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Datasheet for the decision of 10 July 2017

Case Number: T 0989/14 - 3.3.05

Application Number: 04758776.1

Publication Number: 1613566

IPC: C04B35/64, B29C67/00

Language of the proceedings: EN

Title of invention:
Method for producing ceramic objects

Applicant:
Siemens Aktiengesellschaft

Headword:
Selective laser sintering/SIEMENS

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - non-obvious solution

Decisions cited:

Catchword:

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Case Number: T 0989/14 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 10 July 2017

Appellant: (Applicant)	Siemens Aktiengesellschaft Wittelsbacherplatz 2 80333 München (DE)
Representative:	Siemens AG Postfach 22 16 34 80506 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 20 December 2013 refusing European patent application No. 04758776.1 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	E. Bendl
Members:	J.-M. Schwaller
	R. Winkelhofer

Summary of Facts and Submissions

I. This appeal lies from the decision of the examining division to refuse European patent application No. 04 758 776.1 on the grounds that claim 1 of the main request then on file did not meet the requirements of Article 123(2) EPC and that claim 1 of the auxiliary request lacked inventive step over document D3 (WO 02/40744 A1).

II. With its statement of grounds of appeal, the appellant filed six sets of amended claims as main request and auxiliary requests 1 to 5.

III. In a communication, the board inter alia expressed its preliminary opinion that document D2 (US 4 863 538 A) represented the closest prior art and that the claimed subject-matter of the then third auxiliary request appeared to lack inventive step over D2 taken in combination with the teaching of D3.

IV. The appellant answered that it withdrew the main, first and second auxiliary request, and made the third and fourth auxiliary requests the new main request and first auxiliary request, respectively. The fifth auxiliary request was maintained as such. On 7 July 2017, the appellant submitted three additional sets of claims as auxiliary requests 2 to 4.

V. At the oral proceedings before the board the discussion focused on the compliance of the claimed subject-matter with Articles 54 and 56 EPC.

At the end of the discussion, the appellant withdrew the then pending main request and auxiliary requests 1 and 3 and made auxiliary request 2 the new main

request. Auxiliary requests 4 and 5 became new auxiliary requests 1 and 2.

VI. Independent claim 1 of the now main request reads as follows:

"*1. A process for producing a ceramic mold from ceramic powder, said process comprising:*
providing a powder bed and a laser,
scanning the laser over the powder bed and laser sintering the powder bed in such a way that the geometry of the mold is produced from raw material powder bed,
said process further comprising forming a first region of the mold by laser sintering of a first ceramic powder and forming a second region of the mold integral with said first region by laser sintering of a second ceramic powder, wherein the first ceramic powder has a first average grain size and the second ceramic powder has a second average grain size,
wherein the forming of at least one of the first and second regions comprises controlling at least one parameter selected to provide a different material property in the first and second regions of the mold, wherein additional layers of powder and additional steps of laser heating maybe added to form a ceramic shape in accordance with the mold, and wherein the first region of the ceramic mold comprises an inner region of the mold, and the second region of the ceramic mold comprises an outer region of the mold and further wherein the process is controlled so that said inner region is relatively denser than said outer region of the mold."

Independent claim 9 reads as follows:

"9. A ceramic mold formed by the process of claim 1 wherein the first ceramic powder comprises a first material and the second ceramic powder comprises a second material different than the first material, wherein the first ceramic powder has a first average grain size and the second ceramic powder has a second average grain size."

Claims 2 to 8 and 10 to 12 are dependent on claims 1 and 9, respectively, and refer to preferred embodiments thereof.

VII. The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request, filed as auxiliary request 2 with submission of 7 July 2017, or alternatively of auxiliary requests 1 or 2, filed as auxiliary requests 4 and 5 with submission of 7 July 2017 and with the statement of grounds of appeal, respectively.

Reasons for the Decision

1. Main request

1.1 Amendments

The claims of this request meet the requirements of Article 123(2) EPC as they have a basis as follows in the application as filed:

- claim 1: in claims 1, 2, 8 and the passages at pages 3, lines 6 to 7 and 16, and page 4, last paragraph;

- dependent claims 2 to 8: in claims 4 to 11;

- claim 9: in claim 12 and page 3, lines 6 to 8;

- dependent claims 10 to 12: in claims 13 to 15.

1.2 Clarity

The wording of the claims of the main request is sufficiently clear, concise and supported by the description.

Therefore, the requirements of Article 84 EPC are met.

1.3 Novelty

None of the documents cited in these proceedings discloses a process for producing a mould by laser sintering of ceramic powders such that the inner region of the mould is relatively denser than the outer region.

A ceramic mould formed by the above process using a first and second ceramic powder comprising two different materials is also not disclosed in any of the documents in the proceedings.

It follows that independent claims 1 and 9, and by the same token claims 2 to 8 and 10 to 12 which depend thereon, meet the requirements of Article 54(1),(2) EPC.

1.4 Inventive step

Applying the problem-solution approach, the subject-matter of claim 1 of the main request involves an inventive step in the following respects:

1.4.1 The application in suit relates to a process for producing ceramic objects, more particularly for rapidly producing, by means of laser sintering, a ceramic mould having different material properties at selectable locations within said object (see "Summary of the invention").

1.4.2 D2 (US 4863538 A) relates to the production of ceramic objects by laser sintering of ceramic powders whereas D3 (WO 02/40744) teaches about laser melting of ceramic powders. Given that the application in suit relates to laser sintering, D2 represents the closest prior art.

D2 also discloses the preparation of an object which can be used as a mould (see Figure 4), and so the problem vis-à-vis this prior art might be seen in the provision of a cost-effective laser sintering process for rapidly producing a mould having different material properties.

1.4.3 As a solution to this problem, the application proposes the process according to claim 1 at issue, which is in particular characterised in that the laser sintering process uses two ceramic powders and is controlled in such a way as to provide a denser inner region of the mould, compared to the outer region.

1.4.4 As regards the obviousness of the claimed subject-matter, none of the documents in the proceedings discloses the solution proposed above.

The closest prior art D2 discloses the creation of objects in a layer-by-layer manner. Although post-treatment is disclosed in the paragraph bridging columns 6 and 7, no suggestion is made as to how to obtain articles having a denser inner region, compared to the outer region. Thus, D2 alone does not render the claimed subject-matter obvious.

D3 discloses the preparation of a hybrid ceramic object from ceramic powders of different types (D3, page 4, lines 18 to 23) by **melting** the powders at selected different regions by means of a laser beam and depositing successive layers of the molten powders to form the three-dimensional ceramic object. It is doubtful whether the skilled person would apply the teaching of D3, which relates to laser **melting**, to the method as claimed, relating to sintering. And even if this were the case, D3 teaches only that "multiple feeds can be selectively graded to form a hybrid part having different ceramic regions corresponding to different ceramic powders" (page 4, lines 22 to 23), resulting in "[c]eramic parts and structures with high density" (page 5, line 29). No hint is given in D3 as to how to produce a mould having a denser inner region and a less dense outer region, and so even if the skilled person had an incentive to look at document D3, he would not arrive at the wording of claim 1 at issue.

D1 (US 5837960 A) discloses (claim 1) a process including the step of laser melting similar to the one of D3, but for the production of three-dimensional articles made from metal or alloy powders. In the specific embodiments of claims 10 or 12, the powder composition can be varied during formation of the article or an article of variable density can be formed. D1, however, discloses neither the production

of ceramic articles nor the preparation of a mould, let alone of a mould having its inner region denser than its outer region. So if the skilled person had an incentive to look at this document, he would not arrive at the wording of claim 1 at issue either. The process according to claim 1 at issue has the further advantage that it is cost-effective in comparison with the processes known from documents D1 and D3, since the powders are not melted, but sintered.

1.4.5 The above reasons apply similarly to the ceramic mould according to claim 9, which is formed by the process of claim 1 at issue and which is further distinguished from the disclosure of document D2 in that two ceramic materials are used to produce the mould.

1.4.6 It follows from the above considerations that, having regard to the state of the art, the subject-matter of independent claims 1 and 9 at issue, and by the same token that of dependent claims 2 to 8 and 10 to 12, which include all the features of claims 1 and 9, respectively, is not obvious to a person skilled in the art, and so involves an inventive step in the sense of Article 56 EPC.

2. Since the claims of the main request meet the requirements of the EPC, there is no need to consider the lower-ranking requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the main request, filed as auxiliary request 2 on 7 July 2017, and the description to be adapted.

The Registrar: The Chairman:

A. Vottner E. Bendl

Decision electronically authenticated