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Datasheet for the decision of 15 March 2010

Case Number: T 0799/06 - 3.3.05

Application Number: 99968353.5

Publication Number: 1147066

IPC: C03C 17/36

Language of the proceedings: EN

Title of invention:
Glazing panel

Patentee:
AGC Flat Glass Europe SA

Opponents:
Pilkington Deutschland AG
Interpane Entwicklungs- und Beratungsgesellschaft mbH & Co. KG

Headword:
Glazing panel/AGC FLAT GLASS EUROPE S.A.

Relevant legal provisions:
EPC Art. 54, 56, 83

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (no) (all requests) - technical solution derivable from a combination of two documents"

Decisions cited:
-

Catchword:
-

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Case Number: T 0799/06 **-** 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 15 March 2010

Appellant: (Patent Proprietor)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 5 April 2006 revoking European patent No. 1147066 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: G. Raths
Members: H. Engl
H. Preglau

Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division posted on 5 April 2006 to revoke European patent EP-B-1 147 066.

In its decision the opposition division held that claims 1 and 2 in accordance with the main request lacked an inventive step having regard to document

D7: EP-A-0 877 006

The claims of the auxiliary request were rejected as unclear (Article 84 EPC).

II. The following documents were also cited during the opposition procedure:

D1: EP-A-0 464 789
D2: US-A-5 834 103
D3: EP-A-0 718 250
D6/O2: EP-A-0 847 965
D7/O2: DE-A-41 35 701

III. The appeal of the patentee (henceforth: the appellant) was filed under cover of a letter dated 30 May 2006. The grounds of appeal were received on 3 August 2006 together with two sets of amended claims as a main and auxiliary request, respectively, and several additional documents.

IV. Further sets of amended claims as auxiliary requests 1 to 3, replacing auxiliary request 1 on file, were filed under cover of a letter dated 11 February 2010. Said

auxiliary requests 1 and 3 were subsequently withdrawn (telefax message of 12 March 2010); the modified claims of auxiliary request 2 were submitted as a new auxiliary request 1 and a new auxiliary request was submitted as auxiliary request 2.

V. The independent claims in accordance with these requests read as follows:

Main request:

"1. A glazing panel carrying a coating stack comprising in sequence at least:
a glass substrate
a base antireflective layer
an infra-red reflecting layer, and
a top antireflective layer
characterised in that the top antireflective layer comprises at least the following sequential structure:
a) a mixed oxide layer which comprises an oxide which is a mixture of Zn and at least one additional material X, in which the atomic ratio X/Zn is within the range 0.05-0.6 and in which X is one or more of the materials selected from the group consisting of Ti, Zr, Nb, Ta, Al and Bi, and
b) an overlying layer which comprises a nitride comprising at least one of the materials Al, Si and Zr."

"2. A glazing panel carrying a coating stack comprising in sequence at least:
a glass substrate
a base antireflective layer
an infra-red reflecting layer, and

a top antireflective layer
characterised in that the base antireflective layer comprises at least the following sequential structure:
a) a layer which comprises a nitride comprising at least one of the materials Al, Si and Zr, and
b) an overlying mixed oxide layer which consists essentially of an oxide which is a mixture of Zn and at least one additional material X, in which the atomic ratio X/Zn is within the range 0.05-0.6 and in which X is one or more of the materials selected from the group consisting of Ti, Zr, Nb, Ta, Al and Bi."

"14. A method of manufacturing a glazing panel having a haze of less than about 0.5 comprising the step of subjecting a glazing panel in accordance with any preceding claim to a heat treatment process at at least 570 °C."

First auxiliary request:

The ***first auxiliary request*** corresponds to the set of claims in accordance with the main request, but with claim 2 being deleted.

Second auxiliary request:

"1. A glazing panel carrying a coating stack comprising in sequence at least:
a glass substrate
a base antireflective layer
an infra-red reflecting layer, and
a top antireflective layer
characterised in that the top antireflective layer comprises at least the following sequential structure:

a) a mixed oxide layer which comprises an oxide which is a mixture of Zn and at least one additional material X, in which the atomic ratio X/Zn is within the range **0.08-0.5** and in which X is one or more of the materials selected from the group consisting of **Ti and Al**, and
b) an overlying layer which comprises a nitride comprising at least one of the materials Al, Si and Zr."

Changes with respect to the claims in accordance with the main request appear in **bold**. Independent process claim 14 has been deleted.

VI. Oral proceedings took place on 15 March 2010.

VII. The arguments of the appellant (patentee) may be summarized as follows:

Document D3 represented the closest prior art. It disclosed in example 2 a layer system comprising layers of pure ZnO and a barrier layer of Si_3N_4. The object of D3 was to provide a glazing panel wherein luminous transmittance T_L and emissivity ε remained unchanged during heat treatment. Pure ZnO layers were described in document D3 as stable and inert under the conditions of heat treatment. Therefore, starting from D3, there was no incentive to modify the pure ZnO layers of D3, for instance in the way disclosed in D7. But even if the skilled person had combined D3 and D7 - which was denied -, the inevitable result would have been a ZnAlO layer additionally doped with Si. It was significant that the combination of ZnO and Si_3N_4 as taught in D3 was not repeated in D7 (belonging to the same patentee). D6/02 referred to D3 and observed that glazing panels

with the said combination of ZnO and Si_3N_4 exhibited a stable T_L, but showed pinholes or haze (*"aspect un peu flou"*). In summary, the combined teaching of all documents was that the problem of thermal stability could not be completely solved by ZnO and Al layers alone. Therefore, the claimed invention did not follow in an obvious manner from D3 in combination with D7.

The appellant accepted that Al was added to Zn targets for improving the sputtering process, but only in small amounts in the order of 1%. In accordance with the invention, the addition was significantly higher and amounted to 5% Al or more.

VIII. The arguments of respondent O1 (opponent O1), insofar as they are relevant for the decision taken, may be summarized as follows:

Respondent O1 did not maintain the novelty objections, raised in the written procedure on the basis of D7, during the oral proceedings.

As regards lack of inventive step, respondent O1 relied on the combination of documents D3 and D7, and D1 and D2, respectively.

Starting from document D3 as the closest prior art, the respondent defined the problem to be solved as providing an alternative heat-treatable solar control glazing panel having a haze of less than 0.5. To solve this problem, D7 proposed a doping of the ZnO layer(s) with 5 to 10% of Al or Ti. D7 already stated that pure ZnO layers had a poor mechanical and chemical stability. Therefore, supposing that the glazing panels according

to D3 exhibited too much haze after heat treatment - which was, in the respondent's view, not proven -, then D7 showed a way of overcoming this problem. The combination of Zn and Al was particularly recommended in D7. It was not relevant that D7 itself taught a further improvement of adding Si to the Zn/Al layer(s).

IX. The arguments of respondent O2 (opponent O2), insofar as they are relevant for the decision taken, may be summarized as follows:

Claim 2 lacked novelty having regard to D6/O2, disclosing in example 4 a layer system having a barrier layer 8b of Si_3N_4 in combination with a stabilizing dielectric layer 8a. According to the description (page 6, lines 1 to 5), the stabilizing dielectric layer, which could be located over or below the barrier layer, could consist of one of more metallic oxides, including titanium and aluminium oxides. Therefore, D6/O2 disclosed all the claim features in combination.

X. Requests

The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the set of claims filed as a main request with the statement of grounds of appeal, or, in the alternative, on the basis of the sets of claims filed with letter dated 12 March 2010 as auxiliary requests 1 and 2.

The respondents requested that the appeal be dismissed.

Reasons for the Decision

1. Having regard to Articles 54, 83 and 123(2) EPC, the board is satisfied that the requirements of these Articles are fulfilled. Since the appeal is dismissed for other reasons, it is not necessary to give a detailed reasoning.

2. Inventive step (all requests)

2.1 The opposed patent relates to heat-treatable solar control glazing panels comprising a coating of at least a base anti-reflecting layer, an infra-red reflecting layer and a top anti-reflecting layer. The term *"heat treatable glazing panel"* as used in the opposed patent means that the glazing panel carrying the coating stack is adapted to undergo a bending and/or thermal tempering and/or thermal hardening operation and/or other heat treatment process without the haze of the so treated glazing panel exceeding 0.5, and preferably without the haze exceeding 0.3. A heat treatment process involves heating or exposing the glazing carrying the coating stack to a temperature greater than about 560°C, for example, between 560°C and 700°C in the atmosphere. See paragraphs [0001], [0017] and [0020] of the opposed patent.

2.2 The parties identified document D3 as representing the closest piece of prior art. The board can accept this choice because D3 aims at solving the same technical problem as the opposed patent, namely to provide coated low-emissivity glass panels which exhibit stable optical and thermal properties under the conditions of

a heat treatment, such as bending or tempering (D3, page 2, lines 3 to 5; page 3, lines 5 to 19).

The parties took the heat treatable solar control glazing panel according to D3, example 2 (Tables 4 and 5, pages 9 and 10) as the starting point for assessing inventive step. Said panel has the following layer structure:

glass // Si_3N_4 / ZnO / Ag / Nb / ZnO / Si_3N_4

The nitride film (which may also be a nitride of Al) serves as a protective (barrier) layer against oxygen diffusion during the heat treatment (D3, page 3, line 52 to page 4, line 1; example 1).

2.3 The problem underlying the opposed patent in the light of document D3 may be defined as providing a solar control glazing panel which remains stable and substantially haze free under heat treatment.

2.4 As a solution to the above defined technical problem, the opposed patent proposes glazing panels having a coating stack according to claim 1 of the main request, characterized in that the base antireflecting ZnO layer is not doped with an additional element X (claim 1) or in that top antireflecting ZnO layer is not doped with an additional element X (claim 2).

2.5 The next step is to examine whether the technical problem is actually solved.

According to the patent in suit, paragraph [0020], the term "heat treatable glazing panel" means that the

glazing panel carrying the coating stack is adapted to undergo a bending and/or thermal tempering and/or thermal hardening operation without the haze of the so treated glazing panel exceeding 0.5. However, the board cannot accept the achievement of a haze value of less than 0.5 as evidence for solving the technical problem over the whole scope of the claims. This value has been demonstrated only for specific glazing panels having a five layer coating system consisting of two infra-red reflecting layers and three dielectric layers based on $ZnAlO_y$. For the less complex coating stacks encompassed by the independent claims, consisting of only one infra-red reflecting layer and two dielectric layers, there is no evidence that a haze of less than 0.5 after heat treatment is obtained.

In the board's view, the examples regarding glazing panels having a five layer system consisting of two infra-red reflecting layers and three dielectric layers based on $ZnAlO_y$ provided in the opposed patent demonstrate however that the above defined technical problem has been solved. The board also accepts that all claimed glazing panels are thermally stable to an extent that they may be said to remain substantially haze free.

Therefore, the board is satisfied that the underlying technical problem as defined above is indeed solved by glazing panels as defined in claims 1 and 2.

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

According to the argument of respondent O1, the claimed solution was obvious in view of D3 in combination with D7.

Document D7 is concerned with the problem of making multilayer solar control coatings on glass thermally stable. In this connection, the authors of D7 refer ***inter alia*** to document D3 (D7, page 2, lines 7 to 10) and state that layers of pure ZnO exhibited reduced mechanical and chemical stability (page 2, lines 21 to 24). Thus D7 discloses in particular solar control (low-E) glazing panels having the following layer system wherein the ZnO layers are doped:

Glass // SnO2 / ZnAlSiO / Ag/ barrier CrNi / SnO2

The ZnAlO layer underlying the IR-reflecting Ag layer is additionally doped with Si (in the example: 0.2% Si) which renders the coating stack stable under heat treatment condition, as demonstrated by the practically unchanged values of luminous transmission T_L (%) and emissivity E (%) before and after the heat treatment (page 4, lines 40 to 55).

D7 also discloses a comparative example without the Si dopant (page 3, line 43). In this embodiment, the coating shows a certain increase in emissivity E (%) and luminous transmission T_L (%) after the heat treatment. D7 also states that the coated glass of the comparative example after heat treatment at 670°C shows a haze (voile) (page 4, lines 21 to 25), due to oxygen diffusion. However, the amount of such haze has not been specified.

According to D7, page 3, lines 8 to 11, the amount of Al in the ZnO layer(s) ranges from 0.3 to 8 wt-%. The latter value of 8 wt-% Al corresponds to approximately 17.4 atom-% Al and thus falls within the range of the X/Zn atomic ratio of 0.05 to 0.60 as claimed in the opposed patent.

In the board's opinion, D7 provides an incentive for the skilled person to use Al doped ZnO layers in view of their better stability. It is without particular relevance in this connection that according to D7 the mechanical and chemical stability may be still further increased by adding minor amounts (0.05 to 1.0%) of Si as an additional dopant, because it has not been shown that the glazing panels in accordance with the opposed patent perform better in terms of luminous transmission T_L (%) and emissivity E (%) before and after the heat treatment than the comparative example of D7, which contains no such additional dopant. It is, in the board's view, also not relevant for the improvement in thermal stability whether the ZnO film doped with Al forms the top (claim 1) or the base (claim 2) antireflective layer, as in both cases the dopant will inevitably contribute to the stability of the ZnO layer. This may be seen from claim 1 of the patent application as originally filed and published in WO-A-00/37381 according to which it was sufficient that the doped antireflective ZnO layer was comprised in at least one of the antireflective layers (base or top antireflective layer). Furthermore, as regards the subject matter defined in claim 2 of the main request, the presence of small amounts of further constituents, such as SiO_x, in the base antireflective layer is not excluded.

The appellant referred to page 5, lines 36 to 39 and lines 45 to 47 of D3, stating that ZnO was stable and inert at high temperatures. It argued that, therefore, no need existed to seek for a further improvement in thermal stability. The board cannot accept this argument, because D7 (a later patent application referring to D3) subsequently modified D3's disclosure by stating that layer systems containing pure ZnO exhibit reduced mechanical and chemical stability because of the development of internal stress (page 2, lines 17 to 24). Thus, the skilled person learned from D7 that improvements of thermal and mechanical stability of the layer system disclosed in D3 could be expected by modifying the ZnO layers with a dopant, in particular with Al.

The board therefore concludes that the subject matter of claims 1 and 2 of the main request follows in an obvious manner from the teachings of D3 and D7. The subject matter of claims 1 and 2 of the main request does not involve an inventive step (Article 56 EPC).

2.7 Claim 1 of the first auxiliary request is identical to claim 1 of the main request. The restricted range of the atomic ratio X/Zn of 0.08 to 0.5 in claim 1 of the second auxiliary request is not distinguished over the respective atomic ratios disclosed in D7 (see point 5.6 above); and the restricted group of materials X also comprises X = Al which is the preferred dopant in accordance with D7.

As regards the independent claims in accordance with the first and second auxiliary requests, the same

reasoning as outlined under points 2.1 to 2.6 applies *mutatis mutandis*, as the restriction made in the said claims does not affect the substance of the objections raised against the claims of the main request. The obviousness conclusion in view of D3 and D7 therefore remains unchanged.

The subject matter of claim 1 of the first and second auxiliary requests does not involve an inventive step (Article 56 EPC).

3. In summary, none of the requests on file is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar The Chairman

C. Vodz G. Raths