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**Datasheet for the decision
of 7 April 2020**

Case Number: T 0292/18 - 3.3.07

Application Number: 99925867.6

Publication Number: 1005318

IPC: A61K6/083

Language of the proceedings: EN

Title of invention:

OPTIMUM PARTICLE SIZED HYBRID COMPOSITE

Patent Proprietor:

Kerr Corporation

Opponent:

3M Deutschland GmbH

Headword:

OPTIMUM PARTICLE SIZED HYBRID COMPOSITE/Kerr Corporation

Relevant legal provisions:

EPC Art. 100(b)

Keyword:

All requests - Sufficiency of disclosure (No)

Decisions cited:

T 0109/08, T 1444/13

Catchword:



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Boards of Appeal
Chambres de recours

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Case Number: T 0292/18 - 3.3.07

D E C I S I O N
of Technical Board of Appeal 3.3.07
of 7 April 2020

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
30 November 2017 concerning maintenance of the
European Patent No. 1005318 in amended form.**

Composition of the Board:

Chairwoman P. Schmitz
Members: D. Boulois
E. Duval

Summary of Facts and Submissions

- I. European patent No. 1 005 318 was granted on the basis of a set of 12 claims.
- II. An opposition was filed under Article 100 (a) EPC on the grounds that its subject-matter lacked novelty and inventive step.
- III. The patent was revoked a first time for lack of novelty of all requests. The opposition division decided also not to introduce the late filed ground of opposition pursuant to Article 100(b) EPC.
- IV. In its decision T 109/08, the Board decided to set the decision under appeal aside and to remit the case to the opposition division for substantive examination of the grounds pursuant to Article 100(b) EPC.
- V. The patent was revoked a second time for lack of compliance of the requests pursuant to Articles 123(2) and 123(3) EPC.
- VI. In its decision T 1444/13, the Board decided that the main request, the claims as granted, did not comply with Article 123(2) EPC, while auxiliary request 1 filed with letter of 23 August 2013 complied with Articles 123(2) and 123(3) EPC. The case was remitted to the opposition division for examination of the outstanding issues, in particular the ground of sufficiency of disclosure.
- VII. The present appeal lies from the decision of the opposition division finding that the patent in amended

form meets the requirements of the EPC. The decision was based on the set of claims filed with letter of 23 August 2013 as auxiliary request 1.

Independent claim 1 of auxiliary request 1 read as follows:

"1. A dental composite comprising a resin base and about 11% by volume to about 80% by volume filler comprising a ground structural filler and a microfiller, wherein the ground structural filler comprises between about 10% by volume and about 70% by volume of the composite and comprises ground particles of mean particle size between about 0.05 μm and about 0.5 μm and contains less than 50% by volume of particles above 0.5 μm in diameter, and wherein the microfiller comprises between 1 and 10.0% by volume of the composite and comprises particles of mean particle size of about 0.04 μm or less."

VIII. The documents cited during the opposition proceedings included the following:

D10: table with calculations concerning the conversion from vol% to wt%

D11: data sheet Aerosil OX 50

D12: data sheet of Triethylene glycol dimethacrylate

D13: data sheet of Bisphenol A glycolate dimethacrylate

D14: declaration of the technical expert Dr. Ulf Drechsler

D15: J. Oral Rehabilitation, 2004, 31, 1090-1101, J. Sabbagh et al.

D16: Posterior Composite Resin Dental Restorative Materials, G. Vanherle and D.C. Smith, 1985

- IX. According to the decision under appeal, the opposed patent was sufficiently disclosed:
- The considerations in points 4.2-4.9 of T 109/08 did not result in the patent being insufficiently disclosed. The fact that the examples related to weight% and that the claims referred to volume%, without any information in the patent about the density of the fillers and resins, did not prevent a conversion between these units and the workability of the claimed invention over the whole claimed scope.
 - It was accepted in the field of dentistry to express the percentage of fillers in volume% as confirmed by D14 and D15, and conversion could be done using the mathematical method referred to in D15 and the specific densities of the fillers and the resin which were in most cases provided by the manufacturer.
- X. The opponent (hereinafter the appellant) filed an appeal against said decision.
- XI. With a letter dated 9 August 2018, the patent proprietor (hereinafter the respondent) filed a main request and auxiliary requests 1 to 3. The main request corresponded to auxiliary request 1 as maintained by the opposition division.

Independent claim 1 of the auxiliary requests read as follows, difference(s) compared with claim 1 of the main request shown in **bold** or ~~stricken through~~ (deletion):

Auxiliary request 1

The subject-matter of claim 1 of this request has been reformulated as follows:

"1. A dental composite comprising a resin base and about 11% by volume to about 80% by volume filler comprising a ground structural filler and a microfiller, wherein the ground structural filler comprises between about 10% by volume and about 70% by volume of the composite and comprises ground particles of mean particle size between about 0.05 μm and about 0.5 μm and ~~contains less than 50% by volume of particles above 0.5 μm in diameter,~~ and wherein the microfiller comprises between 1 and 10.0% by volume of the composite and comprises particles of mean particle size of about 0.04 μm or less, **wherein the ground structural filler contains less than 50% by volume of particles above 0.5 μm in diameter.**"

Auxiliary request 2

"1. A dental composite comprising a resin base and about 11% by volume to about 80% by volume filler comprising a ground structural filler and a microfiller, wherein the ground structural filler comprises between about 10% by volume and about 70% by volume of the composite and comprises ground particles of mean particle size between about 0.05 μm and about 0.5 μm and ~~contains less than 50% by volume of particles above 0.5 μm in diameter,~~ and wherein the microfiller comprises between 1 and 10.0% by volume of the composite and comprises particles of mean particle size of about 0.04 μm or less, **wherein the ground structural filler contains less than 50% by volume of particles above 0.5 μm in diameter and less than 10% by volume of particles above 0.8 μm in diameter.**"

Auxiliary request 3

"1. A dental composite comprising a resin base and about 11% by volume to about 80% by volume filler comprising a ground structural filler and a microfiller, wherein the ground structural filler comprises between about 10% by volume and about 70% by volume of the composite and comprises ground particles of mean particle size between about 0.05 μm and about 0.5 μm and ~~contains less than 50% by volume of particles above 0.5 μm in diameter,~~ and wherein the microfiller comprises between 1 and 10.0% by volume of the composite and comprises particles of mean particle size of about 0.04 μm or less, **wherein the ground structural filler contains less than 50% by volume of particles above 0.5 μm in diameter and less than 10% by volume of particles above 0.8 μm in diameter.**"

- XII. A communication from the Board, dated 28 October 2019, was sent to the parties. In this, the Board expressed its doubts as regards sufficiency of disclosure.
- XIII. With a letter dated 23 March 2020, the respondent provided further arguments and at the same time informed the Board and the appellant that it would not be attending the oral proceedings, and requested that a decision on the appeal be made based on the arguments submitted in writing.
- XIV. Oral proceedings were cancelled.
- XV. The written arguments of the appellant may be summarised as follows:

With regard to sufficiency of disclosure, the problem was the use of the feature "volume%" in the claims,

while the description and the examples used "weight%" only when determining amounts of fillers.

This question was already discussed in decision T 109/08.

Document D10 was not sufficient to lay the groundwork for a general understanding of the disclosure with regard to the conversion of weight% to volume%. D10 only served as a model for an exemplary calculation in order to establish a general conversion constant of 1.4 for showing the lack of novelty over D5, by using the densities of the ingredients as disclosed in D11-D13. However, D10 did not show the conversion of the data in examples A-C of Table 3 of the contested patent from weight% to volume%, using the densities as disclosed in D11-D13.

First the density of the barium aluminoborosilicate glass used in the examples was not known, and D11 only provided density values for "Inert Dental Glasses", which varied in a range of 2.6 to 3.0 g/cm³.

D12 disclosed the density of Aerosil OX 50 used in examples A-C, which was disclosed as being about 2.2 g/cm³. This was not an exact value and could not be regarded as an enabling disclosure for a conversion from weight% to volume%.

It was not apparent why the opposition division completely ignored the teaching of D15, which disclosed that the technique of determining the percentage of filler by volume was not simple, since the density was difficult to measure due to the wide variation of filler morphologies. D15 showed the lack of reliability with regard to the values of densities given by the

manufacturers, and mentioned that picnometric methods for measuring a percentage of fillers by volume showed wide variations.

D14 could also not be used in support of sufficiency of disclosure, since this statement did not give any useful information which would provide a solution to the problems of densities of filler material disclosed in the contested patent.

This lack of precise determination of an important parameter resulted in a lack of enablement for the skilled person, at least over significant areas of the claimed subject-matter.

XVI. The written arguments of the respondent may be summarised as follows:

While the densities of different compositions of resin bases and filler particles might have varied, it was not the proportion of these components that was important, it was the proportion by volume. The skilled person could produce a composite that had a resin base and a specified volume of filler particles, as explained in the statement D14. D14 explained that it was common practice to convert the volume percentage required for each component into mass fractions and then to weigh out and to mix together the required mass fractions.

The physical relationship between density, mass and volume was well understood, and was taught to school students from an early age.

The person skilled in the art was well equipped to convert a volume of a specific type of filler particles

to a corresponding weight, by for instance looking up the density of the specific filler particles, as provided by the supplier, or by measuring the densities of the filler particles directly by using a gas pycnometer and multiplying by the volume. D15 mentioned that it was possible to measure the percentage of fillers by volume by direct or indirect methods.

Moreover, in the composite of the present invention, solid filler particles were surrounded by a resin matrix. Microfiller particles could be located within the interstices of the structural filler particles, but in order to be located there, the microfiller had to displace resin from the interstices. As the resin in the composite surrounded the filler particles and filled any gaps, there was no hidden gaps or air-filled interstices between particles that might have affected the overall volume and density of the composite. This meant that the volume of the resin, structural filler and microfiller of the composite were additive.

It was also clear that it was the absolute density of the material that should be used when converting the mass and volume of a material. This was the actual density of the actual substance and did not include any free space that may exist between particles. This absolute density was provided by the manufacturers' data sheet or could be measured by a number of known techniques, for example with a gas pycnometer.

It would be immediately clear to the skilled person that the powder characteristics of bulk/apparent/tapped density would not be used.

Hence, it was clear that the claimed invention was sufficiently disclosed.

XVII. Requests

The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed, alternatively that the decision under appeal be set aside and the patent be maintained according to one of the sets of claims filed as auxiliary requests 1-3 with letter of 9 August 2018.

Reasons for the Decision

1. Main request - Sufficiency of disclosure

- 1.1 Claim 1 relates to a dental composite comprising a resin, a ground structural filler and a microfiller, only defined by their mean particle sizes and amounts in volume%.

The chemical nature and physical form of the resin and the fillers is in particular unspecified and totally open in the claims; the resin may include, according to the description, commercially available monomers of very different chemical natures, as shown in paragraphs [0029]-[0030] of the specification, and the filler materials are to be chosen from a broad palette of materials, as shown by the several different alternative possibilities given for the fillers in paragraph [0023] of the specification. The claimed subject-matter is therefore very broad and encompasses

a great number of possibilities as to the fillers and the resin.

The structural filler is furthermore ground, which means it is not spherical, and has an irregular shape with interstices (see par. [0017] and [0014]). The degree of grinding is also not specified in the claims.

Moreover, in line with the consideration set out in point 2 of decision T 1444/13 , in view of the fact that claim 1 concerns a product as such, i.e. the dental composite material, the amounts of the different fillers specified in claim 1 relate to their volume percentages in the final composite dental material, i.e. in the product obtained after the combination of the fillers.

The question arises as to whether the skilled person would know what amounts of the different fillers should be combined in order to arrive at the claimed volumes after their combination.

- 1.2 The description does not give any teaching on the approximative amounts in weight or even initial volumes of the different filler powders to be used to arrive at the claimed volumes% after combination.

Examples A-C of the contested patent only give the initial weight amounts of a specific combination of silanated barium aluminosilicate as structural filler (SP-345), and of two different fumed silica together as a microfiller combination (silanated OX 50 fumed silica of average particle size of 0.04 um and TS-530 hydrophobic fumed silica of average particle size of 0.02 um).

Thus, apart from the specific combination of all examples, the skilled person does not have any general information as to the initial weight amounts or initial volume amounts of each individual component of the filler to be used to obtain the final claimed composite with its volume amounts. In view of the broad definition of the claimed invention, this amounts as such already to a necessary experimentation and an undue burden for the skilled person.

- 1.3 The description of the contested patent is also silent about how to possibly convert the composition from amounts defined in weight percent to the claimed volume percent and/or to the amounts in weight of components to be used initially to obtain the claimed volume percent.

Tables 3 and 4 give the amounts of the components of several formulations in weight percent and the total filler amount (load) in weight and volume percent, with a conversion factor between the weight and the volume varying between 1.3 and 1.5. It appears thus from said examples that the conversion factor is dependant on the combination in quality and amounts of structural filler, microfiller(s) and resin chosen and is not generalisable and predictable.

- 1.4 The description does also not give any teaching as to which density has to be used (bulk or absolute density, apparent density, tapped density...) or the method, apparatus or calculation to be used to determine the volume of said powders or solids; moreover, no common general knowledge document has been cited as regards the method of calculation or conversion used in the field of dental composite.

The values of these different densities may be very different, as shown by D12 which gives an absolute density of about 2.2 g/cm³ and a tapped density of 130 g/L for Aerosil OX50.

In the present case, the choice of the type of density for the calculation is all the more important, since all the filler powders are first mixed together, and added later to the resin in a planetary mixer, where they are blended during several hours (see par. [0028]-[0031] of the specification). Hence, it is not credible that the use of the absolute density can provide a reliable conversion for the weight% used in the examples to the volume% used in the final composite of the claims. The measurement of the absolute density is made on an untapped volume of powder, while in the present case, the filler mixture and final composite is prepared by blending.

- 1.5 Moreover, it is also obvious that the conversion to or the determination of the corresponding volume% of the claimed combination depends also on other factors than the density, such as inter alia the amounts or ratio of amounts of the different powders and the size, porosity or nature of the components used. It is also obvious that the degree of grinding of the structural filler, which is not specified in the claims, has an incidence on the final shape of the filler and on its surface adsorption properties, and thus on the final volume percent.

In the present case, the filler mixture as claimed consists of a mixture of powders with very different sizes, namely a ground structural filler comprised with a size between 0.05 µm and 0.5 µm, with less than 50% by volume of particles above 0.5 µm, and a microfiller

with a mean particle size of 0.04 μm or less; the amounts are very variable since said structural filler may be present in a broad range of 10 to 70% by volume, while the microfiller may be comprised in a range between 1 and 10% by volume. In view of the broad amount ratio and of the different particle sizes, it does not appear possible to know what amounts of the different fillers should be combined in order to arrive at the claimed volumes after their combination, especially in view of the interactive behavior of the structural ground filler and the microfiller(s).

The porosity and the morphology of the powders are also important factors and play a role, especially as regards the structural filler, since it is said that the resin is retained within the interstice of the structural filler, and the microfiller particles may be located within the interstices of the structural filler particles and displace them from the interstices (see par. [0014]-[0017] of the specification). It appears to be common sense that when adding load volumes of a resin and of two or three filler materials of different particle sizes, the component(s) with smaller particle size fills the interstices between the bigger particles of the other component(s), and this behavior has an incidence on the final total volume, as is acknowledged in par. [0035] or [0017] of the specification. Thus, the total volume of resin and fillers in the composite taken will be different from the arithmetic load volumes of the different individual filler or resin materials and is difficult to predict.

1.6 Consequently, this amounts in an unpredictability as to the obtainable volume% and to a **"try and see"** method for obtaining the claimed volume% and/or for the preparation of the claimed composite.

Consequently, the skilled person does not know what initial amounts of the different fillers should be combined in order to arrive at the claimed volumes after their combination and the claimed invention is not sufficiently disclosed.

- 1.7 The respondent argued that it was obvious that it was the absolute density which should be used, and school-age children knew that the relationship between the mass and the volume was governed by the density of the material. The respondent cited documents D10, D14 and D15 in support of its arguments.

The Board does not contest this argument as such, but considers that it may only apply to a powder of a unique product, and not to a blend of several powders different in size, granulometry and porosity since it does not take into account the interaction between the different powders and the possible wide variations for a same powder. This is emphasized and confirmed by document D15, cited by the respondent, which states the following on page 1090:

"Percentage of fillers by volume can be measured through direct and indirect methods. The direct method using the picnometric technique showed **wide variations and high standard deviations** [...]. The indirect technique uses a mathematical formulation including the percentage of fillers by weight and the density of the fillers. This procedure is not always simple, because if the percentage of fillers by weight is easy to measure, it is not the case with the density **due to the wide variations of filler morphologies and molecular compositions**" (emphasis added by the Board).

Hence, D15 confirms that the knowledge of the density of the filler(s) is not sufficient for determining the volume corresponding to a specific weight only by calculation. In the present case, this is all the more crucial, since the structural filler must have an irregular shape to shelter the microfiller within its interstices.

According to the opposition division, D10 shows the conversion of weight% into volume% for the specific examples A-C of Table 3 of the contested patent, using the densities of the respective ingredients known from D11-D13. However, the evidence fails to show that the density of the barium aluminoborosilicate glass used in the examples of the patent is known. In any case, this specific calculation does not provide further information and cannot constitute evidence of a generally applicable method for conversion.

D14 is a statement which reminds that restorative composite may be described in terms of volume% and weight%; this statement merely repeats that it is a simple matter to convert from volume fraction to mass fraction and vice-versa, without providing further evidence or element as to the teaching of the contested patent.

1.8 Consequently, the claimed invention is not sufficiently disclosed.

2. Auxiliary requests 1-3

Independent claim 1 of all auxiliary requests comprises the same feature of volume percentage of the ground structural filler and the microfiller as claim 1 of the main request and all requests present therefore the

same deficiency as to sufficiency of disclosure as the main request. The conclusion reached for the main request applies therefore *mutatis mutandis* to all auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairwoman:



B. Atienza Vivancos

P. Schmitz

Decision electronically authenticated