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**Datasheet for the decision
of 7 June 2011**

Case Number: T 0467/08 - 3.2.07

Application Number: 98939529.8

Publication Number: 1007756

IPC: C23C 14/08

Language of the proceedings: EN

Title of invention:

Coatings with a silver layer

Patent Proprietor:

Pilkington Deutschland AG

Opponents:

Applied Materials GmbH & Co. KG
SAINT-GOBAIN GLASS FRANCE
AGC Flat Glass Europe SA
Guardian Industries Corp.
Interpane Entwicklungs- und Beratungsgesellschaft mbH & Co.

Headword:

-

Relevant legal provisions:

EPC Art. 54(2), 56, 123(2)
RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):

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Keyword:

"Request not to admit specific additional auxiliary requests into the appeal procedure (refused)"

"Request to disregard in the appeal procedure comparative test results submitted in the opposition proceedings (see point 1.2) (refused)"

"Allowability of amendments (main request and second auxiliary request - no; sixth auxiliary request - yes, first, third and fourth auxiliary request: withdrawn; fifth auxiliary request replaced by sixth"

"Relevant state of the art (C2 - yes)"

"Inventive step (sixth auxiliary request - no)"

Decisions cited:

T 0064/02, T 0569/02, T 0718/98, T 0870/96

Catchword:

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Case Number: T 0467/08 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 7 June 2011

Appellant:
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Representative: -

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted 18 December 2007
revoking European patent No. 1007756 pursuant
to Article 102(1) EPC 1973.**

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
I. Beckedorf

Summary of Facts and Submissions

I. The appellant (patent proprietor) lodged an appeal against the decision of the Opposition Division to revoke the European patent EP-B-1 007 756.

II. The following documents are cited in the present decision:

Of the opposition proceedings:

C1 = DE-A-39 41 027

C9 = EP-A-0 678 484

C29 = Proc. of the 3rd ISSP (Tokyo 1995), pages 63-70

Filed in the appeal proceedings:

A18 = WO-A-99 00528 (application as originally filed)

C2 = Leybold Systems Brochure "TwinMag", published October 1996 (notarized copy dated 11 September 2008)

C45 = Collection of flyleaves of Leybold brochures

C47 = EP-A-0 908 421

III. Five oppositions had been filed against the patent in its entirety under Article 100(a) EPC, for lack of novelty (opponents 04 and 05) and inventive step (opponents 01 to 05), under Article 100(b) EPC, that the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art (opponents 02 and 05); and under Article 100(c) EPC, that claim 1 of the patent extends beyond the content of the application as originally filed (opponents 04 and 05).

The Opposition Division found that the ground of opposition under Article 100(b) EPC submitted by

opponent 02 was not admissible for not being substantiated. It further considered that the subject-matter of claims 1 and 8 of the main request (i.e. the patent as granted) is novel, particularly with respect to the closest prior art C1 and that this conclusion equally applies to the subject-matter of the claims of all the auxiliary requests. The Opposition Division further considered that the subject-matter of product claim 8 of the main request lacks inventive step over C1 and that this conclusion equally applies to the identical claims 8 of the first and second auxiliary requests. Then it considered that the subject-matter of restricted product claim 8 of the third auxiliary request also lacks inventive step with respect to C1. Likewise the process of claim 1 of the fourth auxiliary request was considered to lack inventive step in view of C1 or in view of a combination of the teachings of C1 and C2. The Opposition Division further considered that the claims 1 of the fifth and sixth auxiliary request contained an optional feature which rendered claims 1 unclear and which contravened Rule 57(a) EPC 1973. Therefore these auxiliary requests were considered not to be allowable either. As a result the patent was revoked.

IV. With a communication dated 7 April 2011 and annexed to the summons to oral proceedings the Board presented its preliminary opinion with respect to the claims of the main request and first to eighth auxiliary requests as filed with the grounds of appeal.

From the nine requests only the eighth auxiliary request appeared to be formally allowable under Articles 100(c) and 123(2) and Rule 80 EPC.

Document C2 appeared to belong to the state of the art according to Article 54(2) EPC.

With respect to the issue of inventive step the Board remarked amongst others that C1 appeared to represent the uncontested closest prior art.

Thus at the oral proceedings set it would be discussed whether or not the subject-matter of process claim 1 and product-by-process claim 8 of the main request would be rendered obvious by the available prior art documents and particularly by C1 alone or by a combination of the teachings of C1 and the general knowledge of the person skilled in the art or by a combination of the teachings of C1 and C2.

- V. With letter dated 6 May 2011 the appellant maintained the main request and submitted amended first to fourth auxiliary requests with adapted description pages for all requests in combination with arguments concerning the allowability of the amendments made as well as the patentability of the subject-matter of their claims, partly taking account of the Board's comments in the summons. The requests for remittal to the department of first instance and for reimbursement of the appeal fee were not maintained in view of the Board's communication.
- VI. With letter dated 6 May 2011 respondent 04 taking account of the Board's comments in the summons submitted further arguments with respect to inadmissible extension and lack of inventive step.

With letter dated 3 June 2011 submitted by fax on the same day respondent 01 submitted an affidavit of Mr. Richert concerning C2.

VII. Oral Proceedings before the Board were held on 7 June 2011. To start, the objection to the admissibility of the appeal was no longer maintained by respondents 01 and 05. Thereafter the requests of respondent 03 not to allow the additional requests which had not been considered by the Opposition Division and not to consider the appellant's submissions filed during the opposition proceedings with letter dated 22 October 2007 were discussed. This was followed by the issue of Article 123(2) EPC with respect to process claim 1 and Article 100(c) EPC with respect to product claim 8 of the main request, respectively, the latter with the explicit consent of the appellant. As a consequence of this discussion - the ground of Article 100(c) EPC was considered to apply to product claim 8 - the first, third and fourth auxiliary request were withdrawn by the appellant. Then the issue of Article 123(2) EPC with respect to claim 1 of the second auxiliary request was discussed which resulted in the filing of an amended claim 1 of a new fifth auxiliary request, which after a further discussion, particularly with respect to clarity, was replaced by claim 1 of a newly filed sixth auxiliary request which was objected to by respondent 02 under Article 123(2) EPC but only for its dependent claims 2-6. Before the final discussion of inventive step it was discussed whether C2 belongs to the state of the art under Article 54(2) EPC. Thereafter inventive step of the subject-matter of claim 1 of the sixth auxiliary request was discussed with respect to C1 alone and in combination with C2.

- (a) The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of one of the sets of claims filed as main and second auxiliary requests with letter of 6 May 2011 and filed as sixth auxiliary request during the oral proceedings.
- (b) The respondents 01 to 05 requested that the appeal be dismissed.

At the end of the oral proceedings the Board announced its decision.

VIII. Independent claims 1 and 8 of the main request read as follows (amendments compared to claim 1 as granted are in bold; emphasis added by the Board):

"1. Process for coating **a glass pane** with a coating comprising at least one silver layer and inner and outer antireflection layers by magnetron sputtering characterised in that the inner antireflection layer is a multiple layer which comprises a **[layer of] titanium oxide layer with a thickness of 15 - 50 nm**, applied to **the glass pane** by medium frequency sputtering, and a layer of zinc oxide **with a thickness of 2 - 18 nm** between the titanium oxide layer and a silver layer **with a thickness of 7 - 20 nm, wherein the zinc oxide layer is applied directly onto the titanium oxide layer and contiguous to the silver layer.**"

"8. Glass pane with a transparent thin-layer system applied by means of magnetron cathode sputtering, the

system consisting of a multiple lower antireflection layer, which comprises a titanium oxide layer directly on the glass pane, as well as a zinc oxide layer contiguous to the silver layer, a transparent silver layer, optionally at least one pair of layers consisting of a spacing layer and a further transparent silver layer, as well as an outer antireflection layer, characterised in that the titanium oxide layer is a titanium oxide layer with a thickness of 15 - 50 nm applied by means of medium-frequency sputtering from two titanium cathodes in an oxygen-containing atmosphere, that the titanium oxide layer is directly contiguous to a zinc oxide layer with a thickness of 2 - 18 nm, and that the silver layer contiguous to the lower antireflection layer possesses a thickness of 7 - 20 nm and a specific conductivity of at least 2.1×10^5 S/cm."

IX. Claim 1 of the second auxiliary request reads as follows (amendments compared to claim 1 as granted are in bold with deletions in brackets; emphasis added by the Board):

"1. Process for coating glass with a coating comprising at least one silver layer and inner and outer antireflection layers by magnetron sputtering characterised in that the inner antireflection layer is a multiple layer which comprises a layer of titanium oxide [**applied by medium frequency sputtering**] and a layer of zinc oxide between the titanium oxide layer and a silver layer, **wherein the 15 - 50 nm thick titanium oxide layer is applied by means of medium frequency sputtering from two titanium cathodes in an oxygen-containing atmosphere onto the substrate and**

wherein the 2 - 18 nm thick zinc oxide layer, which is contiguous to the silver layer, is applied directly onto the titanium oxide layer."

- X. Claim 1 of the sixth auxiliary request reads as follows (amendments compared to claim 1 as granted are in bold with deletions in brackets; emphasis added by the Board):

"1. Process for coating glass with a coating comprising **[at least one] a transparent** silver layer and inner and outer antireflection layers by magnetron sputtering characterised in that the inner antireflection layer is a multiple layer which comprises a layer of titanium oxide **[applied by medium frequency sputtering]** and a layer of zinc oxide between the titanium oxide layer and **[a] the transparent** silver layer, wherein the 15 - 50 nm thick titanium oxide layer is applied by means of medium frequency sputtering from two titanium cathodes in an oxygen-containing atmosphere directly onto the substrate and wherein the 2 - 18 nm thick zinc oxide layer, which is contiguous to the silver layer, is applied directly onto the titanium oxide layer."

- XI. The appellant argued essentially as follows:

The limit date set by the Opposition Division in their summons to oral proceedings for filing submissions has been respected with the letter dated 22 October 2007 but the comparative tests have not been considered in the decision although their admissibility had been discussed at the oral proceedings (see minutes dated 18 December 2007, point 4). In the meantime respondent

03 had ample time to analyse and consider these test results (which only confirm the results of the examples comprised in the patent in suit) but it refrained from doing so. The same is valid with respect to the other respondents. On the other hand, the appellant took position on all points of the impugned decision. Therefore the comparative test submission of 22 October 2007 should not be excluded from the appeal proceedings.

With respect to the alleged extension of the subject-matter of process claim 1 of the main request it has to be considered that the application as originally filed (corresponding to the published A18) comprises several terms such as "applied to" (see e.g. A18, page 7, fifth paragraph), "onto", "on", "to", "contiguous to", "directly to" which all have the same meaning, i.e. that the titanium oxide layer is applied directly on the glass pane or substrate. Compared to "onto" the addition of the term "directly" merely puts further emphasis on this fact, but does not change it in substance. Although the other original process claims 17-19 (due to the definition "comprising") allow for the presence of additional intermediate layers, process claim 1 of the main request is, in view of the description, restricted to glass panes having the titanium oxide layer directly on the glass substrate.

It is clear for the skilled person from the original application A18 that also the terms "glass", "substrate" and "glass pane" are interchangeable. Likewise it employs the synonymous terms "lower antireflection layer" and "inner antireflection layer", the latter one in the context of process claims 17-19.

It is further clear to the skilled person that MF sputtering according to the definition on page 6 and its reference to C18 and C35 implies the use of two titanium cathodes for the reactive sputtering in an oxygen containing atmosphere. This interpretation is also based on the understanding of the person skilled in the art in 1997, even if nowadays it were possible to sputter from other cathodes. Requiring this feature in claim 1 would be superfluous as it is already implied via the description.

The term "applied to" refers to the titanium oxide since otherwise said applied to would have been placed directly after the term "multiple layer". Furthermore, it is the core of the invention that the titanium oxide is applied to the glass pane and the description has to be considered for a proper understanding of the invention and there a two layer system in combination with MF sputtering is disclosed (see e.g. A18, page 5, last paragraph). Dependent claim 2 of the main request actually could have been deleted but in view of Rule 80 EPC such an amendment was not possible.

The above arguments with respect to the synonymous use of "applied to" made with respect to process claim 1 of the main request likewise apply to the similar amendments made in process claim 1 of the second auxiliary request which is based on process claim 1 as originally filed. It is clear from the entire application as originally filed that more specifically glass panes having transparent layers are meant. Therefore requiring the feature "transparent silver layer" would likewise over-characterise claim 1 of the second auxiliary request.

Process claim 1 of the sixth auxiliary request overcomes the objections raised with respect to claim 1 of the second auxiliary request. It is based on process claim 1 as originally filed in combination with glass as the specified substrate which is derivable from the application as originally filed. The dependent claims 2-6 of the sixth auxiliary request correspond to claims 2-6 as originally filed which depended on original claim 1 and which have a counterpart in the description as originally filed. Hence the objection of respondent 02 cannot hold.

C2 is a dubious document since it has a lay-out different from e.g. the other brochures of Leybold as proven by C45 and the date printed on the cover has a different font and size than that used for other text on the cover, e.g. for the authors. The affidavit was obtained very late, as late as the Friday before the oral proceedings, and it does not comply with the applicable requirements. Its content is also doubted. According to page 5 of the respondent 01's letter dated 12 November 2008 C2 is a transcript of the original which obviously can only be a copy of the original. With such inconsistencies it is not convincing that this brochure actually has been distributed to the public before the priority date of the patent in suit.

It is accepted that C1 can be used as the closest prior art, though also other documents could be used similarly. C1 does not allow to arrive at the subject-matter of claim 1 of the sixth auxiliary request since the person skilled in the art would have to make three selections but has no reason to do so. The core of the

invention of C1 is defined in claim 5 while claim 1 specifies four metal oxides or mixtures of two or more of them. The three examples of C1 involve lower layers comprising a 3-layer system (examples 1 and 2) with only a very thin innermost TiO_2 -layer, or a 2-layer system (example 3) with an innermost SnO_2 -layer (see also column 9, lines 30 to 44). For the 2-layer system there is no TiO_2 -layer, and the formula for replacing one compound by the other (SnO_2 by TiO_2) (see column 10, lines 11 to 15) would result in an embodiment having a thickness of the TiO_2 -layer outside the thickness range specified in claim 1 of the sixth auxiliary request. The patent in suit aims at obtaining particularly high electrical conductivities in order to lower the emissivity of the coated glass. The experiments submitted with letter dated 22 October 2007 proved this effect. C1 does not suggest to modify this lower layer and particularly not to omit the SnO_2 layer. The TiO_2 serves to improve the adhesion between the glass and the SnO_2 -layer in the 3-layer system (see column 6, line 68 to column 7, line 8). C9 refers to the French patent family member of C1 and describes a 3-layer system under the silver layer (see page 2, lines 22 to 28), thus did not consider to replace the SnO_2 layer by TiO_2 .

C2 is a document concerned with an apparatus for the high-rate sputtering of ZnO , SnO_2 , etc. (see pages 2 and 3). SnO_2 has a sputtering rate which is twice that of TiO_2 (see page 6, table). C2 proposes concepts for coatiers for producing SnO_2 -based low-E glass or $\text{SiO}_2/\text{TiO}_2$ -based anti-reflex systems (see pages 8 and 10). It deals with the question as to how to produce the desired thin layer system most economically.

Taking account of the teaching of C2 the person skilled in the art would start from example 3 of C1 and would apply medium-frequency sputtering. Thereby he would, however, not arrive at the subject-matter claimed which thus involves an inventive step.

The post-published C47 is supporting evidence for inventive step since it reveals the use of conventional sputter apparatuses for producing low-E glass having a silver layer thickness of 16 nm and a conductivity of 1.3×10^5 S.cm (see paragraphs [0046] and [0050]).

XII. Respondent 01 argued, insofar as relevant for the present decision, essentially as follows:

The admissibility of the appeal is no longer contested.

Claim 1 of the main request contravenes Article 123(2) EPC since it does not define the sputtering from two titanium cathodes in an oxygen containing atmosphere. This feature is not over-characterised since it may be possible to sputter the titanium oxide layer from TiO_x or TiO_2 cathodes which is not excluded by the subject-matter of claim 1. According to the disclosure of the patent in suit in 1997 there existed no other process than that described on page 6, nevertheless the appellant acknowledges that the omission of this feature allows for the sputtering from sub-stoichiometric TiO_x cathodes. The argument that claim 1 of the main request has to be interpreted in the light of the description cannot hold since claim 1 is not considered to be unclear and therefore should be interpreted as it is.

Claim 1 of the second auxiliary request still does not define that the titanium oxide is "directly applied to" the glass. Furthermore, the term "substrate" does not necessarily imply that it is the - uncoated - glass substrate. Hence there may still be further layers between the glass and titanium oxide layer. Furthermore, claim 1 of the second auxiliary request allows the presence of non-transparent silver layers whereas original claim 1 required transparent ones. Therefore claim 1 of the second auxiliary request contravenes Article 123(2) EPC either.

The affidavit of Mr. Richert concerning C2 has always been offered and therefore cannot have been filed late. The glass department of Leybold had been transferred to another company so that the original of C2 was no longer available. Mr. Richert was at that time responsible for this glass department. Furthermore, he was one of the authors of the brochure C2 so that it would be absurd to doubt his affidavit concerning the content of C2 as well as (the date of) its public availability.

It is not true that 3 selections are necessary to arrive at the subject-matter claimed in claim 1 of the sixth auxiliary request. C1 discloses a general embodiment with a single metal oxide layer, one zinc oxide and the silver layer (see column 7, lines 21 to 27). The skilled person is likewise taught as to how to dimension the thickness of the layers and arrives at a thickness falling within claim 1 of the sixth auxiliary request. Furthermore, C1 suggests replacing SnO_2 by TiO_2 so that the skilled person would try to produce a system only comprising TiO_2 which can be made more

economically due to the use of two targets only. It achieves the same conductivity of 2.1×10^5 S.cm as the patent in suit. Since C1 mentions only magnetron sputtering (see column 4, lines 54 to 56) the person skilled in the art has to choose the most appropriate one which at the priority date is medium-frequency reactive sputtering (see Board's communication, point 9.6). In view of C2 the improvement of the economic aspect and that of the morphology is obvious, the latter one resulting in the bonus effect of improved conductivity anyway. Therefore the subject-matter of claim 1 of the sixth auxiliary request lacks inventive step.

XIII. Respondent 02 argued, insofar as relevant for the present decision, essentially as follows:

The application as originally filed only disclosed reactive sputtering from metallic titanium cathodes and not the use of ceramic cathodes such as TiO_x . Hence claim 1 of the main request contravenes Article 123(2) EPC.

Claim 1 as originally filed defined a process for the production of a thin layer system with a transparent silver layer whereas claim 1 of the second auxiliary request defines a process for coating glass not requiring a transparent silver layer and still does not define that the titanium layer is directly applied to the glass. Furthermore, the definitions "at least one silver layer" and "a silver layer" in lines 1 and 4 of claim 1, which appear to be based on claims 1 and 17 as originally filed, render the same unclear.

The dependent claims 2-6 of the sixth auxiliary request contravene Article 123(2) EPC since claim 1 of this request is based on claim 19 as originally filed which did not have any dependent claims.

The patent in suit does not prove the alleged improvement of the conductivity of the silver layer since its examples are not comparable. The problem to be solved is thus the mere provision of an alternative process with respect to claim 1 of C1.

XIV. Respondent 03 argued, insofar as relevant for the present decision, essentially as follows:

It is requested not to allow the additional auxiliary requests into the appeal procedure, as they correspond to those not having been considered by the Opposition Division, in line with T 64/02 (not published in OJ EPO). It is also requested to exclude from the proceedings the late-filed results of the comparative tests as submitted by the appellant with letter dated 22 October 2007 during the opposition proceedings, in accordance with T 569/02 and T 718/98 (both not published in OJ EPO). Although the minutes of the oral proceedings held on 22 November 2007 before the Opposition Division state that the admissibility of these documents has been questioned and discussed (see minutes, points 3 and 4) the minutes and the impugned decision are absolutely silent about the result, i.e. whether or not these documents were admitted. Since these comparative tests have not been considered in the impugned decision the respondent 03 had no reason to react to them since their relevancy was not apparent.

If the appellant's arguments concerning the omission of the feature of the two titanium cathodes and the oxygen containing atmosphere were true then these features should be in claim 1 of the main request, particularly as this feature was comprised in claim 1 as originally filed.

The amendments made to claim 1 of the second auxiliary request do not overcome the problems related to the omission of the feature "directly applied to".

C1 deals with the corrosion of the silver layer but aims to reduce the emissivity of the coated glass (see column 10, lines 20 to 34) so that it concerns the same purpose (see T 870/96, not published in OJ EPO). Medium-frequency sputtering affects the properties of the silver layer due to the lower roughness of the underlying layer (see patent in suit, column 2, lines 15 to 18 and C1, column 8, lines 19 to 28). The specific embodiment of C1 with the thin TiO₂-layer under a thicker SnO₂ layer is the result of the used sputtering apparatus but does not explain why SnO₂ should be preferred as alleged by the appellant (see column 9, lines 32 to 37).

XV. Respondent 04 argued, insofar as relevant for the present decision, essentially as follows:

The argument concerning the omission of the term "directly" cannot hold since thereby claim 1 of the main request now still covers embodiments having further layers between the glass and the titanium oxide layer. The appellant does not contest that there may be additional layers but only argued that "applied to" has

the same meaning as "directly applied to". According to claim 1 the additional layers would be present only between the glass pane and the titanium oxide layer due to the definition "multiple layer which comprises ...". Furthermore, none of the appellant's new requests comprises the term "directly" although this deficiency has been mentioned in the Board's communication. It is known from a textbook published in 1988, which was filed in parallel proceedings, that sub-stoichiometric TiO_x can be HF-sputtered at 50 KHz using only one cathode. This layer is, however, not reactively sputtered.

Since original claim 1 required "directly applied to" claim 1 of the second auxiliary request contravenes Article 123(2) EPC.

Claim 1 of C1 only requires glass with a single metal oxide layer with a contiguous zinc oxide layer of at most 15 nm and a silver layer thereon. C1 does not expressly require to sputter a SnO_2 layer since TiO_2 has a higher refractive index and higher transparency than SnO_2 . There is also no preference for SnO_2 ; the only reason for sputtering SnO_2 was the fact that it could be sputtered more economically with DC sputtering than TiO_2 . C2 stresses that economic sputtering of TiO_2 is possible with medium-frequency sputtering and that it is particularly suited for low-E TiO_2 systems (see page 7).

XVI. Respondent 05 argued, insofar as relevant for the present decision, essentially as follows:

The admissibility of the appeal is no longer contested.

The term "applied to" of claim 1 of the main request refers actually to the term "multiple layer" and not to the "titanium oxide". This different definition therefore covers embodiments different from claim 1 as originally filed which specified that the titanium oxide layer was "applied directly to" the glass substrate. The appellant may argue about what is intended by the claims 1 and 2 of the main request, but the person skilled in the art understands that claim 1 - in view of claim 2 specifying the two titanium cathodes and oxygen containing atmosphere - is broader than claim 2.

Claim 1 of the second auxiliary request does not overcome the objection concerning the absence of "directly applied to".

C2 gives hints with respect to the improved properties of the TiO_2 layer so that no *ex-post-facto* reasoning is made; to the contrary, the skilled person gets an explicit incentive to combine the teachings of C1 and C2.

Reasons for the Decision

1. *Procedural matters*

1.1 Requests

The Board remarks with respect to respondent 03's request concerning the non-admittance of the auxiliary requests not considered by the Opposition Division that the amended independent claims of the six auxiliary

requests as filed in the opposition proceedings with letter dated 22 October 2007 or during the oral proceedings of 22 November 2007 - even if the objected optional feature "preferably nitrogenous" were deleted - are **not** identical with any of the amended independent claims of the eight auxiliary requests as filed with the grounds of appeal and are therefore **not** part of the appeal proceedings since the appeal procedure is a separate procedure wherein the appellant filed different sets of claims with different independent claims.

Furthermore, the Board remarks in this respect that it is within its discretion to allow such requests, as correctly stated in T 64/02 (*supra*, see point V ii) of the facts and submissions), as requests filed for the first time in appeal, since it finds fault in the manner in which the Opposition Division exercised its discretion in the opposition proceedings. The refusal to allow any further auxiliary request to be filed, wherein said optional feature "preferably nitrogenous" would have been deleted, was tainted with a procedural violation as it was not followed up by any reasoning in the decision as to why the discretion was exercised in this manner.

Therefore respondent 03's request not to admit such additional auxiliary requests into the appeal procedure is refused.

1.2 Comparative test results

Respondent 03 requests the Board to disregard the comparative test results filed by the appellant with

letter of 22 October 2007 for being late filed. With this, the respondent 03 in essence wants the Board to exclude a party's submission made in the opposition proceedings retrospectively; this was confirmed by the professional representative of the respondent 03 when asked by the Board during the oral proceedings.

However, neither the EPC itself nor the RPBA provide for such a decision of the Boards of Appeal. The Boards of Appeal can merely review a decision taken by the Opposition Division concerning the admittance or non-admittance of late filed submissions, documents and requests filed in those earlier proceedings, or it can decide whether or not to admit submissions, documents and requests filed in the appeal proceedings.

1.2.1 The former is subject to certain limitations.

Having regard to the somewhat contradictory setting of limits by the Opposition Division in its **summons** to oral proceedings (22 October 2007) on the one hand and in the **annexed communication** (two months before the date of the proceedings, i.e. 22 September 2007) on the other hand, the Board can only establish that the issue of whether or not the comparative test results should be admitted into the opposition proceedings has been discussed at the oral proceedings of 22 November 2007 before the Opposition Division as derivable from points 3 and 4 of the minutes of the oral proceedings. The minutes, however, do not mention any result of this discussion except the statement that "*the Proprietor is allowed to file any document to defend his case upto [sic] the limitation date set by the Opposition Division*".

Since the decision under appeal is entirely silent on this issue, the Board is not in a position to review whether and how the Opposition Division exercised its discretion. However, the Board cannot - as requested by the respondent 03 - put itself in place of the Opposition Division and review as such all the facts and circumstances. That is not the function of the Boards of Appeal (see G 7/93, OJ EPO 1994, 775, point 2.6 of the reasons).

In contrast, the fact that the issue was discussed during the oral proceedings and that the Opposition Division did not take an explicit decision to refuse to admit the comparative test results leads the Board to the conclusion that said submission of the appellant was part of the opposition proceedings.

The two cited decisions T 569/02 (*supra*) and T 718/98 (*supra*) concern two cases different from the present wherein very shortly (i.e. one month and about one week, respectively) before the date of the scheduled oral proceedings before the **Board** experimental evidence and other documents were submitted by parties, which then in accordance with the established case law decided not to admit these documents into the proceedings (see Case Law of the Boards of Appeal, 6th edition 2010, chapter VII.C.1.3.4).

- 1.2.2 Remains the question whether there are reasons to not consider the appellant's submission of 22 October 2007 and its test results in the appeal proceedings.

The Board could reject a party's submission merely within the framework of Articles 12 and 13 RPBA. However, none of the prerequisites provided for in said Articles are met:

As a consequence of the conclusion that said submission was part of the opposition proceedings it cannot be late filed in the appeal proceedings according to Article 13 RPBA. For the same reason they cannot be eliminated by the Board on the basis of Article 12(4), 1st alternative RPBA. In addition to this, they were not (explicitly) rejected by the Opposition Division and, therefore, cannot be disregarded on the basis of Article 12(4), 2nd alternative RPBA. Neither can it be held that the respondents did not have sufficient time to react to them and to produce, if necessary, their own comparative tests, as they have been filed more than three years ago.

In this context it is to be noted that according to Article 12(2) RPBA the reply to the appeal should contain the respondent's complete case. In this respect respondent 03 chose to limit itself to argue solely on the admissibility of this submission but not on its content. That is the choice of the respondent; however, it cannot expect the Board to provide intermediate rulings on such requests so as to facilitate the respondent's decision whether to react in substance to such a submission or not.

- 1.2.3 Taking account of the above deliberations the Board cannot accede to respondent 03's request to exclude from the present proceedings the test results and further submissions based on it.

2. Allowability of amendments (Article 123(2) EPC)

Claim 1 of the main request

2.1 Process claims 1, 17 and 19 of the application as originally filed (corresponding to the published A18) read (emphasis in bold added by the Board):

"1. Process for the production of a thin-layer system with a transparent silver layer by means of magnetron cathode sputtering, where between the substrate and the silver layer is arranged **a multiple lower antireflection layer, which comprises a titanium oxide layer applied directly to the substrate,** as well as a zinc oxide layer contiguous to the silver layer, characterized by the fact that **the 15-50 nm thick titanium oxide layer is applied by means of medium-frequency sputtering from two titanium cathodes in an oxygen-containing atmosphere** onto the substrate and the 2-18 nm thick zinc oxide layer is applied directly onto the titanium oxide layer."

"17. Process for coating glass with a coating **comprising** at least one silver layer **and inner and outer** antireflection layers by magnetron sputtering characterized in that the **inner** antireflection layer **comprises a layer of titanium oxide applied by medium frequency sputtering.**"

"19. Process for coating glass with a coating **comprising** at least one silver layer **and inner and outer** antireflection layers characterized in that the inner antireflection layer is a multiple layer

comprising a layer of titanium oxide applied by medium-frequency sputtering and a layer of zinc oxide."

- 2.1.1.1 Claim 1 has been amended compared to claim 1 as granted (see point VII above) by the addition of thickness ranges for the layers of titanium oxide, zinc oxide and silver.

Thickness ranges for the titanium oxide layer, the zinc oxide layer and the silver layer are, however, in the application as originally filed only disclosed in the context of the embodiment of claims 1 and 7 as originally filed, which further required "a multiple **lower** antireflection layer between the substrate and the silver layer which comprises a titanium oxide layer **applied directly onto** the substrate" and that "the 15 - 50 nm thick titanium oxide layer is applied by means of medium frequency sputtering **from two titanium cathodes in an oxygen-containing atmosphere onto** the substrate and that the 2 - 18 nm thick zinc oxide layer is applied directly onto the titanium oxide layer" and the arrangement of the "zinc layer contiguous to the silver layer" (see A18, claims 1 and 7; and page 4, third full paragraph to page 5, first paragraph).

Hence this embodiment clearly excludes further intermediate layers between the glass pane and the titanium oxide layer and additionally uses a different definition, namely that of **the lower antireflection layer**, which actually **consists** of the titanium oxide layer and the zinc oxide layer, the latter contiguous to the silver layer.

2.1.2 From the description as originally filed it is also known what is meant by "the medium frequency sputtering" process. By reference to documents C18 and C35, it is clear to the person skilled in the art that this sputtering process uses a pair of metallic magnetron cathodes which generally consist of the same material to be sputtered with the polarity of the cathodes changing periodically at a frequency in the kilohertz range so that the titanium oxide layer is applied from two titanium targets at high coating rate (see page 6, second full paragraph of A18). The sentence "It may be operated using ..." of said passage in the original description in the light of the two cited documents is incorrect in the impression it gives of being an optional feature since both documents **only** disclose the use of said two metal targets in an oxygen-containing atmosphere with the polarity changing in the kilohertz range, i.e. **reactive AC medium frequency sputtering in an oxygen containing atmosphere.** The same teaching can be derived from examples 1, 5 and 6 and the comparative examples 2 and 3. There is no suggestion in the original description that anything else could be meant. Original claims 1 and 7 therefore correctly included these features.

The Board is - with respondent 04 - aware from a parallel case that sub-stoichiometric TiO_x , which is electrically conductive, can be sputtered as such in a non-reactive process (i.e. in an inert gas atmosphere) onto a substrate such as a glass pane. The sputtering of titanium oxide from such a non-metallic cathode in an inert gas atmosphere is, however, **not** envisaged in the application as originally filed.

2.1.3 The result of these amendments is that claim 1 of the main request - which is not restricted to the reactive AC medium frequency sputtering from the two titanium cathodes nor to the aforementioned multiple lower antireflection layer consisting exclusively of a titanium oxide and zinc oxide layer, the titanium oxide layer being disposed directly on the glass substrate - contravenes Article 123(2) EPC, as it has selectively taken up only the thickness ranges from the description as originally filed. It amounts to an "intermediate generalisation". A preliminary conclusion to this effect had already been drawn in point 7 of the Boards communication annexed to its summons to oral proceedings.

2.1.4 The fact that, with the present wording, another layer can be present between the glass substrate and the titanium oxide layer is confirmed by the fact that claim 1 of the main request, due to the definition "**comprising** at least one silver layer **and inner and outer** antireflection layers" (see point VIII above) appears to have been based in examination on claim 17 or claim 19 as originally filed. With this wording these claims - as admitted by the appellant - aimed at a broader scope than original claim 1 and allowed the presence of further layers between the glass substrate and the titanium oxide layer.

Further, from the wording of claim 1 of the main request and taking account of the comma after the feature "a thickness of 15 - 50 nm" it is clear that the term "**applied to**" refers to the feature "**a multiple layer** which **comprises** a titanium oxide layer with a thickness of 15 - 50 nm", i.e. the multiple layer is

"applied to" the glass pane. Since the multiple layer **comprises** said titanium oxide layer this definition of the multiple layer according to claim 1 of the main request **cannot** exclude the presence of further layers between the glass pane and the specified titanium oxide layer. Thus it is evident that that the other terms "applied to", "onto", "on", "to", "contiguous to", etc. are **not** identical with a definition "directly applied to" as argued by the appellant.

Finally, all the passages quoted by the appellant use a different wording than claim 1 of the main request and actually refer to "Surprisingly, it is possible to provide silver layers ... with the series of layers **glass/titanium oxide/zinc oxide**, a special twin lower antireflection layer and on the other hand **the first of these component layers** being produced by the use of the medium-frequency sputtering process" (see A18, page 5, last paragraph) and "Especially preferred glass panes according to the invention are distinguished by the fact that **the first layer** of the lower antireflection layer **is a** preferably nitrogenous **titanium oxide layer** with a thickness of 15 - 50 nm, **applied to the glass pane** by the use of medium-frequency sputtering process ..." (see A18, page 7, last paragraph), i.e. that the titanium oxide layer is the first layer of this multiple layer and is directly applied to the glass pane.

From the above it will be clear that the argument of the appellant that "applied to" as claimed in present claim 1 implicitly means "directly applied to", cannot hold either.

2.1.5 It is also clear from the subject-matter of dependent claim 2 of the main request - which comprises the feature relating to the two titanium cathodes and the oxygen containing atmosphere not taken up from claim 1 as originally filed - that the feature "medium frequency sputtering" of claim 1 of the main request is apparently meant to be interpreted in a broader manner, i.e. **not** being restricted to two titanium cathodes and **not** requiring a reactive oxygen containing atmosphere for the sputtering step of the titanium oxide layer (see point 2.1.2 last paragraph above).

As already discussed in point 2.1.2 above, the context of the thickness ranges of the different layers is the one determined by original claims 1 and 7 and the relevant original description (see pages 4 and 5 of A18). The fact that claims 17 and 19 only refer in general terms to medium frequency sputtering cannot help as a basis for not mentioning these two cathodes and the reactive oxygen atmosphere in claim 1, as the passage at page 5, second full paragraph of A18 - the counterpart to claims 17 to 19 as originally filed - is drafted such that the skilled person would not see the subject-matter of claims 17 and 19 as a separate invention, but as one employing the medium-frequency sputtering as previously discussed for original claims 1 and 7.

2.1.6 Consequently, claim 1 of the main request does not comply with Article 123(2) EPC. The main request is therefore not allowable.

The main request not being allowable for the above reason, the Board does not need to go into the reasons

why claim 8 of this request is also not allowable (see point VII above).

Claim 1 of the second auxiliary request

Claim 1 of this request now includes the missing features regarding the medium-frequency sputtering process. However, there is no layer thickness given for the silver layer, as in claim 1 of the main request.

- 2.2 Claim 1 as originally filed and the relevant passage in the original description (see A18, page 5) defined a process for the production of a thin layer system with "a **transparent** silver layer" (see point 2.1 above) with a thickness of 7-20 nm whereas claim 1 of the second auxiliary request now defines a process for coating glass which does **not** require this transparent silver layer, by merely defining "at least one silver layer" and "a silver layer" (see point IX above).

As with the amendments in claim 1 of the main request, this amounts to an inadmissible intermediate generalisation from the specific context of claims 1 and 7 and the relevant description, which requires the silver layer to be transparent.

- 2.2.1 Furthermore, claim 1 of the second auxiliary request - due to the used wording "the inner antireflection layer is a multiple layer which **comprises** a layer of titanium oxide and a layer of zinc oxide between the titanium oxide layer and a silver layer" in combination with "wherein the 15 - 50 nm thick titanium oxide layer is applied ... **onto the substrate**" - still does not define that the titanium oxide layer is **directly** applied to

the glass and thereby allows for the presence of further layers.

2.2.2 Finally, the definitions "at least one silver layer" and "a silver layer" in claim 1, which definitions were already present in claim 1 as granted, allow for the presence of two silver layers, a first in the combination with the titanium oxide and zinc oxide layers ("a silver layer", "the silver layer") and the second being "the at least one silver layer".

Since claim 1 of the second auxiliary request does not specify on which side of the substrate this second silver layer is arranged the appellant's arguments concerning an implicit transparency thereof cannot hold. The same conclusion applies to the appellant's arguments concerning the omission of the feature "**directly**" of the definition "applied ... onto the substrate" which allows the presence of unspecified further layers contrary to the disclosed embodiment according to claim 1 as originally filed, corresponding to the pagebridging paragraph of pages 4 and 5 of the description of A18.

2.2.3 Consequently, claim 1 of the second auxiliary request does not comply with Article 123(2) EPC. The second auxiliary request is therefore not allowable.

Claim 1 of the sixth auxiliary request

2.3 Claim 1 of the sixth auxiliary request (see point X above) is based on claim 1 as granted with the features considered inadmissibly left out from the amendments relating to the thicknesses of the titanium oxide and

zinc oxide layers (transparency of the silver layer, direct application on the glass, features of the sputtering process), see points 2.1 and 2.2, now incorporated.

The Board is satisfied that claim 1 according to the sixth auxiliary request now complies with Article 123(2) EPC.

Due to the thickness limitations of the titanium oxide and zinc oxide layers its subject-matter has been restricted compared to that of claim 1 as granted so that the requirements of Article 123(3) EPC are likewise met.

2.4 After the deliberations on the issue of Article 123(2) EPC at the oral proceedings before the Board concerning claim 1 of the sixth auxiliary request respondent 02 raised a new objection under Article 123(2) EPC against the dependent claims 2-6 of the sixth auxiliary request based on the assumption that process claim 1 thereof would be based on claim 19 as originally filed, see point XIII above.

2.4.1 Article 12(2) RPBA requires the parties to present their complete case as early as possible, for the respondent this is the reply to the appeal. The Board notes that respondent 02 did not file any reply to the grounds of appeal, nor any later submission to this effect. Consequently, the case of respondent 02 did not contain any objections of added subject-matter, let alone with respect to the dependent process claims of the patent as granted.

- 2.4.2 The reasons for these new objections also do not lie either in the amendments made in appeal to claim 1 as granted (see point VIII above) or in an amendment made to claim 1 at the oral proceedings, since the second auxiliary request forming the basis for the sixth auxiliary request is based on the eighth auxiliary request as filed together with the grounds of appeal, but are related to amendments made during the examination phase of the application underlying the patent in suit. They also cannot be seen as a consequence of a direction given by the Board (Article 12(2)(b) RPBA).
- 2.4.3 These objections under Article 123(2) EPC have also **not** been raised at any time by any opponent during the opposition procedure, let alone in the notices of opposition of opponents 04 and 05, which were the only parties to raise objections under Article 100(c) EPC, however only to the features contained in claim 1 as granted (see point III above).
- 2.4.4 These objections under Article 123(2) EPC are thus to be considered a new attack on the patent in suit with new facts and new arguments which represents an amendment of respondent 02's case at the latest possible stage of the appeal proceedings.
- 2.4.5 The Board, in exercising its discretion according to Article 13(1) RPBA, taking account of the fact that these objections could have been raised much earlier in the proceedings, does not admit this amendment of respondent 02's case.

2.4.6 Furthermore, since claim 1 of the sixth auxiliary request is based on claim 1 of the patent as granted and amended as required (see point 2.3 above) respondent 02's objection is *prima facie* not relevant since the subject-matter of dependent claims 3-7 of the patent as granted corresponds to that of claims 2-6 of the sixth auxiliary request.

3. *Relevant state of the art (Article 54(2) EPC)*

3.1 The appellant doubted the authenticity of the publishing date of October 1996 present on the filed copy of document C2 and during the entire proceedings had requested inspection of the original. With its reply to the grounds of appeal dated 12 November 2008 respondent 01 submitted a notarized copy of the original of C2 bearing the same (publishing) date of October 1996 which is well before the priority date of the patent in suit.

The appellant emphasised that this date is printed in a font and size which differs from that used for the names of the authors so that the front page of the copy of C2 might have been manipulated.

The Board considers, however, that the font and size of this date is identical with that used at the bottom of the front page of the brochure C2. The font itself is the same as that of the rest of the text on the front page.

In its communication annexed to the summons the Board had remarked with respect to this issue that if the appellant questions said date it is up to it to prove

its allegations by supplying evidence (see point 8.1 of the communication). Although this might now be difficult since the company in question - Leybold - no longer exists, the Board considers that at the time of receiving the opposition citing C2 it would not have been impossible to retrieve an original of C2. The appellant refrained from doing so and therefore the burden of proof still lies with it.

3.2 The appellant also questions the public availability of C2. With letter dated 3 June 2011 submitted by fax on the same day respondent 01 submitted an affidavit of Mr. Richert dated 1 June 2011 wherein he states that the brochure C2 was used since October 1996 for advertising the "TwinMag^R" apparatus of Leybold. The brochure was publically available for all visitors of Leybold Systems GmbH and was also distributed at fairs and conferences such as the "Glasstec" in Düsseldorf in October 1996. Mr. Richert also stated that the document C2 submitted into the proceedings is an exact copy of the original brochure of 1996.

3.2.1 Since an affidavit concerning C2 has always been offered by respondent 01 (see letter dated 12 November 2008, page 5, last paragraph) it therefore cannot have been filed late, even if it would have been filed at the oral proceedings before the Board only.

Respondent 01 argued that Mr. Richert was at the transfer time responsible for the glass department when it had been transferred to another company so that the original of C2 was no longer available to him or respondent 01.

Since Mr. Richert is one of the five authors of the brochure C2 the Board holds that it is credible that he can remember the specific circumstances surrounding this brochure, particularly as to when it has been published, namely in October 1996 and that it has been distributed at the "Glasstec" in October 1996.

Therefore the statement of Mr. Richert is considered to be credible, particularly when further considering the content of documents C6 and C29 as further evidence in this context. Patent document C6 has filing and publishing dates of 22.12.95 and 19.12.96, respectively, and already refers to the reactive MF magnetron sputtering of titanium oxide with a dual magnetron sputter source with alternating polarity and a frequency of between 30 and 80 KHz (see column 2, lines 42 to 52; claims 1 and 6). C29 originates from Leybold and was published in 1995. C29 deals with the AC TwinMag^R reactive magnetron sputtering of insulating materials (see C29, page 70, conclusions). C2 relates to "TwinMag, the Dual Magnetron Cathode of Leybold Systems GmbH, Trademark filed". Consequently, also in view of C6 and C29 the date of October 1996 on C2 is credible.

- 3.3 The fact that the notarized copy of C2 having the date of October 1996 has a different lay-out as e.g. other brochures of Leybold (see C45) has been advanced by the appellant to question the public availability and the publication date. This document, however, cannot prove much since the cover pages of these brochures bear no publication date, except one in the form of "Paper presented at 34th Annual SVC Conference Philadelphia March 1991". This leaves open a change in lay-out in

the 5 1/2 years between March 1991 and October 1996. For the allegation that the other brochures with C45 dated into the mid-nineties, no supporting evidence was filed.

Therefore the appellant's arguments and allegations cannot hold.

3.4 Taking account of the above considerations the Board concludes that C2 belongs to the state of the art according to Article 54(2) EPC.

4. *Inventive step (Article 56 EPC)*

Taking account of the arguments presented by the six parties the Board considers that it has not been shown that the Opposition Division's conclusion was wrong in concluding that the subject-matter claimed in the patent in suit lacks an inventive step. The reasons are, however, more extensive.

Sixth auxiliary request

4.1 C1 represents in the Board's view the closest prior art for process claim 1 by disclosing a process for producing transparent low-E-coatings for glass (see e.g. column 10, lines 20 to 34). According to the teaching of C1 the glass substrate is generally coated with a first layer of a metal oxide selected from the group of tin oxide, titanium oxide, aluminium oxide, bismuth oxide or a mixture of two or more of them, a second layer of zinc oxide having a thickness of not more than 15 nm, with a contiguous silver layer which is coated with an oxide of a sacrificial metal of the group

titanium, aluminium, stainless steel, bismuth, tin and mixtures of two or more of them, which are built by depositing the sacrificial metal and converting it into the oxide (see claim 1). C1 discloses magnetron sputtering of the layers from metal cathodes through reactive deposition in the case of the metal oxides, a particularly suitable form of cathode is a rotatable unit (see column 4, line 54 to column 5, line 2). According to C1 the zinc oxide layer improves the passivity of the silver layer which is thereby less sensitive to oxygen attack (see column 6, lines 52 to 62). The preferred sacrificial metal is titanium (see column 5, line 53 to column 6, line 1).

According to the broader aspect where only a single metal oxide layer is deposited as the first layer between the glass and the zinc oxide, this single layer provides the same effect as the combination of a first titanium oxide and a tin oxide layer under the zinc oxide (see column 7, lines 20 to 26). Preferably the zinc oxide layer has a thickness of 10-13 nm (see claim 8) while the silver layer preferably has a thickness of 8-12 nm (see claim 10).

According to C1 the relative amounts of tin oxide and titanium oxide in the lower (first) layer and the outer coating are generally not critical (see column 9, lines 30 to 32).

Taking account of the respective refractive indexes of TiO_2 and SnO_2 C1 suggests to modify the layers, i.e. for the replacement of **a part** of one by the other, the thickness of TiO_2 should be 75% of that of the SnO_2 (see column 10, lines 11 to 15).

Example 2 of C1 has the following multiple layer:
glass/ 3 nm TiO₂/ 20 nm SnO₂/ 13 nm ZnO/ 12 nm Ag/ ...
while example 3 has the following: glass/ 15 nm SnO₂/ 14
nm ZnO/ 12 nm Ag/... (see examples). The 12 nm silver
layer of both examples 2 and 3 has a resistivity of 4
ohms corresponding to a conductivity of 2.1×10^5 S/cm
(see column 12, lines 11 to 18, lines 34 to 49 and
lines 59 and 60; column 13, lines 49 and 50).

- 4.1.1 The appellant's argument that example 3 represents the closest prior art, which does not allow to arrive at the claimed subject-matter since the person skilled in the art would have to make three selections but has no reasons to do so, is not convincing since there should be inventive step with respect to any feasible prior art. The Board considers example 2 such a feasible prior art, in the light of the above mentioned disclosure of C1. It represents the most promising starting point for the skilled person to arrive at the claimed invention (see Case Law, 6th edition, 2010, chapter I.D.3.5).

Consequently, all the appellant's arguments based on example 3 need not be considered.

- 4.1.2 The process according claim 1 of the sixth auxiliary request differs from the process of C1 for producing the low-E-coating according to example 2 in that
- (i) only a 15 - 50 nm thick titanium oxide layer is applied under the zinc oxide layer
 - (ii) by medium-frequency sputtering from two titanium cathodes in an oxygen-containing atmosphere as the first layer.

4.1.3 The patent in suit does not disclose any particular effect attributed to feature (i). In any case the thickness of the titanium oxide layer, to a certain extent, will influence the low-E properties of the coated glass and for example its reflection colour coordinate values.

With respect to feature (ii) the patent in suit discloses that it allows the reactive deposition of the titanium oxide layer "at high coating rate and that the use of this process evidently leading to a special microscopic structure and/or surface characteristic of the titanium oxide layer, which also finally affects the properties of the silver layer in the manner striven for" (see patent in suit, paragraph [0019]).

It belongs, however, to the common general knowledge of the person skilled in the art that reactive AC medium-frequency sputtering of oxides avoids the arcing problem of conventional DC reactive sputter systems and increases the productivity of the sputter deposition process, i.e. the sputtering rate, by a factor of about 10 (see e.g. C29, page 64, "The arcing Problem"; page 65, "The TwinMag Sputter System"; page 66, paragraphs 4.1 and 4.2; page 70, "Conclusions").

4.2 The objective technical problem starting from the process of example 2 of C1 is therefore to improve this process for the production of the known low-E glass systems including a silver layer (see patent in suit, paragraph [0011]) in economic terms. In this context the Board remarks that the person skilled in the art is always trying to further improve such a low-E glass

system as to its properties e.g. by lowering its emissivity.

4.3 This problem is solved by the process as defined in claim 1 of the sixth auxiliary request.

4.4 The subject-matter of process claim 1 of the sixth auxiliary request is, however, obvious for the following reasons:

4.4.1 The brochure C2 discloses that the TwinMag^R dual magnetron cathode sputter system allows an increase in deposition rates of a factor of up to 10 when compared with DC magnetron sputtering tools (see page 2, third paragraph) and thereby makes layer systems economically feasible which were absolutely uneconomical in the past, e.g. low-E and solar control using titanium oxide and high-quality anti-reflection products for the mass-market (see page 3, sixth paragraph). This medium-frequency reactive sputtering system was developed over years (see page 4).

Furthermore, it discloses that it produces homogenous and extremely smooth layers and it is the only way to deposit a hard TiO₂-coating with the more stable rutile structure which allows to increase the index of refraction to 2.7 as compared to 2.3 for the anatase structure normally obtained by DC sputtering or, with the TwinMag^R, at low sputtering rates (see page 2, fourth and sixth to eighth paragraph). These properties of the rutile structure are very important for the production of both high-quality antireflective coatings with very low light reflection over a wide spectrum, and TiO₂-based low-E coatings with very high optical

transmission, neutral appearance, and very low emissivity (see page 3, second and third paragraphs).

Low-E coatings based on titanium oxide are now economical to produce with the TwinMag^R because of its fivefold increase in sputtering rate. Titanium dioxide layers offer higher transmittance, better neutrality and thus less emissivity than layers based on **tin oxide** (which has a refraction index of 2.0, see page 6, table). With the very high deposition rate, cycle times equivalent to those for tin layers sputtered with planar magnetrons are possible. Thus, titanium dioxide base low-E layer systems can be produced with similar or lower production costs (see page 7, second paragraph).

Furthermore, the TwinMag^R system achieves an extremely high process stability and coating uniformity and solves the arcing problem (see page 2, fifth paragraph; page 6, table).

- 4.4.2 C2 therefore teaches the person skilled in the art that the use of the TwinMag^R system with two metallic cathodes allows to increase the productivity by a factor 5 when reactively sputtering titanium oxide (i.e. reactively sputtering TiO₂ from two titanium cathodes in an oxygen-containing atmosphere). The person skilled in the art is further taught by C2 that the medium-frequency sputtering process produces at high sputter rates the rutile structure of titanium oxide which offers many advantages due to the higher refractive index of the TiO₂ (2.7), higher transmittance, better neutrality and thus less emissivity than SnO₂ (refractive index: 2.0) layers at similar or lower

production costs. Furthermore, the layers are extremely smooth.

- 4.4.3 Hence C2 represents a clear incentive to the person skilled in the art to apply the medium-frequency reactive sputtering process for sputter depositing TiO_2 layers of low-E coatings on glass. Furthermore, C2 represents an incentive - due to the expected improvement of the properties of the TiO_2 layer - to replace the SnO_2 layer by the medium-frequency high rate sputtered rutile structure TiO_2 layer.
- 4.4.4 In this context it has additionally to be considered that the person skilled in the art would apply, at the priority date, the most suitable sputtering process available, since C1 is silent in this respect (see point 4.1 above).
- 4.5 By applying the teaching of C2 concerning the medium-frequency reactive sputtering of TiO_2 and its suggestion to replace the SnO_2 of low-E layers systems by the thereby resulting improved TiO_2 layer, the person skilled in the art would also take account of the suggestion in C1 that TiO_2 may replace SnO_2 according to the formula given in column 10, lines 11 to 15. He would replace the first SnO_2 layer between the TiO_2 and ZnO layer of the inner anti-reflection layer of the embodiment of example 2 by TiO_2 in a 75% thickness and would thus obtain a modified glass pane coated with a (3 nm + 15 nm = 18 nm) thick TiO_2 layer obtained by medium-frequency sputtering. This layer is contiguous to a 13 nm ZnO layer, which is contiguous with the 12 nm Ag layer. Such a low-E glass embodiment with a single metal oxide layer between the glass and the zinc

oxide layer is indicated as a broader aspect and in claim 1 of C1 according to which the inner anti-reflection layer on the glass may consist of only a TiO₂, ZnO and a silver layer.

4.5.1 In the effort to make the known process more economic while at the same time improving the properties of the TiO₂-based low-E glass, the skilled person would arrive at layer thicknesses which anticipate the process for coating glass with a coating according to claim 1 of the sixth auxiliary request without inventive skills.

4.5.2 Any increase of the specific conductivity of the silver layer, as argued by the appellant on the basis of its submissions of 22 October 2007, is thereby obtained as a bonus effect (see Case Law of the Boards of Appeal, 6th edition 2010, chapter I.D.9.8) of the obvious application of medium-frequency reactive sputtering of the titanium since the extremely smooth surface of the TiO₂-layer is caused by the intense ion bombardment which is inherent to this medium-frequency sputtering.

4.6 The other appellant's arguments to the contrary cannot hold either, for the following reasons.

4.6.1 The short description of the French family member of C1 given in C9 (page 2, lines 22 to 28), which refers only to the 3-layer systems of C1 including the SnO₂ and the ZnO under the silver layer and which is used as a starting point for the subsequently described invention according to C9, is not considered to be relevant for the consideration whether example 2 or example 3 represents the closest prior art, as it does not disqualify example 2 as a feasible embodiment. It

merely makes a choice of the prior art to discuss for its own invention, which does not necessarily employ TiO_2 in the inner reflection layer.

- 4.6.2 The fact that one also uses conventional sputtering apparatuses, as e.g. described in C47, for producing low-E glass of a specific quality does not imply that the production of a different quality of low-E glass using a different sputtering apparatus necessarily involves inventive step.
- 4.6.3 The arguments concerning C2 and the alleged preference with respect to sputtering of SnO_2 cannot hold in view of the fact that in C2 the advantages of TiO_2 -layers compared to SnO_2 -layers in low-E glass are explicitly mentioned (see point 4.4, above).
- 4.6.4 For the above reasons the subject-matter of claim 1 of the sixth auxiliary request lacks an inventive step. The sixth auxiliary request is therefore not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders