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Datasheet for the decision of 26 October 2020

Case Number: T 2257/15 - 3.3.02

Application Number: 06734845.8

Publication Number: 1940971

IPC: C09D5/36, C09D5/03, C09D11/02, C09C1/00

Language of the proceedings: EN

Title of invention:
MULTILAYER EFFECT PIGMENT

Patent Proprietor:
BASF Corporation

Former Opponent:
ECKART GmbH

Headword:

Relevant legal provisions:
EPC Art. 123(2), 83

Keyword:
Amendments
Sufficiency of disclosure

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 2257/15 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 26 October 2020

Appellant: (Patent Proprietor)	BASF Corporation 100 Park Avenue Florham Park, NJ 07932 (US)
Representative:	Altmann, Andreas Altmann Stößel Dick Patentanwälte PartG mbB Isartorplatz 1 80331 München (DE)
Former Respondent: (Former Opponent)	ECKART GmbH Güntersthal 4 91235 Hartenstein (DE)
Representative:	Louis Pöhlau Lohrentz Patentanwälte Postfach 30 55 90014 Nürnberg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 8 October 2015 revoking European patent No. 1940971 pursuant to Article 101(3)(b) 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 filed by the patent proprietor (appellant) against the decision of the opposition division (decision under appeal) to revoke its European patent no. 1 940 971 (patent in suit).

II. In its notice of opposition, the opponent requested the revocation of the patent in suit in its entirety based on the grounds for opposition pursuant to Article 100(a) EPC (lack of novelty and lack of an inventive step), Article 100(b) EPC and Article 100(c) EPC.

The decision under appeal is based on the patent in suit as granted (main request) and the sets of claims of auxiliary requests 1 to 6. The opposition division decided that the claims of the main request and the sets of claims of auxiliary requests 1 to 4 did not meet the requirements of Article 100(c) and 123(2) EPC, respectively. It also held that the invention as stipulated in the sets of claims of auxiliary requests 5 and 6 was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art pursuant to Article 83 EPC.

III. The following documents, cited during the opposition proceedings, are relevant for the present decision:

D1 US 2004/0139889 A1

D5 Glausch, R., Kieser, M., Maisch, R., Pfaff, G., Weitzel, J. Perlglanzpigmente. Hannover: Curt R. Vincentz Verlag, 1996, Seiten 13 bis 43

D8 Pfaff, G., Reynders, P. Angle-Dependent Optical Effects Deriving from Submicron Structures of Films and Pigments, Chem. Rev. 1999, 99, Seiten 1963 bis 1981

IV. With its statement of grounds of appeal, the appellant filed:

D9 declaration of Steven A. Jones

V. With its reply to the statement of grounds of appeal, the opponent filed:

D10 Glausch, R., Kieser, M., Maisch, R., Pfaff, G., Weitzel, J. Perlglanzpigmente. Hannover: Curt R. Vincentz Verlag, 1996, Seiten 138 bis 151

VI. By letter dated 22 August 2019, the opponent withdrew its opposition. It was thus no longer a party to the proceedings.

VII. The board issued a communication pursuant to Article 15(1) RPBA 2020 in preparation for the oral proceedings, which had been scheduled upon the appellant's request.

VIII. With a further letter, the appellant filed experimental data and the following document:

D11 S. A. Jones, Colour travel: advanced interference effects, Pigments & Fillers, 2020, 3, Seiten 18 bis 25

IX. On 26 October 2020, oral proceedings before the board took place, at the end of which the board gave its

decision. The opponent did not attend the oral proceedings.

X. The appellant's requests relevant for this decision were as follows.

The appellant requested that the impugned decision be set aside and that the patent in suit be maintained:

- as granted (main request) or, in the alternative;
- in amended form based on the sets of claims of:
  - auxiliary request 1a, filed by letter dated 11 September 2020;
  - auxiliary request 1b, filed during oral proceedings before the board.

The appellant further requested that:

- D10 not be admitted into the proceedings
- the case be remitted to the opposition division for further prosecution if the decision under appeal was set aside and the board did not want to decide on further substantive requirements (novelty and inventive step)

XI. The appellant's arguments, in as much as they are relevant for the present decision, can be summarised as follows.

The combinations of optical thicknesses referred to in claims 1 and 3 to 5 of the main request were set out in tables 2 and 3 of the application as filed. It would have been clear to the skilled person that the 1 micron thick glass substrate used for the pigments in these tables was inert. The colours observed for the three-layer metal oxide stacks were therefore independent of

the substrate; they could be implemented on any substrate. This would also have been evident from D9 (point 3) and D11 (page 19, left column, lines 3 to 6). The general applicability of the combinations of optical thicknesses also followed from the application as filed as a whole. The description (page 3, lines 6 to 11) taught that any encapsulatable smooth and transparent platelet could be used and that its size was not critical *per se*. All the combinations of optical thicknesses listed in tables 1 to 3 were covered by claim 1 as filed. In addition, some of the combinations of those tables were mentioned in the claims as filed in a more general context which did not set any restrictions with regard to additional layers and the thickness of the substrate. Furthermore, although the application as filed (page 13, lines 9 to 13) indicated that the pigments in table 2 were produced by the sol-gel technique, it could not be inferred from this that the pigments necessarily had to consist of the substrate and the three-layer metal oxide stack as argued by the opponent. The claimed subject-matter of the main request therefore met the requirements of Article 123(2) EPC. The same applied, *mutatis mutandis*, to auxiliary requests 1a and 1b.

D1 (example 1) and example 1 of the patent in suit reported different thicknesses for the metal oxide layers simply because D1 reported geometric thicknesses whereas the patent in suit reported optical thicknesses. The opponent's argument that no method allowed very small differences in the optical thickness to be achieved was merely an unsubstantiated allegation. There was no lack of sufficiency.

XII. The opponent's arguments, in as much as they are relevant for the present decision, can be summarised as follows.

In view of tables 2 and 3 of the application as filed, the subject-matter of claims 1 and 3 to 5 of the patent in suit as granted was an unallowable intermediate generalisation. This was because the claims allowed the substrate to have an arbitrary thickness and because the three-layer metal oxide stack on top of the substrate could also comprise further metal oxide layers. Thus, the claimed subject-matter of the main request did not meet the requirements of Article 123(2) EPC.

Both in example 1 of D1 and example 1 of the patent in suit, pigments were prepared with a three-layer metal oxide stack on top of the substrate. Although both examples were identical, the thicknesses reported in D1 and the patent in suit for the three metal oxide layers were different. Furthermore, claim 1 covered nine different metal effect pigments, each having a different metal oxide stack. However, between some of these different stacks, the optical thickness of a given layer (i.e. the first, second or third layer) differed only marginally, e.g. by only 3 nm. No method allowed such small differences in the optical thickness to be achieved. Therefore, the invention of the patent in suit was not sufficiently disclosed.

Reasons for the Decision

Admittance of D10

The opponent filed D10 with its reply to the statement of grounds of appeal. The appellant requested that D10 not be admitted into the proceedings.

The opponent did not explain why it filed D10 only in appeal. It could and should have been filed in first-instance proceedings because the appellant's main request in appeal (the patent as granted) was the same as in first-instance proceedings. Therefore, during the oral proceedings, the board decided not to admit D10 into the proceedings pursuant to Article 12(4) RPBA 2007 in conjunction with Article 25(2) RPBA 2020.

Main request (patent as granted) - Article 100(c) EPC

1. The independent claims 1 and 3 to 5 read as follows.

Claim 1

"*A multilayer effect pigment comprising: a transparent substrate having a layer of titanium dioxide thereon; a layer of silicon dioxide on said titanium dioxide layer; and an outermost titanium dioxide layer placed on said silicon dioxide layer, wherein said inner titanium dioxide layer, said silicon dioxide layer, and the outermost titanium dioxide layer have optical thicknesses of*
203 ± 12 nm, 117 ± 8 nm and 203 ± 12 nm respectively; or
203 ± 12 nm, 58 ± 8 nm and 227 ± 12 nm respectively; or

203 ± 12 nm, 114 ± 8 nm and 205 ± 12 nm respectively; or
203 ± 12 nm, 111 ± 8 nm and 208 ± 12 nm respectively; or
203 ± 12 nm, 108 ± 8 nm and 208 ± 12 nm respectively; or
203 ± 12 nm, 105 ± 8 nm and 210 ± 12 nm respectively; or
203 ± 12 nm, 102 ± 8 nm and 212 ± 12 nm respectively; or
203 ± 12 nm, 99 ± 8 nm and 212 ± 12 nm respectively; or
203 ± 12 nm, 96 ± 8 nm and 215 ± 12 nm respectively;
said pigment being yellow."

Claim 3

"*A multilayer effect pigment comprising: a transparent substrate having a layer of titanium dioxide thereon; a layer of silicon dioxide on said titanium dioxide layer; and an outermost titanium dioxide layer placed on said silicon dioxide layer wherein said inner titanium dioxide layer, said silicon dioxide layer, and said outermost titanium dioxide layer have optical thicknesses of*
243 ± 12 nm, 58 ± 8 nm and 267 ± 12 nm respectively; or
243 ± 12 nm, 117 ± 8 nm and 248 ± 12 nm respectively;
said pigment being red."

Claim 4

"*A multilayer effect pigment comprising: a transparent substrate having a layer of titanium*

dioxide thereon; a layer of silicon dioxide on said titanium dioxide layer; and an outermost titanium dioxide layer placed on said silicon dioxide layer wherein said inner titanium dioxide layer, said silicon dioxide layer, and the outermost titanium dioxide layer have optical thicknesses of
372 ± 12 nm, 58 ± 8 nm and 67 ± 12 nm respectively; or
143 ± 12 nm, 58 ± 8 nm and 45 ± 12 nm respectively; or
95 ± 12 nm, 58 ± 8 nm and 72 ± 12 nm respectively; or
107 ± 12 nm, 58 ± 8 nm and 64 ± 12 nm respectively; or
265 ± 12 nm, 117 ± 8 nm and 265 ± 12 nm respectively;
said pigment being violet."

Claim 5

"*A multilayer effect pigment comprising: a transparent substrate having a layer of titanium dioxide thereon; a layer of silicon dioxide on said titanium dioxide layer; and an outermost titanium dioxide layer placed on said silicon dioxide layer wherein said inner titanium dioxide layer, said silicon dioxide layer, and the outermost titanium dioxide layer have optical thicknesses of*
143 ± 12 nm, 58 ± 8 nm and 72 ± 12 nm respectively; or
119 ± 12 nm, 58 ± 8 nm and 86 ± 12 nm respectively; or
131 ± 12 nm, 58 ± 8 nm and 79 ± 12 nm respectively; said pigment being blue."

Thus, claims 1 and 3 to 5 relate to multilayer effect pigments being yellow, red, violet and blue, respectively. These pigments have the same general structure and comprise a stack of three layers of metal oxides, namely titanium dioxide, silicon dioxide and titanium dioxide (in that order) on a transparent substrate. Furthermore, each claim lists a number of specific alternative stacks by indicating the optical thicknesses of the three metal oxide layers that make up the stack.

2. Claim 1 as filed reads as follows:

> "*A multilayer effect pigment comprising:*
> *a transparent substrate having a layer of titanium dioxide thereon, said layer having an optical thickness of about 85 to 385 nm,*
> *a layer of a low refractive index material on said titanium dioxide layer and an outermost layer of a high refractive index material placed on said low refractive index material layer,*
> *said high refractive index material comprises titanium dioxide having an optical thickness of from about 45 to 420 nm and the low refractive index material is silicon dioxide having an optical thickness of about 30 to 120 nm, and wherein at least one layer has an optical thickness which is different from all of the other layers, whereby the pigment is not a quarter-wave stack.*"

3. The values for the optical thicknesses of the specific stacks in claims 1 and 3 to 5 are disclosed in tables 2 and 3 of the application as filed. These tables show the results of computer simulations of specific pigments. Each of these pigments consists of a 1 micron thick glass substrate and a three-layer stack of

titanium dioxide, silicon dioxide and titanium dioxide, each layer having a specific optical thickness. In the case of table 2, it is additionally stated that the results obtained by simulation agreed with those of pigments actually produced. In addition, tables 2 and 3 indicate, *inter alia*, the colour of each pigment.

4. As is clear from the preceding point, the pigments of tables 2 and 3 consist of a 1 micron thick glass substrate and a three-layer stack of titanium dioxide, silicon dioxide and titanium dioxide, each layer having a specific optical thickness. This assessment is independent from the technique used to prepare the pigments. The appellant's argument (letter of 9 January 2020, page 4, last paragraph, to page 5, second paragraph) as to why the opponent's argument based on the preparation technique used is not convincing is therefore not relevant.

By contrast to the pigments of tables 2 and 3 of the application as filed, claims 1 and 3 to 5 merely mention a "*transparent substrate*" without specifying the substrate material or its thickness. These claims also allow for the presence of additional layers of, for example, metal oxides of any thickness on the three-layer metal oxide stack ("*multilayer effect pigment **comprising***", emphasis added). It follows that the subject-matter of claims 1 and 3 to 5 represents a generalisation of the specific pigments disclosed in tables 2 and 3 of the application as filed but that it is still more specific than the original definition of the invention in general terms (see claim 1 as filed above). The subject-matter of claims 1 and 3 to 5 amounts to an intermediate generalisation.

5. Such an intermediate generalisation cannot be allowable simply because, as argued by the appellant, all the pigments listed in tables 2 and 3 of the application as filed fall within the subject-matter of claim 1 as filed. If this argument were accepted, any intermediate generalisation would be allowable. This, however, would clearly be contrary to the settled case law of the boards (Case Law of the Boards of Appeal of the European Patent Office, ninth edition, 2019, II.E.1.9). The appellant also argued that the application as filed as a whole taught the general applicability of all the optical thickness combinations in tables 2 and 3 and hence that they could be isolated from the specific pigment embodiments disclosed. Whether this is convincing will be assessed in the following.

6. It is well-known that a substrate or a metal oxide layer with a thickness in the wavelength range of visible light is optically active, i.e. it influences the optical properties of the object comprising it. In its communication pursuant to Article 15(1) RPBA 2020, the board referred to the extensive discussions of interference in D5 (chapter 2.1) and D8 (chapters II.A and II.B) in this context. This was not contested by the appellant in the further course of the appeal proceedings. It follows that if the pigments in tables 2 and 3 of the application as filed are modified by the use of a very thin substrate or one or more very thin additional metal oxide layers on top of the three-layer metal oxide stack, the colour will change and no longer correspond to that indicated for the respective pigments in tables 2 and 3. Consequently, the colour indicated in tables 2 and 3 of the application as filed is inextricably linked not only to the specific three-layer metal oxide stack but also to the two following features of the pigments of these tables.

(i) The pigment comprises a 1 micron thick substrate (regarding the "glass" substrate material, see further below).

(ii) The pigment consists of a substrate and the specific three-layer metal oxide stack reported in the tables, i.e. it does not comprise any further metal oxide layers on top of the three-layer metal oxide stack.

These additional features (i) and (ii) cannot therefore be excluded from the claims without generating an unallowable intermediate generalisation. However, as clear from the above, claims 1 and 3 to 5 do not contain these additional features.

6.1 With reference to D9 (point 3), D11 (page 19, left column, lines 3 to 6) and the experimental data submitted with the letter dated 11 September 2020, the appellant argued that the 1 micron thick glass substrate of the pigments in tables 2 and 3 of the application as filed was an optically inactive ("inert") substrate. It would have been clear to the skilled person that this substrate did not affect the optical properties of the three-layer metal oxide stack on top of it and that the properties of the specific stacks were also obtained on other substrates. The combinations of optical thicknesses in tables 2 and 3 were therefore not inextricably linked to the use of a 1 micron thick glass substrate. This also followed from the description as filed stating that "*[a]ny encapsulatable smooth and transparent platelet can be used as the substrate*" and that "*[t]he size of the platelet shaped substrate is not critical per se and can be adapted to the particular use*" (page 3, lines 6 to 11).

The board agrees with the appellant that it would have been readily appreciated by the skilled person that a substrate of sufficiently high thickness, such as 1 micron, was optically inactive and did not have a significant influence on the colour resulting from the three-layer metal oxide stack on the substrate. With such a sufficiently high thickness, the skilled person would also have realised that the colours indicated in tables 2 and 3 as filed were not dependent on the actual substrate material used. However, the substrates of claims 1 and 3-5 are not limited to those which are optically inactive or those which have a specific (minimum) thickness. Quite to the contrary, claims 1 and 3 to 5 allow for very thin substrates to be used which, as explained above and also conceded by the appellant (letter dated 11 September 2020: page 5, paragraph 2), are optically active. The appellant's argument is therefore convincing only in so far as it concerns an interchangeability of substrate materials of a sufficiently thick substrate. However, it is not convincing in so far as it suggests that a substrate of any thickness had no influence on the optical properties of the pigment.

6.2 The appellant also argued that some of the combinations of optical thicknesses in tables 1 to 3 were disclosed in the claims as filed in a more general context, i.e. without features (i) and (ii) mentioned above. It would therefore have been clear to the skilled person that the other combinations of optical thicknesses in these tables were also disclosed in that more general context. Hence, the subject-matter of claims 1 and 3 to 5 was directly and unambiguously derivable from the application as filed.

The board cannot agree with this argument, at least not in this case. Each of the pigments in tables 1 to 3 is a specific embodiment. Therefore, even if the skilled person would have inferred from the claims as filed that some of these specific embodiments could be generalised, they could not, in the light of their common general knowledge (see above), have assumed that the same applies to the other pigments listed in the tables but not in the claims as filed.

7. For the reasons given above, the subject-matter of claims 1 and 3 to 5 amounts to an unallowable intermediate generalisation. The main request is therefore not allowable.

Auxiliary request 1a - Article 123(2) EPC

8. The claims of auxiliary request 1a differ from those of the main request only in that claims 1 and 3 to 5 contain the following additional feature:

> "*wherein the transparent substrate is a 1 micron thick natural or synthetic mica, kaolin or glass flake substrate*"

As clear from the discussion of the main request, this additional feature addresses the objection related to feature (i) above. However, claims 1 and 3 to 5 are still not restricted with regard to the possibility of additional metal oxide layers on the three-layer metal oxide stack (see feature (ii) above). For the reasons given above, the subject-matter of claims 1 and 3 to 5 does therefore still amount to an unallowable intermediate generalisation and auxiliary request 1a is not allowable.

Auxiliary request 1b

9. Amendments (Article 123(2) EPC)

The claims of auxiliary request 1b differ from those of the main request in that claims 1 and 3 to 5 contain the following additional feature:

> "*wherein the transparent substrate is a 1 micron thick natural or synthetic mica platelet substrate, 1 micron thick kaolin platelet substrate or 1 micron thick glass flake substrate*"

Furthermore, the multilayer effect pigments of claims 1 and 3 to 5 have been limited in so far that they now consist of the substrate and the three-layer metal oxide stack on top of it. These two limitations address the objections related to features (i) and (ii) above. The subject-matter of claims 1 and 3 to 5 does therefore not amount to an intermediate generalisation but now properly reflects specific pigment embodiments of tables 2 and 3 of the application as filed. Furthermore, as explained above under point 6.1, the skilled person would have realised that it was the sufficiently high thickness of the substrate which made it optically inactive and not the substrate material itself. The skilled person would therefore have understood that, provided that the substrate material was of sufficiently high thickness, the glass substrate used for the pigments in tables 2 and 3 of the application as filed could be replaced by other substrate materials without significantly changing the colour resulting from the three-layer stack of metal oxides on it. The list of substrate materials now recited in claims 1 and 3 to 5 is based on page 3, lines 6 to 8, of the application as filed.

Furthermore, claim 2 is based on the combination of claims 1 and 4 as filed. Claim 6 is identical to claim 9 as filed. Claims 7 and 8 are based on claims 8 and 10 as filed, respectively.

Thus, the claimed subject-matter of auxiliary request 1b meets the requirements of Article 123(2) EPC.

10. Amendments (Article 123(3) and 84 EPC)

Compared to the claims as granted, the scope of the claims of auxiliary request 1b has clearly been restricted. The board is also satisfied that the claims of auxiliary request 1b are clear.

The claims of auxiliary request 1b therefore also meet the requirements of Articles 123(3) and 84 EPC.

11. Sufficiency of disclosure (Article 83 EPC)

11.1 Both D1 (example 1) and the patent in suit (example 1) describe a process for the manufacture of a multilayer effect pigment. Since both processes are identical, identical products should be obtained in both cases. However, while the layer thicknesses of the metal oxide stack reported for the product in D1 (62 nm, 80 nm and 57 nm, see paragraph [0034]) do not fall within any of the ranges of the granted claims, the product of example 1 in the patent in suit is stated to be according to the invention (paragraph [0035]). The opponent considered this as proof that the invention of the patent in suit was not sufficiently disclosed. According to the appellant, this difference in thicknesses was due to the fact that D1 reported geometric thicknesses whereas the patent in suit

reported optical thicknesses. According to the patent in suit (paragraph [0023]), the optical thickness was the product of the actual geometric thickness of the layer and the refractive index of the material of the layer.

Even if, for the sake of argument, the thicknesses reported in D1 were optical thicknesses and hence different from the ones required by claim 1, this would still not result in insufficiency of disclosure. Since the process disclosed in D1 and example 1 of the patent in suit are identical, it could at most be concluded that the optical thicknesses actually obtained in example 1 of the patent in suit are as reported in D1, implying that example 1 of the patent in suit is not according to the claims. The fact that an example in a patent is not according to its invention does not necessarily imply that the invention is insufficiently disclosed. As long as the remainder of the patent taken together with common general knowledge would have allowed the skilled person to put the invention into practice, sufficiency is to be acknowledged. In this context, the board shares the appellant's view that the skilled person would have known how to prepare multilayer effect pigments falling within the subject-matter of the claims of auxiliary request 1b and thus having layers with optical thicknesses as defined in the claims, based on D9, points 4 and 5.

11.2 The opponent also argued that claim 1 covered nine different metal effect pigments, each having a different metal oxide stack. However, between some of these different stacks, the optical thickness of a given layer (i.e. the first, second or third layer) differed only marginally, e.g. by only 3 nm. No method allowed such small differences in optical thickness to

be achieved. However, the opponent did not provide any proof for this allegation. This objection must therefore fail.

11.3 In summary, Article 83 EPC does not prejudice maintenance of the patent in suit based on the set of claims of auxiliary request 1b.

12. Remittal (Article 111(1) EPC)

As clear from point II above, the decision under appeal deals exclusively with the grounds for opposition pursuant to Article 100(b) and 100(c) EPC. An assessment of the opponent's arguments put forward under the ground for opposition pursuant to Article 100(a) EPC has not yet taken place. To give the appellant the possibility to have the matter reviewed in first-instance proceedings and on appeal, and in line with its request, the case is remitted 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 opposition division for further prosecution.

The Registrar: The Chairman:

N. Maslin M. O. Müller

Decision electronically authenticated