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Datasheet for the decision of 13 December 2022

Case Number: T 0868/17 - 3.3.02

Application Number: 09755679.9

Publication Number: 2283083

IPC: C09D5/00

Language of the proceedings: EN

Title of invention:
PROCESS FOR THE PRODUCTION OF A DARK-COLOR MULTI-LAYER COATING

Patent Proprietor:
Coatings Foreign IP Co. LLC

Opponent:
PPG Industries, Inc.

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step

Decisions cited:
T 2191/13

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Case Number: T 0868/17 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 13 December 2022

Appellant: (Opponent)	PPG Industries, Inc. One PPG Place Pittsburgh, PA 15272 (US)
Representative:	f & e patent Braunsberger Feld 29 51429 Bergisch Gladbach (DE)
Respondent: (Patent Proprietor)	Coatings Foreign IP Co. LLC The Corporation Trust Company Corporation Trust Center 1209 Orange Street Wilmington, DE 19801 (US)
Representative:	LKGLOBAL Lorenz & Kopf PartG mbB Patentanwälte Brienner Straße 11 80333 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 13 February 2017 rejecting the opposition filed against European patent No. 2283083 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	M. O. Müller
Members:	A. Lenzen
	L. Bühler

Summary of Facts and Submissions

I. This decision concerns the appeal of the opponent (appellant) against the opposition division's decision (decision under appeal) to reject the opposition to European patent No. 2 283 083 (patent).

II. The following documents, submitted before the opposition division, are relevant to the present decision:

D3 US 7,211,324 B2
D6 PVD Aluminum Pigments: Superior Brilliance for Coatings & Graphic Arts, PCI Paint & Coatings Industry, 1 June 2000

III. With the reply to the statement of grounds of appeal, the patent proprietor (respondent) filed the set of claims of the first auxiliary request.

IV. In preparation for the oral proceedings, scheduled at the parties' request, the board issued a communication pursuant to Article 15(1) RPBA 2020.

V. During the oral proceedings, held on 13 December 2022 by videoconference in the presence of both parties, the board decided:

- not to disregard the respondent's data initially filed on 12 October 2015 with the reply to the notice of opposition
- to admit the respondent's defence according to which the teaching of D6 was not compatible with example 1 of D3

At the end of the oral proceedings, the chair announced the order of the present decision.

VI. The parties' final requests relevant to the present decision were as follows.

The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The respondent requested that the appeal be dismissed, implying that the patent be maintained as granted (main request), or, in the alternative, that the patent be maintained in amended form based on the set of claims of the first auxiliary request, filed with the reply to the statement of grounds of appeal.

VII. The appellant's appeal case relevant to the present decision can be summarised as follows. D3 was the closest prior art, and example 1 (table 6) was the most suitable starting point for the assessment of inventive step. The subject-matter of claim 1 of the main request differed from example 1 of D3 only in the thickness of the aluminium flake pigment, which was higher in D3. The data filed by the respondent before the opposition division on 12 October 2015, allegedly showing an improvement for the aluminium flake pigment of claim 1 of the main request, should not be admitted because they had not been refiled with the reply to the statement of grounds of appeal. Instead, they had only been filed with the respondent's last written submission shortly before the oral proceedings before the board. Even if the respondent's more ambitious objective technical problem based on these data was accepted, its solution did not require an inventive step in view of a combination of D3 with D6. D6

concerned physical vapour deposition (PVD) aluminium flake pigments which had a thickness as required by claim 1 of the main request. D6 disclosed that these pigments exhibited better light reflectance than thicker aluminium flake pigments, such as used in example 1 of D3. Even if D6 were understood to relate only to visible light, the skilled person would still have inferred from D6 that the better reflectance also applied to near-infrared (NIR) light. This was because D6 attributed the higher visible light reflectance to a higher mobility, which allowed the flakes to arrange more parallel to the substrate. The respondent's defence according to which the teaching of D6 was incompatible with example 1 of D3 should not be admitted. In any event, this defence was not convincing. Thus, claim 1 of the main request did not involve an inventive step. The same reasoning applied to claim 1 of the first auxiliary request.

Summaries of the respondent's arguments are contained in the reasons for this decision.

Reasons for the Decision

Admittance issues

1. With the reply to the notice of opposition, the respondent had submitted experimental data showing, *inter alia*, that aluminium flake pigments having a thickness as provided for in claim 1 (see below) exhibit a higher reflectance for visible and near-infrared (NIR) light than the aluminium flake pigments of example 1 of D3. On appeal, the respondent referred to these data when formulating the objective technical problem. The appellant requested that these data not be admitted into the appeal proceedings.

At the oral proceedings, the board decided not to disregard these data and to include them in the appeal proceedings. Because an inventive step cannot be acknowledged even if the respondent's objective technical problem based on these data is accepted in its favour, the patent must ultimately be revoked (see below). The appellant is therefore not adversely affected by the decision to include these data in the appeal proceedings, and this decision does not have to be reasoned.

2. At the oral proceedings before the board, the respondent argued that the teaching of D6 was incompatible with example 1 of D3. More specifically, the guidelines given in D6 for formulations containing PVD aluminium flake pigments were incompatible with the formulation of example 1 of D3. The appellant requested that this defence not be admitted into the appeal proceedings.

At the oral proceedings, the board decided to admit this defence. Because it is not convincing and therefore an inventive step cannot be acknowledged, the patent must ultimately be revoked (see below). The appellant is therefore not adversely affected by the decision to admit this defence, and this decision does not have to be reasoned.

Main request (patent as granted) - inventive step

3. Background

Dark-colour coatings often contain carbon black pigments which absorb radiation in the near-infrared (NIR) wavelength range and transform it into heat.

Substrates coated with paint coatings of this type therefore heat up in the NIR-containing sunlight. This type of heating is often undesirable, for example, for the actual substrate material itself and/or for the interior of the substrate. A typical example of a substrate comprising an interior is a motor vehicle. Vehicles with light-colour coatings do not heat up as much and less fuel is required to operate the vehicle air-conditioning system than in models painted in a dark colour. Nevertheless, dark-colour coatings may still be desirable for other reasons, such as aesthetic ones.

The patent sets out that its process provides a dark-colour multi-layer coating which heats up only comparatively slightly in sunlight (paragraphs [0004] and [0005]).

4. Wording of claim 1

4.1 Claim 1 reads as follows (including the respondent's breakdown into features (A) to (M) and the corresponding sub-features, as shown on pages 2 and 3 of the reply to the statement of grounds of appeal; note that "J" had been omitted by the respondent for reasons of legibility):

"*(A) A process for the production of a dark-color multi-layer coating, comprising the successive steps:*

(B) (1) applying an NIR-opaque coating layer A' from
(B1) a pigmented,
(B2) solvent- or waterborne coating composition A
(B3) to a substrate,

(C) (2) applying a coating layer B' from a
(C1) pigmented coating composition B
(C2) onto the substrate provided with coating layer A',

(D) wherein the pigment content of coating composition A consists
(D1) 90 to 100 wt.% of at least one 10 to 80 nm thick aluminum flake pigment
(D2) and 0 to 10 wt.% of at least one further pigment,
(D3) which is selected in such a way that NIR-opaque coating layer A' exhibits low NIR absorption,

(E) wherein the pigment content of coating composition B consists
(E1) 50 to 100 wt.% of at least one black pigment with low NIR absorption
(E2) and 0 to 50 wt.% of at least one further pigment,
(E3) which is selected in such a way that coating layer B' exhibits low NIR absorption and
(E4) that the dark-color multi-layer coating exhibits a brightness L (according to CIEL*a*b*, DIN 6174), measured at an illumination angle of 45 degrees to the perpendicular and an observation angle of 45 degrees to the specular, of at most 10 units,*

(F) wherein the sum of the respective wt.% equals 100 wt.%,

(G) wherein the coating layers A' and B' are cured,

(H) wherein the term "coating layer A' which exhibits

low NIR absorption" shall mean an NIR-opaque coating layer A' which exhibits an NIR reflection of at least 55% over the entire NIR wavelength range of 780 to 2100 nm,

(I) wherein the term "NIR-opaque coating layer" refers to a dried or hardened pigmented coating layer with a film thickness at least as thick that underlying substrate surfaces (substrate surfaces located directly beneath the coating layer) with different NIR absorption are no longer discernible by NIR reflection measurement,

(K) wherein the term "coating layer B' exhibiting low NIR absorption" shall mean a coating layer B' which would exhibit an NIR reflection of at least 40% over the entire NIR wavelength range of 780 to 2100 nm, if it were applied and dried or hardened on an NIR-opaque coating layer pigmented exclusively with at least one 10 to 80 nm thick aluminum flake pigment, and

(L) wherein a black pigment with low NIR absorption is one which, when pigmenting a coating composition with the respective black pigment and a 10 to 80 nm thick aluminum flake pigment in a pigment weight ratio of 10:90 and without using other pigments, results in the NIR reflection of a dried or cured coating layer applied from the coating composition in an NIR-opaque film thickness being at least 40 % over the entire wavelength range of 780 to 2100 nm, and

(M) wherein coating layer B' is a visually opaque coating layer."

4.2 Thus, claim 1 relates to a process for the production of a dark-colour multi-layer coating by successively applying two coating compositions A and B to a substrate.

Coating composition A resulting in a layer A' comprises a 10 to 80 nm thick aluminium flake pigment as an indispensable pigment component (feature (D1)). For coating composition B, resulting in a layer B', the indispensable pigment component is a black pigment with low NIR absorption (feature (E1)). In view of these indispensable pigment components, the structure of the multi-layer coating resulting from the process of claim 1 may be described as follows:

(i) a substrate
(ii) a first NIR-opaque layer A' containing a 10 to 80 nm thick aluminium flake pigment, applied on the substrate
(iii) a layer B' containing a black pigment with low NIR absorption, applied on layer A'

Due to its black pigment, layer B' gives the structure a dark colour. When layer B' is exposed to sunlight, the NIR light that passes through layer B' is reflected by the aluminium flakes in layer A' and then passes back through layer B' and leaves the coating. Overall, therefore, the NIR light entering the coating is not absorbed but reflected. In this way, heating of the substrate and the underlying space is mitigated.

5. Construction of claim 1

5.1 As far as pigments are concerned, coating compositions A and B are defined by features (D1) to (D3) and (E1) to (E4), respectively. In addition to the respective

indispensable pigment component (features (D1) and (E1)), each coating composition may contain a further pigment (features (D2) and (E2)).

There was disagreement between the parties on how features (D3) and (E3)/(E4) had to be construed.

5.2 The respondent argued that claim 1 could only be interpreted to mean that features (D3) and (E3)/(E4) related to the pigment content mentioned in features (D) and (E). This implied that features (D3) and (E3)/(E4) were relevant not only for the optional further pigments but also the indispensable pigments. In favour of the respondent, the board acknowledges that this may indeed be a technically sensible interpretation of claim 1.

5.3 However, based on its wording, claim 1 can also be interpreted to mean that features (D3) and (E3)/(E4) relate only to the optional further pigments, this implying that these features are in fact not relevant for the indispensable pigments. This interpretation is also technically sensible. As explained above, the patent aims to provide a dark-colour multi-layer coating which heats up only comparatively slightly in sunlight. These objectives (dark colour, low heating in sunlight) are achieved by distributing the two indispensable pigments over the two superimposed coating layers A' and B'. The further pigments contained in both layers, if any, should of course not counteract these objectives. And this is exactly what is ensured if features (D3) and (E3)/(E4) are interpreted as referring to the optional further pigments only. Features (D3) and (E3) ensure low NIR absorption (= low heating); feature (E4) ensures low brightness (= dark colour). Moreover, this

interpretation, which is broader than that advocated by the respondent, is fully consistent with the patent (paragraphs [0023] and [0040]).

5.4 Since the wording of claim 1 should be given its broadest technically sensible meaning, the latter interpretation is adopted in the following.

5.5 It follows from the adopted interpretation of claim 1 that, in assessing whether a feature of claim 1 is anticipated by a piece of prior art, features (D3) and (E3)/(E4) are relevant only if there is actually a pigment in the prior art which can be subsumed under the further pigment(s) according to claim 1. The same applies to features (H) and (K) of claim 1 because they define what is meant by low NIR absorption in features (D3) and (E3).

6. Closest prior art

6.1 There was agreement between both parties that D3 is the closest prior art and that example 1 (table 6) is the most suitable starting point for the assessment of inventive step. The board saw no reason to deviate from this unanimous view.

6.2 D3 (column 1, lines 10 to 14) generally relates to a method of forming a laminate film which assumes a jet black colour and does not absorb heat, thus having a heat shielding function. Example 1 discloses a process for the production of such a laminate film with the following steps 1 to 5 (column 17, line 55 to column 18, line 6):

- Step 1: Application of heat shielding coating No. 1 to a test plate, giving a dry film thickness of

35 µm and a hiding film thickness of 25 µm, followed by baking at 140 °C for 20 minutes. Heat shielding coating No. 1 comprises the aluminium flake pigment "ALUPASTE 7680NS" as the only pigment. It also contains butyl cellosolve (i.e. 2-butoxyethanol) as a solvent.

- Step 2: Application of black base coating No. 1 to the film obtained in step 1. Black base coating No. 1 comprises the perylene black pigment "PALIOGEN BLACK L-0084" as the only pigment. It also contains butyl cellosolve as a solvent.
- Step 3: Application of colour clear coating No. 1 to the film obtained in step 2.
- Step 4: Application of a clear coating to the film obtained in step 3.
- Step 5: Heating at 140 °C for 20 minutes giving a cured film.

The cured film has a brightness L* of 1.31 units and a jet blackness rating of A, which means a good jet blackness (table 6 and table 9, note 6).

7. Distinguishing feature(s)

7.1 The film resulting from example 1 of D3 comprises four layers and is located on a test plate. Hence it is a multi-layer coating. Furthermore, the film is jet black and hence of a dark colour (feature (A) of claim 1).

7.2 The composition used in step 1 of example 1, its application to a test plate and the film resulting from it correspond to coating composition A, its application to a substrate and coating layer A' of claim 1, thus disclosing features (B)/(I), (B1) to (B3) and (D) to (D2) of claim 1 - except for the thickness of the aluminium flake pigment, which, as was common ground

between the parties, is greater in D3 than the range provided for in claim 1 (see feature (D1)).

More specifically, in step 1 of example 1, a heat shielding coating composition is applied to a test plate, i.e. a substrate (features (B) and (B3)). This composition contains butyl cellosolve, i.e. a solvent (feature (B2)). It also contains the aluminium flake pigment "ALUPASTE 7680NS" (feature (B1)) as the only pigment. This pigment, therefore, makes up 100% of the pigment content of this composition (features (D), (D1), (D2)). Because features (D3) and (H) only come into play when a further pigment is contained in amounts of >0% (see above), they are not relevant for the composition of step 1.

With regard to the NIR opacity of coating layer A', feature (I) of claim 1 specifies that it must be at least thick enough that underlying layers with different NIR absorption are no longer discernible by NIR reflection measurement. The thickness given in example 1 for the dry film (35 µm) is greater than the hiding film thickness of the coating composition (25 µm). According to D3 (column 6, lines 31 to 39), this means that the shielding effect of the dry film (caused by the reflection of visible light by the aluminium flake pigments) is so high that underlying patterned layers are no longer discernible, in other words, the dry film is opaque to visible light. But if the dry film is opaque to visible light, this must apply *a fortiori* to NIR light, since - as argued by the appellant based on the respondent's data of 12 October 2015 (see the appellant's letter dated 19 February 2018, page 3, paragraphs 3 to 5) and not disputed by the respondent - aluminium flake pigments

reflect NIR light even more strongly than visible light.

7.3 The composition of step 2 of example 1, its application to the film obtained in step 1 and the film resulting from it correspond to coating composition B, its application to coating layer A' and coating layer B' of claim 1, thus disclosing features (C) to (C2), (E), (E1)/(L) and (E2).

More specifically, in step 2 of example 1, a black base coating composition is applied to the film obtained in step 1 (features (C) and (C2)). This composition contains the perylene black pigment "PALIOGEN BLACK L-0084" (feature (C1)), which is a black pigment with low NIR absorption according to the patent (paragraph [0039]) (features (E1) and (L)). Because it is the only pigment, it makes up 100% of the pigment content of this composition (features (E), (E1) and (E2)). Because features (E3)/(K) and (E4) only come into play when a further pigment is contained in amounts of >0%, they are not relevant for the composition of step 2.

7.4 Feature (F) is self-evident because the weight percentages of the components of a composition always add up to 100 wt.%. Both coating layers are cured in step 5 (feature (G)). The cured film has a good jet blackness. Hence, the film resulting from step 2 is a visually opaque coating layer (feature (M)).

7.5 Thus, the subject-matter of claim 1 differs from the process of example 1 of D3 only in that the aluminium flake pigment has a lower thickness, i.e. a thickness in the range of from 10 to 80 nm.

7.6 According to the respondent, features (H), (I), (K) and (L) of claim 1 were further distinguishing features. This was because D3 did not disclose that these features were taken into account when performing the process disclosed.

This argument is not convincing because it amounts to saying that the skilled person had to make certain considerations in carrying out a process according to claim 1 which are allegedly not disclosed in D3. However, such differences can only be of a mental, i.e. non-technical, nature and cannot render the subject-matter of claim 1 novel over the prior art (T 2191/13, points 2.3 and 12.4 of the Reasons).

8. Technical effect and objective technical problem

According to the respondent, the feature distinguishing the subject-matter of claim 1 from example 1 of D3 (i.e. a lower thickness of the aluminium flake pigment) caused a higher reflection, particularly of NIR light. Given this, the objective technical problem was to provide a process to produce an improved dark-colour multi-layer coating which heats up only comparatively slightly in sunlight while maintaining, at the same time, the other desirable and advantageous properties of a common dark-colour multi-layer coating.

In favour of the respondent, it is assumed below that this is correct.

9. Obviousness

9.1 It is already known from D3 that NIR light is of particular importance in heating dark-colour coatings. Therefore, to improve the dark-colour multi-layer

coating of D3 towards lower heating, the skilled person would have tried to further improve the reflection of NIR light by the aluminium flake pigment in D3 and turned to D6.

9.2 D6 concerns aluminium flake pigments obtained by physical vapour deposition (PVD) and their production, properties, and application in the graphic arts industry and in coatings. To improve the specular reflectance of PVD pigments, their thickness is usually adjusted between 30 to 50 nm, which is significantly lower than that of conventional aluminium flake pigments (100 to 500 nm). The lower thickness increases their mobility so that when a composition containing them is applied, they arrange themselves parallel to the substrate and form a nearly uniform surface without any discernible edges.

9.3 The board agrees with the appellant that D6 teaches higher visible light reflectance for 30 to 50 nm thick aluminium flake pigments than for aluminium flake pigments which are thicker. This was not contested by the respondent. However, it argued that the teaching of D6 explicitly concerned only visible light and could not simply be assumed to apply to NIR light as well. In other words, it could not simply be assumed that 30 to 50 nm thick aluminium flake pigments had to have a higher NIR light reflectance than the thicker aluminium flake pigment of example 1 of D3.

This is not convincing. The higher visible light reflectance of 30 to 50 nm thick aluminium flake pigments compared to thicker aluminium flake pigments is attributed in D6 to a higher mobility, which allows the flakes to arrange more parallel to the substrate, rather than to strongly wavelength-dependent

interactions between the incident light and the aluminium flake pigments. Starting from D3, which already discloses that aluminium flake pigments reflect NIR light, the skilled person would have had no doubt that the more parallel arrangement of the aluminium flake pigments associated with the transition to pigments having a thickness of 30 to 50 nm would also result in an improved reflection of NIR light.

9.4 Thus, when seeking to provide a process to produce an improved dark-colour multi-layer coating which heats up only comparatively slightly in sunlight, the skilled person would have replaced the aluminium flake pigment of example 1 of D3 with the aluminium flake pigments of D6 having a thickness of 30 to 50 nm. This thickness range falls squarely within the range of claim 1 (10 to 80 nm). At the same time, when leaving the other characteristics of example 1 of D3 unchanged, the skilled person would have maintained the desirable and advantageous properties of the dark-colour multi-layer coating of D3. Therefore, the subject-matter of claim 1 does not involve an inventive step.

9.5 The respondent argued that D6 disclosed pigment/binder ratios of from 2:1 to 1:2 and acetates, glycols and ketones as solvents for the formulations containing PVD aluminium flake pigments (page 7, lines 16 to 18; page 8, lines 1 to 4). In contrast, the pigment/binder ratio in the formulation of example 1 of D3 was 0.33/1 and thus outside the range specified in D6. Furthermore, the solvent used in D3 was a glycol ether and did not belong to one of the solvent classes mentioned in D6. Therefore, the skilled person would not have considered D6 in an attempt to improve example 1 of D3.

This is also not convincing. The pigment/binder ratios of from 2:1 to 1:2 disclosed in D6 and referred to by the respondent relate to formulations used in the graphic arts industry but not to coating compositions with which claim 1 is concerned. It is not at all evident that the considerations applicable to the former would necessarily apply also to the latter. Furthermore, D6 discloses typical PVD aluminium flake pigment contents of 1 to 1.5% and binder contents of approximately 4.3% for coating compositions (page 8, lines 1 to 4). The pigment/binder ratio encompassed by these values (1/4.3 to 1.5/4.3 = 0.23 to 0.35) includes the value given by the respondent for example 1 of D3 (0.33). Thus, if anything, the more relevant teaching of D6 is fully consistent with example 1 of D3 in terms of pigment/binder ratio. While it is true that D6 discloses acetates, glycols and ketones as solvents for coating compositions, D6 makes it very clear that these solvents represent only a typical selection of solvents. The teaching of D6 cannot, therefore, be interpreted to mean that formulations containing PVD aluminium flake pigments must necessarily contain only solvents which are acetates, glycols or ketones.

9.6 In summary, the subject-matter of claim 1 of the main request does not involve an inventive step, and the main request is not allowable.

First auxiliary request

10. Claim 1 of the first auxiliary request differs from claim 1 of the main request only in that the definition of the term "*coating layer A' which exhibits low NIR absorption*" has been changed in feature (H). However, it was concluded above that feature (H) is not relevant for the assessment of inventive step when starting from

example 1 of D3. This amendment, therefore, does not change the assessment above for the main request, which also applies to the first auxiliary request. Hence, the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step, and the first auxiliary request is not allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

N. Maslin M. O. Müller

Decision electronically authenticated