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D E C I S I O N
of 31 May 1995

Case Number: T 0905/92 - 3.4.2

Application Number: 88107482.7

Publication Number: 0291010

IPC: G02B 1/10, G02B 5/22, C03C 17/36

Language of the proceedings: EN

Title of invention:
Low reflectance bronze coating

Applicant:
PPG INDUSTRIES, INC.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54 and 56

Keyword:
"Novelty and inventive step (yes, after amendment)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0905/92 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 31 May 1995

Appellant: PPG INDUSTRIES, INC.
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Representative: Sternagel, Hans-Günther, Dr
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 18 May 1992 refusing European patent application No. 88 107 482.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: R. Zottmann
L. C. Mancini

Summary of Facts and Submissions

I. European patent application No. 88 107 482.7 with publication No. 0 291 010 was refused by decision of the Examining Division.

The reason given for the refusal was that the subject-matter of the independent method claim was not new in view of the prior art described in document

D1: US-A-4 022 947.

The following further document will be cited in this decision:

D2: EP-A-0 185 314.

II. The Appellant (Applicant) lodged an appeal against said decision.

III. In communications pursuant to Article 110(2) EPC, the Board of Appeal expressed its preliminary opinion that the application did not meet the provisions of the EPC and informed the Appellant by which amendments the existing deficiencies could be removed.

IV. To meet these objections, the Appellant filed amended claims and a correspondingly adapted description.

V. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the following documents:

Claims: 1 to 12 as filed with the letter dated 10 November 1994;

description: pages 1, 2, 2a and 3 to 6 as filed with the letter dated 10 November 1994.

VI. Claims 1 and 5 according to the Appellant's request read as follows

"1. An article of manufacture for the control of solar energy comprising:

(a) a glass substrate;

(b) a transparent film of a stainless steel oxide which exhibits colour and low reflectance and is deposited on a surface of said substrate (a); and

(c) a transparent nickel or chromium metal alloy film which exhibits neutral low reflectance and neutral low transmittance and is deposited on said film (b),

said films (b) and (c) in combination with the substrate (a) providing a coated transparent article which exhibits colour, low reflectance and neutral low transmittance."

"5. A method of making an article of manufacture for the control of solar energy, said method comprising the steps of:

(b) sputtering onto a surface of a glass substrate (a) a transparent film of a stainless steel oxide which exhibits colour and low reflectance; and

(c) sputtering over said film (b) a transparent nickel or chromium metal alloy film which exhibits neutral low reflectance and neutral low transmittance;

said films (b) and (c) in combination with the substrate (a) providing a coated transparent article which exhibits colour, low reflectance and neutral low transmittance."

Claims 2 to 4 are dependent on Claim 1 and claims 6 to 12 are dependent on Claim 5.

VII. Arguments particularly supporting the request to grant a patent on the basis of the documents as cited in V. above were not submitted by the Appellant. However, mainly the following arguments seem to support also said request:

The article of manufacture according to the invention and prepared in accordance with the Example has low reflectance (ca. 12%) in the visible range both from the film side (R_{fv}) and glass side (R_{gv}) and a reflectance of about 40% in the IR range from both the film side (R_{fi}) and the glass side (R_{gi}). The corresponding data of the article according to Example 11 (Fig. 8) of D1, the closest prior art, are similar for R_{fi} (about 50%) and R_{gv} (about 10%), but smaller for R_{gi} (about 8%) and greater for R_{fv} (about 50%). These improvements are obtained by replacing the outer coating (stainless steel) with high reflectance by a layer (Ni or Cr metal alloy) with low reflectance but nevertheless efficiently controlling the solar energy inside the building, that is maintenance of neutral low transmittance and relatively high R_{gi} to reduce solar energy transmittance and relatively high R_{fi} to retain heat inside the building to reduce heating

costs - when the article is used as architectural glass where the coating is inside the building. The experts in the art did not believe to obtain these effects by said measure. Insofar the present invention was unobvious.

Reasons for the Decision

1. The appeal is admissible.

2. *Requirements of Article 123(2) EPC*

In the Board's opinion, there are no objections under Article 123(2) EPC to the amendments of the claims and the description since they do not introduce subject-matter not contained in the application as originally filed.

3. *Novelty of Claim 1*

3.1 D1 discloses a transparent article capable of transmitting a desired proportion of visible radiation while reflecting a large portion of incident solar radiation. The transparent substrate, e. g. glass, is coated with two thin layers selected from a Fe, Ni and Cr alloy and Fe, Ni and Cr alloy oxide. In one embodiment, the metal film lies between the substrate and the metal oxide film. In another embodiment, the metal oxide film lies between the substrate and the metal film. Example 11 is the only specific example given for the latter embodiment. There a stainless steel oxide film is sputtered onto a glass substrate, and a stainless steel metal film is sputtered onto said oxidic film. From Figure 8 arises that R_{fv} and R_{fi} are around 50%, whereas R_{gv} and R_{gi} are well below 20% and the

transmittance in the whole range of solar energy on the surface of the earth is well below 20%, the mean value in the visible range being about 10% and in the IR range about 10%.

3.2 The article of manufacture for the reflectance of solar energy according to D2 consists of a glass substrate, a transparent film of a metal oxide which exhibits colour and is deposited on the glass and a highly reflective transparent metallic film deposited on said metal oxide film. The examples show that an article according to said prior art exhibits mirror-like properties from the film side.

3.3 The remaining documents of the Search Report are much less relevant with respect to the subject-matter of Claim 1 of the application-in-suit than D1 and D2.

3.4 Since thus none of the documents discloses a transparent article with all the features of Claim 1, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC with respect to the prior art of the Search Report.

4. *Inventive step of Claim 1*

4.1 It is undisputed that the nearest prior art with respect to the subject-matter of Claim 1 is described in Example 11 of D1, see also 3.1 above.

4.2 This prior art differs from Claim 1 above all in that the outer coating (c) is replaced by a transparent stainless steel film which exhibits relatively high reflectance. Such a transparent article, when used as architectural glass where the coating is inside the building, has a mirror-like appearance from inside (R_{fv} is relatively high: ca. 50% according to Figure 8) while

only moderately reflecting IR radiation from outside (R_{gi} is very low: ca. 8% according to Figure 8). In contrast thereto, the article according to Claim 1, apparently, does not show such disadvantageous properties, but shows the following advantageous properties: neutral low transmittance (16.8% according to the Example), low R_{gv} (about 12%) and relatively high R_{fi} (about 40%). Transmittance and R_{fi} are important for the control of solar energy while R_{gv} is important for the appearance of the building.

4.3 The problem underlying the invention according to Claim 1 is therefore to improve the article of D1 in such a manner that the reflectance in the visible range from the film side (R_{fv}) is low and the reflectance in the IR range (R_{gi}) is relatively high while maintaining nevertheless as far as possible said advantageous properties.

4.4 High reflectance of the transparent article is an essential feature of the concept of both D1 and D2 (see in both documents the abstract and the independent claims). If, nevertheless, the skilled person envisaged to leave said concept, he could, in view of the numerous possibilities of varying the parameters of the article (e.g. choice of the substances for the layers, number and sequence of layers) and interaction effects between the layers, not arrive at a solution according to Claim 1 on the basis of said nearest prior art or of D2 without any inventive skill, all the more as the skilled person could not expect that in spite of the low reflectance of the outside coating (replacing the high reflectance outside coating of said nearest prior art) said advantageous properties of the known article (see section 4.3 last sentence) could be maintained.

4.5 Therefore, the subject-matter of Claim 1 involves an inventive step as defined in Article 56 EPC, and consequently said claim is allowable (Article 52(1) EPC).

5. Claim 5 concerns a method for making an article according to Claim 1 comprising all features of the article of Claim 1 and is, therefore, likewise allowable.

6. Dependent Claims 2 to 4 and 6 to 12 concern particular embodiments of Claim 1 and, respectively, 5 and are, therefore, likewise allowable.

7. In the result, the Board takes the view that the claims comply with the requirements of the EPC. Since this applies also to the other documents of the application, a patent can be granted on the basis of the documents according to section V. above.

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 with the order to grant a patent on the basis of the following application documents as agreed by the Board of Appeal:

   Claims: 1 to 12 as filed with the letter dated 10 November 1994;

   description: pages 1, 2, 2a and 3 to 6 as filed with the letter dated 10 November 1994.

The Registrar: The Chairman:

P. Martorana E. Turrini