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Datasheet for the decision of 8 April 2014

Case Number: T 1141/13 - 3.2.08

Application Number: 05726978.9

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Language of the proceedings: EN

Title of invention:
METALLIC GLASS LAMINATE, PROCESS FOR PRODUCING THE SAME AND USE THEREOF

Applicant:
Topy Kogyo Kabushiki Kaisha
Tohoku Techno Arch Co., Ltd.

Headword:

Relevant legal provisions:
EPC Art. 123(2), 54

Keyword:
Amendments - added subject-matter (auxiliary requests 6 to 11 -yes)
Novelty- yes (auxiliary request 12)

Decisions cited:

Catchword:

Beschwerdekammern
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Chambres de recours

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Case Number: T 1141/13 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 8 April 2014

Appellant: (Applicant 1)	Topy Kogyo Kabushiki Kaisha 5-9, Yonban-cho Chiyoda-ku Tokyo 102-8448 (JP)
Appellant: (Applicant 2)	Tohoku Techno Arch Co., Ltd. 468 Aoba, Aramaki, Aoba-ku Sendai Miyagi 980-0845 (JP)
Representative:	Jungen, Rolf Lippert, Stachow & Partner Frankenforster Strasse 135-137 51427 Bergisch Gladbach (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 22 October 2012 refusing European patent application No. 05726978.9 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: T. Kriner
Members: M. Alvazzi Delfrate
D. T. Keeling

Summary of Facts and Submissions

I. By decision posted on 22 October 2012 the examining division refused European Patent application No. 05 726 978.9.

In its decision the examining division held that all the requests then on file comprised subject-matter which lacked novelty in view of

D3: OTSUBO, F. et Al. : "Formation of amorphous Fe-Cr-Mo-8P-2C coatings by the high velocity oxy-fuel process" JOURNAL OF THERMAL SPRAY TECHNOLOGY, 9(4), pages 494-498.

II. The appellant (applicant) lodged an appeal against this decision on 21 December 2012, paying the appeal fee on the same day. The statement setting out the grounds of appeal was filed on 1 March 2013.

III. Oral proceedings before the Board of Appeal were held on 8 April 2014.

IV. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of one of the auxiliary requests 6 to 11 or 13 to 15, all filed on 7 March 2014, or auxiliary request 12 filed at the oral proceedings.

V. **Auxiliary request 6** (now main request) comprises independent method claim 1 and independent product claim 11. Claim 1 reads as follows:

"A production method of a metallic glass laminate (118), comprising thermally spraying amorphous metallic glass powder (20) on a substrate (22, 112) to form metallic glass laminate (118), characterized in that at least part of the amorphous metallic glass powder (20) is heated below crystallization starting temperature thereof by thermal spraying to be converted to a supercooled liquid state and wherein the amorphous metallic glass powder in the supercooled liquid state is solidified and laminated on a substrate surface."

Auxiliary request 7 comprises solely method claims wherein method claim 1 corresponds to claim 1 of auxiliary request 7.

Claim 1 of **auxiliary request 8** differs from claim 1 of auxiliary requests 6 and 7 by the addition of the feature according to which

the amorphous metallic glass powder "hits a substrate surface in the supercooled liquid state".

Claim 1 of **auxiliary request 9** differs from claim 1 of auxiliary request 8 by the addition of the wording

"thereby producing a thermal sprayed coating layer of metallic glass (114, 124) of an amorphous phase having a porosity equal to or less than 2% and a crystallization degree of 10% or lower".

Claim 1 of **auxiliary request 10**, differs from claim 1 of auxiliary request 9 in that the characterising portion reads as follows (differences in evidence)

"~~at least part of~~ the amorphous metallic glass powder (20) is heated below crystallization starting

temperature thereof by thermal spraying to be converted to a supercooled liquid state and hits a substrate surface in the supercooled liquid state and in the supercooled liquid state is solidified and laminated on ~~a~~ the substrate surface thereby producing a thermal sprayed coating layer of metallic glass (114, 214) of an amorphous phase having a porosity equal to or less than 2 % and a crystallization degree of 10 % or lower."

Claim 1 of **auxiliary request 11** differs from claim 1 of auxiliary request 10 by the addition of the wording

"wherein no oxide layer is formed in the thermal sprayed coating layer of metallic glass (114, 124)."

Claim 1 of **auxiliary request 12** reads as follows:

"A production method of a metallic glass laminate (118), comprising thermally spraying amorphous metallic glass powder (20) on a substrate (22,112) to form metallic glass laminate (118), characterized in that at least part of the amorphous metallic glass powder (20) is heated by thermal spraying to be converted to a supercooled liquid state and hits a substrate surface in the supercooled liquid state and in the supercooled liquid state is solidified and laminated on a substrate surface."

Auxiliary requests 13 to 15 did not play a role for the present decision.

VI. The arguments of the appellant can be summarised as follows:

Auxiliary requests 6 to 11 - Article 123(2) EPC

It was true that the feature according to which at least part of the amorphous metallic glass powder is heated by thermal spraying below its crystallisation starting temperature was not present literally in the application as originally filed. However, claim 2 as originally filed disclosed that at least part of metallic glass powder was in a molten state or supercooled liquid state on the substrate surface. Given that the powder had a very short time to cool down before hitting the substrate, the temperature to which the powder was heated by thermal spraying was clearly below its crystallization starting temperature. Moreover, paragraph [0041] explicitly described that it was advantageous to heat the particles below the crystallisation starting temperature. Hence, paragraph [0041] and claim 2 disclosed the feature introduced in the claim. Furthermore, the importance of this feature was also apparent from the rest of the application, as evidenced for instance by paragraphs [0045] and [0046], which emphasised that the particles should be maintained in the supercooled liquid state.

Accordingly, claim 1 of auxiliary requests 6 to 11 did not comprise amendments contrary to Article 123(2) EPC.

Auxiliary request 12 - Novelty

D3 related to the formation of metallic amorphous coating by a high velocity oxy-fuel process. However, it did not disclose the temperature of the powder or its state when it hit the substrate. As to the product shown in Figure 3, it could not be said, especially in view of its oxidation, that in its production the amorphous metallic glass powder, or at least part of it, hit the substrate surface in a supercooled liquid

state. Accordingly, the subject-matter of claim 1 of auxiliary request 12 was novel.

Reasons for the Decision

1. The appeal is admissible.

2. Article 123(2) EPC

2.1 Claim 1 of all the auxiliary requests 6 to 11 has been amended by introducing the feature according to which at least part of the amorphous metallic glass powder is heated by thermal spraying below its crystallisation starting temperature.

2.2 In order to comply with Article 123(2) EPC the subject-matter of the amended claim 1 must be directly and unambiguously derivable from the application as originally filed.

2.3 In the present case it is undisputed that a verbatim disclosure of the feature cited above cannot be found in the application as originally filed.

It is true that, according to paragraph [0041], if the metallic glass is heated to the temperature range below its crystallisation starting temperature it safely solidifies to an amorphous state without a large influence of the cooling rate. However, this passage does not mention thermal spraying of a powder but merely refers to a metallic glass. Hence, it cannot be directly and unambiguously derived from this paragraph that in the process of the invention the amorphous metallic glass powder, let alone at least part of it,

is heated by thermal spraying below its crystallisation starting temperature. Indeed, the first part of paragraph [0041] rather indicates that in the process of the invention the powder is heated above its crystallisation starting temperature, since it describes that in said process the metallic thermal spray particles hit the substrate and the metallic glass solidifies through the supercooled liquid state, in which a molten state is maintained even in the temperature range below the melting point.

As to claim 2 and paragraphs [0045] and [0046], all these passages relate to the state of the powder or a part of it on the substrate or when it hits the substrate. Hence, although it is accepted that the powder has a limited time to cool down before hitting the substrate, these passages cannot be considered to clearly and unambiguously disclose that the temperature to which the powder is heated by thermal spraying lies below its crystallisation starting temperature.

2.4 Therefore, claim 1 of each of the auxiliary requests 6 to 11 has been amended contrary to the requirements of Article 123(2) EPC.

3. Auxiliary request 12 - Novelty

3.1 Lack of novelty can be established only if the claimed subject-matter is directly and unambiguously derivable from the prior art.

3.2 D3 discloses a production method of a metallic glass laminate comprising thermally spraying amorphous metallic glass powder with three different compositions, called 10Cr, 20 Cr and 10Mo (see abstract). By using the 10Mo powder a coating with a

100% amorphous structure is obtained (see abstract and 4. Conclusions). Hence, D3 discloses a production method of a metallic glass laminate, comprising thermally spraying amorphous metallic glass powder on a substrate to form metallic glass laminate.

3.3 However, D3 is silent on the state of the powder when it hits the substrate surface. Therefore, it does not explicitly disclose that at least part of the amorphous metallic glass powder hits a substrate surface in the supercooled liquid state.

Nor can this feature be directly and unambiguously derived from the microstructure of the product obtained in D3. It is true that Figure 3 shows a very dense coating (see also page 495, right-hand column, first full paragraph), thus pointing to a low viscosity of the powder when it hits the substrate. However, a low viscosity does not necessarily indicate a supercooled state but is also exhibited by particles in the molten state, which, by an appropriate cooling rate, can also form an amorphous coating. Indeed, the presence of an oxide film in the coating (see D3, page 495, right-hand column, first full paragraph) rather points to this second possibility (see paragraph [0044] of the application in suit).

3.4 Therefore, the subject-matter of claim 1 of auxiliary request 12 is novel.

4. Since the examining division did not consider the issue of inventive step the Board deems it appropriate to remit the case for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division for further prosecution on the basis of auxiliary request 12 filed at the oral proceedings.

The Registrar: The Chairman:

V. Commare T. Kriner

Decision electronically authenticated