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D E C I S I O N
of 24 November 1998

Case Number: T 0267/96 - 3.3.5

Application Number: 90902696.5

Publication Number: 0408771

IPC: C04B 35/10

Language of the proceedings: EN

Title of invention:
Alumina ceramic, abrasive material, and production thereof

Patentee:
SHOWA Denko Kabushiki Kaisha

Opponent:
(01) Minnesota Mining and Manufacturing Company
(02) H.C. STARCK GmbH & Co. KG

Headword:
Alumina ceramic/SHOWA DENKO

Relevant legal provisions:
EPC Art. 54(1)

Keyword:
"Novelty (no), features implicitly disclosed"

Decisions cited:
-

Catchword:

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0267/96 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 24 November 1998

Appellant: (Opponent 01)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 16 February 1996 concerning maintenance of European patent No. 0 408 771 in amended form.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar
M. B. Günzel

Summary of Facts and Submissions

I. European patent No. 0 408 771 was maintained in amended form on the basis of the amended set of claims 1 to 10 submitted during oral proceedings before the Opposition Division on 28 November 1995 in response to two oppositions. Claim 1 thereof reads as follows:

"An α-alumina-based ceramics material made of crystals of a particle diameter of no greater than 0.2 µm on an average or a particle diameter of substantially no greater than 0.2 µm, and having a density of no lower than 95% of the theoretical density and a Vickers hardness measured under a load of 500 g of no lower than 19.62 GPa (2,000 kg/mm^2)."

In the decision, inter alia, the following prior art document was considered:

D1: EP-A-0 294 208.

II. Both opponents appealed. In the appeal proceedings the opposition grounds of lack of novelty and lack of inventive step rejected by the Opposition Division were maintained. Oral proceedings took place on 24 November 1998. The respondent (patentee) had informed the Board that he would not attend the oral proceedings and it was not represented there.

The arguments against novelty of claim 1 put forward by the appellants during the appeal proceedings can be summarized as follows:

The product of claim 1 was anticipated by Examples 9 and 15 of D1. Although said examples did not mention the hardness of fibres produced with the processes disclosed therein, they inevitably had the required

hardness. Although the Vickers hardness under a load of 500 g (VH_{500}) could not be measured directly on the fibres themselves it must be equal to the hardness of ceramic products formed from the same starting materials and, apart from the spinning step, treated in the same way. The appellants had reproduced said examples, measured the crystal grain size, the density and the hardness of the ceramics so obtained and found that they fulfilled all the requirements of present claim 1.

III. The respondent refuted the appellants' arguments. With respect to Examples 9 and 15 of D1 it was maintained that the material disclosed therein did not have the required hardness.

The respondent's arguments presented in writing can be summarized as follows:

Following Example 9 of D1, only small products, unsuitable for measuring the Vickers hardness at a load of 500 g (HV_{500}), were obtained. A conversion factor for the conversion of the results obtained under a load of 100 g (HV_{100}) to values valid for a load of 500 g might only be applied to measured values obtained for the same substance, using the same device, and by the same person. A conversion factor could not be applied to the test results of the repetition of Example 9 by appellant I (opponent 01). A conversion factor could be used within the purview of the experiments described in the respondent's submissions dated 23 December 1994, comparing Example 9 of D1 and Comparative Example 3 of the patent in suit. In repeating Example 9 of D1, cracking occurred even at a load of 100 g since the size of specimen was too small. According to the results of these experiments Example 9 of D1 did not meet the requirements of the patent in suit.

With respect to Example 15 of D1 it was argued that the density of the ceramic according to Example 15 was unknown and that it was questionable that the hardness under a load of 500 g could have been measured.

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

The respondent requested that the appeals be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

2.1 D1 discloses microcrystalline alumina-based ceramic articles. In particular it discloses in Example 9 a flexible ceramic fibre having a uniform microstructure of α-alumina crystals with a grain size of 0.1 to 0.2 µm with very little, if any, evident porosity. The exact density and the hardness are not revealed. Appellant I repeated said example in order to determine the density and the hardness of the ceramics obtained with the process described therein. The fibre spinning step was omitted because the Vickers hardness cannot be measured on the fine fibres obtained according to Example 9 of D1. Appellant I obtained small ceramic particles having a density of 95.2% and a HV_{100} of 23.22 GPa. Because of the small size of the particles the hardness under a load of 500g could not be measured. A conversion factor for the conversion of HV_{100} to HV_{500} was determined by comparing their values in similar ceramics. The ceramics chosen were the ceramics obtained according to Examples 3 and 4 of the patent in suit. For Example 3 a conversion factor of 0.958 and

for Example 4 a conversion factor of 0.956 was obtained. Since the ceramics of said Examples 3 and 4 consist of the same material (α-alumina), having the same microstructure (crystal size between 0.10 and 0.30) and a density (over 95%) comparable with that of the ceramic fibres of Example 9 of D1, the Board accepts that a conversion factor so obtained may be used for determining the HV_{500} value from the measurement of the HV_{100} on ceramic particles obtained according to Example 9 of D1. Taking the lowest conversion factor 0.956, the Vickers hardness HV_{500} of the ceramics obtained according to said prior art Example 9 is 22.20 GPa, ie clearly within the range of more than 19.6 GPa as required by present claim 1.

2.3 Since the conversion factor was determined by the same person in the same ceramic system with the same device, it fulfils the requirements mentioned by the respondent in the letter of 13 January 1997, page 2, first sentence. But even if the conversion as determined by the respondent were applied, the result would still fall within the range of claim 1. The respondent made comparative hardness measurements at 100 and 500 g on a ceramic made according to Comparative Example 3 of the patent in suit and found as average value for HV_{100} 20.1 GPa and for HV_{500} 18.3 GPa; ie a conversion factor of 0.91 (18.3/20.1). When applied to the HV_{100} of 23.22 GPa for the ceramics of Example 9 of D1, a HV_{500} of 21.13 GPa is obtained. The respondent's argument that the hardness measurements on the small grains obtained according to Example 9 of D1 are unreliable because of cracking during measurement even if a load of only 100 g is applied, is not convincing. Although cracking probably occurred in some measurements, the respondent himself was able to measure the hardness of four or five grains obtained according to Example 9 of D1 (respondent's letter of 23 December 1994, point a iv).

This means that at least some grains were obtained on which measurements could be made without unacceptable cracking. The standard test method for Vickers indentation hardness of advanced ceramics (ASTM C 1327-96a) allows for some cracking. There is no evidence that the measurements of Appellant I were not in agreement with the requirements of said standard test.

2.4 The Board accepts that the hardness measurements performed on ceramic particles of the same composition and made under the same conditions as the corresponding ceramic fibres are representative for the hardness of the corresponding fibres. This has, in fact, not been contested by the respondent. On the contrary, with respect to Example 15 of D1 the respondent has indicated that he believed that, whether or not spinning of the gel is carried out, the obtained products were the same (respondent's letter of 13 January 1977, page 3).

2.5 The Opposition Division had accepted novelty on the grounds that it was uncertain whether the values achieved by appellant I would necessarily lie within the claimed range (point 9 of the reasons of the contested decision). The supposed uncertainty was based on the following arguments:

(a) the repetition was made under conditions which deviated from the essential requisites which are presupposed to achieve the claimed ceramic, and

(b) the hardness values HV_{500} presented to oppose novelty were not measured but calculated, for which there was no reliable basis.

The Board cannot accept these arguments for the following reasons:

Argument (a) would only apply if one supposes that the claimed ceramic can only be obtained by a process as disclosed in the patent in suit. There is however no evidence for such a supposition. On the contrary, the experiments performed by the appellants show that the claimed ceramics can also be obtained under process conditions which deviate from those mentioned in the patent in suit.

Argument (b) has already been dealt with under point 2. above. Even if some uncertainty in the measurements and conversion is taken into account, the hardness value determined for the product made according to Example 9 of D1 lies within the claimed value.

2.6 Further, during the appeal proceedings appellant II (opponent 02) provided convincing evidence that the fibres obtained in Example 15 of D1 fulfilled all the requirements of present claim 1. With the grounds of appeal measurements were presented for a product made according to Example 15 of D1. Apart from the fibre spinning feature, the process conditions were essentially the same as in said example. Particles of a size of less than 5 mm were obtained consisting of α-alumina crystals and having a hardness HV_{500} of 20.5 GPa and a grain size not greater than 0.2 µm . During the oral proceedings appellant II submitted that the density was 97.8%. The particle size of up to 5 mm is so large that, contrary to the reservation expressed by the respondent, the Board has no doubt that the hardness under a load of 500 g could have been reliably measured.

2.7 For these reasons the Board holds that the product of

claim 1, which is not limited to any specific form and thus includes ceramic fibres, is anticipated by the fibres of Examples 9 and 15 of D1, and thus lacks novelty within the meaning of Article 54(1) EPC.

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:

S. Hue R. Spangenberg