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**Datasheet for the decision
of 4 August 2014**

Case Number: T 0974/12 - 3.3.06

Application Number: 06007509.0

Publication Number: 1710015

IPC: B01J35/04, F01N3/022, F01N3/28,
B01D53/86, B01D39/20

Language of the proceedings: EN

Title of invention:
Ceramic honeycomb structure

Patent Proprietor:
Ibiden Co., Ltd.

Headword:
Ceramic honeycomb structure/IBIDEN

Relevant legal provisions:
EPC Art. 52(1), 54, 84, 111(1), 123(2), 123(3)

Keyword:
Amendments - allowable (yes) - added subject-matter (no) -
clear (yes) - broadening of claim (no)
Novelty - (yes)
Remittal to the department of first instance

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 0974/12 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 4 August 2014

Appellant: Ibiden Co., Ltd.
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Ogaki-shi, Gifu (JP)

Representative: Hager, Thomas Johannes
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 13 February
2012 revoking European patent No. 1 710 015
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman B. Czech
Members: E. Bendl
U. Lokys

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division revoking European patent No. 1 710 015.
- II. In this decision, posted on 13 February 2012, the opposition division concluded that the respective claims 1 according to the then pending requests either lacked novelty over document
- D6: EP 1 479 882 A1 (main request)
- or were objectionable under Article 123(2) EPC (auxiliary requests 1, 2 and 3) and 123(3) EPC (at least auxiliary request 1).
- III. By letter dated 13 March 2012 the sole opponent withdrew its opposition.
- IV. With its statement of grounds of appeal, the patentee/appellant filed five sets of claims as main request and auxiliary requests 1 to 4 and argued that the requirements of novelty and inventive step were met in view of the prior art documents cited in the opposition proceedings, i.e. D6 and
- D1: EP 1 249 262 A1,
D2: EP 1 479 881 A1,
D3: EP 1 247 556 A1,
D4: SAE Technical Paper Series: "Strength and Thermal Shock Resistance of Segmented Wall-Flow Diesel Filters", Int. Congress and Exposition Detroit, Michigan, Feb. 24-28, 1986
D5: EP 1 419 816 A1 and
D7: EP 1 437 168 A1.

- V. The appellant was summoned to oral proceedings. In the communication issued in preparation of the oral proceedings the board addressed issues under Articles 123(2), 84 and Rule 80 EPC regarding the then pending sets of claims.
- VI. Thereupon, with its letter of 22 May 2014, the appellant filed a further set of amended claims 1 and 2 as new sole (main) request replacing all the previously pending requests.
- VII. The appellant was informed by the rapporteur (in a telephone conversation with the representative, Mr Hager, on 28 May 2014) of the board's preliminary view that this amended set of claims appeared to comply with the requirements of Article 123(2) EPC and the novelty criterion of Articles 52(1)/54 EPC), and of the the intention of the board to, therefore, remit the case to the opposition division for further prosecution.
- VIII. With fax received on 2 June 2014, the appellant announced that considering said preliminary opinion of the board, it withdrew its request for oral proceedings.
- IX. The scheduled oral proceedings were cancelled.
- X. In a further telephone conversation on 10 July 2014 between Mr Hager and the rapporteur outstanding issues of clarity were addressed, *inter alia* regarding the feature "Unilube". In the course of the conversation the following amended wording of claim 1 was considered as potentially overcoming all outstanding objections regarding clarity, added matter and novelty:

"1. A honeycomb structure wherein:

a plurality of porous ceramic members (20) are bonded through an adhesive layer (11), each of the porous ceramic members (20) having a plurality of cells (21), which are arranged in parallel while being separated by cell walls (23), and the cells extending in a longitudinal direction of the honeycomb structure (10), wherein

a relation expressed by an expression (1) is satisfied:

$$2 \leq B \leq 100/3 \cdot A - 10/3$$

where A (in g/cm³) designates apparent density of the porous ceramic members (20) and B (in GPa) designates Young's modulus of the adhesive layer (11), wherein

the porous ceramic members (20) are formed as follows:

7,000 parts by weight of coarse powder of α -silicon carbide having an average particle size of 22 μ m and 3,000 parts by weight of fine powder of α -silicon carbide having an average particle size of 0,5 μ m are wet-mixed;

further, 1100 parts by weight of organic binder, i.e. methyl cellulose, 330 parts by weight of plasticizer, 150 parts by weight of lubricant, i.e. glycerin and a proper amount of water are added and kneaded to obtain a mixture composition;

after that, the mixture composition is extruded to produce a prismatic raw molded body;

next, the raw molded body is dried by use of a microwave dryer so as to be formed into a ceramic dried body;

after that predetermined cells are plugged with plug paste the composition of which is similar to that of the raw molded body;

next, the raw molded body is dried again by the dryer, then degreased at 400 °C and fired at 2,200 °C for three hours under an argon atmosphere at normal pressure; thereby manufacturing a porous ceramic member made of a silicon carbide sinter having a porosity of 45%, an average pore size of 11 μm , the porous ceramic member measuring 34.3 mm by 34.3 mm by 150 mm and having a number of cells 21, i.e. a cell density of 46.5 cells/cm², the thickness of the cell walls being 0.25 mm, the apparent density being 0.55 (g/cm³) and the open area ratio being 68.8%,

wherein the adhesive layer (11) and the honeycomb structure are formed as follows:

30 parts by weight of silicon carbide powder having an average particle size of 0.5 μm , 7 parts by weight of silica sol with a SiO₂ content in sol of 30 wt%, 63 parts by weight of silica-alumina fibers with 3 μm in average fiber diameter and 60 μm in average fiber length, 0.5 parts by weight of carboxymethyl cellulose and water are mixed and kneaded;

wherein in the preparation of the adhesive paste, a required amount of water is added so that the viscosity of the adhesive paste is 40 \pm 5P;

using the adhesive paste as an adhesive layer 2 mm thick, 16, i.e. 4 by 4 porous ceramic members are

bonded and successively cut by a diamond cutter thus producing a cylindrical block;

next, the adhesive paste is used as a coat forming paste and applied to the outer circumferential portion of the ceramic block 15 so as to be 0.5 mm thick, and then dried at 120 °C; thus manufacturing a cylindrical honeycomb structure measuring 143.8 mm in diameter and 150 mm in length."

Dependent claim 2 remained unchanged (version filed with the letter of 22 May 2014):

"2. The honeycomb structure according to claim 1, wherein a catalyst is carried and supported in at least a part of the cell walls (23)."

XI. In its letter of 21 July 2014 the appellant once again confirmed that the wording of claim 1 to be considered was the one considered during the phone conversation of 10 July 2014 (see point X). With said letter the appellant also submitted document

D8 = EP 2 484 654 A1

to prove that the "Unilube" plasticizer referred to in the patent was combusted upon firing.

XII. The appellant requested in writing that the decision be set aside (see letter of 25 June 2012, page 7, first paragraph) and the patent be maintained on the basis of claim 1 discussed with the rapporteur on 10 July 2014 (see letter of 21 July 2014, paragraph 1, referring to the communication dated 15 July 2014) and dependent claim 2 submitted with its letter of 22 May 2014.

XIII. The arguments of the appellant of relevance here can be summarised as follows:

Article 123(2) EPC

- Independent claim 1 was a combination of claim 1 as originally filed with example 7.

Article 84

- The clarity of amended claim 1 was no longer objectionable.

Novelty

- The specific combination of features as claimed was not been disclosed in any of the documents cited in opposition procedure.
- Therefore, novelty of the claimed subject-matter was given.

Reasons for the Decision

Admissibility of the appellant' request

1. The board considers the appellant's sole request as a *bona fide* attempt to deal with issues raised in the board's communication with regard to the sets of claims previously on file. Moreover, the amendments made to the claims are *prima facie* considered to meet the clarity requirements, are no longer objectionable under Article 123(2), (3) EPC and render the claimed subject-matter novel over the cited prior art. The grounds having led to the revocation of the patent (see point II *supra*) thus no longer prejudice the possible maintenance of the patent.

Therefore, the board decided to admit the appellant's request despite its late filing during the appeal procedure (Articles 114(2) EPC and 13(3) RPBA).

Admissibility of the amended claims under Rule 80 EPC

2. In view of the amendments made to the claims earlier objections under Rule 80 are overcome.

Allowability of the amendments under Article 123(2), (3) EPC

3. Amended claim 1 contains the definition of the honeycomb structure according to claim 1 as originally filed and additionally comprises, almost literally, the sequence of specific preparation steps according to example 7 described in the patent and the application. Moreover, features characterising the physical properties of the ceramic members, the adhesive layer and the final honeycomb structure so obtained are also included in claim 1.

- 3.1 Said example 7 refers to the combination of porous ceramic member D with adhesive paste C (see Table 3). More specifically, the details concerning the preparation of the honeycomb structure that were incorporated into claim 1 find a basis in the following parts of the application as filed:

- 3.1.1 The passage described on page 19, lines 4 to 8 relates to the manufacture of porous ceramic members B to F, i.e. also of porous ceramic member D. It refers back to the process steps described in the passage from page 18, line 9 to page 19, line 2.

- 3.1.2 In the manufacture of porous ceramic member D, certain parameters of the preparation process are set according to the indications in Table 1. The properties of the so-prepared ceramic member D are also indicated in Table 1.
- 3.1.3 The preparation of adhesive paste C used according to example 7 is described on page 22, lines 1 to 11, and page 23, lines 1 to 2. The parameters to be set when preparing paste C are indicated in Table 2.
- 3.1.4 The further steps required when combining members D with paste C and shaping the aggregate body in order to obtain the final honeycomb structure according to example 7 are set out on page 23, 4 to 11, in combination with lines 13 to 16.
- 3.1.5 However, the reference to the specific commercial plasticizer used according to said example, i.e. "*Unilube made by NOF Corp.*", was not incorporated into claim 1. Document D8, submitted by the appellant, shows that "Unilube" plasticizer is combusted at a firing temperature of 1500°C (cf. paragraphs [0092],[0095] of D8). As the claimed process involves firing at the much higher temperature of 2,200°C, the board has no doubts that "Unilube" is completely combusted in the claimed process. Consequently, the board concludes that no subject-matter extending beyond the content of the application as filed is generated by virtue of the omission of the indication "Unilube" from the wording of the claimed process.
- 3.1.6 The application as filed, and in particular example 7, thus discloses a honeycomb structure obtained using the process steps defined in claim 1 and displaying all the physical/morphological features of the finished

structure required by claim 1. Hence, the board is satisfied that amended claim 1 at issue finds a fair basis in the application as filed a honeycomb structure.

3.2 Dependent claim 2 corresponds to claim 4 as originally filed.

3.3 By virtue of the incorporation of further features into claim 1, the scope of the claims is restricted compared to the ones as granted.

3.4 Hence, in the Board's judgement, claims 1 and 2 are not objectionable under Article 123(2), (3) EPC.

Allowability of the amendments under Article 84 EPC

4. The board is satisfied that the wording of the amended claims at issue is clear and supported by the description, i.e. that the previously raised objections under Article 84 EPC are overcome.

Admissibility of "product by process" claim 1

5. In proceedings before the EPO, the characterisation of a claimed product by the process of its preparation, usually referred to as "product by process claim", is admissible under certain conditions. Such claims may comprise both product and product-by-process features.

5.1 A criterion usually applied when assessing the admissibility of such a claim is whether or not the claimed product can be described in any other way.

5.1.1 In this regard, the board accepts that the legitimate attempt of the appellant to limit the claimed subject-

matter to the specific embodiment described in example 7 does not appear to be possible without including features of the respective preparation process used for the following reasons.

5.1.2 In the present case, several physical properties of the ceramic members, of the adhesive layer(s) and of the final honeycomb structure are influenced by the method of preparation used. The omission of one or more of these processing steps would therefore define the claimed honeycomb structure and its properties in more general terms than disclosed in example 7. Such an intermediate generalisation of the original disclosure in example 7 would thus at least potentially be objectionable under Article 123(2) EPC.

5.1.3 Thus, the board accepts that, in the present case, the product according to example 7 cannot be claimed with sufficient detail in another way than in the form of a "product-by-process" claim.

5.2 Another criterion considered is whether the product so claimed can actually be distinguished from prior art products, in order to make it possible to fully assess its patentability.

Since in the present case, the claimed subject-matter is clearly novel (see point 6 *infra*) when taking into account all the features of claim 1, the board is satisfied that this criterion is also sufficiently met.

5.3 The board concludes that claim 1 is not objectionable for being (partially) put in a product-by-process form by virtue of the amendments made.

Novelty

6. The board is satisfied that a honeycomb structure displaying, in combination, all the product features of claim 1 at issue (including dimensions of ceramic members, paste layers and honeycomb structure, paste layer and ceramic member material composition, cell density, porosity, average pore size, wall thickness, apparent density, open area ratio) is not directly and unambiguously disclosed in any of the prior art documents cited in the opposition proceedings:

6.1 The honeycomb structures exemplified in D1 (see paragraph [0041] and Table 1) differ at least in terms of wall thickness (0.38 mm) and cell density (31 cells /cm²). Moreover, D1 is silent on porosity.

6.2 Most of the honeycomb structures exemplified in D2 (examples 1 to 39) differ from the ones according to claim 1 at issue at least in terms of the particle size distribution of the coarse SiC powder used for producing the ceramic members and in terms of the wall thickness (0.3 mm).

Examples from example 40 onwards are made from 20 µm SiC particles but in admixture with fine Si powder, and also differ at least in terms of wall thickness (0.30 mm).

Moreover the examples are either silent about porosity and average pore size values (examples 1 and 40) or display values differing from the ones required by claim 1 at issue (examples 10 and 19: porosity 50%, average pore diameter 20µm; example 49: porosity 55%, average pore diameter 20 µm).

- 6.3 The honeycomb structures exemplified in D3 (see paragraphs [0054] and Table 1) differ at least in terms of the wall thickness (0,3 mm) and cell density (37,2 cells/cm²). No indications are given concerning pore sizes or porosity of said exemplified structures.
- 6.4 The honeycomb structures according to D4 are not made from SiC, but from cordierite (see page 11, left-hand column penultimate full sentence) and have different average pore sizes of (12, 25 and 35 µm; see tables 1(a), 1(b) and 2).
- 6.5 The honeycomb structures exemplified in D5 are not made from SiC (see tables 1 and 4 to 8; columns labelled "Material"), let alone in combination with the porosity and average pore sizes as defined in claim 1 of the request.
- 6.6 According to document D6 (cited as novelty-destroying by the opposition division in view of novelty objections), the porosity is preferably set to a value between 40 and 80% (see [paragraph 40]), the pore diameter ranging between 5 and 100 µm (paragraph [0042]). Only examples 10 and 16 give concrete information in this respect, but refer to a porosity of 50% in combination with an average pore diameter of 20 µm, i.e. being different from the ones according to claim 1 at issue. Moreover, the only concrete value for the wall thickness (0.30) is given in examples 1, 10, 16, but it differs from the one according to claim 1 at issue.
- 6.7 The honeycomb structures actually exemplified in D7 (see paragraph [0037] and Table 1) are made from a SiC/Si powder mix and also differ at least in terms of

their wall thickness (380µm), cell density (31 cells/cm²) porosity and average pore size.

- 6.8 Therefore, the honeycomb structures according to claim 1 at issue and, consequently, the ones according to narrower claim 2 dependent thereon, are novel over the prior art cited by the adverse party in the opposition proceedings (Articles 52(1) and 54(1)(2) EPC).

Remittal of the case

7. The Board, not wishing to deprive the appellant of an assessment of the compliance of the patent in the amended version at issue with the other requirements of the EPC by the department of first instance, considers it appropriate to remit the case to the opposition division pursuant to the provisions of Article 111(1) EPC.

Order

For these reasons it is decided that:

1. The impugned decision is set aside.
2. The case is remitted to the opposition division for further prosecution on the basis of claims 1 and 2 according to the appellant's request (claim 1 see "Attendance note about a phone conversation" posted on 15 July 2014 and claim 2 as submitted with letter of 22 May 2014).

The Registrar:

The Chairman:



D. Magliano

B. Czech

Decision electronically authenticated