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Datasheet for the decision of 5 March 2024

Case Number: T 1708/22 - 3.3.05

Application Number: 13001601.7

Publication Number: 2610232

IPC: C04B35/486, A61C7/14, A61C13/00, B82Y30/00, C04B35/645

Language of the proceedings: EN

Title of invention:
ZIRCONIA SINTERED BODIES WITH HIGH TOTAL LIGHT TRANSMISSION

Patent Proprietor:
TOSOH CORPORATION

Opponents:
1.3M Deutschland GmbH (DE)/
2.3M Innovative Properties Company (US)

Headword:
Zirconia sintered bodies/Tosoh

Relevant legal provisions:
EPC Art. 83, 111(1)

Keyword:
Sufficiency of disclosure - main request (yes)
Appeal decision - remittal to the department of first instance (yes)

Decisions cited:
G 0003/14, T 0063/06, T 2387/09, T 1076/21

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1708/22 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 5 March 2024

Appellant: (Patent Proprietor)	TOSOH CORPORATION 4560, Kaisei-cho Shunan-shi Yamaguchi 746-8501 (JP)
Representative:	Müller-Boré & Partner Patentanwälte PartG mbB Friedenheimer Brücke 21 80639 München (DE)
Respondents: (Opponents)	3M Deutschland GmbH (DE)/ 3M Innovative Properties Company (US) Carl-Schurz-Str. 1 / P.O. Box 33427 41453 Neuss / St. Paul, 55133-3427 Minnesota (DE)
Representative:	Brem, Roland 3M Healthcare Germany GmbH OIPC Espe Platz 82229 Seefeld (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 11 May 2022 revoking European patent No. 2610232 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	E. Bendl
Members:	T. Burkhardt
	O. Loizou

Summary of Facts and Submissions

I. The patent proprietor's (appellant's) appeal lies from the opposition division's decision to revoke European patent No. 2 610 232 B1.

II. The following documents were among those discussed at the opposition stage:

D4 US 4,742,030 A
D9 US 2002/0031675 A1
D12 EP 3 088 373 A1
D21 EP 3 159 323 B1
D24 F. Zhang et al., "Importance of tetragonal phase in high-translucent partially stabilized zirconia for dental restorations", Dental Materials, 36, 2020, 491-500
D29 EP 2 692 311 B1

III. Following the board's communication under Article 15(1) RPBA 2020, the respondents cited specific contributions from the following Internet forums.

D35 https://www.researchgate.net/post/How-can-theoretical-density-be-calculated, Internet forum
D36 https://www.researchgate.net/post/How-can-theoretical-density-be-calculated, Internet forum

IV. The only independent claim of the patent as granted reads as follows:

"1. A translucent yttria-containing zirconia sintered body which has a grain size of 2.0 µm or smaller, a relative density of 99.5% or higher, and a total light transmittance, as measured at a thickness of 1 mm with visible light having a wavelength of 600 nm, of 40% or higher, and which is made of crystal phases which are constituted of a fluorite type tetragonal crystal phase and a fluorite type cubic crystal phase, the proportion of the fluorite type tetragonal crystal phase being 30%-80%, the zirconia sintered body comprising zirconia containing yttria in an amount larger than 4 mol% and not larger than 6 mol%."

The remaining claims 2 to 9 directly or indirectly refer to claim 1 and describe preferred embodiments.

V. The opposition division concluded, *inter alia*, that the patent as granted did not meet the requirements of Article 83 EPC because of the parameters "relative density" and "total light transmittance" in claim 1 of the patent in suit.

VI. The appellant's arguments at the appeal stage, where relevant to the present decision, can be summarised as follows.

The main request met the requirements of Article 83 EPC.

The case was to be remitted to the opposition division for examining patentability.

VII. The respondents' arguments at the appeal stage, where relevant to the present decision, can be summarised as follows.

The main request did not meet the requirements of Article 83 EPC for several reasons.

In view of the filing date of the patent in suit, the case was not to be remitted.

VIII. The appellant (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request (patent as granted) or alternatively in amended form on the basis of one of auxiliary requests 1 to 60, all auxiliary requests filed with the statement of grounds of appeal.

The joint respondents (joint opponents) requested that the appeal be dismissed.

Reasons for the Decision

Main request: Article 83 EPC

The respondents argued that the patent in suit did not meet the requirements of Article 83 EPC. They indicated several contentious issues:

- the "relative density of 99.5% or higher" in claim 1,
- the "total light transmittance ... of 40% or higher" in claim 1,
- the unit of the fluorite type tetragonal crystal phase in claim 1 and
- the parameters of the hot isostatic press (HIP) process.

However, for the reasons set out below, the invention of the patent as granted is sufficiently disclosed and meets the requirements of Article 83 EPC.

1. Preliminary remarks

As preliminary remarks, it is noted that

- while the patent in suit contains numerous inventive examples (see Tables 6 and 7), the respondents have not provided any experimental evidence for their allegations, and
- the respondents have not contested that the examples of the patent in suit can be reproduced.

2. Relative density

2.1 In the respondents' view, the skilled person did not know how to determine the relative density of a sintered body, in particular if it contained further compounds such as HfO_2 in addition to zirconia and yttria.

It was an ill-defined parameter and it was not possible to obtain substantially all the embodiments falling under the scope of claim 1.

In line with T 63/06, in the case in hand, too, there was only a weak presumption that the invention was sufficiently disclosed, and therefore the burden of proof had shifted to the appellant.

2.2 However, these arguments are not convincing.

The equation in paragraph [0080] of the patent in suit indicates that the relative density is the ratio of the

actual and the theoretical density. Theoretical density values are provided for 2%, 3% and 4% Y_2O_3.

In addition, paragraphs [0100] and [0103] of the patent in suit provide for theoretical densities for 5% and 6% Y_2O_3, namely 6.05 g/cm^3 (=5.86 g/cm^3/96.8%) and 6.03 g/cm^3 (=5.96 g/cm^3/98.9%), respectively. It appears that the opposition division did not account for these paragraphs when concluding that the invention was not sufficiently disclosed.

The respondents argue that paragraphs [0099] to [0103] only relate to very specific sintered bodies with unknown compositions, i.e. to TZ-5Y and TZ-6Y. This is not convincing since the yttria content of these zirconia powders is indicated in paragraphs [0099] and [0102]. Moreover, it has not been disputed that TZ-5Y and TZ-6Y were accessible commercial products of which the composition could be determined.

Consequently, the patent in suit discloses theoretical-density values for zirconia containing 2%, 3%, 4%, 5% and 6% Y_2O_3 covering the entire claimed range.

Moreover, the skilled person would plot these values in a diagram and discover a neat linear relationship between the Y_2O_3 concentration and the theoretical density.

The linear interpolation is so exact that its difference from the values in paragraphs [0080], [0100] and [0103] of the patent in suit is much less than 0.5% (i.e. the magnitude of the relative-density range from 99.5% to 100% in claim 1).

2.3 Moreover, at least at the opposition stage, the respondents appear to have succeeded in determining the relative density for the prior art, e.g. for Example 3 of **D4**.

2.4 While the patent in suit recommends the use of raw materials of high purity (e.g. paragraphs [0056] and [0057]), claim 1 does not limit the amount of further compounds, such as Fe, Ni or oxides, in addition to zirconia and yttria, such as Al_2O_3 or HfO_2. The presence of these compounds is indeed possible (see e.g. the patent in suit (paragraphs [0021], [0028] and [0057]), **D9** (paragraph [0046]) or **D29** (paragraph [0097])).

In the respondents' view, these further compounds had a significant influence on the theoretical density (as allegedly demonstrated by Table 1 of **D12**) but the patent in suit contained no guidance on how the theoretical density was to be determined in this case.

Irrespective of the question of the publication date of D12, the respondents have, however, failed to provide evidence that the presence of these other oxides does not *also* affect the other parameters in claim 1 (i.e. the parameters in addition to the relative density, such as grain size, light transmittance or crystal types). To the contrary, even the respondents confirm that these other components do have an impact on the crystal structure and grain size.

In other words, the respondents have provided no evidence for an yttria-containing zirconia sintered body in which, while the other parameters in claim 1 are respected, the influence of further compounds on the theoretical density is such that a problem of

sufficiency of disclosure arises. Therefore, under the present circumstances, sufficiency of disclosure must not be considered in an isolated manner for the relative density, but has to be considered in combination with the other features of claim 1.

What is more, even the respondents acknowledged at the oral proceedings at the appeal stage that there were different methods for determining the theoretical density, including X-ray diffraction analysis or a determination via the porosity. There is no evidence on file to prove that these methods result in significantly different results in cases in which the other parameters in claim 1 are within the claimed ranges.

2.5 There is also no evidence on file to prove that not substantially all the embodiments falling under the scope of claim 1 could be obtained.

Under these circumstances, the burden of proof has not shifted to the appellant just because the opposition division arrived at the conclusion that the patent in suit did not meet the requirements of Article 83 EPC (see T 1076/21, catchword).

2.6 Irrespective of the admissibility of the specific contributions of Internet forums D35 and D36, they cannot be considered to express common general knowledge. In addition, there is no evidence that these contributions also apply to cases in which, as under the present circumstances, the yttria-containing zirconia sintered sample is available and can be examined. There is also no evidence that any issue permeates the entire claim, and not just its borders.

2.7 The respondents further argued that e.g. sample A1 in Table 2 of the patent in suit even comprised two different types of tetragonal crystals and that it was unclear how the relative density was to be determined under these circumstances.

However, the examples in Table 2 of the patent in suit do not satisfy the requirement with regard to the yttria content of claim 1 (paragraph [0082]).

Under these circumstances, the presence of two types of tetragonal crystal types was irrelevant.

2.8 The respondents also argued that **D4** disclosed theoretical density *ranges* in column 8, lines 18 to 24, for tetragonal and cubic zirconia. Because of the narrow density range in claim 1 of the patent in suit, the error margins resulting from these ranges permeated the entire claim.

This argument is also unconvincing since the density ranges in D4 account for the influence of the yttria content on density as indicated in column 8, line 19. There is thus no proof of a wide density range for a given specific yttria concentration.

2.9 Furthermore, the respondents pointed to D22 and D23 (the communications under Article 15(1) RPBA 2020 regarding other oppositions that were issued by board 3305 in a different composition than at present), which held that the inventions were not sufficiently disclosed because of the relative-density parameter in the claims.

However, irrespective of the fact that D22 and D23 are only preliminary opinions and of their binding effect

on the present case, the conclusions do not apply to the case in hand. In those cases, the theoretical density was determined by means of an equation based on a *single* Y_2O_3 concentration, i.e. 3 mol%. It was considered to be unclear how different Y_2O_3 values were to be accounted for (D22: point 13.2; D23: point 12.5).

2.10 Any difference in the order of the theoretical differences for the tetragonal and the cubic crystal phases between **D4** (column 8, lines 18 to 21) and **D21** (paragraph [0029]) is irrelevant, since it relates at most to an issue of clarity (which is not to be discussed under the present circumstances according to G 3/14) and since, moreover, D21 was published after the priority and filing dates of the patent in suit.

2.11 Similarly, the differences in the fraction of the tetragonal crystal phase and in the density between Table 1 of **D24** (page 494) and paragraph [0100] of the patent in suit also relate at most to the clarity of claim 1 of the patent in suit; however, this aspect is not open for discussion as the claims are those as granted.

2.12 While the density was also the contentious parameter when assessing sufficiency of disclosure in T 2387/09, invoked by the respondents during the oral proceedings, the conclusions cannot apply to the case in hand.

While a method of measuring the density was not disclosed in the patent in suit in that case (point 2.4 of the Reasons), the patent in suit in the case in hand explains how the relative density is determined (see the discussion above).

3. Total light transmittance

The respondents also argue that the open-ended range for the total light transmittance of 40% or higher cause insufficiency of disclosure, in particular since none of the examples of the patent in suit have a total light transmittance above 46% (Table 7).

However, the fact that, in the present case, sintered bodies with a total light transmittance significantly higher than 46% possibly cannot be produced by means of the preparation method described in the patent in suit is not sufficient *per se* for proving insufficiency.

In accordance with claim 1, the crystal phases of the sintered body are constituted by fluorite type tetragonal and cubic phases, the fluorite type tetragonal crystal phases amounting to between 30% and 80%.

It has not been disputed that fluorite type cubic crystals result in higher light transmittance than fluorite type tetragonal crystals (see e.g. paragraph [0044] of the patent in suit).

The board therefore considers that the total light transmittance of the sintered body is *inherently* limited by the other features of claim 1 (Case Law of the Boards of Appeal, 10th edition, 2022, II.C.5.5.2).

In the present case, the open-ended range hence does not cause insufficiency of disclosure.

4. Unit of the fluorite type tetragonal crystal phase

In the respondents' view, the invention was moreover not sufficiently disclosed because it was unclear whether the proportion of the fluorite type tetragonal crystal phase between 30% and 80% was in weight%, volume% or mol%.

However, the patent in suit indicates in paragraph [0078] that said proportion is determined "by the Rietveld analysis after an XRD examination".

The appellant's assertion that this method yields weight percentages has not been disputed.

The board therefore agrees with the opposition division, as expressed in its preliminary opinion accompanying the summons to oral proceedings, and also finds that this is not a problem of sufficiency of disclosure.

5. HIP sintering conditions

The respondents are of the opinion that the skilled person has to carry out a whole research program for producing the claimed sintered body.

However, paragraphs [0045] to [0063] of the patent in suit describe the steps to be followed in the process for producing the sintered bodies of the invention and Examples 51 to 60 in Tables 6 and 7 illustrate the invention.

More particularly, paragraphs [0060], [0063] and [0088] explain what to do if a sintered body has low light transmittance (i.e. if "blackening" has occurred):

- use a ceramic vessel instead of a carbon/graphite vessel,
- allow only limited access for air, e.g. by using argon in a semi-sealed vessel, i.e. a vessel covered by a plate.

It is explained that these measures prevent carbon monoxide from forming.

Again, the respondents have provided no evidence for their allegations nor have they alleged an undue burden for not doing so.

6. Remittal

6.1 The appellant also requested that the case be remitted to the department of first instance for further prosecution.

6.2 By contrast, in view of the filing date of the patent in suit in 2007, the respondents requested that the case not be remitted.

6.3 Pursuant to Article 111(1) EPC, the board may either exercise any power within the competence of the department responsible for the decision appealed or remit the case to that department for further prosecution.

It is the primary function of appeal proceedings to give a judicial decision on the correctness of the decision under appeal (Article 12(2) RPBA; see also Case Law of the Boards of Appeal, 10th edition, 2022, V.A.1.1, second paragraph and the decisions referred to in it).

In the decision under appeal, patentability has not been dealt with. All the requests failed because of Article 83 EPC or Article 123(2) EPC.

According to established case law, remittal in accordance with Article 111(1) EPC is normally considered by the boards where essential questions regarding the patentability of the claimed subject-matter have not yet been examined and decided on by the department of first instance (Case Law of the Boards of Appeal, 10th edition, 2022, V.A.9.3.2 a)).

Under the circumstances of the case in hand, not remitting the case to the examining division would therefore require the board to carry out an in-depth examination of the application rather than to review the contested decision in a judicial manner, which is the primary purpose of appeal proceedings.

Pursuant to Article 11 RPBA the Board will not remit a case to the department whose decision was appealed for further prosecution, unless special reasons present themselves for doing so. Under the circumstances set out above the Board finds that this amounts to the special reasons within the meaning of Article 11 RPBA 2020.

Therefore, the Board exercises its discretion while at the same time also taking into account the filing date of the patent. The case is remitted to the opposition division for further prosecution (Article 111(1) EPC).

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 for further prosecution.

The Registrar: The Chairman:

L. Malécot-Grob E. Bendl

Decision electronically authenticated