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Case Number: T 0225/18 - 3.3.02

Application Number: 11708557.1

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Language of the proceedings: EN

Title of invention:
TITANIUM DIOXIDE

Patent Proprietor:
Huntsman P&A UK Limited

Opponent:
KRONOS INTERNATIONAL, INC.

Headword:

Relevant legal provisions:
EPC Art. 56, 84

Keyword:
Inventive step
Claims - clarity

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Catchword:

Beschwerdekammern

Boards of Appeal

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Case Number: T 0225/18 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 17 November 2022

Appellant: (Opponent)	KRONOS INTERNATIONAL, INC. Peschstrasse 5 51373 Leverkusen (DE)
Representative:	Cohausz & Florack Patent- & Rechtsanwälte Partnerschaftsgesellschaft mbB Bleichstraße 14 40211 Düsseldorf (DE)
Respondent: (Patent Proprietor)	Huntsman P&A UK Limited Titanium House Hanzard Drive Wynyard Park Stockton-on-Tees, TS22 5FD (GB)
Representative:	Barker Brettell LLP 100 Hagley Road Edgbaston Birmingham B16 8QQ (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 19 December 2017 rejecting the opposition filed against European patent No. 2536793 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	M. O. Müller
Members:	P. O'Sullivan
	L. Bühler

Summary of Facts and Submissions

I. The appeal of the opponent (hereinafter appellant) lies from the decision of the opposition division to reject the opposition against European patent 2 536 793.

II. The following document *inter alia* was cited in opposition proceedings:

D1: WO 2009/136141

According to the contested decision, the claims of the patent as granted *inter alia* involved an inventive step over D1 as closest prior art.

III. With the statement of grounds of appeal, the appellant submitted documents D6a, D6b, D9, D10, D10a, D10b, D11, D12a, D12b and D14 to D17, as well as experimental report D18.

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

V. Oral proceedings by videoconference took place on 17 November 2022.

VI. Requests relevant to the present proceedings

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

The patent proprietor (hereinafter respondent) requested as main request the maintenance of the patent as granted, implying dismissal of the appellant's appeal.

Alternatively, it requested maintenance of the patent on the basis of the sets of claims of the first to eighth auxiliary requests submitted with the reply to the statement of grounds of appeal.

The respondent furthermore requested that documents D6a, D6b, D9, D10, D10a, D10b, D11, D12a, D12b, D14 to D17, and experimental report D18, not be admitted into the appeal proceedings.

VII. The appellant's submissions insofar as relevant to the present decision may be summarised as follows:

Main request - inventive step

- The subject-matter of claim 1 lacked inventive step starting from D1 as closest prior art, *inter alia* from example 4C thereof. In particular, the problems referred to by the respondent and set out in the patent were already solved by example 4C of D1. The objective technical problem underlying claim 1 was the provision of an alternative composition with the same good UV protection and acceptable whitening. The selection of the claimed average particle size was routine and based on the teaching of D1 itself.

First auxiliary request - inventive step

- Despite the narrower average particle size range claimed, claim 1 lacked inventive step for the same reasons as provided for claim 1 of the main request.

Second auxiliary request - inventive step

- The added feature in claim 1, namely the percentage weight range of the effect coating material with which the particles were coated, did not further distinguish the subject-matter of claim 1 from example 4C of D1. Hence, claim 1 lacked inventive step for the same reason as claim 1 of the main request.

Third auxiliary request - inventive step

- The patent was silent on any technical effects linked to the additional feature in claim 1, namely an average particle size to average crystal size ratio of less than 1.4. Furthermore, the skilled person would have derived the claimed ratio from D1 by comparison of the ratio of the respective average crystal and average particle sizes provided therein. The objective technical problem hence remained the same as for claim 1 of the main request, and claim 1 lacked inventive step over D1 for the same reasons.

Fourth auxiliary request - inventive step

- The amendment to claim 1, namely the increase in the lower limit for the concentration of particulate material dispersed in the medium, did not further distinguish the subject-matter of claim 1 over example 4C of D1. Hence, claim 1 lacked inventive step for the same reason as claim 1 of the main request.

Sixth auxiliary request - inventive step

- D1 inherently disclosed that the compositions disclosed therein attenuate the effects of UV light on a substrate to solar radiation, as required by use claim 1. Hence, claim 1 lacked inventive step for the same reasons as provided for claim 1 of the main request.

VIII. The respondent's submissions insofar as relevant to the present decision may be summarised as follows:

Main request - inventive step

- Starting from D1 as closest prior art, the claimed subject-matter involved an inventive step. For detailed arguments, reference is made to the reasons for the decision.

First auxiliary request - inventive step

- There was no suggestion in D1 to use titanium dioxide having an average particle size in the narrower range now provided in claim 1. The subject-matter of claim 1 hence involved an inventive step.

Second auxiliary request - inventive step

- D1 as a whole did not teach the combination of features required by claim 1 in order to solve the objective technical problem. Hence the subject-matter of claim 1 involved an inventive step.

Third auxiliary request - inventive step

- The use of an average particle size to average crystal size ratio of less than 1.4 led to a higher value for tint reduction, as well as bluer undertone, both of which were not obvious in view of D1. Proof was not necessary for these effects to be taken into account in the formulation of the objective technical problem. Hence, claim 1 involved an inventive step.

Fourth auxiliary request - inventive step

- D1 as a whole did not teach the combination of features required by claim 1 in order to solve the objective technical problem. Hence the subject-matter of claim 1 involved an inventive step.

Sixth auxiliary request - inventive step

- D1 did not disclose the use of a composition to attenuate the effects of UV light on a substrate exposed to solar radiation, as required by claim 1. Starting from example 4C of D1, the claimed use involved an inventive step.

Seventh auxiliary request - clarity (Article 84 EPC)

- The requirement "*without also increasing UV light activated photocatalytic effects*" in claim 1 was to be assessed relative to the substrate itself as the reference point, before application of the composition of the invention. Claim 1 therefore fulfilled the requirements of Article 84 EPC.

Reasons for the Decision

1. Admittance - documents

The respondent requested that documents D6a, D6b, D9, D10, D10a, D10b, D11, D12a, D12b, D14 to D17, and experimental report D18, submitted by the appellant with the statement of grounds of appeal, not be admitted into the appeal proceedings.

Since none of these documents were required in order for the board to reach a final conclusion on all claim requests (infra), a decision on the admittance thereof was not necessary.

Main request (patent as granted) - Article 56 EPC

2. Background

2.1 The patent relates to UV light attenuating compositions with the purpose of providing UV protection to solar radiation exposed substrates (paragraph [0001]). Prior art forms of titanium dioxide (TiO_2) were known to absorb UV light, but had the disadvantages that UV light could form radicals which could decompose organic matter (photocatalytic effects) and lead to damage. Furthermore, conventional TiO_2 conferred whitening, which was undesirable in many applications, such as in coloured compositions (paragraph [0003]). Accordingly, the patent set out to produce material that could be used to increase the UV light protective capability of a sun-exposed item, without also increasing the UV light activated photocatalytic effects (i.e. radical formation; paragraph [0004]).

2.2 Contested claim 1 of the main request reads as follows:

"1. *A composition imparting UV protective capability, the composition comprising:*

a coated particulate material having a substantially rutile crystal habit and an average particle size greater than or equal to 0.5 µm, and

a medium, wherein the medium is a component or combination of components within which the coated particulate material can be dispersed,

wherein the particulate material is dispersed in the medium at a concentration that is within a range of from 1% by volume to 40% by volume, based on the total volume of composition,
wherein the particulate material is selected from titanium dioxide, doped titanium dioxide and a mixture thereof, and
wherein the particulate material is coated with one or more inorganic pigment coating that may be used to impart effects."

3. Closest prior art

3.1 The appellant submitted that D1 was a suitable closest prior art for the assessment of inventive step in relation to the subject-matter of contested claim 1.

3.2 D1 is a patent document and relates to TiO_2 containing particulate materials and compositions (page 1, lines 2-3). D1 sets out to provide coloured compositions comprising TiO_2 particles which efficiently scatter near infrared (NIR) radiation, have ultra-low photocatalytic activity, and which may be used to improve the lifetime of items exposed to the sun (page 1, lines 4-7; page 2, lines 32-34; page 3, lines 5-13).

3.3 The respondent suggested in written proceedings that D1 was not a suitable starting point for the assessment of inventive step, essentially on the basis that it addressed NIR reflection, and not protection from UV, which was the aim underlying the contested patent. The respondent also suggested that inventive step could be acknowledged on the basis that the claimed subject-matter represented a "problem invention" (Case Law of the Boards of Appeal, 10th Edition, I.D.9.12), i.e. the posing of the problem (UV protection) was itself not obvious.

3.4 However, although D1 is indeed directed to the preparation of compositions comprising TiO_2 particles with high NIR radiation scattering (e.g. D1, page 3, lines 5-16), it also discloses that said particles absorb strongly in the UV region (page 8, lines 30-31), and possess low levels of photocatalytic activity that were previously unattainable (page 4, lines 20-23).

The board therefore sees no reason to exclude D1 as a suitable starting point in the assessment of inventive step. For the same reason, it cannot be accepted that UV protection is an unrecognised problem. Hence, the claimed subject-matter cannot be seen to represent a so-called "problem invention" as argued by the respondent.

3.5 The appellant submitted that *inter alia* example 4C of D1 (page 36) was an appropriate starting point from within the disclosure of D1 for the assessment of inventive step.

3.6 Example 4C of D1 discloses the production of a paint comprising coated TiO_2, and employs the coated TiO_2 of example 3B (page 34), which in turn employs the TiO_2 prepared in example 1C (pages 32-33) as the starting material. Example 1C describes the production of TiO_2 with a mass average crystal size of > 0.5 µm (page 34, line 14). These crystals are used to prepare the large crystal TiO_2 of example 3B by a process which involves milling (page 34, lines 23-25).

3.7 The respondent submitted that without hindsight, there was no reason why the skilled person would start specifically from example 4C of D1. There was no indication that in D1 that specifically example 4C, modified as required according to contested claim 1, would be useful in protecting from UV radiation whilst conferring less whitening to a coloured product - i.e. essentially the technical problem which the patent set out to solve (infra). Rather, the assessment of inventive step was to be based on what the skilled person would have objectively inferred from D1 as a whole.

3.8 As noted by the appellant however, D1 as a whole teaches the use of a specific particulate coated TiO_2 in order to achieve high NIR scattering, as well as strong UV absorption and low photocatalytic activity (page 7, lines 26-32; page 9, lines 13-18; page 18, lines 8-16). Since example 4C discloses the use of the coated TiO_2 of D1 in a paint, it is evident from the overall disclosure of D1 that the paint thus produced is intended to possess the aforementioned benefits described in general in D1.

Consequently, example 4C of D1 is a suitable starting point within D1 for the assessment of inventive step.

4. Distinguishing features

The sole matter of dispute between the parties was whether the coated particulate material of example 4C of D1 displayed an average TiO_2 particle size greater than or equal to 0.5 µm as required by contested claim 1.

In the following, in the respondent's favour, the board assumes that example 4C of D1 does not directly and unambiguously disclose this feature. Rather, example 4C is silent in relation to the average particle size.

5. Objective technical problem

5.1 According to the respondent, choosing an average particle size within the claimed range had the technical effect of offering more UV protection per unit of visible opacity than conventional pigmentary TiO_2. This meant that for a given level of whitening, more UV protection was provided: the same coating colour, in terms of its lightness, would provide superior UV protection. Equally, for a similar level of UV protection, darker coloured coatings could be prepared than would have been achievable with prior art compositions (see reply to the statement of grounds of appeal, section 2.2, pages 11 and 12).

5.2 In view of the aforementioned effect, the respondent formulated the objective technical problem starting at example 4C of D1 as the provision of a composition providing a dark colour (i.e. less whitening) or a translucent nature while at the same time offering good UV protection, or alternatively as the provision of a composition having improved UV protection, without changing the colour, as compared to coatings based on conventional TiO_2.

As stated by the respondent, both of these problems result from the aforementioned increase in UV protection per unit of visual opacity compared to conventional pigmentary TiO_2. They thus represent two sides of the same coin.

5.3 There is no comparative data on file demonstrating that the claimed average particle size leads to any particular advantage over the particles employed in D1, in particular over example 4C of D1, and none was relied on by the respondent.

5.4 In fact, as argued by the appellant, the problems referred to by the respondent are already solved in D1.

Example 4C of D1 is a paint comprising TiO_2 according to the invention of D1 as set out above. D1 discloses that this material has noticeably diminished reflectance of visible light, which lies in contrast to conventional TiO_2 pigment which is very reflective of visible light and affects the colour of a composition by making it paler. Thus the TiO_2 of D1 blends in a composition with a darker more intensely coloured colorant without affecting the colour as much as conventional TiO_2 (D1, page 3, lines 14-28; page 6, lines 5-12).

5.5 As noted by the appellant, this property is demonstrated in example 5 of D1. In this example, PVC plaques were prepared, both with conventional TiO_2 and with the TiO_2 of D1 (page 37, lines 7-10). Reflectance spectra were obtained comparing the tint reduction of the various samples (figure 5). Figure 5 compares the lightness value L* (wherein black is assigned a value 0, and white 100) for different volume concentrations of conventional TiO_2 and the TiO_2 of the invention of D1. It shows that the TiO_2 of D1 exhibited lower visible tint reduction, enabling a higher concentration to be used to achieve a given L* value, relative to conventional TiO_2. Specifically, figure 5 shows, for example, that at a TiO_2 volume concentration of 50%, conventional TiO_2 had an L* value of 40, while also at a volume concentration of 50%, the "large crystal TiO_2" of D1 has an L* value of 30 and was therefore darker. Similarly, the graph demonstrates that at the same L* value, for example 40, the volume concentration of "large crystal TiO_2" (70%) was higher than that for conventional TiO_2 (50%). Furthermore, as set out above, said particulate material absorbs strongly in the UV region (D1, page 7, lines 30-31).

5.6 Thus, it follows from D1 that a higher volume concentration of TiO_2, at least by virtue of the fact that it contains more TiO_2, will provide more UV protection without changing the colour, compared to a lower volume concentration of conventional TiO_2. This corresponds to the second problem set out by the respondent above. It also follows that the first problem set out by the respondent, namely the provision of a composition providing a dark colour (i.e. less whitening) or a translucent nature while at the same time offering good UV protection, is also solved by the titanium dioxide material of example 4C, both problems representing, as set out above, two sides of the same coin.

5.7 The respondent argued that figure 5 of D1 could not be considered as proof that the above-mentioned effects are already present in D1. This argument however failed to convince the board.

5.7.1 First, the respondent submitted that the average particle size of the "standard TiO_2" used in figure 5 of D1 was not known, such that no conclusions could be drawn from the comparison depicted in said figure. The board notes however that the particle size of conventional rutile TiO_2 is provided in D1 as being from 0.25 to 0.40 µm (page 9, lines 32-33). The values of this range are lower than the particle size reported for the TiO_2 of example 5 and figure 5 of D1 (0.85 µm, page 37, line 9). The comparison with conventional TiO_2 in figure 5 is therefore valid.

5.7.2 Second, the respondent submitted that the data in figure 5 only concerned "large **crystal** TiO_2", and not TiO_2 having an average **particle** size as required by contested claim 1. Thus, the comparison did not demonstrate an effect which could be linked specifically to the particle size.

However, as noted by the appellant, as stated above, example 5 on which figure 5 is based employs TiO_2 having a particle size of 0.85 µm. Therefore, while figure 5 may refer to "large crystal TiO_2", the material tested has a particle size which falls within the range of contested claim 1, and is therefore relevant.

5.7.3 Third, the respondent argued that the data in figure 5 concerned compositions comprising a specific resin in addition to TiO_2. Such a composition had a different refractive index to the corresponding crystals lacking the resin. The data depicted in figure 5 of D1 did not pertain to the TiO_2 itself, and thus could not validly demonstrate an effect linked specifically to the TiO_2 particle size.

However, the fact that the TiO_2 of figure 5 is in a composition with a resin cannot render it irrelevant for demonstrating an effect, in particular because contested claim 1 is also directed to a composition the further components of which are not defined. Moreover, the board does not see any reason why the presence of a resin should invalidate the effect deducible from figure 5, and no such reasons, let alone evidence, was submitted by the respondent.

5.7.4 The respondent finally argued that the effect of UV protection demonstrated in D1 was distinct from that underlying the contested patent. Specifically, D1 concerned the durability/weatherability of the composition itself, as demonstrated in particular in example 7 of D1, in which panels were assessed for mass loss after exposure to a weathering instrument. In contrast, the contested patent was concerned with protection of the underlying substrate onto which the composition was applied. Therefore, D1 did not teach the skilled person that the TiO_2 disclosed therein would provide a solution to the problem of UV protection of the **underlying substrate**. Hence, a different objective technical problem was solved in the patent.

The board disagrees. Firstly, the alleged distinction does not feature in the respondent's own formulation of the objective technical problem as set out above. More importantly, the respondent conceded that neither the description of the patent nor the examples demonstrated specifically UV protection of an underlying substrate, as opposed to protection of the composition itself.

Furthermore, the board considers the alleged distinction to be contrived: if a (coating) composition is applied to a substrate, and said composition comprises TiO_2 which, through absorption of UV light, confers a certain durability or weatherability on the coating composition itself, it follows that not only constituents of the coating (such as the resin) physically lying below particles of TiO_2 (relative to the incident UV light), but also any substrate onto which said composition is applied, will also necessarily be protected from UV light. More specifically, incident UV light will be absorbed by the coating composition and any underlying substrate will be necessarily and thus inherently also protected. Indeed, UV protection depends on the integrity of the coating composition, independently of whether the desired protection is of the coating composition itself, or of the underlying substrate to which it is applied. Furthermore, the board notes that the patent does not comprise any other indications which could support said distinction. Indeed, the sole example in the patent does not measure the integrity of the substrate underlying the coating composition of the invention. On the other hand, both the patent and D1 describe the TiO_2 disclosed therein as having reduced UV light activated photocatalytic properties (patent paragraphs [0005] and [0014]; D1, page 2, lines 32-33 and page 4, lines 20-24), and ascribe improved photostability to this effect (patent, D1, page 1, lines 9-11).

5.8 Hence, there are no new technical effects linked to the distinguishing feature of contested claim 1 compared to example 4C of D1.

5.9 It follows that the objective technical problem underlying contested claim 1 starting from example 4C of D1 is as set out by the appellant, namely the provision of an alternative composition with the same good UV protection and acceptable whitening.

6. Obviousness

6.1 The appellant submitted that the solution to the proposed problem, set out in contested claim 1, was obvious *inter alia* in view of D1 alone.

6.2 The board agrees. As set out above, example 4C of D1 does not disclose the average TiO_2 particle size. Hence, the skilled person must select an appropriate size to arrive at the subject-matter of claim 1.

6.3 As noted by the respondent, D1 links the benefit of particulate TiO_2 disclosed therein to a large **crystal** size (e.g. page 3, lines 14-19; page 7, lines 26-32; page 9, lines 13-22). However, the respondent's allegation that D1 does not also connect the average **particle** size to the disclosed benefits is incorrect. Specifically, in addition to teaching specific crystal sizes, D1 clarifies that crystal size is different from particle size (page 9, lines 29, page 10, line 2), and explicitly sets out the average particle size of the particulate material of the invention (page 10, lines 3-8):

"*... the NIR scattering particulate material has an average particle size ... of greater than 0.40µm. For example, the average particle size may be greater than 0.40µm and up to 1.2 µm. Preferably the average size is greater than or equal to 0.45µm, such as from 0.45µm to 1.1µm, e.g. from 0.50 to 1.0µm, more preferably from 0.60 to 1.0µm.*"

Hence, D1 teaches that in relation to the particulate material disclosed therein, crystal size and average particle size go hand in hand.

6.4 The ranges recited for the average particle sizes in D1, including the preferred range, fall within the range recited in contested claim 1. Therefore, wishing to provide an alternative composition to example 4C of D1 as set out above, the skilled person would in a routine manner have chosen from within these ranges, and thereby would have arrived at the subject-matter of contested claim 1.

It follows that the subject-matter of contested claim 1 lacks inventive step pursuant to Article 56 EPC.

First auxiliary request - inventive step (Article 56 EPC)

7. Compared to claim 1 of the main request, claim 1 of the first auxiliary request is amended to stipulate that the average particle size is "*greater than or equal to 0.7 µm and less than or equal to 1.5 µm*". Thus, the lower limit for the particle size is raised from 0.5 to 0.7 µm, and an upper limit of 1.5 µm is introduced.

As argued by the appellant, the conclusion with respect to claim 1 of the main request remains valid for claim

1 of this request, despite the narrower average particle size range. Specifically, the claimed range overlaps significantly with the ranges taught in the description of D1 as set out above. Hence, in the same manner as for claim 1 of the main request, it would have been a routine matter for the skilled person to select a particle size within the range defined in claim 1.

The subject-matter of claim 1 of the first auxiliary request thus lacks inventive step for the same reasons as provided for claim 1 of the main request.

Second auxiliary request - inventive step (Article 56 EPC)

8. Compared to claim 1 of the main request, claim 1 of the second auxiliary request is amended by addition of the text:

"*wherein the particles are coated with the effect coating material at a level of from 0.1% to 7% by weight, relative to the total weight of titanium dioxide or doped titanium dioxide*"

As noted by the appellant, this feature is disclosed in example 4C. Specifically, example 4C employs the coated TiO_2 prepared according to example 3B. Example 3B describes the preparation of coated TiO_2 with 3% silica and 2% alumina (page 34, lines 26-32). Thus the TiO_2 of example 4C is coated with 5% effect coating material, which thus falls within the scope of claim 1. This was not contested by the respondent.

Hence, the subject-matter of claim 1 is not further distinguished from example 4C of D1 compared to claim 1 of the main request. Consequently, the objective technical problem as set out above, and the obviousness of the proposed solution remain the same as for claim 1 of the main request.

The subject-matter of claim 1 of the second auxiliary request thus lacks inventive step for the same reasons as provided for claim 1 of the main request.

Third auxiliary request - inventive step (Article 56 EPC)

9. Compared to claim 1 of the main request, claim 1 of the third auxiliary request comprises the additional text:

"*and wherein the ratio of the average particle size to to average crystal size for the particulate material is < 1.4*"

It was not disputed that this feature represents an additional distinguishing feature of the claimed subject-matter over example 4C of D1.

9.1 The respondent submitted that the use of an average particle size to average crystal size ratio of less than 1.4 led to a higher value for tint reduction, as well as bluer undertone, both of which were not obvious in view of D1. While the respondent conceded that no proof of these effects was at hand, in particular in the example of the patent for which the ratio of average particle size to average crystal size was not provided, it also argued that such proof was not necessary for the effects to be taken into account in the formulation of the objective technical problem.

9.2 The board disagrees. It is established case law that when an alleged technical effect is neither credible nor demonstrated by evidence, it cannot be taken into account in the formulation of the objective technical problem. In the present case, in the absence of any such evidence, there is no reason to consider the alleged effects as credible. Therefore, the objective technical problem underlying claim 1 remains the same as for claim 1 of the main request.

9.3 The skilled person starting at example 4C of D1 would be required to choose an appropriate ratio of average particle size to crystal size. The arbitrary selection of such a ratio is however within the routine abilities of the skilled person and for this reason alone cannot contribute to inventive step. Furthermore, while D1 does not explicitly teach a ratio, such ratio would be arrived at from working within the preferred ranges provided in D1 for both average crystal size and average particle size (e.g. page 9, lines 13-18 and page 10, lines 3-8). The respective ranges taught include the ratio recited in claim 1 (e.g. an average crystal size of more preferably 0.60µm or greater, and an average particle size of more preferably from 0.60 to 1.0 µm). Furthermore, at least example 5 employs TiO_2 having a ratio falling within the claimed range (example 5, page 37, lines 8-10, ratio = 0.88 (0.85/0.97)). Hence, by following the teaching of D1 the skilled person would choose a ratio from within the range recited in claim 1.

9.4 Consequently, for this reason, in addition to the reasons provided for claim 1 of the main request, claim 1 of the third auxiliary request lacks inventive step pursuant to Article 56 EPC.

Fourth auxiliary request - inventive step (Article 56 EPC)

10. Compared to claim 1 of the main request, in claim 1 of the fourth auxiliary request the lower limit for the concentration range of the particulate material dispersed in the medium was raised from 1% to 5% by volume.

As stated by the appellant, in example 4C of D1, TiO_2 was employed in an amount of about 23% v/v (D1, page 36, lines 16-17), which falls within the claimed range of 5 - 40% by volume. This was not disputed by the respondent. Hence, the subject-matter of claim 1 is not further distinguished from example 4C of D1 compared to claim 1 of the main request. Consequently, the objective technical problem set out above, as well as the obviousness of the proposed solution, remain the same as for claim 1 of the main request.

The subject-matter of claim 1 of the fourth auxiliary request thus lacks inventive step for the same reasons as provided for claim 1 of the main request.

Fifth auxiliary request - inventive step (Article 56 EPC)

11. Compared to claim 1 of the main request, claim 1 of the fifth auxiliary request is amended by the qualification that the average particle size is "*as determined by X-ray sedimentation*".

At oral proceedings, the respondent agreed that the amendment to claim 1 of this request was intended to overcome an objection of lack of sufficient disclosure, and did not change the situation with regards to inventive step compared to claim 1 of the main request.

The subject-matter of claim 1 of the fifth auxiliary request thus lacks inventive step for the same reasons as provided for claim 1 of the main request.

Sixth auxiliary request - inventive step (Article 56 EPC)

12. Compared to claim 1 of the main request, claim 1 of the sixth auxiliary request is essentially amended by a change of category to a use claim. Specifically, claim 1 reads as follows:

"*Use of a composition to attenuate the effects of UV light on a substrate exposed to solar radiation, wherein the composition is a* [composition according to claim 1 of the main request]"

12.1 As set out above in relation to claim 1 of the main request, the respondent argued that the effect of UV protection demonstrated in D1 was distinct from that underlying the contested patent: D1 concerned the durability/weatherability of the composition itself, while the patent concerned protection of the underlying surface onto which the layer was coated. The reformulation of claim 1 of the sixth auxiliary request was intended to express this distinction: the "substrate" corresponded to the underlying object onto which the composition of the contented patent was to be applied.

12.2 The board does not agree. As set out above, the use disclosed in D1, namely, the improved durability/ weatherability of the coating composition of example 4C, is inseparable from the use to protect an underlying substrate onto which said coating is applied, since in application of the coating to a substrate, the substrate is necessary also protected.

Hence, the claimed use cannot be considered as a new use over that disclosed in D1.

Consequently, claim 1 of this request does not comprise any further distinguishing features over D1 compared to claim 1 of the main request, and for this reason alone, lacks inventive step.

12.3 The subject-matter of claim 1 of the sixth auxiliary request hence lacks inventive step.

Seventh auxiliary request - clarity (Article 84 EPC)

13. Claim 1 of the seventh auxiliary request is also directed to the use of a composition, with the following additional test compared to claim 1 of the sixth auxiliary request: "*whereby said composition is applied onto one or more surfaces of a substrate to provide UV light protection without also increasing UV light activated photocatalytic effects*".

13.1 To enable the board to interpret claim 1 for the purpose of assessing inventive step, the respondent was requested to provide an interpretation of the requirement in claim 1 that the effects of UV light on a substrate are attenuated "*without also increasing UV light activated photocatalytic effects*". In particular, the reference point in relation to which it was to be determined whether said photocatalytic effects were increased was not known to the board.

The respondent submitted that the reference point was the substrate itself, before application thereto of the composition of the invention.

13.2 This interpretation cannot be accepted. The requirement "*without increasing UV light activated photocatalytic effect*" in claim 1 implies that said photocatalytic effects are already present to some extent before application of the composition of the invention. However, the patent ascribes said photocatalytic effects to TiO_2 itself (paragraph [0014]). Therefore, the substrate must be absent of any photocatalytic effects, since it does not comprise TiO_2. Furthermore, even if it were accepted that the substrate was the reference point, the skilled person would not expect a TiO_2 composition of the invention to be absent any photocatalytic effects whatsoever, since this is what would be required by claim 1 in order for the requirement "without increasing" (compared to a substrate with no such effects) to be fulfilled. In view of these inconsistencies, it is not clear from claim 1 that the substrate represents said reference point, as argued by the respondent.

13.3 Hence, the nature of said reference point in claim 1 is at the very least ambiguous, with the consequence that the scope of the claim is unclear.

13.4 Consequently, claim 1 of the seventh auxiliary request lacks clarity pursuant to Article 84 EPC.

Eighth auxiliary request

14. Claim 1 of the eighth auxiliary request is directed to the use of a composition, with the following additional test compared to claim 1 of the sixth auxiliary request: "*whilst providing a balance of low pastellisation, low tinting reduction and reduced photo-activity properties*".

As noted by the board at oral proceedings, the term "low" in relation to pastellisation and tinting reduction in claim 1 is a relative term whose definition in the context of claim 1 is unknown. Thus, claim 1 does not define the conditions under which pastellisation or tinting reduction are to be considered "low". An explanation as to the definition of said term in the context of claim 1 was also not provided by the respondent. The scope of claim 1 thus cannot be determined, with the consequence that the requirements of Article 84 EPC are not fulfilled.

Consequently, claim 1 of the eighth auxiliary request lacks clarity pursuant to Article 84 EPC.

15. Since none of the respondent's claim requests are allowable, the patent is to be revoked.

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