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**Datasheet for the decision
of 26 January 2016**

Case Number: T 1501/13 - 3.3.06

Application Number: 04701488.1

Publication Number: 1587881

IPC: C09C1/00

Language of the proceedings: EN

Title of invention:

MULTI-LAYER EFFECT PIGMENT WITH THE OUTERMOST LAYER HAVING A
LARGER THICKNESS

Patent Proprietor:

BASF Corporation

Opponent:

ECKART GmbH

Headword:

Multi-layer effect pigment/BASF

Relevant legal provisions:

EPC Art. 83, 52(1), 54, 111(1)

Keyword:

Sufficiency of disclosure - (yes)

Novelty - main request (yes)

Remittal (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 1501/13 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 26 January 2016

Appellant: BASF Corporation
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 15 April 2013
revoking European patent No. 1587881 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman B. Czech
Members: E. Bendl
C. Heath

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division to revoke the European patent No. 1 587 881.
- II. The patent had been opposed on the grounds of insufficiency of disclosure, lack of novelty and lack of inventive step. In the appealed decision the opposition division concluded *inter alia* that the amended claims according to the then pending main request and first auxiliary request met the requirements of Articles 84 and 123 EPC, but that the subject-matter of claim 1 thereof lacked novelty over (only) one of the six documents cited against novelty by the opponent, namely D2: US 2002/0104461 A1.

The opposition division also took into account document TR: An experimental report by Mr. Grüner, dated 12 February 2013.

- III. The independent claims according to this main request read as follows:

"1. A multilayer effect pigment comprising:

a transparent substrate having a layer of a transparent high refractive index material thereon,

at least one pair of transparent layers, one of which is a high refractive index material and the other of which is a low refractive index material, wherein the low refractive index material is silicon dioxide having a thickness in the range of 40 to 80 nm,

wherein the total number of layers is an odd number, each layer differs in refractive index from any adjacent layer by at least about 0.2 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."

"7. In a paint or ink composition including a pigment, the improvement which comprises said pigment being the effect pigment of claim 1."

"8. In a plastic composition including a pigment, the improvement which comprises said pigment being the effect pigment of claim 1."

"9. In a cosmetic composition including a pigment, the improvement which comprises said pigment being the effect pigment of claim 1."

Claims 2 to 6 are dependent on claim 1 and describe more specific embodiments of the claimed pigment.

IV. In its statement of grounds, the appellant (patent proprietor) argued that the opposition division erred in its judgement, since the subject-matter of the (re-filed) claims according to the main request and the first auxiliary request that had been pending before the opposition division was novel. D2 did not directly and unambiguously disclose a pigment which was "*not a quarter-wave stack*". The claimed subject-matter was novel and inventive.

Nevertheless, it filed six further sets of amended claims as auxiliary requests 2 to 7.

The appellant also asked for the remittal of the case to

the opposition division for consideration of inventive step.

V. The respondent (opponent) rebutted the appellant's arguments and maintained *inter alia* that the claimed invention was insufficiently disclosed and that the subject-matter of claim 1 of the main request lacked novelty, or at least an inventive step, over the disclosure of document D2. It requested that a final decision be taken by the board, also regarding the issue of inventive step.

VI. In preparation for the oral proceedings, the board issued a communication, pointing out *inter alia* issues possibly to be debated further as regards the pending main request, including the interpretation of claim 1 (feature "*at least one layer ...quarter-wave stack*"), sufficiency of disclosure and novelty over D2. It indicated its intention to remit the case to the opposition division for the examination of inventive step if one of the pending claim requests were found to overcome all the other objections addressed in the communication.

VII. With its reply, the appellant submitted document

D11: A declaration by Mr Steven A. Jones dated
18 December 2015,

concerning the actual disclosure of D2, and document

D12: A. McLeod, "The Quarterwave Stack: 1. Early History", Society of Vacuum Coaters Bulletin, 2012 Summer Bulletin, pages 22-27.

In a subsequent letter, it withdrew its request for

admission of post-published document D12 into the proceedings "for procedural economy".

VIII. The respondent, in its reply of 18 January 2016, merely announced that it would not attend the oral proceedings.

IX. Oral proceedings were held on 26 January 2016 in the absence of the respondent. The issues discussed were the interpretation of claim 1, sufficiency, novelty over D2 (claim 1 of the main request) and the appellant's request for remittal. In the course of the oral proceedings, reference was also made to the contents of D11 and of D12.

X. Requests:

The appellant requested that the appealed decision be set aside and the patent be maintained based on the main request, or on one of the auxiliary requests 1 to 7, all filed the grounds of appeal.

The respondent requested in writing that the appeal be dismissed.

XI. The arguments of the **appellant** of relevance to the present decision can be summarised as follows:

Sufficiency of disclosure

- The person skilled in the art knew what a "quarter-wave stack" was. Reference was made to the definition given in paragraph [0004] of the patent in suit and in the prior art documents cited in this paragraph. The wording in claim 1 reading "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" related to two different requirements, since the different optical thickness of said at least one layer could also be a whole number multiple of the wave length considered, which possibility was excluded by the second requirement.

- The person skilled in the art also knew how to produce quarter-wave stack pigments. Hence, the person skilled in the art obviously knew as well how to produce stacks which were definitely non-quarter-wave stacks.

- At most, there was a grey area at the boundary between quarter-wave and non-quarter-wave stack pigments, in the sense that pigments made to conform as closely as possible to the ideal of a quarter-wave stack could, in reality, slightly differ from the ideal configuration in terms of layer thicknesses, making it difficult to qualify them as quarter-wave or non-quarter-wave stacks. However, such grey area would not hinder the skilled person from putting the claimed invention into practice.

Novelty

- D2 was not novelty destroying, because it did not directly and unambiguously disclose pigments with the claimed combination of features, in particular it did not describe non-quarter-wave stack pigments. The examples of D2 lacked essential details as to processing conditions and (consequently) the properties of the final products obtained. This deficiency could not be overcome by means of the respondent's comparative

test (document TR), supposed to demonstrate allegedly implicit properties of the pigments exemplified in D2. The examples of D2 could therefore not be considered to disclose, directly and unambiguously, pigments with all the features of claim 1 at issue.

Remittal of the case to the department of first instance

- Questions regarding inventive step had not been debated at the oral proceedings before the opposition division and were not addressed in the decision under appeal.
- Therefore, the case should be remitted to the opposition division if the issue of inventive step were to be considered.

The counter-arguments of the **respondent** can be summarised as follows:

Sufficiency of disclosure

- In claim 1 the features reading
 - i) *"wherein at least one layer has an optical thickness which is different from all of the other layers,"* and
 - ii) *"whereby the pigment is not a quarter-wave stack"*meant that one layer had to have an optical thickness different from the other layers, and that this resulted in the non-quarter-wave stack structure of the pigment. The non-quarter stack structure was a consequence of the different optical thickness of said one layer. Hence features i) and ii) were *de facto* one and the same. The appellant considered that features i)

and ii) expressed two distinct requirements. If this view were to be adopted by the board, the claims would be objectionable under Article 83 EPC, since the skilled person would not know which further measures would have to be taken in order to obtain a non-quarter-wave stack, i.e. how to reproduce the claimed invention. Such lack of information thus amounted to an insufficiency of the disclosure.

- According to a second line of argument, when fabricating quarter-wave stacks, the pigments obtained always differed to some extent from the ideal configuration in terms of their (real) optical layer thicknesses. Since the required difference in terms of optical thicknesses of adjacent layers was not quantified in claim 1, any non-ideal quarter-wave produced in reality could be considered to be a non-quarter-wave stack pigment. The skilled person would therefore not know where the boundary was between a real (non-ideal) quarter-wave stack pigment and pigments as claimed were to be seen. Finding out where this boundary was in terms and attempting to re-work the claimed invention was not possible without undue burden.

Novelty

- D2 was novelty-destroying for claim 1. D2 disclosed multilayer effect pigments with a transparent substrate (like mica) and an SiO₂ layer of preferably 30 to 80 nm thickness, sandwiched between two TiO₂ layers.
- As apparent from document TR, the pigments obtained according to examples 1 to 4 of D2 (implicitly) comprised non quarter wave stacks with

an SiO₂ layer thickness as required in claim 1 at issue.

- In particular, the silvery colour of the pigments described in D2 implied that they were non quarter-wave stacks.

Remittal

- Remittal of the case would delay the issuance of the final decision. For the sake of legal certainty and procedural economy, a final decision should thus be reached by the board at the oral proceedings.

Reasons for the Decision

Procedural issues

1. Admissibility of late-filed items of evidence
 - 1.1 Documents D11 and D12 were only filed by the appellant after the parties had been summoned to oral proceedings.
 - 1.2 D12 is a post-published, review-type document which is of relevance insofar as it confirms what was common general knowledge regarding quarter-wave stacks long before the filing date of the patent in suit.

Declaration D11 provides technical comments and data supposed to counter statements made by the respondent in its reply to the statement of grounds regarding the allegedly implicit disclosure of document D2.

- 1.3 The admissibility of these documents into the proceedings was not called into question by the

respondent.

- 1.4 Taking into account the above, the board decided to admit D11 and D12 into the proceedings despite their late filing (Article 114(2) EPC and Article 13(3) RPBA).

Main request

2. Amendments

The opposition division decided that the claims according to the request at issue were not objectionable under Articles 84 or 123(2), (3) EPC. This finding was not challenged by the respondent and the Board has no reason for calling it into question, either.

3. Interpretation of claim 1

- 3.1 The parties took different views regarding the proper interpretation of the following features of claim 1:

- i) *"wherein at least one layer has an optical thickness which is different from all the other layers,"*
- ii) *"whereby the pigment is not a quarter-wave stack".*

Whereas the appellant argued that i) and ii) were different features, the respondent regarded feature ii) to be a consequence of feature i).

- 3.2 For the board, the wording of claim 1 leaves room for both interpretations, considering that the term *"whereby"* is somewhat ambiguous in that it may, but need not necessarily, express a causal relationship between said features i) and ii).

Therefore, the corresponding text of the description of

the patent in suit may be referred to and used in interpreting the features in question.

- 3.3 Paragraph [0004] of the patent in suit refers to prior art relating to "*multi-coated effect pigments*" and contains the following statements (emphasis added):

*"[A]ll of such prior art requires that **each coated layer possess an optical thickness equal to a whole number multiple of a one-quarter of the wave-length** at which interference is expected. Such construction of the so-called quarter-wave stacks is widely accepted and implemented in the thin film industries."*

- 3.4 It was not disputed by the respondent that the definition of "*quarter-wave stacks*" contained in this paragraph was common general knowledge and thus known to the skilled person.

The respondent even explicitly referred to said definition in its reply to the grounds of appeal (page 7, point 2.3), stating (translation by the board): "The person skilled in the art knows, on the basis of its common general knowledge in the technical field concerned, that a quarter-wave stack is at hand if the conditions defined in paragraph [0004] of the patent in suit are met" ("Der Fachmann weiß auf Grund seines Fachwissens, dass ein quarter-wave stack dann vorliegt, wenn die in Absatz [0004] des Streitpatents angegebenen Bedingungen erfüllt sind").

- 3.5 Irrespective of any causal relationship between features i) and ii), the wording of claim 1 clearly requires the multi-layer effect pigment claimed to be of a non-quarter-wave type, i.e. to be **different** from the ones

mentioned as prior art in paragraph [0004] of the patent in suit.

3.6 It follows, however, from the definition of quarter-wave stacks contained in paragraph [0004], that a stack in which **not** each of the individual layers has "*an optical thickness equal to a whole number multiple of a one-quarter of the wave-length at which interference is expected*" is **not** a quarter-wave stack.

3.6.1 In other words, a multilayer effect pigment comprising one layer having an optical thickness different from that of all the other layers, but being a whole number multiple of one-quarter of the wave-length considered, would still *in toto* meet the quarter-wave stack definition. Such a pigment is excluded by the requirement of feature ii).

3.6.2 Since a pigment is not necessarily a non-quarter-wave stack simply because one of the layers has an optical thickness different from the one of the other layers, the requirements of features i) and ii) are **not** one and the same as argued by the appellant in line with the reasons given in the decision under appeal.

4. Sufficiency of disclosure (Article 83 EPC)

4.1 According to a first line of argument of the respondent based (*arguendo*) on the interpretation adopted by the board (3.6, *supra*), the skilled person would not know which additional requirements had to be met, in addition to the different optical thickness of at least one layer (feature i, *supra*), such that a non-quarter-wave stack would be obtained. The person skilled in the art would thus not know how to carry out the invention.

4.2 This argument does not convince the board. Firstly, it was not in dispute that the coating techniques required were known to the skilled person. Secondly, considering the generally accepted definition of a quarter-wave stack (paragraph [0004] of the patent), the board holds that the person skilled in the art would know that by setting the optical thickness of (at least) one of the layers such that it differed from the other layers **and** such that it was not a "*whole number multiple of a one-quarter of the wave-length*" considered, he would obtain a pigment with features i) **and** ii).

4.3 According to a second argument of the respondent, the invention was insufficiently disclosed because the skilled person would not know where exactly the boundary was between multi-layer pigments with quarter-wave stacks and those with non-quarter-wave stacks.

4.3.1 In this respect, the board observes that it is undisputed that quarter-wave stack optical coatings, their specific properties and methods for their production were known. This is also apparent from the acknowledgement of the prior art in paragraph [0004] of the patent and from D12 (page 22, Section "What is a quarter-wave stack?", second full paragraph, first two sentences, in combination with page 25, right-hand column, first full paragraph: "... by the early 1950's, the quarter-wave stack was well understood. Its properties could be readily calculated and it was becoming a very important structure in optical coatings.").

4.3.2 It is also not disputed that a skilled person would be able to produce and identify (absence of said specific properties) a multi-layer coated pigment which does clearly not comprise a quarter-wave structure. The

appellant's argument was rather that any quarter-wave stack pigment produced in reality would always differ to some extent from an ideal quarter wave stack due to the difficulties associated with the exact setting of the optical and physical thicknesses of the multiple layers deposited on the substrate and may, therefore, be considered as non-quarter-wave stack pigment.

4.3.3 The board therefore holds that the person skilled in the art is in a position to distinguish, for a given substrate and given coating materials, between a pigment clearly comprising a quarter-wave stack (displaying also the characteristic optical properties thereof) and a pigment clearly not comprising a quarter-wave stack (not displaying said properties). The skilled person is not hindered from producing and ascertaining the nature of both types of pigments.

4.3.4 The board does not exclude that it may occur that a real pigment produced displays the properties of a quarter-wave stack, but so faintly that it becomes difficult to qualify it as either a quarter-wave or a non-quarter-wave stack type pigment. This is, however, an issue of clarity (Article 84 EPC) rather than sufficiency (Article 83 EPC). This ambiguity, or fuzzy boundary, does not, however, make it impossible to work the invention at all.

4.4 Thus, in the board's judgement, the claimed invention is disclosed in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art without undue burden. Hence, the requirements of Article 83 EPC are met.

5. Novelty

5.1 The only novelty attack maintained by the respondent was based on document D2.

5.2 Claim 1 of D2 is directed to a

"silver-coloured luster pigment comprising a multiply coated platelet-shaped substrate and at least one layer sequence of

- layer (A) a high refractive coating consisting of TiO_2 which has a thickness of 5 - 200 nm,
- layer (B) a colourless coating having a refractive index $n \leq 1.8$ and a thickness of 10 - 300 nm, and
- layer (C) a high refractive coating consisting of TiO_2 which has a thickness of 5 - 200 nm, and optionally
- layer (D) an outer protective layer."

5.3 According to claim 5 of D2, dependent on claim 1, layer (B) comprises silicon dioxide. According to claim 15, dependent on claim 1 but not on claim 5, layer (B) preferably has a thickness of 30 and 80 nm. None of the claims of D2 refers expressly to quarter-wave stacks or non-quarter wave stacks.

5.4 Several choices must thus be made within the total disclosure of D2 to arrive at at a multi-layer effect pigment as defined in claim 1 at issue:

- Silicon dioxide has to be selected for layer (B) from all conceivable compounds having a refractive index ≤ 1.8 ,
- the thickness of of the silicon dioxide layer(s) has to be set to a value within the narrower range of from 40 to 80 nm, and

- the combination of transparent substrate and layers (materials, thicknesses) must be such that a non quarter-wave stack results.

- 5.5 For the skilled person, the combination of features according to claim 1 at issue is thus not directly and unambiguously derivable from the claims of D2 taken alone.
- 5.6 Neither does the general description of D2 contain a more specific teaching in this respect. According to the respondent and the decision under appeal, the examples of D2 describe pigments (implicitly) falling within the ambit of claim 1 at issue, even if features i) and ii) are considered as distinct requirements. In this respect, the board observes the following:
- 5.6.1 Examples 1 to 4 of D2 describe the preparation of silver-colored luster pigments comprising a multiply coated (with $\text{TiO}_2\text{-SiO}_2\text{-TiO}_2$ layer stack) platelet substrate without, however, indicating the optical or physical (geometrical) thickness values and refractive indices of the various layers.

Relying on the results of a comparative test (preparation of a gold-coloured, brilliant effect pigment of the type mica-iron titanate- $\text{SiO}_2\text{-TiO}_2$ pigment; layer thicknesses taken from a SEM picture) presented in document TR, the respondent concluded *inter alia* that the SiO_2 layers of the pigments produced according to said examples 1 to 4 all had thicknesses in the range of from 40 and 80 nm, as required by claim 1 at issue.

- 5.6.2 The board notes that the preparation process of the respondent's comparative example (see test part

"AM-17-003" of document TR) differs from the ones according to the examples of D2 not only in the process conditions, but also in the materials used. Moreover, the mica substrate particles used in the respondent's comparative example have a particle size in the range of from 10 to 50 μm , whereas in the examples of D2 the mica particle size is in the range from 10 to 60 μm . Moreover, none of documents TR and D2 contains indications regarding regarding the actual size distribution. The process conditions during coating (temperatures, concentrations) are different and other parameters like reactor vessel configuration, addition rate and agitation conditions are not even mentioned in D2 and TR although, as pointed out in declaration D11 (point 8), these parameters may have a significant influence on the optical properties of the pigments obtained. This was not disputed by the respondent.

It was furthermore pointed out by the appellant at the oral proceedings that no direct conclusions could be drawn from the starting amount for preparing the pigments, as not all of the used material actually deposited on the substrate.

- 5.6.3 Given the differences between the comparative experiment performed by the respondent and the preparation processes described in examples 1 to 4 of D4, the sheer number of vaguely defined or missing bits of information, and the absence of more precise indications or evidence regarding the optical properties of the pigment of examples 1 to 4 of D2, the board accepts that based on the evidence on file it cannot be concluded with the required degree of certainty whether the pigments resulting from the processes of examples 1 to 4 of D2 are, directly and unambiguously, of the non-quarter-wave or quarter-waves stack type.

- 5.7 The respondent's allegation that D2 necessarily described non-quarter-wave pigments considering the reference to its silvery appearance was rebutted by the appellant with reference to computer simulations mentioned in declaration D11 (points 6 and 7), which appear to show that silvery pigments according to D2 may well be of the quarter-wave stack type. The respondent did not call this into question.
- 5.8 In the board's judgement, based on the above considerations, it has not been convincingly shown that D2 discloses, directly (at least implicitly) and unambiguously, a pigment with all the features of claim 1 at issue.
- 5.9 Hence, the subject-matter of claim 1 of the main request is novel over the prior art invoked by the respondent (Articles 52(1) and 54 EPC).
- 5.10 Consequently, the more specific pigments according to dependent claims 2 to 6, as well as the compositions according to claims 7 to 9 comprising such novel pigments, are novel, too.
6. Remittal to the department of first instance
- 6.1 The board observes that the above findings may have a significant bearing on the decision still to be taken regarding inventive step. This issue was not debated at the oral proceedings before the opposition division and, hence, not addressed in the decision under appeal.
- 6.2 The respondent did not take the opportunity to attend the oral proceedings to further substantiate its request not to remit. In writing, it merely pointed out the

lengthening of the opposition/appeal proceedings implied.

6.3 For the board, the fact that the final decision in this case will be handed down at some later point in time is implicit to any remittal and not, as such, at odds with the requirement for procedural economy.

6.4 Since the main purpose of the appeal proceedings is to review of the decision taken by the department of first instance, the board thus considers it appropriate to remit the present case to the department of first instance pursuant with Article 111(1) EPC, as requested by the appellant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance for further prosecution.

The Registrar:

The Chairman:



D. Magliano

B. Czech

Decision electronically authenticated