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**Datasheet for the decision
of 18 December 2018**

Case Number: T 2195/15 - 3.2.03

Application Number: 10154811.3

Publication Number: 2361704

IPC: B22F3/105, C22C29/06,
C22C32/00, C22C33/02

Language of the proceedings: EN

Title of invention:

Metal multiphase material and manufacturing method therefore

Patent Proprietor:

VBN Components AB

Opponent:

Uddeholms AB

Headword:

Relevant legal provisions:

RPBA Art. 12(4), 13(1)

EPC R. 80

EPC Art. 123(3), 83, 54, 56

Keyword:

Late-filed facts - submitted with the statement of grounds of appeal - admitted (yes)

Late-filed evidence - request identical to request not admitted in first instance proceedings

- admitted (yes)

Amendment occasioned by ground for opposition - (yes)

Amendments - allowable (yes)

Sufficiency of disclosure - (yes)

Novelty - (yes)

- implicit disclosure (no)

- selection invention (no)

Inventive step - (yes)

Decisions cited:

T 0666/89, T 2017/14, T 1214/11, T 0026/85

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 2195/15 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 18 December 2018

Appellant: VBN Components AB
(Patent Proprietor) Libro Ringväg 51
752 28 Uppsala (SE)

Representative: Brann AB
P.O. Box 3690
Drottninggatan 27
103 59 Stockholm (SE)

Respondent: Uddeholms AB
(Opponent) 683 85 Hagfors (SE)

Representative: Zacco Sweden AB
Valhallavägen 117
Box 5581
114 85 Stockholm (SE)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 30 September
2015 revoking European patent No. 2361704
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman G. Ashley
Members: B. Miller
G. Weiss

Summary of Facts and Submissions

- I. European patent No. 2 361 704 relates to a metal multiphase material and a manufacturing method thereof.
- II. An opposition was filed against the patent, based on the grounds of Article 100(a) EPC together with both Articles 54 and 56 EPC and of Article 100(b) and (c) EPC.

The opposition division found that the contested patent in amended form according to the main request of the patent proprietor did not meet the requirement of Article 83 EPC.

- III. This decision was appealed by the patent proprietor (the appellant), who requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims filed with the statement setting out the grounds of appeal (main request) alternatively, on the basis of one of the set of claims filed with letter dated 18 October 2018 as first and second auxiliary requests.
- IV. The respondent (the opponent) requested that the appeal be dismissed.

V. Claims

(a) Main request

Claim 1 according to the main request reads as follows:

"A metallic multiphase material comprising:
a metal matrix;
said metal matrix is based on Co;
carbides embedded in said metal matrix;
a maximum size of said carbides being less than 20 μm ;
said metallic multiphase material having a carbon
content in the range of 0.8 % by weight to 3.5 % by
weight,
characterized in that said metallic multiphase material
having an oxygen content less than 30 ppm by weight."

Claim 2 of the main request reads:

"A metallic multiphase material comprising:
a metal matrix;
said metal matrix is based on Ni;
carbides embedded in said metal matrix;
a maximum size of said carbides being less than 20 μm ;
said metallic multiphase material having a carbon
content in the range of 0.8 % by weight to 3.5 % by
weight,
characterized in that said metallic multiphase material
having an oxygen content less than 30 ppm by weight."

Claim 4 of the main request reads:

"A method for manufacturing of a metallic multiphase
material, comprising the step of:
providing (210) a powder of an initial metallic
multiphase material;

said initial metallic multiphase material comprising a metal matrix, based on at least one of Fe, Co and Ni, in which carbides are embedded;

placing (220) said powder of said initial metallic multiphase material in an oxygen-free environment;

melting (230) said powder of said initial metallic multiphase material locally in a first portion by exposing said first portion of said powder of said initial metallic multiphase material to an energy beam during a first time period; and

solidifying (240) a final metallic multiphase material for giving said final metallic multiphase material a maximum size of said carbides less than 20 μm , characterized in that:

said initial metallic multiphase material having a carbon content in the range of 0.8 % by weight to 3.5 % by weight;

said local melting in turn comprising the step of reducing an oxygen content of said final metallic multiphase material in said first portion to less than 30 ppm by weight by allowing at least a part of an oxygen content of said melted initial metallic multiphase material to react with carbon of said melted initial metallic multiphase material into oxides of carbon."

Claim 7 of the main requests reads

"A method for manufacturing of an object of a metallic multiphase material manufactured according to claim 6, characterized in that

said step of placing (220) said powder of said initial metallic multiphase material in an oxygen-free environment comprises providing (221) of a thin layer of said initial metallic multiphase material; and

said step of repeating (250) said step of melting and said step of solidifying comprises moving (251) of said energy beam over an area of said thin layer melting and solidifying said initial metallic multiphase material in said area into a common body."

Claims 3, 5 and 8 to 11 of the main request relate to preferred embodiments of the metallic multiphase materials and methods according to claims 1, 2, 4 and 7.

Auxiliary request 1 is based on claims 4 to 11 of the main request.

Auxiliary request 2 is based on claims 7 to 11 of the main request.

VI. State of the art

The following documents cited in the opposition proceedings are relevant for this decision:

D13: US-A-4 323 284;

D14: US-A-4 576 642;

D15: EP-A-1 647 606;

D16: WO-A-2008/105788;

A2: Cormier et al.: "Characterization of H13 steel produced via electron beam melting", Rapid prototyping Journal, pages 35 to 41;

A3: Best et al.: "The role of oxygen content on properties of PM materials", Powder Met, 2010, pages 1 to 16.

The following further documents have been cited in the appeal proceedings

a) by the appellant with the statement setting out the grounds of appeal:

- D24: Wohlers et al.: "History of additive manufacturing", Wohlers Report 2012; pages 1 to 26;
- D25: Gibson et al.: "Additive Manufacturing Technologies", pages 8 to 9, 34 to 37;
- D26: Arcam A2 EBM user's manual, pages 3-12, 3-24, 3-25;
- D27: Arcam A2 EBM Build Assembler Manual, 2010, pages 1 to 13.

b) by the respondent with the reply to the appeal:

- D17: Hellman et al.: "Commercial Gas Atomisation Of High Speed Steel", Metal powder report, vol. 40, no. 1, January 1985, pages 38 to 40;
- D18: Söderfors Powder AB: "New generation high speed steel powders", Powder Metallurgy, vol. 39, no. 3, pages 176 to 178;
- D19: EP 1 249 510 A2;
- D20: T 1214/11;
- D21: Badrossamay et al.: "Layer formation studies in selective laser melting of steel powders", Proc. SFF Symp. Austin, Texas, USA, 2006, pages 268 to 279;
- D22: Akhtar et al.: "The effect of pre-alloyed steel powder compositions on build quality in direct laser re-melting", Proceedings of Solid Free Form, Fabrication Symposium 2004, pages 141 to 150;

D23: Akthar et al.: "Direct selective laser sintering of tool steel powders to high density: Part B – The effect on microstructural evolution", Proceedings of the Solid Freeform Fabrication Symposium 2003, pages 656 to 667.

c) by the appellant with the letter dated 18 October 2018:

D31: Childs et al.: "Selective laser sintering (melting) of stainless and tool steel powders: experiments and modelling", Proc. IMechE Vol. 219, Part B: J. Engineering Manufacture, 2005, pages 339 to 358;

D32: Data sheet for argon process gas and purity grade for process gases from Linde.

d) by the respondent with the letter dated 17 October 2018:

D28: Sinha et al.: "Effect of residual elements in high performance nickel base superalloys for gas turbines and strategies for manufacture", Bull. Mater. Sci., Vol. 28, No. 4, 2005, pages 379 to 382;

D29: Xie et al.: "Effect of oxygen, nitrogen and magnesium on segregation, solidification and mechanical properties in alloy 718", Superalloys 718, 625 and Various Derivatives, The Mineral, Metals & Materials Society, 1991, pages 241 to 250;

D30: EP 2 415 888 A2.

VII. With the summons to oral proceedings, the Board sent a communication pursuant to Articles 15(1) of the Rules

of Procedure of the Boards of Appeal (RPBA) indicating to the parties its preliminary opinion of the case.

VIII. Oral proceedings were held on 18 December 2018.

IX. The appellant's arguments, as far as relevant for the main request, can be summarised as follows.

The documents submitted by the respondent during appeal were all late filed and not relevant for the claimed subject-matter. Therefore they should not be admitted into the proceedings.

The subject-matter of claims 1 and 2 was based on a combination of claims as originally filed. The subject-matter of claims 4 and 7 was based on claims 8 and 11 as filed in combination with the technical teaching on page 8, lines 27 to 29 and on page 9, lines 4 to 19 of the application.

All information necessary for a skilled person to rework the invention was presented in the contested patent, in particular the carbon content of the initial material and the conditions for melting by an energy beam and solidifying.

The subject-matter of claims 1 and 2 was novel, since none of the documents D13 to D16 disclosed a nickel (Ni) or cobalt (Co) based alloy comprising an oxygen level and a carbon level as defined in claims 1 and 2.

Starting from D14 as the closest prior art the skilled person had no incentive to lower the oxygen content of the metal powder. A3 further taught that the oxygen content of metal powder was usually well above 30 ppm

and therefore did not provide a motivation for the skilled person to lower the oxygen content.

Furthermore, none of the cited documents disclosed or at least suggested a localised melting process in an oxygen free atmosphere as defined by claims 4 and 7 to provide a metallic material having a reduced oxygen content.

X. The respective arguments of the respondent can be summarised as follows.

Documents D17 to D20 should have been admitted into the opposition proceedings. They were re-submitted in appeal in reaction to the arguments presented by the appellant in the statement setting out the grounds of appeal.

D28 to D30 had been filed in reaction to the arguments presented by the appellant.

Documents D24 to D27 submitted by the proprietor were not prior art under Article 54(2) EPC.

The claims filed with the grounds of appeal did not fulfil the requirements of Rule 80 EPC, because claim 4 contained amendments which were not occasioned by a ground of opposition.

The restriction of the level of oxygen to 30 ppm for any type of material defined in the claims was not supported by page 9, lines 16 to 19 of the originally filed application. The claimed oxygen content was described therein only in combination with the specific process as set out on page 9. From page 8, lines 16 to 23 it was apparent that a further reduction of the oxygen content was only obtainable by processing under

vacuum. However, this requirement was missing from the wording of claim 4. Moreover, claim 4 did not define that the powder contained nitrogen as taught on page 12, lines 1 to 5. Accordingly, the amendment constituted an unallowable generalisation. Furthermore, the application as filed did not provide support for the term "final" in claim 4.

The skilled person could not rework the invention without undue burden, since the contested patent did not describe all necessary information such as the oxygen content of the metal powder. Furthermore a complete working example was missing from the contested patent.

It was well known that oxygen is an undesired impurity in metal alloys. A low impurity content is generally desirable and could be obtained by known measures. Upper levels for impurities in an alloy could not be regarded as distinguishing features as set out in T 2017/14 points 1.1.8 and 2.5 of the reasons and in T 1214/11, point 2.3 of the reasons. Moreover, the oxygen level defined in claim 1 did not fulfil the requirements of a selection invention in line with the reasoning in T 26/85 and T 666/89. Accordingly, the subject matter of claims 1 and 2 lacked novelty in regard to D13 to D16.

The subject matter of claim 4 lacked novelty in view of each of D21, D22 and D23, since the oxygen level defined in claim 4 was inevitably achieved when reworking the method disclosed therein.

Starting from D14 the subject-matter of claims 1 and 2 was obvious, since the skilled person would reduce the

level of an impurity in an alloy to improve its properties.

The subject matter of claim 4 differed from what was known from A2 solely in the carbon content, because the features of carbide size and oxygen content would be automatically fulfilled. Document A2 itself pointed out that the electron beam free-form fabrication was well suited for a wide variety of metals and metal composite materials. Accordingly, the application of a known method to known materials was obvious for a skilled person.

Alternatively starting from D21 the subject-matter of claim 4 was also obvious, since it was known that electron beam melting was equivalent to laser beam melting.

The subject-matter of claim 7 was obvious for the same reasons as the subject-matter of claim 4.

Reasons for the Decision

1. Admissibility of documents D17 to D32

1.1 Documents D17 to D20

1.1.1 During the oral proceedings held on 15 September 2015 the opposition division decided not to admit the late filed documents D17 to D20 into the proceedings (Article 114(2) EPC).

This decision is reasoned and based on a prima facie assessment of the relevance of the content of these documents (point 11 of the minutes, point 2.2 of the reasons of the impugned decision).

The opposition division therefore applied its discretion under Article 114(2) EPC in an appropriate manner.

The Board sees no reason to question the conclusion of the opposition decision not to admit these documents into the opposition proceedings.

1.1.2 Nevertheless, these documents have been re-submitted with the reply to the grounds of appeal and in principle form the basis of the present appeal proceedings according to Article 12(2) RPBA.

The admission or not of these documents into the appeal proceedings is, however, governed by Article 12(4) RPBA. Following this provision, consideration of a document which was not admitted in the first instance proceedings is at the discretion of the Board. In fact,

the wording of Article 12(4) RPBA puts documents that could have been submitted before the department of first instance but were not and documents that were submitted but were not admitted on an equal footing.

The Board must establish whether these submissions can be considered an appropriate and immediate reaction to developments in the proceedings. This is not to say that, in doing so, the Board is re-exercising the discretion of the department of first instance based on the case as it was presented then. Rather, the Board has to exercise its discretion under Article 12(4) RPBA independently, giving due consideration to the appellant's additional submissions.

- 1.1.3 The filing of documents D17 to D19 constitutes a reaction to the argument presented by the appellant that metal powder does not have a low oxygen content (see point 4 of the reply to appeal).

Therefore, the Board concludes that documents D17 to D19 are not to be held inadmissible under Article 12(4) RPBA, since it represents the usual practice of parties to provide evidence to support their allegations and counter-arguments.

- 1.1.4 D20 is a reprint of a decision of the boards of appeal, which can always be cited by a party to support its case.

- 1.2 Documents D21 to D23

These documents have been submitted by the respondent with the reply to appeal. The admission or not of these documents is therefore also governed by Article 12(4) RPBA.

Documents D21 to D23 have been filed in view of the arguments submitted by the appellant in section 5 of the statement setting out the grounds of appeal (see point 10 of the reply to appeal).

Therefore, the Board does not see any reason to make use of its discretion pursuant to Article 12(4) RPBA and to exclude documents D21 to D23.

1.3 Documents D24 to D27

These documents were filed by the appellant with the statement setting out the grounds of appeal and address the reasoning in the contested decision.

Therefore, the Board concludes that documents D24 to D27 are not to be held inadmissible under Article 12(4) RPBA.

1.4 Documents D28 to D32

These document were filed by the appellant and the respondent after oral proceedings had been arranged.

The admission or not of these documents is therefore governed by Article 13(3) RPBA.

Documents D28 to D32 do not change the case of each party. Documents D28 to D30 merely address the previous argument of the respondent, that metal alloys having an extremely low oxygen content are known in the art. D31 to D32 on the other hand support the argument of the appellant that the low oxygen content as defined in claim 4 is not the evitable result of the method disclosed in documents D21 to D23.

Therefore, the Board admits documents D28 to D32 into the proceedings pursuant to Article 13(3) RPBA.

1.5 In summary, the Board concludes that all late filed documents D17 to D32 submitted by both parties are a reaction to the development of the proceedings and can be taken into consideration.

2. Main request - Rule 80 EPC

It is undisputed that, in comparison to claim 7 as granted, claim 4 of the main request has been amended in reaction to the grounds of opposition by rearranging some features. In addition, a formal error resulting from this amendment has been corrected in claim 4 of the main request filed with the grounds of appeal:

"solidifying (240) ~~said~~ **a** final metallic multiphase material for giving ~~a~~ **said** final metallic multiphase material a maximum size of said carbides less than 20 μm ,"

This correction is a direct consequence of the rearrangement of the features within the claim as granted, which itself was caused by a ground of opposition.

Thus, the amendments to the claims as granted as submitted with the grounds of appeal are caused by a ground of opposition and meet the requirements of Rule 80 EPC.

3. Main request - Article 100(c) EPC

3.1 Claims 1 and 2 of the main request are based on claims 1, 6 and 7 in combination with claim 4 or 5 as originally filed.

3.2 Claim 4 of the main request is based on claim 8 as originally filed which has been amended in that

- i) the metal matrix is based on at least one of Fe, Co and Ni
- ii) the wording of the local melting step has been changed to "in turn comprising the step of reducing an oxygen content of a final metallic multiphase material in said first portion to less than 30 ppm"
- iii) the wording of the solidifying step has been changed to "for giving said final metallic multiphase material a maximum size of said carbides of less than 20 μm ".

3.2.1 concerning amendment i)

The application as filed describes on page 8, lines 27 to 29 that the metal matrix is based on Fe, Co and/or Ni. This is a general statement and refers to both the metallic material and to the corresponding method of manufacturing described in the application.

Page 12, lines 1 to 5 of the application discloses that metal powder always contains nitrogen. Although claim 4 does not refer to the nitrogen content, there is no intermediate generalisation of the disclosure of the application, since neither claim 8 as filed nor the

teaching on page 8 of the application is directly linked to the statement on page 12.

3.2.2 concerning amendment ii)

On page 9, lines 14 to 19 of the application the characteristics of the products obtained are presented in a general context. In particular, "By the presented ideas of manufacturing by local melting" an oxygen content of less than 50 ppm can be achieved, most preferably less than 30 ppm.

The teaching of claim 4 in this regard therefore corresponds to the teaching on page 9 as filed.

3.2.3 concerning amendment iii)

The expression "for giving said final metallic multiphase material a maximum size of said carbides of less than 20 μm " in claim 4 of the main request is based on the general disclosure on page 9, lines 4 to 6 of the application.

Although the term "final" is not explicitly mentioned on page 9, it is clear in the context of the application that the maximum size of the carbides refers to the end product as mentioned in claim 1.

3.3 The respondent argues in this regard that the application does not disclose the literal wording of the method defined by claim 4.

Article 123(2) EPC requires that an application shall not be amended such that the technical teaching extends beyond the teaching as originally filed. A literal

identical wording for an amendment is, however, not required in the application as originally filed.

According to the general principles developed by case law, for an amendment to be allowable it has to be directly and unambiguously derivable from the application as originally filed (Case Law of the Boards of Appeal, 8th edition, 2016, Chapter II.E.1.2.1).

As indicated above, this requirement is met by the wording of claim 4, since the various features introduced into the wording of claim 8 as filed are described in general on page 9 as filed.

- 3.4 In summary, the opposition ground pursuant to Article 100(c) EPC does not prejudice the maintenance of the patent in amended form on the basis of the main request.

- 4. Main request - Article 100 (b) EPC
 - 4.1 The opposition division decided that the contested patent does not provide enough guidance to manufacture a metallic material or to rework a method according to claims 1, 2, 4 and 7 of the main request. The impugned decision is based on the conclusion by the opposition division that the skilled person was only possibly able to achieve a material with an oxygen content below 30 ppm and carbides having a size of below 20 μm after carrying out a full research program.

 - 4.2 However, the contested patent describes the production of the material according to claims 1 and 2 by indicating a possible material to be used and a suitable manufacturing machine (see paragraphs [0032], [0035], [0036] and [0046]).

Moreover, the contested patent describes in detail in paragraph [0032] one way of carrying out the invention for an Fe-based material.

Fe-based materials are similar to Ni- and Co-based materials. There is no reason to expect that Ni- or Co-based materials would behave fundamentally different in a free-forming operation compared to Fe-based material. Hence, no doubts arise that the claimed material defined in claims 1 and 2 can be achieved by the skilled person when following the method described in detail for an Fe-based material.

- 4.3 No specific details are given in the contested patent on the vacuum level or purity of the inert gas atmosphere during the melting step as pointed out in point 5 of the impugned decision.

However, paragraph [0029] discloses that the low oxygen content is achieved by the reaction of oxygen and carbon in the metal ($C_{\text{metal}} + O_{\text{metal}} \rightarrow CO_{\text{gas}}$). Should a skilled person aim at a reduction of the oxygen level in a metallic material in this manner, it is self-explanatory that the vacuum level and the inert gas purity are crucial in order to avoid oxidation of carbon by the remaining atmospheric oxygen.

If the skilled person realises that the intended oxygen level is not achieved, it is immediately evident that the vacuum level or the inert gas purity were perhaps not sufficient. This can be verified and dealt with within the customary practice of a skilled practitioner.

Hence, no undue burden exists for the skilled person to adjust the level of vacuum or to select inert gas of sufficient purity in order to prevent any predictable oxidation of carbon in the metallic material by atmospheric oxygen.

- 4.4 Document A2 (see Conclusions, lines 7 to 11) teaches that the process conditions of the electron-beam melting (EBM) significantly affect the metallurgical properties.

However, the skilled person is aware of the various factors influencing the metallurgical properties and therefore could adapt the process proposed by the contested patent to the specific scenario (type of metal, shape, temperature during manufacture, etc.).

The factors influencing the carbide size, such as the temperature during manufacturing are known to the skilled person.

Moreover, the contested patent identifies the critical factors and even provides suggestions on how to influence them (paragraph [0048]) dependent on the apparatus, the metal powder used and the shape and the size of the body to be manufactured.

- 4.5 The contested patent discloses in paragraph [0032] a specific apparatus (ARCAM A2), and that "this production machine was used in a series of tests to manufacture a number of different shapes and geometries of components" and that "the tests were repeated with different individual settings on the machine, depending on which type of powder layer that was molten and the present heat exchange with the chamber and the building

plate", although no specific details on the individual settings are presented.

However, it comes within the normal experimental routine of a skilled person to adjust certain parameters dependent on the size of the article to be manufactured, its material and the machine used.

The factors influencing the crucial parameters (oxygen level and carbide size) are known to the skilled person. The corresponding analytic methodology required to perform the defined methods and to check the final metallic multiphase material are also known in the field of metallurgy.

Any further metallurgical and mechanical properties do not seem to be of any importance for reworking the subject-matter of claims 1 and 2, since further properties of this type are not defined in said claims.

- 4.6 The respondent argues that the claimed method can only be performed under vacuum, which is not required according to claim 4.

However, the contested patent teaches in paragraph [0029] that the local melting process can take place not only under vacuum but also in other oxygen free environments.

Claim 4 therefore does not lack any essential feature necessary for the skilled person to repeat the invention defined therein.

- 4.7 The respondent further argues that the contested patent does not disclose a complete working example, since it

does not disclose the oxygen content of the starting material.

However, it is evident that when wishing to reduce the oxygen content, the skilled person would choose a material with an appropriately low level of oxygen as the starting material when repeating the invention as defined in the contested patent. There is no difficulty in choosing an appropriate metallic material since, as also confirmed by the respondent in referring to D17 to D19, alloys having a sufficiently low oxygen content are known in the art.

4.8 In conclusion, the Board cannot see any reason why the skilled person would be confronted with an undue burden when repeating the methods defined in claims 4 and 7, or when providing a metallic multiphase material as defined in claims 1 and 2. The ground of opposition pursuant to Article 100(b) EPC does not prejudice the maintenance of the patent in amended form on the basis of the main request.

5. Main request - Article 100 (a) EPC

5.1 Novelty (Article 54 EPC) - claims 1 and 2

5.1.1 The respondent argues that the subject-matter of claims 1 and 2 lacks novelty in view of D13 (col. 2, lines 44 to 50), D14 (table I and table II), D15 (claim 1, examples) and D16 (table 1).

The multiphase metallic material disclosed in said documents is based on Ni or Co with a carbon content between 0.8 to 3.5 % by weight (D13: col. 2, lines 44 to 50; D14: table I and table III; D15: examples, table 1: e.g. alloy WR-11, WR-12) and with carbides having a

particle size below 20 μm (D14: col. 7, lines 32 to 38; D15: paragraph [0015], D16: figure 3a).

None of the metallic materials proposed by D13 to D16 is manufactured by a localised melting by an electronic beam in an oxygen-free environment which leads to the low oxygen content as indicated in the contested patent (claim 4).

Hence, none of documents D13 to D16 discloses the oxygen content for the metallic material and it has not been demonstrated that the oxygen content as defined in claim 1 is inherently met by the alloys defined in D13 to D16.

- 5.1.2 It might well be that the skilled person considers oxygen as being an impurity as argued by the respondent. However, this does not unambiguously lead to the conclusion that the oxygen content in the alloys proposed by D13 to D16 has to be as low as 30 ppm or even lower.

Document A3 (figures 9 and 13) on the contrary teaches that the oxygen content is usually not that low, and no proof has been provided by the respondent that the oxygen level defined in claims 1 and 2 is inevitably met by the metallic material of the cited prior art documents.

According to established case law a simple speculation or a certain probability, even a high one, that a feature is present in a prior art document is not sufficient for questioning novelty (Case Law of the Boards of Appeal, 8th edition, 2016, Chapter I.C.4.1 and I.C.4.3).

5.1.3 In this context the respondent cites T 1214/11 and T 2017/14.

T 1214/11 concluded that a claimed purity level of an alloy is inherently met by an alloy known in the art (see point 2.3 of the reasons).

T 2017/14 concluded that it had not been demonstrated by the patent proprietor that the impurities of the prior art alloys are inevitably above the claimed limits (see point 2.5 of the reasons).

The above cases can be distinguished from the present case in that the alloys defined in claims 1 and 2 contain an upper limit for the oxygen which is not inevitably achieved by the alloys described in the cited prior art, see points 5.1.2 and 5.1.3 above. The conclusions in both cited decision are therefore not relevant for the present case.

5.1.4 The respondent further cites T 26/85 and T 666/89 and argues that the oxygen level defined in claim 1 does not fulfil the requirements of a selection invention.

In the present case, however, the prior art does not disclose the oxygen content at all. Consequently, the range indicated in claim 1 cannot be regarded as a selection from a broader range disclosed in the prior art.

5.1.5 In summary, the Board concludes that the subject-matter of claims 1 or 2 is novel in view of the disclosures of D13 to D16.

5.2 Novelty (Article 54 EPC) - Claim 4

5.2.1 The respondent submitted that the method of claim 4 lacks novelty in light of D21.

It discloses on page 269 (section "Experimentation") selective laser melting of a gas atomized M2 tool steel powder having a carbon content of 0.88 % (see table 1 of D21). The process is performed under an argon atmosphere to protect the powders from oxidation. The re-melting is performed by subjecting the powder to a laser energy beam.

D21 does not explicitly disclose the oxygen content and the carbide size as required by claim 4.

5.2.2 According to point 5 of the grounds of appeal three basic requirements have to be met to achieve the required carbide size and oxygen content:

- i) The initial material based on at least one of Fe, Co and Ni with a carbon content of 0.8 to 3.5% by weight should be melted by the energy beam.
- ii) The material should solidify fast enough to give a small carbide size.
- iii) The melting and solidifying should take place in an oxygen-free atmosphere.

This statement is confirmed in the contested patent in paragraphs [0029] and [0046] where it is explained that if the atmosphere is not oxygen free during the selective melting, atmospheric oxygen is consumed and not the oxygen present in the alloy.

D21 itself does not describes the level of purity of the argon gas. However, it refers in the experimental

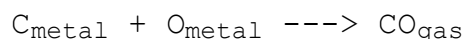
section to D31, which is from the same authors as D21. D31 discloses in section 3.1 the process used in D21 in more detail and specifies that the argon gas has a purity of 99.9 %.

5.2.3 D32 demonstrates that argon gas having this level of purity still comprises oxygen. This leads to an atmosphere during the local melting process which contains far more oxygen than is present in the claimed metal, as is evident from the following calculations presented by the appellant on page 6 of the letter dated 18 October 2018:

	Gas purity	99.9%	
	O content	0.03%	
	Gas flow	5-10	l/min
	Gas density	1,8	g/l
	Available O from gas	5.4	mg
O from metal	Build speed	1	cm ³ /h
	Density	8	g/cm ³
	Metal mass (1h)	8	g
	O content	100	ppm
	Available O from metal	0.80	mg

5.2.4 It follows that the process according to D21 does not take place in an oxygen free atmosphere as required by the wording of claim 4.

Correspondingly, it cannot be concluded that in an atmosphere of 99,9 % argon the reaction



described in paragraph [0029] of the patent inherently takes place, leading to a reduction of the oxygen content in the metal, since it is more likely that the carbon in the metal will react with the oxygen of the atmosphere.

Therefore it has not been demonstrated, that the process of D21 inevitably has the step of reducing the oxygen content as required by claim 4.

5.2.5 D22 discloses on pages 141 to 142 (section "Experimental procedure") selective laser melting (SLM) of tool steel powders and high speed steel (HSS) powders. In particular, gas atomized M2 HSS powder with 0.8 wt.% C and Fe-based P58 with 1.4 wt.% C (see table 3 of D22) are re-melted under argon.

D23 (page 657, section: "Experimental Techniques") discloses as well a selective laser melting of gas atomized M2 tool steel powder having a carbon content of 0.88 wt.% (abstract). The process is performed under argon atmosphere at a pressure of 30 mbar in order to protect the powders from oxidation.

Hence, D22 and D23 disclose a process similar to the process of D21 and the same argumentation applies for them as with respect to D21.

5.2.6 In summary, the subject-matter of claim 4 differs from the disclosure in D21, D22 and D23 in that the melting step takes place in an oxygen free atmosphere and the oxygen content of the metallic material is reduced to below 30 ppm.

5.2.7 In conclusion, the opposition ground pursuant to Article 100(a) EPC in combination with Article 54 EPC does not prejudice the maintenance of the patent in amended form on the basis of the main request.

5.3 Inventive step (Article 56 EPC) - Claims 1 and 2

5.3.1 Document D14 is a suitable starting point for the assessment of inventive step with respect to the subject-matter of claims 1 and 2, since it discloses both Co- and Ni-based alloys with a carbon content of 0.8 to 3.5 wt% and a carbide size of 0.5 to 3 μm (see table III and col. 7, lines 35 to 38).

The subject-matter of claims 1 and 2 differs from the metallic multiphase material disclosed in D14 in that the oxygen content is below 30 ppm by weight.

5.3.2 The objective technical problem to be solved can be formulated as how to improve the mechanical properties, such as toughness and fatigue.

5.3.3 Powdered metal in general has a relatively high oxygen content due to its manufacturing process and its large surface area. This general expectation of the skilled person is confirmed by A3 which discloses that the oxygen content of Ni-materials (see Fig.13) is between 100 and 170 ppm.

A similar order of magnitude is presented in D17 for iron powder which is said to have an oxygen content of some 100 ppm (D17, page 2, right hand column, second last full paragraph).

Therefore starting from D14 and considering the general knowledge, the skilled person has no incentive to believe that a powder can be obtained having an oxygen content which is much lower than in commonly used metal powder.

5.3.4 Documents D28 to D29 do however demonstrate that nickel based super alloys having an oxygen-content of below 30 ppm are known in the art (D28, chapter 1; D29, table 1), but these documents do not concern a metal powder, but rather a cast metal. Furthermore the metallic material disclosed therein does not have a carbon content as required by claims 1 and 2. In particular, D28 does not specify the carbon content, and the alloy according to D29 (table 1) has a carbon content which is below the range indicated in claims 1 and 2. Hence, there is no incentive to consult these documents in order to solve the underlying problem.

Even if the skilled person were to consider these documents, he would neither find a motivation to reduce the oxygen content in powdered metal, nor find instructions as to how this could be achieved.

5.4 Inventive step (Article 56 EPC) - Claim 4

5.4.1 Document A2 discloses a method for manufacturing a metallic multiphase material by using electron beam melting step (see the section "Conclusions").

A2 therefore deals in principle with the same type of process as defined in claim 4 and can be considered as a possible starting point for assessing inventive step.

5.4.2 The method according to A2 comprises the following steps (see section "Experimental procedure"):

a) providing a powder of an initial metallic multiphase material (tool steel H13), which comprises a metal matrix based on Fe in which carbides are embedded;

- b) placing the powder in an oxygen-free environment (although not explicitly mentioned, this feature is an inherent feature of the electron beam melting step);
- c) melting the powder locally in a first portion by exposing it to an energy beam during a first time period;
- d) solidifying said final metallic multiphase material.

H13 tool steel used according to A2 has a carbon content of 0.32 to 0.45 (table I of A2).

A2 does not describe the size of the carbides. However, A2 shows in figure 9 a SEM photograph at 30 000X magnification in which carbides are visible. Taking into account the size of the carbides in the photograph and their magnification it can be concluded that the carbide size is below 20 μm .

5.4.3 The subject-matter of claim 4 differs from the method of A2 in that

- the initial metallic multiphase material has a carbon content in the range of 0.8 % by weight to 3.5 % by weight and
- the localised melting step achieves an oxygen content of below 30 ppm.

5.4.4 These distinguishing features are not independent from each other and cannot be evaluated separately, since the carbon reacts with the oxygen present in the metallic material. Hence, the carbon content has an impact on the oxygen level achieved by the localised melting step (see paragraph [0029] of the contested patent).

This link between the carbon content and the oxygen level also leads to the conclusion that the required oxygen level is not inherently achieved by the method according to A2, since the H13 tool steel used therein does not contain 0.8 to 3.5 wt% of carbon.

5.4.5 Therefore, the Board concludes that the objective technical problem to be solved cannot simply be defined as the provision of a mere alternative, as was proposed by the respondent, but has to be formulated as the provision of a method achieving a metallic material with a lower oxygen content.

5.4.6 A2 teaches on page 36, right column, lines 8 to 12 that the method described therein works in exactly the same manner with a wide variety of metallic materials.

However, this teaching in A2 does not provide any incentive to use a different type of steel having a higher carbon content in the expectation of achieving a metallic material with a low oxygen content of below 30 ppm.

Therefore, the Board reaches the conclusion that the subject-matter of claim 4 of the main request is not obvious.

5.4.7 The respondent identified in addition D21 as a possible starting point.

As indicated above in point 5.2.6 the subject-matter of claim 4 differs from the disclosure in D21 in that the melting step takes place in an oxygen free atmosphere and in that the final metallic material has an oxygen content below 30 ppm.

Neither D21 nor any other cited document describes that the oxygen content in the metallic material can be lowered by using an oxygen free atmosphere during the selective laser melting. In this regard it might be known that electron beam melting is an alternative method to the laser melting used according to D21. However, none of the cited documents teaches that the oxygen content of a metallic material can be lowered below 30 ppm when using electron beam melting in an atmosphere which is free of oxygen.

Hence, the subject-matter of claim 4 is not obvious when starting from D21.

5.5 Inventive step (Article 56 EPC) - Claim 7

As indicated above, it is known from A2 to use electron beam melting (EBM) for additive manufacturing (AM) of a H13 tool steel (see Figure 1). Therefore it can also be considered as a possible starting point for assessing inventive step for the subject-matter of claim 7.

It follows that in regard to the subject-matter of claim 7 the same arguments as set out above with respect to claim 4 apply.

Therefore, the Board reaches the conclusion that the subject-matter of claim 7 of the main request is not obvious when starting from A2.

5.6 In summary, the opposition ground pursuant to Article 100(a) EPC in combination with Article 56 EPC does not prejudice the maintenance of the patent in amended form on the basis of the main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of :
 - claims 1 to 11 of the main request filed with letter dated 22 January 2016;
 - specification, pages 2, 3, 5 to 7 as granted;
 - specification, page 4 submitted at the oral proceedings before the Board;
 - figures as granted.

The Registrar:

The Chairman:



C. Spira

G. Ashley

Decision electronically authenticated