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Datasheet for the decision of 22 September 2017

Case Number: T 1971/12 - 3.4.02

Application Number: 07103373.2

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Language of the proceedings: EN

Title of invention:
Colored Anti-Fog Mirror

Applicant:
Murakami Corporation

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

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Case Number: T 1971/12 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 22 September 2017

Appellant: (Applicant)	Murakami Corporation 12-25, Miyamoto-cho Shizuoka-shi, Shizuoka, 422-9569 (JP)
Representative:	dompatent von Kreisler Selting Werner - Partnerschaft von Patent- und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 19 April 2012 refusing European patent application No. 07103373.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	H. von Gronau
	G. Decker

Summary of Facts and Submissions

I. The appeal of the applicant is directed against the decision of the examining division to refuse the European patent application No. 07 103 373.2. The examining division refused the application on the ground that the subject-matter of claim 1 did not involve an inventive step over document

D1: EP 1 099 671 A1

as closest prior art document in combination with document

D3: WO 98/39262 A.

The examining division has also cited document

D2: EP 1 623 657 A.

II. The appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the claims filed with the grounds of appeal.

As an auxiliary measure oral proceedings were requested.

III. In a communication annexed to summons to oral proceedings the board expressed its provisional opinion that inter alia the subject-matter of claim 1 did not involve an inventive step in view of document D1 as closest prior art document in combination with document

D4: JP 07 266 982 A and document

D4a: the EPO machine translation in English of document D4.

Document D4 was cited in the Japanese examination proceedings with respect to the corresponding Japanese application. Documents D4 and D4a were introduced by the board into the appeal proceedings.

IV. With letter dated 25 July 2017 the appellant informed the board that they would not attend the oral proceedings. The appellant did not put forward any arguments in reply to the communication of the board.

V. Oral proceedings took place on 22 September 2017. At the end of the oral proceedings the board announced its decision.

VI. Claim 1 as filed with the grounds of appeal reads as follows:

"A colored anti-fog mirror that reflects incident light to emit reflected light, having a spectral reflection spectrum having a maximum reflectance in a visible region over 510 nm and not more than 600 nm, the colored anti-fog mirror comprising;
a substrate (12);
a hydrophilic functional layer (18,28) containing a photocatalytic substance; and
a metallic reflecting film (14) provided between said substrate (12) and said hydrophilic functional layer (18, 28);
wherein said hydrophilic functional layer (18, 28) comprises a hydrophilic film (17) consisting of a hydrophilic substance, and a photocatalytic film (16) consisting of a photocatalytic substance provided on

the metallic reflecting film side of said hydrophilic film (17),
wherein said hydrophilic substance consists of silicon dioxide and said photocatalytic substance consists of titanium dioxide,
characterized in that
said metallic reflecting film (14) has a thickness in a range of 5 to 100 nm, wherein said hydrophilic film (17) has a thickness in a range of 10 to 50 nm, and said photocatalytic film (16) has a thickness in a range of 50 to 130 nm, wherein said metallic reflecting film (14) consists of titanium and/or of niobium and has a spectral reflection spectrum in which the reflectance increases monotonically from short wavelength to long wavelength over the whole visible region, such that the variation in the color of the mirror surface at locations, where the thickness of the hydrophilic functional layer varies, is suppressed."

Reasons for the Decision

1. Amendments (Article 123(2) EPC)

Independent claim 1 as filed with the grounds of appeal is based on claims 1 to 4 and 6 as originally filed in combination with the originally filed description, where on page 15, lines 19 - 20 the thickness of 5 to 100 nm of the metallic reflecting film is disclosed, where on page 18, lines 5 - 8 the thickness of 10 to 50 nm of the hydrophilic film is disclosed, and where on page 17, lines 5 - 9 the thickness of 50 to 130 nm of the photocatalytic film is disclosed. The feature that the variation in the color of the mirror surface at locations, where the thickness of the hydrophilic functional layer varies, is suppressed, can be deducted

from paragraph 0041 of the description as originally filed.

Accordingly, claim 1 as amended meets the requirements of Article 123(2) EPC.

2. Novelty - claim 1 (Article 54 EPC 1973)

2.1 Document D1 (cf. embodiment 1, figures 1 and 6a) discloses a colored anti-fog mirror comprising a substrate 3, a metallic reflecting film 8 of Cr coated on the substrate, and a hydrophilic functional layer (cf. films 10 and 12) consisting of a photocatalytic film 10 consisting of TiO_2 and a hydrophilic film 12 consisting of SiO_2. The peak reflectance of the mirror in the example of figure 6A is at a wavelength of 550 nm. The thickness of hydrophilic film 12 is in the range of 10 - 50 nm (cf. page 4, lines 41 - 43, table 2 on page 5), the thickness of photocatalytic film 10 in document D1 is preferably set at 150 nm or below (cf. page 5, lines 6 - 8) and in the example of figure 6A it is set at 105 nm (which is in the claimed range of 50 - 130 nm).

The subject matter of claim 1 differs from D1 in that the metallic film is made of titanium and/or niobium having a thickness of 5-100 nm. The additional characteristic of the reflecting film of titanium or niobium indicated in the present claim 1 that these materials have a reflection spectrum "*in which the reflectance increases monotonically from short wavelength to long wavelength over the whole visible region, such that the variation in the color of the mirror surface at locations, where the thickness of the hydrophilic functional layer varies, is suppressed*", is

implicit with the claimed reflecting films and does not represent a further limiting feature.

2.2 Document D2 is directed to an anti-fog mirror with a metallic reflecting film such as a chromium or Ti-Rh alloy film and a composite functional layer with a photocatalytic function and a hydrophilic function (cf. abstract and paragraph 0028). This document does not disclose titanium or niobium for the reflecting film either.

2.3 Document D3 discloses a heat formable mirror and addresses the problem that coatings of flat glass sheets consisting of the usual reflecting layer using chromium as the reflective metal and then heat-bent tend to develop defects which may be referred to as pits (cf. page 1, lines 30 - 35). Document D3 proposes to increase the heat resistance by having a base layer 14 consisting of several layers on the substrate and to apply a reflective metallic film 16 further from the substrate, the metallic film being niobium, titanium or aluminium (cf. page 4, lines 15 - 18; figure 1). Document D3 does, however, not disclose a hydrophilic functional layer.

2.4 Document D4 discloses a reflecting mirror with a reflecting film of titanium which can be covered with titanium oxide and silicon oxide films (cf. translation D4a, paragraphs 0009, 0010), but document D4 does not disclose thickness values for the protective films.

2.5 Therefore, the subject-matter of claim 1 is new in the sense of Article 54(1) EPC 1973.

3. Inventive step - claim 1 (Article 56 EPC 1973)

3.1 Document D1 is the closest prior art document. As noted above, the subject-matter of claim 1 differs from D1 in that the metallic film is made of titanium and/or niobium having a thickness of 5-100 nm.

Titanium and/or niobium both have a reflection spectrum in which the reflectance increases monotonically from short wavelengths to long wavelengths (cf. Figure 2, (a) and (c) of the application). In paragraph 0017 of the present application it is stated: "*Moreover, the metallic reflecting film preferably has a spectral reflection spectrum in which the reflectance increases monotonically from short wavelength to long wavelength over the whole visible region. A colored anti-fog mirror of the present invention having such a metallic reflecting film is able to exhibit a spectral reflection spectrum having a maximum reflectance in a desired wavelength region for a broad range of thicknesses of the hydrophilic functional layer. Moreover, even in the case that the thickness of the hydrophilic functional layer varies, there will be little variation in the color of the mirror surface*".

3.2 The differing feature therefore has the effect of achieving a spectral reflection spectrum having a maximum reflectance in a desired wavelength region for a broad range of thicknesses of the hydrophilic functional layer and little variation in the color of the mirror surface.

3.3 In view of the disclosed effect the problem is to have a mirror with less variation in the color of the mirror surface.

3.4 The examining division combined document D3 with closest prior art document D1 to arrive without

inventive step at the subject-matter of claim 1. Document D3 is in the field of mirrors and also deals with rear-view mirrors for cars. Document D3 addresses the problem that coatings of flat glass sheets consisting of the usual reflecting layer using chromium as the reflective metal and then heat-bent tend to develop defects which may be referred to as pits. Document D3 proposes to increase the heat resistance by having a base layer 14 consisting of several layers on the substrate and to apply a reflective metallic film further from the substrate, the metallic film being niobium, titanium or aluminium. The reflectance of these metals is not addressed. The dependence of the color of the mirror from the thickness of a TiO_2 film is also not addressed.
The board is therefore of the opinion that the person skilled in the art would not find a solution to the above identified problem in document D3. In particular, the person skilled in the art would not receive any incentive from document D3 to replace in the mirror of document D1 the chromium reflecting film with a titanium or niobium film.

3.5 To solve the above problem the person skilled in the art would rather consider document D4. Document D4 relates to a rear-view mirror with an enhanced anti-glare effect due to titanium oxide and silicon oxide films on a glass substrate (cf. translation D4a, paragraphs 0004 and 0010). It addresses the problem that the color tone of the mirror is difficult to control because the thickness of the layers needs to be accurately formed (cf. translation D4a, paragraph 0007). It proposes that the reflective layer be made of titanium which results in better characteristics in comparison to a traditional reflecting mirror (cf. translation D4a, paragraphs 0008 and 0009). In a

comparative example a chrome mirror is described (cf. translation D4a, paragraph 0014). Document D4 states that the reflecting film of titanium has a large allowable range of the film thickness (cf. translation D4a, paragraph 0031) and in the example the film thickness of titanium is about 0,1 µm (cf. translation D4a, paragraph 0019) which lies within the range defined in claim 1 (5 - 100nm).

3.6 The person skilled in the art would consider document D4 to solve the above problem identified with respect to document D1 as closest prior art. The person skilled in the art learns from document D4 that a reflecting film of titanium is advantageous to stabilize the color tone of the mirror in comparison to chromium. Without inventive skill the person skilled in the art would apply a reflective layer of titanium having a thickness within the claimed range in the mirror structure disclosed in document D1.

Therefore, the subject-matter of claim 1 with the option of titanium as reflecting film does not involve an inventive step in the sense of Article 56 EPC 1973.

3.7 Therefore, claim 1 is not allowable.

4. In the communication annexed to the summons to oral proceedings the board has already put forward the above argumentation that the subject-matter of claim 1 does not involve an inventive step. In their reply the appellant informed the board that they would not attend the oral proceedings, but the appellant did not put forward any arguments in support of the patentability of the claimed subject-matter.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl R. Bekkering

Decision electronically authenticated