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D E C I S I O N
of 22 September 2004

Case Number: T 0485/00 - 3.3.5

Application Number: 95118362.3

Publication Number: 0703315

IPC: C01F 11/18

Language of the proceedings: EN

Title of invention:
Method for improving the optical properties of paper

Patentee:
MINERALS TECHNOLOGIES INC.

Opponent:
Solvay (Société Anonyme)

Headword:
Calcium carbonate filler/MINERALS TECHNOLOGIES

Relevant legal provisions:
EPC Art. 100(b), 54, 56

Keyword:
"Sufficiency of disclosure: yes - measuring methods not expressly indicated in patent"
"Novelty: yes"
"Inventive step: yes - non obvious alternative"

Decisions cited:
T 0432/94, T 0225/93, T 0032/85, T 0492/92

Catchword:
-

Case Number: T 0485/00 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 22 September 2004

Appellant: (Proprietor of the patent)	MINERALS TECHNOLOGIES INC. 405 Lexington Avenue New York, NY 10174-1901 (US)
Representative:	Bawden, Peter Charles Bawden & Associates 4 The Gatehouse 2 High Street Harpenden, Hertfordshire AL5 2TH (GB)
Respondent: (Opponent)	Solvay (Société Anonyme) Rue du Prince Albert, 33 B-1050 Bruxelles (BE)
Representative:	Jacques, Philippe Solvay S.A. Département de la Propriété Industrielle Rue de Ransbeek, 310 B-1120 Bruxelles (BE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 17 March 2000 revoking European patent No. 0703315 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman:	M. M. Eberhard
Members:	B. P. Czech
	S. U. Hoffmann

Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division revoking European patent No. 0 703 315.

The sole claim of the patent as granted read as follows:

"1. A method for improving the optical properties of paper characterized by utilizing calcium carbonate having a blocky six-sided rhombohedral final crystal morphology, with a surface area of from about 3 to about 15 m^2/g, an average discrete particle size of from about 0.2 to about 0.9 microns, wherein the discrete particles have an aspect ratio less than 2, and a particle size distribution such that at least about 60 weight percent of the particles lie within 50 percent of the equivalent discrete particle average spherical diameter, as a filler in papermaking."

II. The documents cited by the parties during the opposition proceedings include the following:

D1: EP-B-0 179 597 (corresponding to D1': EP-**A**-0 179 597)

D2: US-A-3 320 026

D3: G. Herdan, "Small particle statistics", 1953, Elsevier Publishing Company, pages 256 to 271

D4: R.D. CADLE, "Particle size determination", 1955, Interscience Publishers, Inc., pages 92 to 101

D5: T. Allen, "Particle Size Measurement", 1975, Chapman and Hall Ltd, pages 74 to 76, 85 to 93 and 112 to 119

D7: R. Gill and W. Scott, "The relative effects of different calcium carbonate filler pigments on optical properties"; Tappi Journal, January 1987, pages 93 to 99

D8: R.A. Gill, "The behavior of on-site synthesized precipitated calcium carbonates and other calcium carbonate fillers on paper properties", No. 2, 1989, Nordic Pulp and Paper Research Journal, pages 120 to 127

D11: Kirk-Othmer, Encyclopedia of chemical technology, 3rd edition, 1978, Volume 4, pages 430 and 431

and

a declaration of Mr Gerald M. Hein comprising Exhibits A to D.

III. The opposition division came to the conclusions that the granted patent met the requirements of Article 100(b) EPC, but that the claimed subject-matter lacked novelty in view of D7.

IV. With its statement of grounds of appeal the appellant (proprietor of the patent) filed the following document as evidence for the presence of novelty and inventive step over D7:

D9: J.D. Passaretti, "High Opacity Fillers: A New PCC Morphology and its Properties in Wood Free and Wood containing Paper"; Reprinted from 1991 Papermakers Conference, April 1991, TAPPI PRESS, pages 293 to 298.

With its further letter dated 20 July 2000, it filed a copy of an undated "photograph" labelled "Exhibit 1".

V. In its reply, the respondent (opponent) maintained that the claimed method lacked novelty and inventive step in view of D7.

VI. With its letters dated 26 July and 12 August 2004, the appellant filed

P1: "clearer pictures from" D7 and enlargements thereof (photocopies)

P2: scanned and enlarged versions of images from D9 (photocopies)

P3: "clearer copies from the original photographs that formed the basis of Figures 3, 4, 10, 11, 12, 13 and 19 in the original application" (photocopies).

VII. In its telefax dated 19 August 2004 the respondent, referring to decisions T 225/93 of 13 May 1997 and T 32/85 of 5 June 1986 contested the sufficiency of the disclosure of the patent in suit, upheld its objections under Article 100(a) EPC and filed documents

D10: A Solvay & Cie brochure together with further documents supposed to establish the publication period of the brochure; and

D12: A copy of the norm ISO 9277:1995(F).

VIII. With its telefax of 23 August 2004, the appellant submitted the further document

D13: C. Klein and C.S. Hurlbut Jr., Manual of Mineralogy, 21st edition, revised 1999, John Wiley & Sons, pages 403 to 408

and an amended claim 1 as auxiliary request.

IX. Oral proceedings took place on 22 September 2004.

During the oral proceedings, the appellant filed two modified versions of claim 1 as auxiliary requests 2 and 3 and document

D14: Collins, Millenium Edition, headword "barrel".

Moreover, the appellant also showed better copies of the original images that had been used for preparing the publication of D7 and also for making the copies P1 filed with letter dated 26 July 2004.

X. The written and oral submissions of the parties, as far as they are relevant for the present decision, can be summarised as follows:

The appellant pointed out that the respondent's objection under Article 100(b) EPC had not been raised in the first reply to the grounds of appeal, but only at a much later stage of the appeal proceedings. Hence, it should be disregarded by the board. Referring to the declaration of Mr Hein, to D7 and D8, to Figure 2 of the patent in suit and to decision T 492/92 of 18 January 1996, it argued that the skilled person would understand that the values for the surface area and average particle size were to be established according to the well known BET method and a standard sedimentation technique (using a "sedigraph" analyser), respectively, since these methods were usual in the field of paper fillers. Moreover, the present case was different from the one underlying decision T 225/93 since the patent in suit described in sufficient detail how the calcium carbonate particles to be used could be prepared and characterised. The way the particle diameter distribution of the particles was defined in claim 1 was a matter of choice and had nothing to do with the measuring technique actually used.

In the appellant's view, the claimed method was new since D7 did not disclose an improvement of the optical properties in the sense of claim 1 in connection with the use of rhombohedral calcium carbonate fillers. Moreover, referring to D14 and to the figures of D7, it submitted that the particles of samples E, L and T used according to D7 were "barrel-shaped" and somewhat rounded. Therefore, they could not be considered to be six-sided and blocky, although they were labelled "rhombohedral". Moreover, it could not be gathered from the figures of D7 that the particles of samples E, L or T had an aspect ratio, i.e. a length to width ratio of < 2. The aspect ratio could not to be equated to the shape factor referred to in D7.

Concerning inventive step, the appellant argued that D2 relates to fillers for paper coatings, and not to fillers used in papermaking. Hence D7 and not D2 should be considered as representing the closest prior art. These different applications implied different problems. D2 was silent concerning most of the properties of the rhombohedral calcium carbonates shown in Figure 4, and considered them to be unsatisfactory. Although no improvement had been shown for sample 5 of the contested patent, the bulk of the data provided indicated a significant improvement in terms of the optical properties obtainable according the invention, as compared to the use of known fillers.

The respondent pointed out that it had already raised the objection under Article 100(b) EPC in opposition and was entitled to raise the same objection again, sufficiently in advance of the oral proceedings. Referring to documents D3, D4, D5, D7, D8, the declaration of Mr Hein, D10 and D12, the respondent argued that the patent did not meet the requirements of Article 100(b) EPC, since the methods for determining the surface area, the average particle size and the size distribution of the particles, and hence the required specific properties of the product to be used according to the invention were not sufficiently described. Even if samples having surface area and average particle size values determined by identified methods were available to the skilled person, the latter could still not carry out the claimed method since the patent did not indicate the methods for measuring these two properties and the various known methods led to significantly differing results. It rejected the conclusions drawn by the appellant from the contents of the declaration of Mr Hein. The sole possibility left to the skilled person for knowing whether or not it actually carried out the claimed method was to measure the properties of several samples using several methods before testing them in the intended application. Having to find those calcium carbonates which lead to the desired results by such a trial and error experimental approach was, however, to be considered as an undue burden in the sense of decision T 32/85. The respondent also argued that due to the similarities with the present case, the conclusions drawn in decision T 225/93 should also apply in the present case.

Furthermore, the respondent argued that samples E, L and T of D7 were clearly described as rhombohedral and were therefore necessarily six-sided. As confirmed by D13, "barrel-shaped" was not a crystal morphology of calcium carbonates. The term might have been used to describe the macroscopic appearance of the particles, as in the case of "rosette-shaped" agglomerates of scalenohedral carbonates. It was not clear from the patent that "blocky" was supposed to mean non-rounded. Most of the particles and aggregates visible in the images of Figure 3 of D7 could thus be described as blocky. The expression "aspect ratio" was not defined in the patent. For near spherical shapes and near cubical shapes the said aspect ratio must be close to one and hence < 2. The figures of D7 showed individual particles of that kind. Moreover, in the better copies of the images published as Figure 3 in D7 shown by the appellant during the oral proceedings, the respondent pointed out a single individual particle that it considered to be six-sided. Since the particles of samples E, L and T had surface area, average particle size and equivalent diameter distribution values as required by claim 1, its subject-matter lacked novelty.

Referring to the data shown for sample 5 in the figures of the patent, the respondent argued that the claim covered embodiments not leading to optical properties improved in comparison with the use of known fillers. Moreover, the patent also referred to paper coating on page 2, line 44. Hence the problem could only be seen in using a different calcium carbonate as a filler in the paper industry. Assuming the claimed method was novel, D2 represented the closest prior art since it disclosed, as even earlier prior art, the use of rhombohedral calcium carbonate for the said purpose. From Figure 4 of D2, it could be gathered that the calcium carbonate was blocky, six-sided and had an average particle size between 0.2 and 0.9 μm and an aspect ratio < 2. It also alleged that from looking at Figure 4, it appeared that at least 60 % of the particles had a particle size close to the average size. In any case, the skilled person could easily modify the particle size distribution and the specific surface area of the particles, e.g. by filtration. Therefore, the claimed subject-matter was obvious.

XI. The appellant requested that the decision under appeal be set aside and the patent be maintained as granted (main request) or, alternatively, on the basis of one of the three sets of claims filed as first auxiliary request on 23 August 2004 and as second and third auxiliary requests during the oral proceedings.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. *Sufficiency of disclosure*

1.1 The opposition division has given a reasoned decision on the issue of sufficiency of the disclosure. At the appeal stage, the respondent has essentially upheld its objection under Article 100(b) EPC as already raised during the opposition proceedings. Under these circumstances, the board does not consider it appropriate and is not aware of any provision of the EPC justifying disregarding this objection merely because it was not submitted with the respondent's first reply to the statement of grounds of appeal, but only with its telefax filed on 19 August 2004 in reply to the summons to oral proceedings. In this connection, see e.g. decision T 432/94 of 19 June 1997, Reasons 5.4.1.

1.2 The invention as claimed relates to a method for improving the optical properties of paper by utilising specific calcium carbonate particles as fillers in papermaking. According to the claim, said specific calcium carbonates are characterised by a specific crystal morphology ("six-sided rhombohedral", "blocky"), by a discrete particle "aspect ratio" of < 2, and by quantitative indications (numerical values/ranges) concerning certain properties thereof (surface area, average particle size, particle diameter distribution).

1.3 Several passages in the description of the patent in suit (see e.g. page 2, lines 15 to 19 and lines 50 to 52; page 5, lines 34 to 35; page 6, lines 4 to 8; and Figures 5 to 7 and 14 to 16) mention that the aim of the invention was to achieve optical properties which are comparable to those obtainable when using calcined clay or titanium oxide, and better than those obtainable when using known forms of calcium carbonate fillers. However, as pointed out by the board during the oral proceedings, claim 1 of the patent in suit does **not** indicate a basis for the comparison implied by the expression "**improving** the optical properties of paper". As pointed out by the respondent during the oral proceedings, the experimental results reported in 5 to 9 of the patent show that the use of products falling under the definition given in claim 1 does **not necessarily** lead to paper properties (pigment scattering coefficient, brightness, opacity) being improved with respect to the use of known calcium carbonate fillers, see the curves for sample 5 and for the "industry standard" sample (non heat-aged scalenohedral **p**recipitated **c**alcium **c**arbonate ("PCC"), "heretofore the best known filler for achieving enhanced optical properties in paper", see page 5, lines 31 to 33) in Figures 5 to 9. Therefore, the board holds that taken in its broadest technically meaningful sense claim 1 also covers methods for paper-making wherein the said specific calcium carbonates are used as filler for obtaining paper having improved optical properties (opacity, brightness, scattering coefficient), but wherein the said properties need not necessarily be improved in comparison with those obtainable using any known calcium carbonate filler, in particular the said "best" scalenohedral PCC referred to in the description of the patent in suit.

1.4 Claim 1 does not contain indications concerning the measuring methods to be used for determining the values of the surface area, average particle size and particle size distribution. Neither does the description of the patent, including the examples, expressly mention the methods used. The question to be answered in connection with the respondent's objections under Article 100(b) EPC is thus whether the patent as a whole provides sufficient information to enable the skilled person to carry out the claimed method, i.e. to use a filler meeting the specifications given in claim 1 concerning surface area, average particles size and particle size distribution, despite the absence of explicit indications about the methods of measurement in the patent in suit.

1.5 In the examples of the patent, processes are described which lead to calcium carbonates meeting the said specifications. The examples also contain indications concerning the factors affecting the morphology and properties of the final product, i.e. the starting materials to be used (ultra-fine PCC) and the process conditions (temperature, pressure, pH, duration of treatment) to be applied. In particular, examples 1, 2 and 3 contain detailed indications on how to obtain products with rhombohedral morphology having

- surface area values lying in the range specified in claim 1, see page 5, line 25 and the values of 6.2, 7.1, 7.4, about 8, 8.2, 8.6, 8.8, 9.3 and

11.2 m^2/g mentioned in example 1, in Figures 5 to 9, and in Table 1 (sample 1); and

- particle size values lying in the average particle size range specified in claim 1, see the ranges of 0.3 to 0.5 μm and of 0.40 to 0.55 μm mentioned on page 5, lines 27 and 42.

1.5.1 From the information presented in Figure 2 ("mass (%)" versus "equivalent spherical diameter"), the skilled person can immediately gather that it shows a **mass** distribution curve and that the particle sizes referred to in the examples are the **equivalent spherical** diameters of the particles. Moreover, from Table 1, footnote (2) ("PSD: 50% Particle Size Distribution in microns"), the skilled person would on the basis of the common general knowledge about particle size measurement understand that the particle size indication in Table 1 (see "0.473" in the "PSD" column) refers to the median, i.e. the average particle size or equivalent spherical diameter at the 50% level in a cumulative mass distribution curve as shown in Figure 2 (see e.g. D5, page 85, section 4.3, 2nd paragraph in connection with Figure 4.3 on page 87).

1.5.2 In the board's view, the wording "60 weight percent of the particles **lie within**" as used in the patent in suit implies that that the expression "within 50% of the ... particle ... **average** ... diameter" designates in its broadest, technically meaningful sense, a closed **range** of particle diameter values (in micrometers) which **comprises** and lies around the said average diameter value, the end values of the range depending on the value "50% of the ... average ... diameter". Moreover, this view is supported by Figure 2, which shows a relatively narrow distribution of the particle sizes around the diameter value corresponding to 50 mass%. The board cannot accept the respondent's interpretation given in its letter of 19 August 2004 (see page 6, 1st paragraph) since it would correspond to a particle size distribution which is not in agreement with what is shown in Figure 2 for the PCC of example 2. The respondent's calculations submitted during the oral proceedings before the opposition division (see minutes, point 9.) further show that the respondent was able to understand the meaning of this parameter and to conclude that the feature was already disclosed in D7. Therefore, the board sees no reason for deviating from the opposition division's understanding that at least 60% by weight of the particles must have an equivalent diameter in the range: average equivalent spherical diameter ± 50% thereof. It is observed that this construction is in agreement with the disclosure in D1', see page 3, 2nd paragraph, page 10, 2nd paragraph, and examples.

1.6 The respondent's arguments and conclusions concerning the surface area are not convincing for the following reasons. All three methods disclosed in D3 for measuring the surface area of a sample of small particles (microscopic, by permeability and by adsorption) are well known to the skilled person. According to D3 they may give very different results, see the bottom of the table on page 269. However, these results were obtained with a molybdenum powder consisting of non-spherical aggregates and agglomerates having a size of from 1 to over 90 μm (see pages 269 and 270). This teaching does not necessarily fully apply to the calcium carbonate particles to be used according to the patent in suit, see e.g. D3, 2nd paragraph from the bottom. For example, according to D10 (which refers to D3) the permeability method and the microscopic method, when used to measure the external surface of calcium carbonate powders, lead to comparable results (see page 8). It is also well-known that the BET adsorption method is a measurement of the total surface area including the internal surface. Hence, it results in a greater surface area for a same sample if the porosity is important (see D3, pages 256, 4th and 5th paragraphs, and page 270, 2nd to 5th full paragraphs). The respondent has not disputed the opposition division's finding that the patent in suit contains sufficient information regarding the method of preparation of the desired calcium carbonates, with several examples. By reproducing an example of the patent in suit such as example 1, which specifies a surface area of about 8 m^2/g for the final product, and measuring the surface area of the resulting product by the well known three methods, the skilled person would be able to recognise whether an adsorption method such as the BET method has been used or another method, since the BET method is known to give higher values. It is common general knowledge that nitrogen is the most commonly used adsorption gas in the BET method. In the board's judgment, reproducing an example and measuring the surface area of the resulting product by two or three well-known methods does not represent an undue burden for the skilled person.

1.7 The respondent's arguments concerning the method for determining the average particle size and particle size distribution are essentially based on D4. According to

D4, different methods of determining particle sizes may give different results and the conversion factors vary considerably from one material to another, see page 98, 1st paragraph. The board observes that in the relatively old document D4, the methods listed in Table II thereof (see page 93) are not all considered to be appropriate for determining particles sizes in the range stated in the patent in suit. However, the respondent has provided no evidence that the remaining methods would lead to very different results in the case of the calcium carbonates prepared as described in the patent. In the board's view, the skilled person trying to reproduce the teaching of the patent in suit would envisage measuring the particle size and particle size distribution by the way which is normally used in the technical field concerned, i.e. in the paper industry, since the patent in suit relates to the use of calcium carbonate as a filler material in papermaking. According to the declaration of Mr Hein, the normal technique for determining particle size in connection with materials used in this field is sedimentation applying Stokes' law. The board has no reason not to accept this statement taking furthermore into account that this method is also used in D1' (sentence bridging pages 10 and 11), D7 (page 99, left-hand column, 3rd full paragraph) and D8 (page 122, left-hand column, 1st paragraph), all relating to calcium carbonate fillers for papermaking. The respondent has provided no evidence that methods other than sedimentation analysis were also usually employed for determining the average particle size and the particle size distribution of calcium carbonate fillers for papermaking. It has also not shown that this method would not be appropriate for calcium carbonates having the particle size indicated in the patent in suit, nor that it would not lead to the results indicated in the examples or to the curve of Figure 2.

1.8 As pointed out by the appellant, the present case differs from the case underlying decision T 225/93 in that the contested patent explicitly describes how calcium carbonates suitable for the claimed method and exhibiting the claimed characteristics may be obtained. Hence, the considerations and conclusions in decision T 225/93 (see Reasons 2.1.3) are not applicable to the present case.

1.9 The respondent has not argued that the description of the patent in suit would not enable the skilled person to prepare and use calcium carbonates as specified in claim 1. In particular, although the burden of proof rests on its side, the respondent has not submitted evidence showing that by reproducing the preparation methods described in the examples of the patent in suit, and determining the surface area, average particle size and particle size distribution using the information disclosed in the patent in suit and the known methods of measurement, the skilled person would not, without undue experimentation in the sense of decision T 32/85, be able to obtain calcium carbonates having the characteristics stated in claim 1, and use them as filler in papermaking.

1.10 Under these circumstances, the board cannot accept the respondent's allegation that due to missing explicit indications concerning the measuring methods to be used, the skilled person wanting to carry out the claimed invention would not know without undue experimentation how to select or identify calcium carbonates suitable for achieving improved optical properties.

1.11 The respondent's arguments thus do not convince the board that the patent in suit does not meet the requirements of Article 100(b) EPC.

2. *Novelty*

2.1 D7 is a study comparing the performance of various types of ground calcium carbonate and PCC filler pigments in papermaking. For each of these samples, D7 also reports the average particle size, a "slope" value characterising the "narrowness" of the particle size distribution, a "shape factor" and the BET surface area. The optical properties (TAPPI brightness, opacity and scattering coefficients) of paper hand-sheets prepared at different loadings of the various calcium carbonate fillers were investigated. See page 93, left-hand column, 1st and 2nd paragraphs, right-hand column, 1st paragraph; page 94, Table II; page 95, middle and right-hand columns, sub-sections "Scattering", "Opacity" and "Brightness"; page 96, figures (SEMs) 3A to 3C, page 97, tables III and IV, Figures 6 and 7, page 98, Figures 8 to 12; page 98 to page 99, section "Experimental procedure".

2.2 The board accepts, and it was not disputed at the oral proceedings, that it could be gathered from the data presented in D7 that the rhombohedral-type PCC samples E, L and T met the requirements of claim 1 concerning the average particle size, the surface area and the particle size distribution (see page 97, Table III, the first six columns from the left). However, for the following reasons, the board does not accept that D7 is to be considered as a disclosure of the use of fillers having a six-sided rhombohedral crystal morphology and an aspect-ratio of less than 2.

2.3 The feature "six-sided"

2.3.1 On page 93 (right-hand column, 1st paragraph), D7 mentions three known crystalline forms of PCC, i.e.
- "calcite, rhombohedral (or barrel-shaped)"
- "calcite, scalenohedral (or rosette-shaped)"
- "aragonite, acicular (or needle-like)".
The "crystalline habit" of the PCCs investigated is stated to be either, rhombohedral, spherical, scalenohedral or acicular (see page 94, Table II). More particularly, PPC samples E, L and T are stated to have a rhombohedral crystalline habit. All samples were classified using scanning electron microscopy (SEM) and by referring to supplier technical literature, see last paragraph of the article). Hence, whilst on the one hand D7 indicates that PCC samples E, L and T are of rhombohedral "crystalline habit", the expression "barrel-shaped" is, on the other hand, used to designate rhombohedral PCCs.

2.3.2 It was neither disputed that a rhombohedral crystal must, in principle, have six faces (see e.g. D13, Figures 12.3, uppermost row of calcite crystal shapes), nor that the term "barrel-shaped" has no precise meaning in terms of crystal shapes. As pointed out by the appellant at the oral proceedings, the list of known PCC fillers on page 93 of D7 also mentions precipitated scalenohedral calcite and its usual designation in the field, i.e. "rosette-shaped", an expression describing its macroscopic appearance. By analogy, the term barrel-shaped was possibly to be considered as a description of the macroscopic appearance of rhombohedral, i.e. six-sided PCCs. However, the expression rosette-shaped relates to a particular kind of agglomerate of individual scalenohedral crystals and is not a description of the scalenohedral crystal shape. Moreover, the reference to "needle-like" PCCs in the list on page 93 of D7 as a further designation for acicular crystals makes it clear that the terms between brackets given in the said list do not necessarily refer to the macroscopic appearance of agglomerates. The board does not see how a rhombohedron could possibly be perceived as being barrel-shaped, even by a layman. Hence, the use by the authors of D7 of the expression "barrel-shaped" to describe crystals of rhombohedral habit raises doubts as to the actual morphology of the crystals in question, in particular since D2 shows that precipitated calcite crystals with "barrel-shaped" prismatic portions and rhombohedral terminators were also known (see also point 3.4.1 below). The board thus concludes that the text of D7 does not necessarily, and therefore not clearly and unambiguously, refer to truly rhombohedral, i.e. six-sided, PCC crystals.

2.3.3 The SEMs 3A to 3C (corresponding to samples L, T and E) as contained in the file copy of D7 available to the board are of a quality that does not permit gathering therefrom that the samples' crystalline habit is six-sided rhombohedral. The board however notes that the discrete particles visible on SEMs 3A to 3C of D7 generally appear to be "rounder" than the ones visible on Figures 3 and 11 of the picture set P3, showing particles stated to have been produced by the method described in the patent in suit. As far as it can be gathered from D7, the particles shown in SEMs 3A to 3C generally have a shape that could possibly be qualified as barrel-shape, but certainly not as six-sided rhombohedral. The same is true for the enlargements comprised in picture set P1, and even for those copies of the original SEMs, i.e. for the images that allegedly served in the preparation of publication of D7 which were shown by the appellant during the oral proceedings. The board thus concludes that the figures of D7 representing samples E, L and T do not clearly and unambiguously disclose truly rhombohedral, i.e. six-sided, PCC crystals either.

2.4 The feature "aspect ratio < 2"

2.4.1 The patent in suit does not comprise a definition of the expression "aspect ratio". However, it is well-known that this expression usually relates, in its broadest meaning, to the length to width ratio of an object. In particular in connection with rhombohedral calcium carbonate crystals, a skilled person would understand this expression as relating to length to width ratio, and hence to the relative elongation, of the particle or crystal.

2.4.2 D7 does not indicate the aspect ratio of the filler particles investigated, but mentions a "shape factor". This shape factor is a measure for the deviation of the particle morphology from the spherical shape, i.e. of a property that is not necessarily equivalent to the relative elongation (aspect ratio). See D7, Table III, 5th column from the left and page 99, left-hand column, the last two paragraphs. It is undisputed that in the case of near-spherical particles, the values of both the aspect ratio and the shape factor would be close to 1. However, there is no evidence on file demonstrating that a shape factor close to and below 2 (see values indicated for samples E, L and T in Table III of D7) could be considered as being necessarily equivalent to an aspect ratio close to and below 2.

2.4.3 As already mentioned above, the quality of the figures (SEMs 3A to 3C) of D7 supposed to show the morphology of the particles of samples E, L and T available to the board is rather poor and/or not very detailed. For this reason, it is also not possible to gather from these figures whether or not these samples comply with the requirement of claim 1 concerning the aspect ratio.

2.5 Pointing out individual particles visible on the larger sized copies of SEMs shown by the appellant during the oral proceedings, the respondent argued that Figure 3 of D7 disclosed individual rhombohedral PCC particles with shapes close to spherical shapes and hence having an aspect ratio close to 1. It also pointed out one single particle in these pictures which it considered to be six-sided rhombohedral. However, even assuming for the sake of argument that an individual particle was clearly visible in the figures of D7 as published (best published quality of the images) which had indeed an aspect ratio of < 2 and/or a six-sided rhombohedral morphology, the board does not accept that this would amount to the disclosure of the use as filler in papermaking of calcium carbonates as defined in claim 1. The claim relates to the use of a multitude of particles having a certain aspect ratio and crystal morphology. Hence, to be novelty-destroying for the claimed method, the bulk of the calcium carbonate particles of the samples described in D7, i.e. at least a substantial amount of the particles shown in the figures, would have to clearly and unambiguously meet the requirements concerning the aspect ratio and crystal morphology (six-sided). This is, however, not the case.

2.6 Summarising, the board is not convinced that the total information (text, data and figures) presented in D7 in connection with samples E, L and T represents a clear and unambiguous disclosure of the use of calcium carbonates having a morphology as defined in claim 1 as a filler in papermaking.

2.7 The board is also convinced, and it was not disputed, that none of the other prior art documents cited in the course of the opposition and appeal proceedings discloses a method with all the features of claim 1.

2.8 The claimed subject-matter is thus novel.

3. *Inventive step*

3.1 The board concurs with the opposition division and the appellant in that D7 represents the closest prior art. Like claim 1 of the contested patent, D7 relates to the use of calcium carbonates, inter alia of PCCs of rhombohedral-type crystal habit, as fillers in papermaking, i.e. to impart the papers with the desirable optical properties such as a certain scattering, opacity and brightness.

3.2 As already indicated under point 1.3 above, the board does not accept that the use as claimed leads, over the entire ambit of claim 1, to optical properties that can be considered as improved in comparison to those achievable when using the known scalenohedral PCC referred to in the patent in suit as being the best known filler for achieving enhanced properties in paper. Figures 5 to 9 show that with the PCC (sample 5) having the claimed crystal morphology and a surface area of 11.2 m^2/g (falling within the claimed range), the optical properties are not necessarily improved over the said best scalenohedral PCC. The comparative examples submitted with the appellant's letter of 23 December 1999 also do not demonstrate an improvement over the said known PCC for products having the claimed crystal morphology and a surface area within the **higher** portion of the claimed range. However, the technical problem with respect to D7 can in any case be seen in providing a further method for obtaining paper with good but not necessarily better optical properties, and in particular with a relatively high brightness. It is plausible in view of the examples in the patent in suit and also undisputed that this technical problem has been solved by using, as a filler in papermaking, the calcium carbonate having the characteristics stated in claim 1.

3.3 D7 merely compares the results achievable with several calcium carbonate fillers available at the time of its publication. D7 does not contain details concerning the methods used to prepare the PCCs that were investigated. Moreover, the PCCs described as rhombohedral or barrel-shaped in D7 were found to be less advantageous than other calcium carbonates of different shapes or origins, at least at higher loadings, because of their tendency to aggregate and lose their scattering efficiency, see page 98, section "Conclusions". Hence, D7 does not suggest the use of PCCs having another crystal morphology, let alone of the rhombohedral type, or any modified preparation process leading to such a particular morphology.

3.4 Document D2

3.4.1 D2 discloses the preparation and use of discrete PCC crystals of a specific habit characterised by a stubby-prismatic form doubly terminated by three faces of a rhombohedron. The prismatic portion of the crystals, samples of which are shown in electron micrographs (Figures 5 and 6), is described as "barrel-shaped", with six gently curved convex faces. The crystals are stated to be remarkably uniform in size, usually averaging about 1 μm in length by about 0.5 to 0.75 μm in width. See in particular claim 16 and column 3, lines 38 to 58.

3.4.2 D2 also mentions rhombohedral calcium carbonate products as even earlier prior art, see column 1, lines 13 to 17 and lines 30 to 31, Figure 4, column 4, lines 1 to 2 and column 6, lines 18 to 20. The prior art calcium carbonate shown in Figure 4 appears to comprise non-elongated, blocky, six-sided rhombohedral crystals, having a relatively uniform discrete particle size of more than about 0.1 and less than about 0.9 μm (see scale on same sheet of D2). The precipitation methods described in (comparative) examples 2 and 4 of D2 lead to crystals having the rhombic structure shown in Figure 4 but an even finer particle size, see column 4, lines 60 to 64 and column 5, lines 12 to 15. D2 is silent about the particle size distribution and the surface area, which values can also not be clearly and unambiguously derived from Figure 4.

3.4.3 D2 indicates that due to their uniformity and freedom from clustering, the particular prismatic-rhombohedral products disclosed therein are superior to conventional rhombohedral calcite in their ease of dispersion to ultimate particles in water, paints, rubber, polyvinyl chloride and the like. According to D2, these products are especially valuable for use in paper **coating**. When used as pigment in coating formulations, they are stated to provide higher gloss than any of the previously used conventional commercial rhombohedral products, as well as an increased printability at less severe calendering conditions. See in particular column 3, line 59 to column 4, line 29; and examples 7 and 8.

3.4.4 It is stated in the introductory part of the patent in suit that it relates to the use of calcium carbonate as **filler** in papermaking (see page 2, lines 4 to 6), and claim 1 explicitly refers to the said use. D11, a document illustrating the common general knowledge in the field, shows that the skilled person differentiates between the use of calcium carbonate in paper coating and as a filler, respectively (see page 430, last two paragraphs and page 431, 1st paragraph). As pointed out by the respondent during the oral proceedings, the description of the patent in suit also refers to other possible uses of the calcium carbonates described therein in the fabrication of paper, including their use in a **coating** stage, see the sentence on page 2, lines 43 to 45. Said sentence literally stems from the much broader parent application 91301797.6 (see EP-A-0 447 094, page 2, lines 47 to 50), and has not been adapted to the sole remaining claim 1 during the grant procedure. However, considering the clear meaning of the expression "use ... as filler in papermaking" as used in claim 1 in the technical field concerned, the quoted sentence **cannot** imply that claim 1 also covers the use of the said calcium carbonates in paper **coating** formulations.

3.4.5 D2 does not mention the use of calcium carbonate as filler in papermaking, and is primarily concerned with improving the gloss and the printability achievable when using calcium carbonate-containing paper coating formulations. Confronted with the stated technical problem, the skilled person would thus not necessarily turn to this document. Moreover, in order to obtain the desired results, D2 advocates the use of a specific type of prismatic-rhombohedral (and hence having more than six sides) calcium carbonate instead of the previously used blocky six-sided rhombohedral calcium carbonates, which are considered to be less suitable. If the skilled person would consider D2 at all, it would thus rather investigate the use of the specific prismatic-rhombohedral calcium carbonates, thereby arriving at a method not falling under claim 1. Hence D2 does not suggest the replacement of the rhombohedral barrel-shaped PCCs disclosed in D7 as fillers in papermaking by previously known rhombohedral PCCs, let alone by products as specified in claim 1.

3.4.6 Since D2 does not relate to the use of calcium carbonates as fillers in papermaking, it does not represent the closest prior art for assessing whether the method claimed in the patent in suit is based on an inventive step. However, even assuming in the respondent's favour, and purely for the sake of argument, that D2 would represent the closest prior art, the claimed method is not obvious in view of the disclosure of this document. Starting from the previous use of materials such as rhombohedral calcium carbonates, D2 recommends the use of calcium carbonates having a different crystal morphology. Hence, without applying ex-post facto considerations, the skilled person would not be induced by D2 to depart from the use of the carbonates having a prismatic-rhombohedral crystal morphology and to go back to the rhombohedral morphology in order to solve a technical problem relating to a different application of calcium carbonate particles. Under these circumstances, it also appears that the respondent's arguments concerning the modification of the particles size distribution by filtration is based on an *ex post facto* analysis of the case.

3.5 For the above reasons, the method of independent claim 1 is not obvious in view of documents D7 and/or D2.

3.6 The board is also convinced and it was not disputed that the other prior art documents cited by the respondent do not contain any additional information rendering the claimed method obvious.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

A. Wallrodt M. Eberhard