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**Datasheet for the decision
of 9 April 2014**

Case Number: T 1397/11 - 3.3.05

Application Number: 01115761.7

Publication Number: 1174397

IPC: C03C17/36, C23C14/34

Language of the proceedings: EN

Title of invention:

Heat-treatable low-E coated articles and method of making same

Patent Proprietor:

GUARDIAN INDUSTRIES CORP.
Centre Luxembourgeois de Recherches pour le Verre
et la Céramique S.A.

Opponents:

SAINT-GOBAIN GLASS FRANCE
Pilkington Deutschland AG

Headword:

Oxidation grading/GUARDIAN

Relevant legal provisions:

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

Keyword:

Admissibility of appeal - appeal sufficiently substantiated
(yes)

Apportionment of costs - (no)

Novelty (main request and auxiliary requests 1 to 8): no -
implicit features (yes)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1397/11 - 3.3.05

**D E C I S I O N
of Technical Board of Appeal 3.3.05
of 9 April 2014**

Appellants:
(Patent Proprietors)

GUARDIAN INDUSTRIES CORP.
2300 Harmon Road,
Auburn Hills,
Michigan 48326-1714 (US)

Centre Luxembourgeois de Recherches pour le
Verre
et la Céramique S.A.
Zone Industrielle Wolser
3452 Dudelange (LU)

Representative:

Hess, Peter K. G.
Bardehle Pagenberg Partnerschaft mbB
Patentanwälte, Rechtsanwälte
Postfach 86 06 20
81633 München (DE)

Respondent 1:
(Opponent 1)

SAINT-GOBAIN GLASS FRANCE
18, avenue d'Alsace
92400 COURBEVOIE (FR)

Representative:

Jamet, Vincent
Saint-Gobain Recherche
Département Propriété Industrielle
39 Quai Lucien Lefranc
93300 Aubervilliers (FR)

Respondent 2:
(Opponent 2)

Pilkington Deutschland AG
Haydnstrasse 19
45884 Gelsenkirchen (DE)

Representative:

Pieper, Karsten
Pilkington Deutschland AG
Haydnstrasse 19
45884 Gelsenkirchen (DE)

Decision under appeal: **Decision of the Opposition Division of the**

Composition of the Board:

Chairman: G. Raths
Members: J.-M. Schwaller
 D. Prietzel-Funk

Summary of Facts and Submissions

- I. The present appeal lies from the decision of the opposition division revoking European patent No. 1 174 397 in particular on the basis of Articles 54(1) and (2) and 83 EPC.

Claim 1 of the main request underlying the decision read as follows:

"1. A coated article including a coating supported by a glass substrate, the coating comprising: an infrared (IR) reflecting layer contacting and sandwiched between first and second layers, said second layer comprising NiCrO_x; and wherein at least said second layer comprising NiCrO_x is oxidation graded so that a first portion of said second layer close to said infrared (IR) reflecting layer is less oxidized than a second portion of said second layer that is further from said infrared (IR) reflecting layer, wherein said infrared (IR) reflecting layer comprises metallic silver (Ag), and wherein said first portion of said second layer comprising NiCrO_x is from 0 to 40% oxidized, and said second portion of said second layer comprising NiCrO_x is at least about 50% oxidized."

Claim 1 of the first auxiliary request underlying the decision read as follows:

"1. A method of making a coated article including an oxidation graded layer, the method comprising: providing a substrate; providing a sputtering apparatus including at least one target; introducing a first gas proximate a first side of the

target and a second gas proximate a second side of the target, the first gas including more oxygen than the second gas so that as the substrate passes below the target an oxidation graded layer is formed, the oxidation graded layer being more oxidized at one portion thereof than at another portion thereof; and wherein the oxidation graded layer contacts an IR reflecting layer comprising metallic silver (Ag) in the coated article."

Claim 1 of the second auxiliary request underlying the decision read as follows:

*"1. A method of making a coated article including an oxidation graded layer, the method comprising:
providing a substrate;
providing a sputtering apparatus including at least one target;
introducing a first gas proximate a first side of the target and a second gas proximate a second side of the target, the first gas including more oxygen than the second gas so that as the substrate passes below the target an oxidation graded layer is formed, the oxidation graded layer being more oxidized at one portion thereof than at another portion thereof; and
wherein the oxidation graded layer contacts an IR reflecting layer comprising metallic silver (Ag) in the coated article, and
wherein the target comprises Ni, and wherein the oxidation graded layer is sputtered directly onto the IR reflecting which comprises Ag, and wherein the one portion of the graded layer that is more oxidized is further from the IR reflecting layer than is the another portion of the graded layer."*

II. The following documents cited during the opposition proceedings are relevant for the present decision:

D7: WO 99/64362 A2

D16: WO 99/25661 A1.

III. In its decision, the opposition division concluded that the product claims did not meet the requirements of Articles 83 and 100(b) EPC because the patent gave no indication as to how a NiCr layer had to be oxidised so that a first portion thereof was from 0 to 40% oxidised, and a second portion thereof was at least about 50% oxidised. The patent was furthermore silent as to how the oxidation had to be performed to obtain a NiCrO_x layer which was progressively less oxidised through its thickness.

The method claims lacked novelty in the light of the disclosure of document D7, in particular the passage at page 8, line 19 to page 9, line 6.

IV. With its grounds of appeal dated 25 August 2011, the proprietors (hereinafter "the appellants") contested the decision and submitted two new documents D20 and D21 (both irrelevant for the present decision) as well as eight amended sets of claims as a main request and as auxiliary requests 1 to 7.

The sets of claims according to the main, first auxiliary, second auxiliary and fourth auxiliary requests all comprise an independent method claim the subject-matter of which is identical to that of claim 1 of the first auxiliary request underlying the decision (see point I above).

Similarly, the sets of claims according to the third and fifth to seventh auxiliary requests all comprise an independent method claim the subject-matter of which is identical to that of claim 1 of the second auxiliary request underlying the contested decision (see point I above).

V. With letter dated 12 March 2012, opponent 2 (hereinafter respondent 2) submitted observations in response to the grounds of appeal along with four new documents:

D22: EP 0 908 421 A2

D23: EP 0 771 766 A1

D24: EP 0 722 913 A1

D25: EP 0 717 014 A1.

Respondent 2 raised in particular novelty objections based on several documents, among them documents D7 and D16, to the subject-matter of the different independent claims then on file.

VI. By letter of 10 September 2012, the appellants filed further observations and they requested the board to reject documents D22 to D25 as belated.

VII. In response to the summons to oral proceedings, opponent 1 (hereinafter respondent 1) submitted two sets of observations: a first one dated 6 February 2014, in which it requested in particular rejection of the main request as inadmissible; a second one dated 6 March 2014, in which it requested rejection of the whole appeal as inadmissible.

VIII. By letter dated 7 March 2014, final written observations were received from the appellants.

IX. At the oral proceedings, which took place on 9 April 2014, respondent 1 requested the reimbursement of its costs to attend the oral proceedings because of the uselessness of the oral proceedings due to the manifest inadmissibility of the appeal.

In the course of the discussion, the appellants submitted an eighth auxiliary request with an independent product claim 1 the subject-matter of which was identical to that of the main request underlying the contested decision (see point I above).

X. At the end of the oral proceedings, the chairman established the parties' requests as follows:

The appellants requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims according to the main request dated 25 August 2011, or alternatively, on the basis of one of the sets of claims according to auxiliary requests 1 to 7, also dated 25 August 2011, or alternatively, on the basis of the claims of the eighth auxiliary request submitted during the oral proceedings before the board.

The respondents requested that the appeal be dismissed. In addition, respondent 1 requested the apportionment of costs (hotel, travel costs, time for preparation).

Reasons for the Decision

1. *Admissibility of the appeal*

1.1 Respondent 1 requested to reject the appeal as inadmissible because the grounds of appeal did not explain which specific points of the decision were erroneous. Furthermore, none of the amended sets of claims filed with the grounds of appeal corresponded to those underlying the contested decision and no explanation was given as to which was the link between the contested decision and the proposed amendments. Thus, the appellants presented a new case to the board of appeal which should be regarded as inadmissible.

1.2 The board cannot follow these arguments because at least the claims of the first auxiliary request correspond to those of the main request underlying the contested decision, except that the dependent claims objected to under Article 123(2) EPC in point 3.3.3 of the decision were deleted. This deletion is obviously a reasonable response to the objection raised in the contested decision and does not urge the board to decide on a "new case". The appeal is therefore admissible.

2. *Admissibility of the requests*

2.1 The board observes that independent **product** claims 1 and 2 of the main request at issue define the oxidation gradient in the NiCrO_x layer in a divergent manner to the requests underlying the decision ("*said second layer comprising NiCrO_x is oxidation graded so that [...] [it] becomes progressively less oxidized through its thickness as it nears said IR reflecting layer*" vs "*said second layer comprising NiCrO_x is oxidation graded*

so that a first portion of said second layer close to said infrared (IR) reflecting layer is [...] from 0 to 40% oxidized and [...] [a] second portion of said second layer comprising NiCrO_x is at least about 50% oxidized", and so the question of admissibility of at least this request would in any case to be assessed. However, since **process** claim 8 of this request, which is identical with process claim 1 of the first auxiliary request underlying the decision, anyway lacks novelty (see point 4. below), for reasons of procedural economy this issue will not be dealt with in the present decision.

2.2 The board holds the eighth auxiliary request admissible under Article 13(1)(3) RPBA, because in spite of its late filing during the oral proceedings before the board, it was submitted in reaction to the board's strategy to first assess the novelty of the process claims, and so the appellants get an opportunity to defend separately their product claims.

3. *Admissibility of documents D22 to D25*

These documents were filed in response to the grounds of appeal in order to show that metallic layers of silver and nickel-chrome were commonly sputtered in one pass, and not in multiple passes as argued by the appellants.

Since from point 4.3.3 below it can be seen that at least documents D23, D24 and D25 are particularly relevant for the issue of this decision, the board admits them into the proceedings.

4. *Main request - Novelty of method claim 8*

The method claim 8 of this request corresponds to claim 1 of the first auxiliary request underlying the contested decision (see item I. above).

- 4.1 Document D7 (claims 1 and 2) discloses a transparent substrate carrying a coating stack comprising at least one metallic coating layer comprising silver or a silver alloy, each metallic coating layer being in contact with two non-absorbent transparent dielectric coating layers, the coated substrate being adapted to withstand a bending or tempering type of heat treatment, characterized in that prior to such heat treatment, each of the dielectric coating layers comprises a sub-layer based on a partially oxidized alloy based on Ni and Cr.

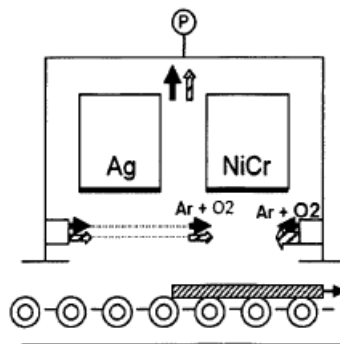
According to claims 20 and 21, the method of manufacturing such a substrate is characterised in that the coating layers are deposited by sputtering, preferably in an oxidising atmosphere.

- 4.2 In the specific embodiments disclosed in the examples, the sputter-coating apparatus comprises five vacuum deposition chambers, each chamber containing one or more magnetron-assisted sputtering cathodes, feed gas inlets and one gas outlet. In particular, the fourth chamber is divided in two compartments, the first one containing a cathode of silver and the second one a cathode of nickel-chromium alloy. Both compartments are fed with an argon/oxygen atmosphere, the deposition of the partially oxidised Ni-Cr alloy sub-layer is described as necessitating a more oxidising atmosphere than in the first second compartment (D7: page 8, line 19 to page 9, line 10). From table A (D7: pages 11 and

12), which summarises the properties of the different coated glasses prepared in the examples, there is no doubt that a NiCrO_x layer is formed on the metallic silver layer.

4.3 The question which arises is whether in the second compartment of the fourth sputtering chamber there is a lower amount of oxygen on the upstream side of the Ni-Cr cathode than on the downstream side and whether the resultant oxidised Ni-Cr layer is more oxidised at one portion than at another portion thereof.

4.3.1 According to respondent 2, the fourth sputtering chamber was configured as follows:



Further, the process run in said chamber lead to an oxidation graded NiCrO_x layer deposited on top of a metallic silver layer.

4.3.2 The appellants contested these conclusions, arguing that there might well be a separation between both compartments and that no mixing of the gases between the compartment thus would occur. Furthermore as explained at page 8, lines 24 and 25 of D7, in order to achieve the desired layers' thicknesses it was necessary to move the substrate several times back and forth underneath the various targets. The idea that only one pass was necessary for sputtering the NiCrO_x

and Ag layers was moreover technically implausible because in such a process the film-forming speed was largely dependent on the speed with which the substrate was moved underneath the targets, and thus the ratio of thickness between Ag and NiCrO_x layer would always basically be the same for all the examples of D7, which *de facto* was not the case. It followed from these considerations that it was not possible to deduce from the sputtering set-up described in D7 whether the Ni-Cr layer applied on the metallic silver layer was sputtered in such a manner that it was oxidation-graded.

- 4.3.3 The board cannot accept these arguments for the following reasons. It is common general knowledge that not only the speed of the substrate can be modified on a sputtering device of the type disclosed in D7, but also the voltage and the intensity of the current, and so the power applied to the individual cathodes, with the consequence that the thickness ratio between the individual Ag and NiCrO_x layers indeed can be varied in another way as by carrying out several passes.

In the board's view, the citation in D7 that several passes were needed concerns the sputtering of the dielectric layers which are much thicker than the metallic layers. Furthermore, as explained by the respondents, the sputtering of metals - such as silver and NiCr - necessitates less energy than oxides or nitrides on which the dielectric layers are based, and so the sputtering of metals is easily made by one single pass. Documents D23, D24 and D25 namely confirm that the deposition of metallic Ag and NiCr layers having the thickness magnitude of the examples in D7 necessitates only one pass.

Regarding the argument that there might be a partition between the two compartments, this option is of course to be envisaged. However, as acknowledged by the parties at the oral proceedings such a partition, if it were present, cannot be gas-tight. It follows that a mixing of the gases inevitably occurs at the junction of the two compartments. This mixing gives rise to an oxygen gradient with the consequence that an oxidation gradient will inevitably be obtained throughout the thickness of the NiCrO_x layer.

The question further arose whether it could be envisaged not to activate simultaneously the targets in the fourth chamber. In the board's view, this option is of course to be envisaged but then there would be no reason to use one chamber divided in two compartments. One would then just have used two separate chambers.

For the board, it follows from the above considerations that the method of making a coated article including an oxidation graded layer as defined in claim 8 of the main request is directly and unambiguously derivable from document D7. Claim 8 therefore lacks novelty under Article 54(1)(2) EPC and this request is thus rejected.

5. *First, second and fourth auxiliary requests*

Claim 10 of the first, second and fourth auxiliary requests being identical to claim 8 of the main request, which lacks novelty, these requests are rejected for the same reason.

6. *Third auxiliary request - Novelty of method claim 7*

The subject-matter of this claim is distinguished from that of method claim 8 of the main request in that the

"target comprises Ni, and wherein the oxidation graded layer is sputtered directly onto the IR reflecting which comprises Ag, and wherein the one portion of the graded layer that is more oxidized is further from the IR reflecting layer than is the another portion of the graded layer".

The board observes that in the examples of D7, the oxidation graded NiCrO_x layer is sputtered directly onto the metallic silver layer and that the apparatus made use in the fourth chamber of a cathode (the "target") comprising nickel, too.

The appellants argued that it might be possible in the examples of D7 that the NiCrO_x layer be more oxidized close to the silver layer than away therefrom. The board cannot accept this allegation because in the sputtering process described in the examples the substrate already coated with metallic silver passes first through the less oxidising atmosphere of the first compartment before passing through the more oxidising atmosphere of the second compartment, and so the more oxidised portion of the graded layer is inevitably located further from the metallic silver layer.

It follows from the above considerations and those in point 4. above that claim 7 of this request lacks novelty (Article 54(1), (2) EPC) in the light of the disclosure of document D7. The third auxiliary request is therefore not allowable.

7. *Fifth to seventh auxiliary requests*

Claim 7 of the fifth auxiliary request and claim 1 of both the sixth and seventh auxiliary requests being

identical to claim 7 of the third auxiliary request, which lacks novelty, these requests are not allowable for the same reason.

8. *Eighth auxiliary request - Novelty of claim 1*

Claim 1 of this request corresponds to claim 1 of the main request underlying the contested decision (see item I. above).

8.1 In the board's view, the product defined in claim 1 of this request is directly and unambiguously disclosed in document D16, in particular in the passage at page 2, line 1 to page 3, line 5, which discloses a glass substrate carrying a solar filter consisting of the following sequence of layers:

- a metal oxide (200 to 400Å thick)
- an infrared reflecting metal (50 to 200Å thick)
- a barrier layer
- a metal oxide layer (400 to 800Å thick)
- an infrared reflecting metal (50 to 200Å thick)
- a barrier layer
- a metal oxide layer (200 to 400Å thick),

with the infrared reflecting metal layers being typically silver or a silver alloy and the barrier layers typically made of metal, partially oxidised metal, or metal oxide to prevent undesired oxidation of the immediately underlying silver layer.

D16 further specifies that where *"the barrier layer is sputter deposited metal and the overlying dielectric is a sputter deposited metal oxide, **the metal barrier is oxidised throughout the majority of its thickness** when the overlying metal oxide is deposited, thus protecting the silver layer from oxidation and forming an additional, thin dielectric layer. Titanium, niobium,*

***nickel chrome** and zinc are commonly used as barriers in this way. A thickness of 1Å or 2Å may **remain as unoxidised metal adjacent** the underlying silver layer. In any case, the thickness and amount of oxidation of the barrier layer is **controlled** such that the residual absorption of the barrier layer in the visible portion of the spectrum is less than 2% and preferably less than 1%.*" (emphasis added by the board).

D16 thus directly and unambiguously discloses a barrier layer which is oxidation-graded in the sense of claim 1 at issue since it has a (first) portion which remains unoxidised, i.e. which is "0% oxidized" in the sense of claim 1 at issue, and a (second) portion which is oxidised throughout the majority of its thickness", which is at least "50% oxidised" in the sense of claim 1 at issue.

- 8.2 The appellants contested the novelty-destroying character of document D16, arguing that the skilled person would have to make a plurality of choices from several lists to arrive at the wording of claim 1 at issue.

The board cannot accept this argument because all the specific - and thus preferred - coated glasses exemplified in D16 (see the Examples) require metallic silver in the infrared reflecting metal layers and metallic titanium in the barrier layers. Thus, in order to arrive at the claimed subject-matter, only one choice is to be made from a list, namely the choice of nickel chrome metal instead of the titanium metal as the material of the barrier layer.

- 8.3 It follows from the above considerations that the subject-matter of claim 1 of this request is not novel

in the light of document D16, and so claim 1 does not meet the requirements of Article 54(1), (2) EPC. Auxiliary request 8 is therefore not allowable.

- 8.4 The request of respondent 1 for the reimbursement of its costs for accommodation and traveling expenses having been caused by the appointment of oral proceedings was based on the alleged uselessness of the oral proceedings due to the manifest inadmissibility of the appeal. Since the appeal is admissible, this request is rejected.

Order

For these reasons it is decided that:

1. The appeal is dismissed.
2. The request for apportionment of costs is rejected.

The Registrar:

The Chairman:



C. Vodz

G. Rath

Decision electronically authenticated