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**D E C I S I O N**  
of 9 May 2000

**Case Number:** T 0484/97 - 3.3.5

**Application Number:** 88104002.6

**Publication Number:** 0332717

**IPC:** C03C 17/36

**Language of the proceedings:** EN

**Title of invention:**  
Transparent laminated product

**Patentee:**  
ASAHI GLASS COMPANY LTD.

**Opponent:**  
SAINT-GOBAIN VITRAGE

**Headword:**  
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**Relevant legal provisions:**  
EPC Art. 56, 111(1)

**Keyword:**  
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**Decisions cited:**  
-

**Catchword:**  
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Case Number: T 0484/97 - 3.3.5

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.5  
of 9 May 2000

**Appellant:** ASAHI GLASS COMPANY LTD.  
(Proprietor of the patent) 12-1, Yurakucho 1-chome  
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**Representative:** Rücker, Ernst, Dr. Dipl.-Chem.  
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**Respondent:** SAINT-GOBAIN VITRAGE  
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**Representative:** Renous Chan, Véronique  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 17 February 1997  
revoking European patent No. 0 332 717 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** R. K. Spangenberg  
**Members:** M. M. Eberhard  
V. Di Cerbo

## Summary of Facts and Submissions

I. European patent No. 332 717 based on application No. 88 104 002.6 was granted on the basis of five claims. The respondent (opponent) filed a notice of opposition requesting revocation of the patent on the basis of lack of novelty and lack of inventive step. During the opposition procedure the respondent relied *inter alia* on the following documents in support of his arguments:

A5: US-A-4 179 181

A7: US-A-4 725 710

A8: US-A-4 718 932

A9: US-A-3 682 528

A10: FR-A-2 273 777

A12: EP-A-0 219 273

A14: Thin-film Optical Filters, 1969, H.A. Macleod, pages 157 to 161

A16: Applied Optics, vol. 22. No. 24, 1983, pages 4127 to 4141, P.H. Berning.

The appellant (proprietor of the patent) filed amended claims on 28 February 1996. Claim 1 thereof reads as follows:

"1. A transparent laminated product comprising a transparent substrate and a coating composed of transparent oxide and silver layers alternately laminated in a total of  $(2n+1)$  ( $n \geq 2$ ) layers with the

inner most and outer most layers being transparent oxide layers and having a surface resistance of at most 10  $\Omega$ /sq. and a visible ray transmission of at least 60%, wherein said transparent oxide layer comprises ZnO, and the thickness of said silver layer is in a range from 6 to 12 nm (60 to 120 Å)."

II. With decision dated 17 February 1997 the opposition division revoked the patent on the ground that the subject-matter of the above quoted claim lacked an inventive step. It held that the skilled person, when confronted with the technical problem of improving the coating systems disclosed in A7, A8 or A12 with respect to visible transmittance and infrared (IR) reflectance, would have considered the teaching of A5 which dealt with an analogous technical problem. A5 disclosed that by doubling the layer stack, a sharper visible-IR edge was obtained and in addition the visible transmission and IR-reflectance were increased. The patent in suit made use of the same principle of doubling the layer stack dielectric-silver-dielectric to achieve the same results. This principle was also known from A14 and would be expected by the skilled person to work independently of the nature of the dielectric. The claimed solution was therefore obvious.

III. The appellant lodged an appeal against this decision and submitted additional experiments with the statement of grounds of appeal. He filed amended claims, as an auxiliary request, on 26 September 1997. Oral proceedings were held on 9 May 2000. At the oral proceedings novelty and inventive step were first discussed on the basis of amended product claims. The appellant then abandoned the request based on the product claims and submitted amended process claims 1 to 3 as the main and sole request. Process claim 1 reads as follows:

"1. Process for producing a transparent laminated product consisting of a transparent substrate and a coating consisting of transparent oxide and silver layers alternately laminated in a total of  $(2n+1)$  ( $n \geq 2$ ) layers with the innermost and outermost layers being transparent oxide layers and having a surface resistance of at most  $10 \Omega/\text{sq.}$  and a visible ray transmission of at least 60%, wherein each transparent oxide layer is a ZnO layer, including the steps of adjusting the thickness of each silver layer within the range of 6 to 12 nm (60 to 120 Å), the thickness of the innermost and outermost transparent oxide layers within the range of 20 to 60 nm (200 to 600 Å), and the thickness of the other transparent oxide layers within the range of 40 to 120 nm (400 to 1200 Å) to obtain the desired colour of reflection."

IV. At the oral proceedings the appellant argued *inter alia* that the objective of the invention was to provide an electrically conductive laminated product which allowed to freely vary the colour in reflection and which exhibited, at the same time, a low surface resistance, a sufficiently high transmission in the visible region, a reflectance in the visible range at the level of a usual transparent glass sheet and a very high reflectance in the IR region with a sharp rise of the reflectance at the near IR region. He emphasised that the possibility of freely varying the reflected colour was the most crucial problem with respect to the closest prior art (for example A8). A three-layer stack as disclosed in A8 did not make it possible to vary freely the reflected colour. The appellant explained on the basis of the examples, comparative examples and Figure 3 to 5 of the patent in suit that, in the case of a 5-layer stack as defined in claim 1, the colour could be varied freely because of the special W-shape of the reflectance curve which had a maximum or peak in reflection within the visible range. By modifying the

thickness of the ZnO layer as in examples 2 to 4, the said peak was shifted to longer or shorter wavelengths within the visible range, thus allowing to change the colour from green to bronze and to bluish green. He further pointed out that the bottom of the W-shaped reflectance curve had to be broad and to extend on the whole visible range since, if it were too narrow, the possibilities of changing the colour would be limited. This was illustrated on Figure 4 which showed the reflectance characteristics of reference example 6, ie a 5-layer stack having a thickness of the silver layers lying outside the claimed range. The unique reflectance curve with its broad W-shape in the visible region allowed the colour to be changed freely by only changing the thickness of one of the five layers. None of the cited documents A5, A7, A8, A9 or A12 disclosed or suggested such a teaching. The specific use of ZnO as the dielectric layer in combination with silver also led to other unexpected results, in particular an improved durability of the silver layers which were more stable to attack by moisture. The appellant contested the respondent's arguments concerning the general knowledge available before the filing date of the patent in suit in the technical field of interference filters. As regards A10 and A16, the appellant indicated that these documents had been hardly relied on by the respondent at the appeal stage so that he could not discuss them in detail at the oral proceedings.

- V. The respondent raised an objection of lack of clarity against amended process claims 1 to 3 filed at the oral proceedings. He objected *inter alia* that claim 1 did not define narrow ranges of thickness associated with specific corresponding colours. It was not clear which layer and to what extent the thickness thereof had to be changed in order to obtain a specific colour. The respondent considered that A5 (and not A8) was the

closest prior art. In connection with the adjustment of the reflected colour, he argued *inter alia* that the reflectance characteristics given in Table 1 of A5 corresponded to a reflectance curve exhibiting approximately a broad W-shape in the visible region. It was well-known in the field of interference filters, before the filing date of the patent in suit, that the reflected colour of a layer stack including one silver layer could be adjusted by varying the optical thickness of the dielectric layer, ie by varying the refractive index and/or the thickness thereof, or by varying the thickness of the silver layer. It also belonged to the general knowledge of the skilled person that by changing the thickness of the dielectric layers, the peak of the W-shaped reflectance curve in the visible range could be shifted to longer or shorter wavelengths within the visible region, thus changing the reflected colour. The adjustment of the colour was therefore only an optimisation which could be made by routine experimentation or by using appropriate software. According to A12, ZnO was the less expensive target for a refractive index similar to that of ZrO<sub>2</sub>. A12 would have given the skilled person an incentive to replace the dielectric material of A5 by ZnO. Both A10 and A16 confirmed the general knowledge that the colour in reflection could be adjusted by varying the refractive index and/or the thickness of the dielectric layer. Furthermore, A9 disclosed that the thickness of the dielectric layer could be changed by amounts up to 50% to change the shape of the transmission passband.

VI. The appellant requested that the decision of the opposition division be set aside and that the patent be maintained on the basis of claims 1 to 3 submitted during the oral proceedings as the main and sole request. The respondent requested that the appeal be dismissed.

## Reasons for the Decision

1. The appeal is admissible.
  
2. As indicated above, the appellant abandoned the product claims at the oral proceedings and replaced them by process claims 1 to 3. Process claims have not been examined during the opposition proceedings. Furthermore, the submitted claims are considerably limited by additional features taken from the description and which have never been examined in combination with the other features. The problem of varying the colour in reflection in order to obtain a greater number of reflected colours referred to in the patent in suit, is of great significance in connection with the new process claims. This aspect of the technical problem, which was not taken into account in the decision under appeal, needs now to be considered for the examination of the process claims. Documents A10 and A16 deal with the problem of colour control or modification of the colour in reflection in the case of architectural glass coatings and might be of relevance in this context. Furthermore, the question which general knowledge was available before the filing date of the patent in suit in the field of interference filters or architectural glass coatings which was in dispute during the oral proceedings still remains to be clarified. Given the stated new situation, the board, in the exercise of its discretionary power pursuant to Article 111(1) EPC finds it appropriate to remit the case to the opposition division for further prosecution.

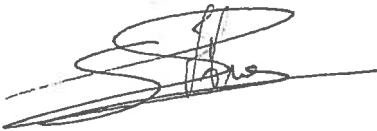


**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution on the basis of the main request submitted during the oral proceedings.

The Registrar:



S. Hue

The Chairman:



R. Spangenberg

H. Hs



Page 2

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