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D E C I S I O N
of 2 February 1999

Case Number: T 0687/96 - 3.3.5

Application Number: 90850227.1

Publication Number: 0406194

IPC: C09C 1/36

Language of the proceedings: EN

Title of invention:

Process for coating titanium dioxide pigments

Patentee:

Kemira OY

Opponent:

Tioxide Group Limited

Headword:

Pigments/KEMIRA

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes) - unexpected improvement"

Decisions cited:

T 0250/87, T 0196/85, T 0429/87, T 0161/88

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0687/96 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 2 February 1999

Appellant: Tioxide Group Limited
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Respondent: Kemira OY
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Decision under appeal: Interlocutory decision of the Opposition Division of
the European Patent Office posted 13 May 1996
concerning maintenance of European patent No. 0 406 194
in amended form.

Composition of the Board:

Chairman: R. K. Spangenberg
Members: A. Liu
W. Moser

Summary of Facts and Submissions

- I. The appeal is against the interlocutory decision of the Opposition Division maintaining European patent No. 0 406 194 in amended form (Article 106(3) EPC).
- II. The decision under appeal was based on claims 1 to 13 filed on 15 March 1996 as an auxiliary request. After having taken into consideration the five documents cited by the Appellant (Opponent), the Opposition Division held that the subject-matter of claim 1 could not be derived from the available prior art. Compared to the closest prior art represented by GB 1 479 989 (D1), the claimed process surprisingly resulted in a product with improved properties. An inventive step was therefore acknowledged.
- III. In his statement of grounds of appeal, the Appellant argued that the process of claim 1 of the patent in suit was obvious in the light of the teaching of D1 in combination with common general knowledge.
- IV. During the appeal proceedings, the Respondent (Patent Proprietor) filed several sets of amended claims. He disputed the common general knowledge relied upon by the Appellant.
- V. Claim 1 of the set of 13 claims, submitted as first auxiliary request on 27 January 1999 and maintained as main request during the oral proceedings held on 2 February 1999, reads as follows:

"1. A process for coating a titanium dioxide pigment

with hydrated oxides of phosphorous, zirconium and aluminium, which comprises forming a dispersion of the titanium dioxide pigment in water, optionally in the presence of a dispersing agent, such as a water soluble silicate and/or an amino alcohol, characterized by adding to the titanium dioxide pigment dispersion in the stated order,

- (1) an acidic hydrolysable titanium compound in an amount of 0.1 to 1.5% by weight, calculated as TiO_2 , and then
- (2) a water soluble phosphate in an amount of 0.1 to 1.0% by weight, calculated as P_2O_5 , whereby a titanium phosphate coating is formed on the pigment particles, and thereafter
- (3) an acidic hydrolysable zirconium salt in an amount of 0.1 to 1.4% by weight, calculated as ZrO_2 ;

making the acidic slurry obtained alkaline with a base, whereby, in addition to said titanium phosphate coating, a hydrated zirconium oxide coating is formed; then adding

- (4) a water soluble, hydrolysable alkaline aluminium compound in an amount of 0.5 to 5.5% by weight, calculated as Al_2O_3 ,

all percentages by weight being based on the weight of the titanium dioxide pigment;

neutralizing the alkaline slurry formed with an acid, whereby the hydrated coating of aluminium oxide is

formed; and recovering the coated titanium dioxide pigment."

The wording of present claim 1 differs from that of claim 1 allowed by the Opposition Division in that in the expression "whereby a hydrated coating of aluminium oxide is formed" the indefinite article "a" has been amended to the definite article "the". The dependent claims 2 to 13 are as granted.

VI. The Applicant argued that the essential difference between the process of claim 1 of the patent in suit and that of the closest prior art document D1 was the order of addition of the titanium and phosphate reagents. However, this difference was irrelevant since a coating of titanium phosphate was formed in the same way, irrespective of the sequence of addition. Whilst it was conceded that the specified ranges for the various components in the patent in suit and in D1 were not identical, it was contended that the ranges of coatings as claimed were commonly found in the art. The Appellant therefore maintained that a skilled person would readily arrive at the process claimed by a combination of D1, in particular Example 2, and common general knowledge.

Experiments were carried out to reproduce pigments according to the process of the invention and to D1; 60° gloss measurements were made on panels coated with paints containing these pigments. Based on these results, the Appellant asserted that the products made according to the invention might show marginal improvements in one respect but this was obtained at the expense of other respects. Relying on the decisions

of the Boards of Appeal T 250/87, T 161/88, T 196/85 and T 429/87, he went on to conclude that the claimed process did not involve an inventive step.

- VII. The Respondent refuted the Applicant's analysis as being oversimplified. It was pointed out that, apart from the differences noted above, the process of the patent in suit was particularly distinguished from D1 in that the alumina coating layer was entirely precipitated from the alkaline side. To show the significance of the last mentioned limiting feature, the Respondent submitted experimental data demonstrating that the properties of the pigments products made according to the claimed invention were superior to those made in accordance with D1.
- VIII. At the end of the oral proceedings, the Appellant requested that the decision under appeal be set aside and the patent be revoked.
- IX. The Respondent requested that the decision under appeal be set aside and that the patent be maintained, on the basis of the following documents:
- (a) main request: claims 1 to 13 filed on 27 January 1999 as first auxiliary request or
 - (b) first auxiliary request: claims 1 to 13 filed on 27 January 1999 as second auxiliary request or
 - (c) second auxiliary request: claims 1 to 13 submitted during oral proceedings, or
 - (d) third auxiliary request: claims 1 to 13 submitted

during oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. The Board concurs with the undisputed findings in the decision under appeal concerning the amendments introduced during the opposition proceedings.

The sole additional amendment of claim 1 is the replacement of article "a" by "the" in the expression "whereby a hydrated coating of aluminium oxide is formed". This amendment is fairly based on the paragraph bridging pages 4 and 5 of the description as filed. Furthermore, it restricts the protection conferred by present claim 1 with respect to claim 1 as granted in that the formation of another alumina coating other than the one thus defined is now excluded. The Board is therefore satisfied that claim 1 fulfils the requirements of Articles 123(2) and (3) EPC. This is not contested by the Appellant.

3. The subject-matter of claim 1 is novel since none of the cited documents discloses a process for coating a TiO_2 pigment in which the final alumina coating is exclusively precipitated from an alkaline slurry. This finding is not disputed by the Appellant.
4. The issue that remains to be decided here is that of

inventive step.

4.1 The invention according to claim 1 concerns a process for coating titanium pigments with hydrated metal oxides. The Board agrees with the parties that the closest prior art is represented by D1 which relates to a process for the treatment of titanium dioxide pigment with hydrous metal oxides with the aim of reducing its photochemical activity. The process comprises forming an aqueous dispersion of pigmentary titanium dioxide, adding to the dispersion acidic water-soluble compounds of aluminium, zirconium and titanium, then a water-soluble compound of phosphorous and thereafter an alkaline reacting water-soluble compound of aluminium and adding to the dispersion a mineral acid to adjust the pH to a value of 6.5 to 8 (see claim 1). The recovered pigment was incorporated in a stoving paint for testing; the durability of the pigments were expressed as gloss and chalk ratings.

4.2 It can be inferred from the description that, with respect to D1, the technical problem underlying the invention is the provision of a method for obtaining a coated titanium dioxide pigment having improved weather resistance and/or better optical properties, such as gloss (see description page 1, paragraph 1).

4.3 The solution to the above problem as proposed by the invention according to claim 1 is distinguished from D1 in that:

- (a) titanium and zirconium compounds are added separately to the slurry (steps (1) and (3)) instead of their being added as a mixed acidic

solution,

- (b) the phosphate is added to the slurry after the titanium compound (step (2)) and not before,
- (c) the amounts of reagents used in the process are different (steps (1) to (4)) and
- (d) the aluminium coating is exclusively precipitated from the alkaline slurry, by addition of an acid (step (4)).

Concerning feature (d), the Board concurs with both parties that said requirement is clearly and unambiguously defined by the expression "whereby **the** hydrated coating of aluminium oxide is formed". Even if aluminate were used as a base for the neutralisation in step (3) of claim 1, the requirement in question would not be met in the case where the alumina coating is formed by addition of aluminate to an acidic slurry as in the process of D1. On the contrary, the present wording of claim 1 clearly implies that specific steps are carried out to ensure that no aluminium coating is present until the pH is reduced in step (4) of claim 1. This signifies that according to the claimed process, even if any alumina coating may have been formed between pH 4 and pH 10 by the use of an aluminate as base for neutralisation, this coating must have redissolved before the final and only alumina coating is precipitated by neutralisation with an acid.

4.4 The effect of the above-mentioned distinguishing features is demonstrated by the data submitted with the Respondent's letter dated 9 December 1998. As was

expressly acknowledged by the Appellant during the oral proceedings, the pigments made according to the present process, Experiment 41/34/TL, exhibit an improvement in 20° gloss values as compared to Experiment 42/34/TL which is a fair reproduction of the teaching of D1 (100% vs. 78%). Moreover, it is noted that the Appellant's 60° gloss test data filed with his letter of 22 May 1997 also show a better value for the pigment obtained according to the invention, Experiment A, than for Experiment B made according to the prior art (100% vs. 93%). Thus the Appellant's own results also confirm the improvement obtained with the product made according to the invention. The Board is therefore satisfied that the technical problem is actually being solved by the invention as claimed.

4.5 It thus remains to be examined whether the solution as proposed is obvious in the light of the relevant state of the art. Document D1 does not provide any information as to possibilities for a further improvement of the weather resistance and the optical properties of the pigments disclosed therein. This was not disputed by the Appellant. He advanced, however, that the technical problem of improving the technically relevant properties of rutile particles, in particular the gloss properties, has already been solved as early as in the 1940's when it became common practice to coat rutile particles with various metal oxides such as oxides of aluminium, phosphorous, silicium or zirconium. The routine way for preparing the coating(s) was to add the soluble compounds to the rutile slurry, then to precipitate the oxides by changing the pH. In the light of this common general knowledge, it was therefore contended that the process as claimed was

merely a routine optimisation resulting in no more than a marginal improvement in one respect at the expense of others. In accordance with the decisions T 250/87, T 196/85, T 161/88 and T 429/87 such process arrived at by mere trial-and-error would be devoid of an inventive step.

4.6. The Board does not concur with the Appellant. While it may be debatable as to whether the improvement achieved should be considered significant or marginal, the Appellant has not provided any evidence showing that this improvement was indeed obtained at the expense of a decrease of performance in other respects. The extent of improvement, however, is in the present case not relevant to the question of obviousness, since the technical problem to be considered here was not to achieve a further breakthrough. Furthermore, the Board considers that, even if it were arguable as to whether the above-mentioned distinguishing features (a) to (c) may be arrived at by mere routine experimentation, the test results submitted by both parties clearly demonstrate that the requirement for the aluminium oxide coating to be exclusively precipitated from the alkaline side (see distinguishing feature (d) above) is the most important feature in the solution to the present technical problem. In this respect, the Appellant was unable to show that there was any common general knowledge or prior art directed to the coating of rutile pigments with alumina, suggesting a process wherein the decisive step of alumina precipitation is conducted by addition of a base to an acidic slurry. In particular, documents D1 to D5 do not contain any pointer in this direction. In the absence of such evidence the Board agrees with the Respondent that the

claimed process, requiring as it does the precipitation of the alumina coating entirely from the alkaline side by addition of an acid, is in no way suggested by the relevant prior art. It cannot be concluded, therefore, that the improvement obtained by the claimed process, including this unprecedented modification, is the result of a mere routine optimisation.

4.7. Moreover, it follows from the Appellant's submission that the desired improvement of the pigments has been sought after since the early 1940's. Against this background, the improvement obtained through the present process modification must be considered to be quite unexpected and certainly not the result of modifying the process of D1 in the light of D2 to D5 or of common general knowledge.

4.8 The present situation is, therefore, not comparable with the situations relevant to the cases cited by the Appellant, where the Boards concerned denied the presence of an inventive step. In T 250/87, the distinguishing feature of the claimed composition was obtained by routine optimisation of required amounts of ingredients fully within the framework of the state of the art. In T 196/85, the claimed process adhered to a teaching proposed in the state of the art, so that the desired result was to be reasonably expected. Finally, in T 429/87 and T 161/88, the skilled person arrived at the claimed subject-matter by combining known teachings in an obvious way. It follows that the cited decisions are not relevant to the present case.

5. For these reasons, the subject-matter of claim 1 of the main request involves an inventive step. Claims 2 to 13

are dependent claims relating to specific embodiments of that subject-matter. The patent can therefore be maintained with these claims, after the necessary adaptation of the description. From this, it follows that the auxiliary requests submitted by the Respondent need not be considered.

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 with the order to maintain the patent with claims 1 to 13 filed on 27 January 1999 as first auxiliary request (main request) and the description to be adapted thereto.

The Registrar:

The Chairman:

S. Hue

R. Spangenberg