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# Datasheet for the decision of 13 September 2013

**Case Number:** T 1943/07 - 3.3.05

**Application Number:** 99937177.6

**Publication Number:** 1109757

**IPC:** C04B35/58, F27B9/24, F27D3/12

**Language of the proceedings:** EN

**Title of invention:**
CERAMIC AND PROCESS FOR THE CONTINUOUS SINTERING THEREOF

**Patent Proprietor:**
KENNAMETAL INC.

**Opponent:**
CeramTec AG Innovative Ceramic Engineering

**Headword:**

**Relevant legal provisions:**
EPC Art. 54, 56, 111(1)
RPBA Art. 12(4), 13(1)

**Keyword:**
Inventive step (all requests):no
no need to reformulate the problem defined in the patent in suit; problem solved; obvious solution

**Decisions cited:**
J 0006/98, T 0248/85, T 0281/03, T 0214/04, T 0105/09

**Catchword:**

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**Case Number: T 1943/07 - 3.3.05**

# D E C I S I O N
# of Technical Board of Appeal 3.3.05
# of 13 September 2013

| | |
|---|---|
| **Appellant:** (Patent Proprietor) | KENNAMETAL INC.<br>P.O. Box 231<br>Latrobe, PA 15650-0231 (US) |
| **Representative:** | Prinz & Partner<br>Patentanwälte<br>Rundfunkplatz 2<br>80335 München (DE) |
| **Respondent:** (Opponent) | CeramTec AG Innovative Ceramic Engineering<br>Fabrikstrasse 23-29<br>D-73207 Plochingen (DE) |
| **Representative:** | Uppena, Franz<br>Chemetall GmbH<br>Patente, Marken & Lizenzen<br>Trakehner Strasse 3<br>60487 Frankfurt/Main (DE) |
| **Decision under appeal:** | **Decision of the Opposition Division of the European Patent Office posted on 10 October 2007 revoking European patent No. 1109757 pursuant to Article 101(3)(b) EPC.** |

**Composition of the Board:**

**Chairman:** G. Raths
**Members:** G. Glod
D. Prietzel-Funk

## Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division to revoke the European patent EP-B-1 109 757 which is concerned with a "ceramic and process for the continuous sintering thereof".

II. In its decision the opposition division found that independent claim 11 of the patent in suit, formulated as a product claim obtainable according to one of the process claims 1 - 10, lacked novelty with respect to D5. The opposition division was of the opinion that it had only to examine whether D5 disclosed the depth of the surface reaction layer of no greater than 127 µm, since the patent proprietor had agreed that all the other features of claim 11 were disclosed in the prior art. The opposition division came to the conclusion that D5 disclosed a surface portion of between 0.01 and 0.1 mm and that said surface portion had to be equated with the surface reaction layer mentioned in claim 1 of the patent in suit which depth was to be no greater than 127 µm.

The following documents were cited during the opposition procedure:

D1: DE-A-33 06 157
D2: US 4 127 416
D3: DE-T-38 77 943
D4: DE-A-34 14 979
D5: US 5 411 923

III. The patent proprietor (appellant) lodged an appeal on 29 November 2007 against the decision of the opposition division and provided the statement of grounds of appeal on 15 February 2008.

IV. The opponent (respondent) replied to the notice of appeal with the letter of 30 June 2008.

V. Summons to oral proceedings for 13 September 2013 were sent on 18 March 2013. In its preliminary non-binding opinion accompanying the summons, the Board indicated that not D5, but D3 was seen to be relevant to the question of novelty of claim 11, while D5 was more relevant to the question of inventive step of all the claims of the patent in suit.

Further submissions were made by the appellant by letter of 1 August 2013 and by the respondent by letter of 12 August 2013, respectively. With the latter, the respondent cited the following documents:

D6: Wittner et al. (1993): Economic Comparison of Continuous and Batch Sintering of Silicon Nitride, American Ceramic Society Bulletin, Vol. 72, No.6, p. 129—137

D7: US 5 648 042

VI. Oral proceedings took place on 13 September 2013, during which novelty and inventive step of the requests were discussed.

VII. **The appellant's** arguments, submitted during the written procedure and oral proceedings, which are relevant to the present decision, can be summarised as follows:

As to novelty:
D1 did not disclose a SiAlON ceramic material having the physical properties as required by claim 11 of the patent in suit and a surface reaction layer as required

by claim 1. A batch processed ceramic part whose surface layer had been removed by grinding like in D1 and a continuous-processed ceramic part like in the claimed invention still differed decisively in their surface structure.

D2 related to a single phase (beta'-SiAlON) ceramic material that was produced by the use of setting powder. The ceramic material had not the physical properties as disclosed in claim 11 of the patent in suit.

D3 failed to disclose a density of the ceramics within the limits of claim 11 of the patent in suit. In addition, neither the exact composition of KYON 2000 (a SiAlON composition) was disclosed nor a surface reaction layer of less than 127 µm of the sintered compact. Only the thickness of the alumina coating was given.

D4 related to a batch process wherein setting powder was used. The obtained ceramic bodies did not have the physical properties present in claim 11 of the patent in suit.

D5 was silent about the physical properties of the sintered ceramic bodies. The term "about" relating to physical properties in claim 11 of the patent in suit was generally apt to help defining values which can be subject to deviation by measurement but were still considered to be within measuring tolerance. A broad interpretation of the term "about" was only justified for the lower end values of the fracture toughness, hardness and density of claim 11 of the patent in suit, since the values of claim 18 extended only beyond the lower end values of the ranges defined in claim 11.

Claim 18 had to be considered independently from claim 11, since claim 18 did not include all the features of claim 11. D5 did not disclose the exact composition of the ceramic bodies. In the table in columns 7 and 8 of D5 only the SiALON amount was given in vol%, but no disclosure was made as to the remaining part of the sintered body.

As to inventive step:
The purpose of D3 was to provide an acceptable coated SiAlON cutting tool. This was achieved by providing a SiAlON specimen, then applying alumina ($Al_2O_3$) to the surface, and finally heat treating the ceramic core substrate to form the resultant ceramic body. D3 would lead away from the process according to claim 1 of the patent in suit since the specimen used was a batch-sintered core SiAlON body.

The invention according to the patent in suit would avoid removal of the surface reaction layer comprised of alpha'-SiAlON, beta'-SiAlON and B-phase ($Y_2SiAlO_5N$) which is formed through a batch sintering process.

D5 related
- to a batch process that did not provide three or four heating zones and subject the green compact to an atmosphere of flowing nitrogen during sintering; and

- to specific ceramic bodies having a surface portion of alpha'-SiAlON that were produced by sintering in a slightly reducing atmosphere that was not further defined.

The problem underlying the patent-in-suit in the light of D5 could be seen as the provision of a process for the production of SiAlON-based ceramics that would

eliminate the need for a post-sintering grinding step so as to remove the surface reaction layer in order to provide an acceptable surface appearance (see paragraph [0010] of the patent-in-suit).

There would be no teaching and motivation in D5 to change the process to arrive at the present invention.

The process disclosed in D5 did not allow to produce a sintered ceramic body according to claim 11 of the patent in suit. The upscaling of the process did not lead inevitably to a continuous process.

D6 and D7 were late filed and should not be admitted into the proceedings. D6 related to automotive parts and not to cutting inserts. If the Board nevertheless decided to admit D6 into the proceedings, the case should be remitted to the opposition division.

VIII. **The respondent's** arguments, submitted during the written procedure and oral proceedings can be summarised as follows:

As to novelty:
D1, D3 and D5 were novelty destroying for the subject matter of claim 11 of the patent in suit.

D1 disclosed a sintering body according to claim 11 of the patent in suit.

D3 disclosed a sintered ceramic body for use as a cutting insert comprising up to 70 vol.-% alpha'-SiAlON, 10 to 99.9 vol.-% beta'-SiAlON and up to 10 vol.-% of an intergranular phase. The surface reaction layer had a thickness in the range of 2 to 10 µm. Table 3 of D3 showed that the heat treated ceramic body had a

hardness and a fracture toughness falling within the ranges given in claim 11 of the patent in suit. The density was only 0.5% above the claimed range.

In addition, the essential features of the process according to claim 1 were known from D5. In the process of D5, the green body remained during the whole sintering process in the same carbon case so that the sintering process was continuous. No setting powder was used and the green compact was subjected to an atmosphere of flowing nitrogen during heat treatment. It was not shown by the patent proprietor that the continuous passing through three or four heating zones led to a different result than the stationary heating with different heating steps like in D5. The temperature ranges for the sintering process were disclosed in claims 18 and 19 of D5 and overlapped with the range given in the patent in suit.

The conversion table for hardness, submitted by letter of 12 August 2013, showed that the hardness values given in D5 were higher than the ones of claim 11 of the patent in suit, but high hardness was a desired outcome of the patent in suit. D5 disclosed that the inner part of the sintered body was made of beta'-SiAlON which led to a high toughness and strength. Since the composition of the sintered body from D5 was identical to the one claimed, the man skilled in the art had to expect that the fracture toughness was also in the range claimed. According to D5 hot isostatic pressing may be applied after sintering. This led to a densification of the sintered body so that the density of the sintered bodies from D5 had to be at least as high as the density given in claim 11 of the patent in suit.

Thus, the subject-matter of claim 11 was unambiguously derivable from D5 to the skilled person.

D2 and D4 disclosed compositions and physical properties as claimed in the patent in suit.

Table VI of the patent in suit did not relate to a ceramic body according to claim 11, since that body was only made from beta'-SiAlON. In addition, the values given in Table V did not fall within the scope of claim 11 of the patent in suit. The composition of composition C was not disclosed in the patent in suit. It was expected that it mainly comprised $Si_3N_4$ and not SiAlON in view of the low amount of Al present.

As to inventive step:
D5 had to be considered as the closest prior art for the process according to claim 1. D5 did not disclose a continuous process comprising a continuous passing of the green compact through three or four heating zones.

This feature could not be considered relevant for inventive step, since D7 showed that such flow-through furnaces were commonly known. In addition, in the examples according to the patent in suit the three heating zones had identical temperatures, which showed that these different heating zones did not have a specific function.

The problem to be solved was to provide a cheaper and automated production of SiAlON ceramic bodies, as indicated in paragraph [0063] of the patent in suit.

D6 disclosed a continuous process for sintering silicon nitride. SiAlON belonged to the family of the silicon nitride based ceramic materials. D5 and D6 related to

the same technical field and SiAlON had substantially the same requirements for sintering than $Si_3N_4$. Upscaling from a batch process to a continuous process was commonly done. It was obvious to the skilled person that the process disclosed in D6 could also be applied to SiAlON ceramic bodies. The skilled person would combine D5 with D6 with a reasonable expectation of success and arrive at a continuous process. Several heating zones were commonly known as illustrated by D7.

*IX.* **Independent claim 1** of the patent in suit **(main request)** reads as follows:

*"1. A continuous process for the manufacture of a sintered ceramic body wherein the ceramic material comprises a two-phase composite of alpha'-SiAlON phase and beta'-SiAlON phase, and a glassy phase; and wherein the alpha'-SiAlON phase ranges from 10 to 70 weight percent of the ceramic material; the beta'-SiAlON phase ranges from 20 to 90 weight percent of the ceramic material, and the glassy phase ranges from 0.1 to 10 weight percent of the ceramic material and wherein the sintered compact has a surface reaction layer with a depth of no greater than 127 µm (.005 inches), said process comprising the steps of:*

*forming a green compact from a ceramic material powder mixture comprising a first component comprising compounds which contain elements of silicon, aluminum, oxygen and nitrogen; and the powder mixture further comprising a second component comprising a compound of at least one element selected from the group consisting of yttrium, scandium, cerium, lanthanum and the metals of the lanthanide series, and the second component comprising between 0.1 and 10 weight percent of the powder mixture;*

*placing said green compact in a container without any setting powder;*
*heat treating the green compact wherein the heat treatment comprises subjecting the green compact to an atmosphere of flowing nitrogen and continuously passing the green compact through at least three or four heating zones so as to produce a sintered compact, and wherein at least one of said heating zones is at a temperature of between 1720°C and 1800°C."*

**Independent claim 11** reads as follows:

*"11. The sintered ceramic body obtainable according to one of claims 1 to 10 wherein the sintered ceramic has the following physical properties: a fracture toughness between about 5.93 and about 6.69 MPa $m^{1/2}$, a hardness of between about 15.68 and about 16.30 GPa, and a density of between about 3.24 and about 3.26 grams per cubic centimeter."*

**The first auxiliary request** differs from the main request in that the term *"about"* in claim 11 and dependent claim 18 in entirety were deleted.

**The second auxiliary request** differs from the main request in that claims 11 to 34 were deleted so that only the process claims 1 to 10 remain.

X. Requests:

The **appellant** requests that the decision under appeal be set aside and the patent be maintained as granted.

Alternatively, it requests to maintain the patent on the basis of one of Auxiliary requests I or II submitted with the letter of 1 August 2013.

The **respondent** requests that the appeal be dismissed.

## Reasons for the Decision

1. Article 100(a) EPC: Novelty: Main request

1.1 As admitted by the respondent, none of the prior art documents D1 to D7 discloses a process wherein a green compact is continuously passing through three or four heating zones. The subject-matter of **independent claim 1** is therefore novel.

1.2 **Independent claim 11** relates to a sintered ceramic body obtainable by a process according to claims 1 to 10. It is thus formulated as a product-by-process claim and any product having the same composition and properties as the one obtainable by a process according to claim 1 has to be considered as novelty destroying(see T 248/85, Reasons 6.4).

Claim 11 is essentially directed to a ceramic material comprising a two-phase composite of alpha'-SiAlON phase and beta'-SiAlON phase, and a glassy phase, wherein the alpha'-SiAlON phase ranges from 10 to 70 weight percent of the ceramic material, the beta'-SiAlON phase ranges from 20 to 90 weight percent of the ceramic material, and the glassy phase ranges from 0.1 to 10 weight percent of the ceramic material and wherein the sintered compact has a surface reaction layer with a depth of no greater than 127 µm. The ceramic material should have the following physical properties: fracture toughness of between about 5.93 and about 6.69 MPa $m^{1/2}$, a hardness of between about 15.68 and about 16.30 GPa, and a density of between about 3.24 and about 3.26 grams per cubic centimeter.

It has to be determined whether a ceramic material like this can unambiguously be derived from the prior art.

1.3 D1 discloses a ceramic material comprising 10 to 70 weight-% alpha'-SiAlON, 20 to 90 weight-% beta'-SiAlON and 0.1 to 10 weight-% of a glassy phase (see claims 1 to 4). The production of such a ceramic material is done via a batch process, wherein a setting powder is used (see example 1). D1 is completely silent about the surface depth of the surface reaction layer. Since the process disclosed in D1 is different from the process according to claim 1 of the patent in suit, it cannot be assumed that the process according to D1 leads to the same product as the process of the patent in suit. Consequently, D1 cannot be considered novelty destroying for the subject-matter of claim 11 of the patent-in-suit.

1.4 D2 does not disclose alpha'-SiAlON and does not anticipate the novelty of the subject-matter of claim 11 of the patent in suit.

1.5 D3 discloses a ceramic body consisting essentially of a matrix of up to 70 volume-% of alpha'-SiAlON, 10 to 99.9 volume-% beta'-SiAlON and up to 10 volume-% of an intergranular phase (see page 6, second paragraph). The heat treated KYON 2000 shown in table 1 comprises alpha'-SiAlON phase and beta'-SiAlON phase, and a glassy phase made of small amounts of N-apatite or N-YAM. It has a toughness of 6,72 MPa $m^{1/2}$, a hardness of 15,84 GPa, and a density of 3,275 grams per cubic centimeter. The surface coating with aluminum oxide prior to heat treatment is 6 µm thick (see page 10, second paragraph). This surface thickness relates to the alloyed surface layer and not to the surface

reaction layer of the KYON 2000 itself. According to claim 1 of the patent in suit the surface reaction layer with a depth of no greater than 127 µm concerns the sintered compact which is the material exiting the three or four heating zones (see penultimate line of claim 1, *"to produce a sintered compact"*).

D3 does not disclose the thickness of the surface reaction layer of the sintered compact, namely KYON 2000, itself. D3 does not disclose any details about the production of KYON 2000 either so that it cannot be argued that the surface reaction layer thickness would be implicitly known.

Therefore, the Board comes to the conclusion that the subject-matter of claim 11 is not unambiguously derivable from D3.

1.6 D4 is silent about the thickness of the surface reaction layer and the fracture toughness. D4 does not disclose the subject-matter of claim 11 of the patent in suit.

1.7 D5 was considered novelty destroying for the subject-matter of claim 11 of the patent in suit by the opposition division. The Board does not share this view.

D5 discloses a sintered body comprising a surface portion comprising alpha'-SiAlON and beta'-SiAlON wherein alpha'-SiAlON has a ratio of at least 0.6 relative to the sum of both, and an inner portion comprising beta'-SiAlON and alpha'-SiAlON wherein beta'-SiAlON has a ratio of at least 0.6 relative to the sum of both (claim 1). The sum of alpha'-SiAlON and beta'-SiAlON assumes 60 to 95 vol % of the entire

sintered body (column 3, lines 65 to 67). The silicon base sintered body may include a boundary phase of glassy phase (see column 4, lines 3 to 12). The starting powdery mixture for producing such sintered bodies comprises $Si_3N_4$ and other selected constituent materials from the group such as $Al_2O_3$, AlN, $SiO_2$, AlON, $Si_2ON_2$, $Y_2O_3$, YN, MgO, CaO, $Na_2O$, oxides or nitrides of rare earth elements and the like (see column 4, lines 22 to 25). $Y_2O_3$ is among the preferred starting materials, since it is used in examples 1 to 5 (2 to 8 weight-% of the raw material composition) and part of the system illustrated in figure 5. The sintered body has a surface portion that has a thickness in the range of 10 to 100 µm (see claims 5 and 6 of D5).

The starting material is press-formed followed by sintering at a temperature of 1550°C to 1800°C under a nonoxidizing atmosphere containing nitrogen (see column 4, lines 26 to 34). The desired surface can be obtained, for example, by sintering in a slightly reducing atmosphere (see column 4, lines 42 and 43) or firing in an atmosphere of nitrogen (see column 4, lines 57 and 58). It is unambiguous from these passages that sintering under nitrogen is one option that allows to obtain the ceramic sintered body having the desired surface properties.

The Board is of the opinion that the composition of the sintered bodies disclosed in D5 overlaps with the composition of the sintered ceramic body according to claim 1 of the patent in suit wherein the alpha'-SiAlON phase ranges from 10 to 70 weight percent of the ceramic material; the beta'-SiAlON phase ranges from 20 to 90 weight percent of the ceramic material, and the glassy phase ranges from 0.1 to 10 weight percent of the ceramic material and wherein the sintered compact

has a surface reaction layer with a depth of no greater than 127 µm (.005 inches). Therefore, the composition with respect to the alpha'-SiAlON phase, the beta'-SiAlON phase and the glassy phase as well as the thickness of the surface reaction layer do not permit to distinguish the ceramic bodies of claim 11 of the patent in suit from the ones disclosed in D5.

However, as admitted by the respondent in its letter of 12 August 2013 (see page 2, last paragraph, first sentence), the hardness values given in D5 (Table in columns 7 and 8) are outside the range given in claim 11. In addition, D5 is silent about the fracture toughness and the density of the sintered body. These physical parameters can also not be deduced from the preparation process disclosed in D5.

The subject-matter of claim 11 is therefore novel with respect to D5.

1.8 As a result, none of the prior art documents anticipates the novelty of the subject-matter of the independent claims 1 and 11. The patent in suit thus meets the requirements of Article 54 EPC.

2. Article 100(a) EPC: Inventive step: Main request

2.1 The invention concerns a continuous heat treating process for the production of ceramics that may be used as cutting inserts, nozzles, wear parts and the like (see [0001] of the patent in suit).

2.2 Cutting tools, wear resistant parts, sliding parts or the like are also addressed in document D5 (column 1, lines 11 to 13). In consent with the parties, D5 is considered as closest prior art, since it relates to

the provision of an improved silicon nitride sintered body which comprises alpha- and beta-SiAlONs. In such a body the wear resistance, toughness and strength can be sufficiently developed, and every such property is improved over the conventional silicon nitride sintered body (see D5, column 1, lines 47-53). As explained above under 1.7, D5 discloses sintered ceramic bodies having the composition and surface thickness as required by the process according to claim 1 of the patent in suit.

2.3 According to the patent in suit the problem to be solved is the provision of a cheaper and easier process for the production of SiAlON-based ceramics having a thin surface reaction layer (see paragraphs [0006], [0010] and [0064] of the patent in suit).

2.4 As a solution to this problem, the patent proposes a process according to claim 1 characterized in that the process is continuous and the heat treatment comprises subjecting the green compact to an atmosphere of flowing nitrogen and continuously passing the green compact through three or four heating zones so as to produce a sintered compact, wherein at least one of said heating zones is at a temperature of between 1720°C and 1800°C.

2.5 It is credible that the problem is solved, since it is generally known that continuous processes are advantageous as compared to batch processes.In particular, the process for making a batch-processed ceramic part requires that the ceramic part be physically removed from the tray in which is was delubed, and then physically placed in the tray in which it is batch-processed. This transfer step adds an additional step to the manufacturing process as well as

additional labor costs. This additional step falls away in a continuous manufacturing process. So the continuous process is easier and the labor costs are reduced, which makes the process cheaper (see patent in suit, [006] ). The problem as defined under point 2.3 is the one underlying the patent in suit in the light of document D5 and so there is no need of reformulation of the problem.

2.6 It now has to be determined whether the solution to the problem is obvious in view of the prior art.

2.6.1 The skilled person starting from D5 as closest prior art knows that the sintering temperature and the sintering atmosphere are critical for obtaining the desired surface portion and surface thickness of the sintered body (see column 4, lines 43 to 58).

The skilled person trying to simplify the process of D5 would thus turn to documents relating to the sintering of ceramic materials, and especially SiAlON bodies, under specific atmospheres, which give indications about processes that have benefits with respect to classical batch processes.

2.6.2 One of those documents would be D6. It discloses several commercially available $Si_3N_4$ powders that were sintered in a commercial belt furnace over the temperature range of 1625°C to 1750°C in flowing nitrogen (see page 136, left-hand column, procedure). D6 teaches that high strength and fracture toughness are obtainable for $Si_3N_4$-compositions sintered in a belt furnace (i.e. a continuous process). These properties are equivalent or even better than for compositions sintered under batch conditions under higher temperatures for longer times (see page 137, left-hand

column, second paragraph). In addition, belt sintering was found to be more cost effective than batch sintering for two sizes of $Si_3N_4$ cam-roller followers (see page 137, left-hand column, last paragraph).

2.6.3 The Board is of the opinion that the skilled person trying to solve the posed problem would have considered the teaching of D6. The reason herefore is that D5 relates to a broad spectrum of applications including cutting tools, wear resistant parts, sliding parts and the like (see column 1, lines 11-12) so that a document like D6 concerning automotive applications (which comprise wear resistant parts and sliding parts) would be of relevance. In addition, the materials obtained in D6 have high toughness and strength, which are properties that are also relevant in D5 (see column 1, lines 49 and 50). D6 even teaches that these properties may be improved by sintering in a belt furnace.

D6 relates to the sintering of silicon nitrides in general, but not to the sintering of SiAlON as defined in D5 (see formulas in column 3 of D5, lines 2 and 17). However, it appears to the Board that the most relevant criterium to be considered is whether the compositions are sinterable under conditions attainable in a belt furnace (see D6, page 137, last paragraph). As indicated above (point 2.6.1), the temperature and the atmosphere are key criteria for the process of D5. D6 clearly teaches that the temperature range of D5 and the nitrogen atmosphere of D5 can also be obtained in a furnace process according to D6 (see page 136, left-hand column, procedure). The difference in chemical composition is not so relevant in that case, since SiAlON has very similar sintering requirements as $Si_3N_4$. The Board sees no reason why the skilled person would

not apply the teaching of D6 to D5.

Therefore, the Board concludes that the skilled person trying to solve the posed problem would take into consideration the teaching of D6 and try a continuous process as disclosed in D6 for the production of the sintered body according to D5 with a reasonable expectation of success.

D6 is silent about the details of the belt furnace used and the presence of several heating zones. However, at the priority date of the patent in suit, the skilled person executing the continuous process of D6 knew that any belt furnace disclosed in the art that is suitable for sintering and allowed temperature ranges as indicated in D6 (1625°C to 1750°C) in flowing $N_2$ was an acceptable belt furnace for the process of D6. D6 does not put any special emphasis on the type of belt furnace to be used, but only mentions a "commercial belt furnace".

In this regard attention is drawn to D7 which discloses a high-temperature belt furnace and explicitly refers to D6. D6 indicates that sintering in belt furnaces is more cost effective than in batch furnaces (column 2, lines 24 to 34). Thus, the skilled person understands that the belt furnace disclosed in D7 should be considered especially appropriate for carrying out the process of D6. The belt furnace of D6 comprises means for continuously feeding a stream of an inert gas (see column 4, lines 62 to 65) and has three heating zones (see column 5, lines 48 to 52).

Thus, the skilled person would consider the belt furnace of D7 as a possible choice for the process of D6.

2.6.4 To conclude, the skilled person, starting from D5, trying to solve the posed problem at the priority date of the patent would apply the teachings of D6 to D5 with a reasonable expectation of success. He would choose the belt furnace according to D7 as one possible option that can be used in D6. In doing so, he would arrive at the process according to claim 1 of the patent in suit.

2.6.5 The choice of several heating zones cannot be attributed a special effect, since the patent in suit is completely silent in that respect. It should also be noted that the only composition given in the patent in suit falling within the ceramic material definition of claim 1 is composition A. Table II of the patent in suit shows that the preparation of that composition according to examples 1 to 5 was done in a belt furnace having equal temperatures for the three heating zones. This confirms that the three heating zones have no other function than just heating.

The argument of the appellant that the continuous process would eliminate the need for a post-sintering grinding step so as to remove the surface reaction layer in order to provide an acceptable surface appearance has to be refuted, since the surface of the sintered ceramic body disclosed in D5 has already the desired thickness of less than 127 µm so that no difference in surface appearance seems to exist with respect to D5.

2.6.6 The Board concludes that claim 1 of the main request lacks an inventive step in the sense of Article 56 EPC in view of D5 in combination with D6 and D7. Therefore, the main request must fail.

3. Article 56 EPC: Inventive step: Auxiliary requests I and II

Claim 1 of auxiliary requests I and II is identical to claim 1 of the main request. The same arguments concerning inventive step as brought forward for claim 1 of the main request apply here.

Claim 1 of auxiliary requests I and II does not fulfill the requirements of Article 56 EPC either, so that said requests must fail.

4. Articles 12(4) and 13(1) RPBA: Late filed documents D6 and D7 - Admission into the proceedings

4.1 D7 was cited by the respondent in its reply to the statement of grounds of appeal (see letter of 30 June 2008, page 3, last paragraph).

4.2 In its statement of grounds of appeal, the appellant tried to refute the arguments of the opposition division concerning D5 as novelty destroying document. In its reply, the respondent considered it necessary to cite D7 (actually filed with letter dated 12 August 2013) to complement the inventive step objection based on D5 (see letter of 30 June 2008, page 5, two last paragraphs).

The Board considers the filing of D7 as a - precautionary - reaction to the arguments brought forward by the appellant in its statement of grounds of appeal.

Therefore, D7 is admitted to the proceedings.

4.3 D6 was (also) filed with the letter of 12 August 2013, one month before the oral proceedings.

D6 complements the line of argument brought forward by the respondent in the reply to the statement of grounds of appeal so that no new situation arises for the Board as well as for the appellant. It can also be considered as a reaction to the preliminary non-binding opinion of the Board, wherein it was made clear that it intended not to remit the case to the opposition division, even if the question of inventive step needed to be discussed.

Furthermore, the submissions of auxiliary request II by the appellant with the letter of 1 August 2013, which did not contain the product claims any more, led to a slightly changed situation for the respondent that required complementation of the already existing inventive step objection.

D6 is cited in D7 (see column 2, lines 26 to 28), which confirms that no new line of argument is presented. D6 is easy to understand and its only two pages (pages 136 to 137) can be considered to be really relevant.

Therefore, D6 is admitted to the proceedings.

5. Article 111(1) EPC: The appellant's request of remittal to first instance

5.1 The EPC does not guarantee the parties an absolute right to two instances in the sense that parties are entitled to have every aspect of fact or of law on which a board of appeal bases its decision examined

previously by the first instance (see J 6/98, Reasons 4; T 105/09, Reasons 2.6; T 214/04, Reasons 3).

5.2 That means that the Board is not hindered to close the case with its final decision, though the ground for opposition of inventive step had not been decided by the opposition division. In addition, the question of inventive step starting from D5 as closest prior art was already discussed in the preliminary non-binding opinion of the opposition division accompanying the summons to oral proceedings before the opposition division.

5.3 Also, the time axis of the procedure and the file contents should not be neglected. The appeal was already filed in 2007. In view of the fact that arguments concerning inventive step were already mostly present before the opposition division, remittal in the present case was unjustified since it would not serve any constructive purpose and would unnecessarily prolong the procedure. The Board therefore exercises its discretion under Article 111(1) EPC not to remit the case for further prosecution to the opposition division for reasons of procedural economy.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz G. Raths

Decision electronically authenticated