10 at% of Pd based on the total amount of Pd and Ag (S8: page 3, lines 35 and 36). Pd is added to the Ag layer to stabilize it (S4: page 2, lines 37 to 41). This effect is independent from the addition of a material selected from the group consisting of Sn, Al, Cr, Ti, Si, B, Mg and Ga at 1-10 at% to the ZnO layer, since that addition concerns the adhesive properties (S8: page 3, lines 29 to 31). This is also in line with page 3, lines 18 to 28 of S8 wherein the positive effect of the addition of that material to ZnO is discussed with respect to an Ag layer in general ("an Ag layer" in line 20) without mentioning Pd. The teaching of the addition of a material to ZnO is therefore not limited to ZnO in contact with a Pd containing Ag layer, but to ZnO in contact with any Ag layer.

The skilled person trying to solve the posed problem (an alternative glazing panel) would add any one of the

materials Sn, Al, Cr, Ti, Si, B, Mg and Ga to ZnO in the range of 1-10 at% with a reasonable expectation of finding an at least suitable alternative to ZnO.

The addition of, for example, Sn to ZnO at the preferred range of 2-6 at% (S8: page 3, line 33) leads to a ratio of Sn/Zn in the range of 0.04 to 0.12. This range is within the range present in claim 1 of the present request.

S8 also teaches the presence of the material selected from Sn, Al, Cr, Ti, Si, B, Mg and Ga in the two layers of ZnO (1) contacting the Ag (2) layer (S8: Figure 3 and page 3, lines 13 and 14). Incorporating the same material into the two ZnO layers of the embodiment of S4 is one of equal alternatives that the skilled person would choose without inventive skill.

The fact that the skilled person has to make several choices to arrive at the present invention is not an indication of inventive step if the **choice is made between alternatives that are equally suitable** (T 939/92, Reasons 2.5.3).

In view of the teaching of S8, the skilled person would therefore incorporate a metal such as Sn in the layers of ZnO of S4 in order to solve the posed problem.

The solution to the problem is obvious in view of S4 in combination with S8.

The main request must fail.

Auxiliary requests 1 to 3

2. Article 56 EPC

As to the invention, the closest prior art and the problem, it is referred to the reasons 1.1 to 1.3 which apply *mutatis mutandis* to auxiliary requests 1 to 3. The infra-red reflecting layers according to claim 1 of auxiliary requests 1 to 3 is silver. However, the embodiment of S4 also contains Ag layers (S4: column 16, lines 48 to 52). Further, the claimed range for the ratios of X/Zn and Y/Zn (0.03 to 0.3.) is still within the limits of the range taught in S8.

For example, the addition of Sn to ZnO at the preferred range of 2-6 at% (S8: page 3, line 33) leads to a ratio of Sn/Zn in the range of 0.04 to 0.12. This range is within the range present in claim 1 of the present request.

In addition, even for glazing panels having X=Y=Sn (auxiliary request 3), there is no evidence that the problem (defined under 1.3 (b)) has indeed been solved over the whole scope of the claim, independently of the thickness of the layers of the embodiment disclosed in S4.

The problem to be solved therefore remains (for auxiliary requests 1 to 3) to find an alternative glazing panel.

The solution remains obvious, since S8 also teaches the addition of Sn to ZnO, Sn being among the materials of X an Y in auxiliary requests 1 to 3.

Auxiliary requests 1 to 3 must also fail.

3. Since the patent fails under Article 56 EPC, there is no need to discuss the other grounds.

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

Decision electronically authenticated