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D E C I S I O N
of 27 July 2004

Case Number: T 0126/02 - 3.2.7

Application Number: 95810684.1

Publication Number: 0771884

IPC: C23C 4/04

Language of the proceedings: EN

Title of invention:

Boron nitride and aluminum thermal spray powder

Patentee:

Sulzer Metco (US) Inc.

Opponent:

H.C. STARCK GmbH & Co. KG

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step -yes"

Decisions cited:

T 0158/97

Catchword:

-



Case Number: T 0126/02 - 3.2.7

D E C I S I O N
of the Technical Board of Appeal 3.2.7
of 27 July 2004

Appellant: Sulzer Metco (US) Inc.
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Representative: Hammer, Bruno, Dr.
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Respondent: H.C. STARK GmbH & Co. KG
(Opponent) Im Schleeke 78-91
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Representative: Peters, Frank M., Dr.
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Law and Patents
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D-51368 Leverkusen (DE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 7 December 2001
revoking European patent No. 0771884 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. Burkhardt
Members: P. A. O'Reilly
R. A. M. Moufang

Summary of Facts and Submissions

I. The appellant (proprietor) filed an appeal against the decision of the Opposition Division to revoke the European Patent No. 0 771 884.

II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC (lack of inventive step).

The Opposition Division held that the subject-matter of claim 1 of the patent as granted was novel but did not involve an inventive step.

The most relevant prior art documents for the present decision are:

D1: Proceedings of the International Thermal Spray Conference & Exposition, Orlando, Florida, USA, 28 May - 5 June 1992, W.J. Jarosinski and M.F. Gruninger, "High Temperature Boron Nitride Abradable Materials", pages 691-694.

D2: EP-A-0 459 114

D3: US-A-3 655 425

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

The respondent requested that the appeal be dismissed.

IV. The independent claims of the patent as granted read as follows:

"1. A composite thermal spray powder substantially in the form of clad particles each of which comprises a core particle of boron nitride and subparticles of aluminum-silicon alloy, the subparticles being bonded to the core particle with an polymeric binder."

"7. A composite thermal spray powder substantially in the form of clad particles each of which comprises a core particle of boron nitride and subparticles of aluminum-silicon alloy, the subparticles being bonded to the core particle with an polymeric binder, the alloy containing 10% to 14% silicon by weight of the alloy with balance aluminum and incidental impurities, the boron nitride being present as 15% to 20% by weight of the total of the boron nitride and the alloy, the polymeric binder being present as 6% to 12% by weight solids of the total of the boron nitride and the alloy, the core particles having a size between 74 μm and 177 μm , and the alloy subparticles having a size between 1 μm and 44 μm ."

V. The appellant argued in written and oral submissions essentially as follows:

The Opposition Division in their decision established that the subject-matter of claim 1 is not obvious. The Opposition Division then relied on Board of Appeal decision T 158/97. That decision is not applicable in this case. The Opposition Division considered that there was no technical effect because there was no advantage. There is no requirement however that the solution to a problem has to be superior to prior art solutions; it only needs to be different to the prior art solution and non-obvious. The powder claimed in

claim 1 in fact results in superior coatings, in particular with respect to abrasability.

The closest prior art is document D2. The problem to be solved compared to this prior art is set out on page 3, lines 3 to 10 of the patent in suit. Document D2 discloses the chemistry of the invention but not the physical properties of the powder. Document D1 discloses only agglomerated powders and teaches against the use of silicon. The combination of document D2 and document D1 would result in an agglomeration of boron nitride and aluminum. Document D3 leads away from the invention since only a partial cladding is proposed and the cladding is not of a metal.

The powder according to the invention results in a coating which has less binder which leads to superior hardness and heat resistance. Also the boron nitride, which decomposes at high temperature, is protected by the aluminum-silicon cladding particles which preferentially melt when subjected to heat. There is thus a technical effect so that Board of Appeal decision T 158/97 is not applicable to the present case.

VI. The respondent argued in written and oral submissions essentially as follows:

The subject-matter of claim 1 does not involve an inventive step. The closest prior art document is document D2. This document is a development from document D3. In document D3 the boron nitride particles were small compared to the metal particles and formed the cladding. In document D2 the boron nitride

particles were of a similar size to the metal particles and formed an agglomeration. It is the next obvious step to make the boron nitride particles even larger compared to the metal particles and hence provide them as core particles.

Starting from document D2 the problem to be solved is to provide an alternative powder. This must be the problem since no improvement has been proven for the powder according to claim 1. In document D1 the skilled person learns that using the larger boron nitride particles of the types BN-2 and BN-3 increases the deposit efficiency of boron nitride in the coating compared to the smaller BN-1 particles. He would thus increase the size of the boron nitride particles and hence provide these as core particles.

The subject-matter of claim 1 also does not involve an inventive step starting from document D1. The difference of claim 1 to the disclosure of document D1 is that the larger boron nitride particles in BN-2 or BN-3 are in a composition with aluminum-silicon particles. The problem to be solved is again to provide an alternative powder for the same reason as given with respect to document D2. In document D2 it is mentioned that the metal particles can be aluminum or an aluminum alloy, preferably aluminum-silicon alloy. The skilled person would thus arrive at the subject-matter of claim 1 starting from document D1.

The technical effects alleged by the appellant have not been proven. Table 3 of the description of the patent in suit does not give a true comparison with document D2. The amount of binder in the coating is less than in

the example from document D2 because the amount of binder in the initial powder according to the invention is less. The amount of binder disclosed in document D2 can be less than the amount mentioned in the patent in suit though the comparative example gives a large amount. The comparative example is neither a true comparison nor does it prove an advantage. Since the technical effects have not been proven Board of Appeal decision T 158/97 is applicable.

Reasons for the Decision

1. *Inventive step*

1.1 Closest prior art

The closest prior art is represented by document D2 which discloses the following features of claim 1:

A composite thermal spray powder comprising particles of boron nitride and particles of aluminum-silicon alloy, the particles being bonded together with a polymeric binder.

1.2 Problem to be solved

The objective problem to be solved by the distinguishing features of claim 1 is to provide an alternative powder for thermal spraying.

1.3 Solution to the problem

The solution to the problem is that the spray powder is in the form of clad particles with the boron nitride particles as core particles and the aluminum-silicon alloy provided in the form of subparticles.

1.4 The solution to the problem is not obvious for the following reasons:

Document D2 is concerned with an agglomerated composite wherein the agglomerated particles are homogeneous with respect to the subparticles. In this case the two subparticles are boron nitride and aluminum-silicon alloy. The powder disclosed in document D2 is itself a development from the teaching of document D3 which is concerned with partially clad particles. In document D2 the advance over the teaching of document D3 is to be seen in the provision of agglomerated particles as opposed to the known clad particles. Document D2 specifically refers to the improved abrasability of agglomerated powder compared to clad powder (column 4, lines 42 to 45).

The skilled person considering alternatives to the powders disclosed in document D2 would not consider clad particles since document D2 specifically teaches away from such particles. When looking for alternatives skilled person may be expected to consider document D1 which concerns boron nitride abrasable materials. The document first discusses systems including boron nitride, aluminum and silicon. A conclusion is reached that the results are better if less silicon is used. There are then considered three

different composite powders, none of which include silicon. A first composite includes boron as fine particles encapsulating a metal. The other two are specifically described as agglomerated and include boron nitride with either aluminum or an alloy of other metals. The teaching of document D1 may thus be seen as avoiding the use of silicon and using an agglomerated powder including boron nitride and a metal alloy. The skilled person starting from document D2 and wishing to solve the objective problem when consulting document D1 would not find any teaching which would lead him in the direction of the distinguishing features of claim 1. With respect to silicon document D1 specifically leads away and with respect to cladding the document gives no hint to do this with boron nitride as the core particle.

The respondent also argued that the subject-matter of claim 1 is a natural development starting from document D3 via document D2 wherein the importance of the boron nitride naturally increases from cladding particle to agglomerate to core particle. The Board cannot agree with this argument. In document D3 it is specifically desired that there should be access to the cladded particle which is metal and should be melted. To this end the cladding is only partial. Document D2 specifically speaks out against core particles. The appellant has explained that boron nitride when exposed to high temperatures will decompose before it melts. This statement has not been challenged by the respondent. Further the appellant explains that one function of the aluminum-silicon subparticles is to protect the boron nitride from the heat of the spraying flame by themselves absorbing the heat by melting. This

explanation is plausible. This means that the function of the cladding in the patent in suit is quite different to that in document D3 wherein the partial cladding should allow thermal access to the core particle. The skilled person receives therefore no information that the subject-matter of claim 1 is just the natural development starting from document D3. The natural development starting from document D3 would be first that the best form of particles is established in document D2, i.e. agglomerated, and then an improvement in the composition is sought, e.g. by looking at document D1. It is true that if the size ratios of the boron nitride particles to the other particles are considered then the subject-matter of claim 1 may be considered to be in a direction starting from document D3. However, two documents cannot be considered to give a strong development line when the second document specifically teaches away from a line in the direction of a cladded particle. The argument of the respondent cannot be followed in this respect.

Also, starting from document D1, as further argued by the respondent, the skilled person would not arrive at the subject-matter of claim 1. This document, as already indicated, teaches against the inclusion of silicon and prefers agglomerated powders. The argument of the respondent that the skilled person would learn to use silicon from document D2 is not sufficient to arrive at the subject-matter of claim 1 since document D2, like document D1, teaches an agglomerated powder.

The Opposition Division in their decision accepted that the subject-matter of claim 1 was not obvious. They considered however that it did not involve an inventive

step since no technical effect or technical justification for the modification could be shown. The Opposition Division considered that the difference to the prior art had no technical function and might be disadvantageous. The Board would note that a technical advantage is not a requirement for inventive step. The requirements for inventive step are set out in Article 56 EPC. It is correct that the comparative example given in the description of the patent in suit comparing the invention with the teaching of document D2 does not unambiguously show a technical advantage. Nevertheless, as explained above the skilled person would not arrive at the subject-matter of claim 1 in an obvious manner and it cannot be said that there is undoubtedly no technical effect. The appellant has argued, even if it is not proven, that an improved abrasability at high temperatures is achieved. The appellant has also plausibly argued the existence of a technical effect in the protection of the boron nitride against decomposition. Where the subject-matter of a claim is not obvious and a technical effect is plausibly argued there is no requirement for comparative tests to prove an advantage. The Opposition Division and the respondent cited Board of Appeal decision T 158/97. The present situation is distinguished from that case since in that case no arguments were presented by the proprietor, in particular with respect to the existence of a technical effect.

- 1.5 Claim 7 is set out in the form of an independent claim. However, the claim contains all the features of claim 1 so that the subject-matter of the claim cannot be obvious if the subject-matter of claim 1 is not obvious.

1.6 Therefore, the subject-matter of claims 1 and 7 of the patent as granted involves an inventive step in the sense of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is maintained as granted.

The Registrar:

The Chairman:

G. Nachtigall

A. Burkhart