

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

**Datasheet for the decision
of 25 July 2013**

Case Number: T 1212/11 - 3.2.03
Application Number: 05005428.7
Publication Number: 1541261
IPC: B22F 1/00, C22B 34/24,
B22F 9/20, B22F 9/22
Language of the proceedings: EN

Title of invention:

Production process for low oxygen refractory metal powder for powder metallurgy

Patent Proprietor:

H.C. STARK, Inc.

Opponent:

CABOT CORPORATION

Headword:

-

Relevant legal provisions:

EPC Art. 76(1), 56

Keyword:

"Subject-matter extends beyond content of earlier application (no) "

"Inventive step (yes) - effect not made credible within whole scope of claim (no) "

Decisions cited:

T 0939/92, T 0087/08, T 0306/09, T 2375/10

Catchword:

-



Case Number: T 1212/11 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 25 July 2013

Appellant I:
(Patent Proprietor) H.C. STARCK, Inc.
45 Industrial Place
Newton,
Massachusetts 02461-1951 (US)

Representative: Maiwald Patentanwalts GmbH
Elisenhof
Elisenstrasse 3
D-80335 München (DE)

Appellant II:
(Opponent) CABOT CORPORATION
Two Seaport Lane
Suite 1300
Boston, Massachusetts 02210-2019 (US)

Representative: Goldbach, Klara
Grünecker, Kinkeldey
Stockmair & Schwanhäusser
Anwaltssozietät
Leopoldstrasse 4
D-80802 München (DE)

Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted
29 March 2011 concerning maintenance of
European patent No. 1541261 in amended form.**

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
I. Beckedorf

Summary of Facts and Submissions

- I. Granted European patent EP-B-1 541 261 is based on application EP-A-05 005 428, which is a divisional of application EP-A-00 959 289 (corresponding to WO-A-01/012364). The patent relates to a process for producing powders of tantalum, niobium and their alloys, which have an oxygen content of less than 100 ppm.
- II. Grant of the patent was opposed on the grounds that the claimed subject-matter does not involve an inventive step (Article 100(a) EPC), and that it does not meet the requirements of Article 76 EPC (Article 100(c) EPC).
- III. The opposition division considered that the subject matter of claim 1 of the granted patent did not comply with the requirements of Article 76 EPC and lacked an inventive step. The opposition division decided that the patent could be maintained on the basis of the claims filed during the oral proceedings as an auxiliary request.
- IV. This decision was appealed by both the patent proprietor and the opponent.

The patent proprietor (hereafter appellant I) filed notice of appeal on 27 May 2011, paying the appeal fee on the same day. A statement containing the grounds of appeal was filed on 29 July 2011.

The opponent (hereafter appellant II) filed notice of appeal on 8 June 2011, paying the appeal fee on the same day. The statement setting out the grounds of appeal was received on 8 August 2011.

V. In accordance with Article 15 of the Rules of Procedure of the Boards of Appeal, the board issued a preliminary opinion of the case, together with a summons to oral proceedings. In response appellants I and II filed further submissions (letters dated 20 June 2013 and 21 June 2013 respectively).

Oral proceedings were held on 25 July 2013.

VI. Requests

Appellant I requested that:

- the decision under appeal be set aside and that the patent be maintained as granted or, alternatively, that the patent be maintained in amended form on the basis of the set of claims filed as an auxiliary request with the letter of 29 July 2011, and
- that the appeal of the opponent be dismissed.

Appellant II requested that:

- the decision under appeal be set aside and that the patent be revoked, and
- that the appeal of the patent proprietor be dismissed.

VII. Claims

(a) Parent application (WO-A-01/012364)

Claim 1 reads as follows:

"1. A process for producing metal powders comprising the steps of:

- providing a hydride powder of a first metal, said first metal being selected from the group consisting of tantalum, niobium and alloys of said metals with each other or one or both of them with other metals, the hydride having an oxygen content of under 300 ppm,
- heating said metal hydride in the presence of a metal having a higher affinity for oxygen,
- removing the metal having a higher affinity for oxygen from the metal, to form a powder of the first metal having an oxygen content of less than 300 ppm."

Dependent claim 3 of the parent application defines the final oxygen content of the powder:

"3. The process of claim 1 wherein the final oxygen content of the metal powder is less than 100 ppm."

(b) Granted Divisional Application

Claim 1 is as follows. Amendments with respect to the parent application are indicated by underlining and strike-through.

"1. A process for producing metal powders comprising the steps of:

- providing a hydride powder of a first metal being selected from the group consisting of tantalum, niobium and alloys of said metals with each other or one or both of them with other metals, the hydride having an oxygen content of under 300 ppm,

- ~~heating~~ mixing said metal hydride ~~in the presence of~~
with a metal having a higher affinity for oxygen, and
heating the mixture;

- removing the metal having a higher affinity for
oxygen from the metal, to form a powder of the first
metal having an oxygen content of less than ~~300~~
100 ppm."

Dependent claims 2 to 8 concern preferred embodiments
of the process of claim 1.

VIII. Prior Art

The following documents were cited in the contested
decision:

- D1: US-A-5 580 516
- D2: US-A-5 242 481
- D3: US-A-4 722 756

Appellant II submitted the following documents with the
statement of the grounds of appeal:

- D4: US-A-4 740 238
- D5: E. Veleckis and R. Edwards, "Thermodynamic
Properties in the Systems Vanadium-Hydrogen,
Niobium-Hydrogen, and Tantalum-Hydrogen", Journal
of Physical Chemistry, Volume 73, No.3, March 1969.
- D6: US-A-4 017 302
- D7: WO-A-97/38143

Appellant I submitted the following document with the
letter of 20 June 2013.

D9: Miller et al, "Metallurgy of the Rarer Metals - 6. Tantalum and Niobium", Academic Press, Inc., New York, 1959, pages 1 to 3.

IX. Submissions of the Parties

Article 76(1) EPC

(a) Appellant II's Case:

Appellant II argued that use of a hydride powder having an oxygen content of less than 300 ppm in order to produce a metal powder with less than 100 ppm oxygen is only disclosed in the parent application in the context of the process defined in claims 1 and 3. Throughout the description reference is made to use of a starting hydride powder with an oxygen content of less than about 1000 ppm in order to produce metal powders with an oxygen content of less than 300 ppm.

Claim 1 of the application requires the step of heating the metal hydride in the presence of a metal having a higher affinity for oxygen. Amendment of this process to "mixing the metal hydride with a metal having a higher affinity for oxygen and heating the mixture..." contravenes Article 76(1) EPC, since there is no disclosure in the parent application of mixing the defined components to produce a metal having less than 100 ppm oxygen.

Appellant II agreed with the reasoning of the opposition division that mixing the metal hydride with the other metal is not an inherent meaning of "heating

in the presence of...", since the latter expression does not require physical contact between the hydride powder and the metal.

The description does not contain any general reference to the mixing of the components. In addition, mixing is not the only means for introducing the metal with higher affinity, as mere presence of the metal in the reaction chamber suffices. Consequently, mixing is not an automatic choice for the skilled person.

Example 3 is the sole example in the parent application that mentions a mixing step that leads to a tantalum powder having an oxygen content (77 ppm) in the claimed range. However, other than it being tantalum hydride, the starting material is unknown; in particular the oxygen content of the tantalum hydride (an important feature of claim 1) is not given. The example concerns a very specific embodiment of the process, in which the tantalum hydride is blended with a specific amount of magnesium and subjected to a specific heating regime, with deoxidation taking place under a specific pressure of argon.

It is well known in the art that chemical processes are sensitive to variations in process parameters, and the other examples of the opposed patent confirm that selection of the correct process parameters is critical for obtaining powders having an oxygen content of less than 100 ppm. It is generally accepted case law of the boards of appeal, in particular in chemical cases, that it is not admissible to extract isolated features from a set of features which have originally been disclosed in combination only for a particular embodiment.

Consequently, it is not possible for Example 3 to provide the basis for the process as defined in claim 1, which includes all tantalum alloys, niobium and niobium alloys and any amount of any metal having a higher affinity for oxygen, and which requires the hydride powder to have an oxygen content of less than 300 ppm; none of these features can be derived from Example 3.

Mention is made in the paragraph bridging pages 2 and 3 of the parent application that a tantalum hydride powder, having a particle size of less than 150 microns, is mixed with a small amount, less than 0.5% of the hydride weight, of magnesium or calcium and subjecting the mixture to a heating and leaching schedule to yield a tantalum powder having under 300 ppm oxygen. However, this specific disclosure also cannot provide a basis for the broadly defined process of claim 1, which results in a powder having even less oxygen, namely, less than 100 ppm.

In summary, the skilled person cannot derive from either the claims or the description of the parent application the combination of features of granted claim 1.

(b) Appellant I's Case:

Appellant I pointed out that the combination of claim 1 and dependent claim 3 of the parent application discloses a process which uses a metal hydride powder with an oxygen content of under 300 ppm as a starting powder, and which results in a metal powder having an oxygen content of less than 100 ppm.

The only amendment to be considered is that the metal hydride powder is now defined as being mixed with the metal having a higher affinity for oxygen, rather than it being in its presence, as defined in claim 1 of the parent application.

According to the general disclosure of the invention in the section entitled "Summary of the Invention", it is said that tantalum hydride is mixed with magnesium or calcium. A specific example (Example 3) also discloses mixing. A skilled person looking at the practical examples of how the powder is made would realise that the mixing step is not limited to tantalum hydride and magnesium. Consequently, the process of claim 1 is derivable from the parent application when considered as a whole.

Inventive Step

(a) Conclusion of the Opposition Division

The opposition division held that the process of claim 1 was inventive over the combination of D1 and D3. However, there was a lack of inventive step, as the technical problem was not solved over the whole ambit of the claim, and essential features for solving the problem were not present in the claim (points 3.2 and 3.5 of the contested decision).

(b) Appellant I's Case:

Appellant I submitted that the reasoning of the Opposition Division was wrong. If the conclusion was

that the objective problem had not been solved, then the problem should have been re-defined and inventive step assessed on the basis of the re-defined problem with respect to the state of the art.

The object of the invention is to produce powders containing less than 100 ppm oxygen. Whereas such a low oxygen content may have an adverse effect on some properties, it can have a beneficial effect on others. There is a general desire to have powders with very low oxygen contents, irrespective of its properties, and this is the purpose of the invention. Concerning D1, the lowest oxygen content obtained by the process of this document is 135 ppm, ie it does not solve the problem addressed by the disputed patent.

Whereas the process of D1 starts from metal powders, that of claim 1 uses hydride powders, which have a different morphology and result in a different chemistry taking place.

D3 discloses a process, in which tantalum hydride powder is heated in a hydrogen gas; this is completely different to the process of D1. In addition, the resulting powder does not have an oxygen content of less than 100 ppm. There is therefore no reason to combine the teachings of D1 and D3, and even if they were to be combined, there is no indication that the desired result can be achieved.

In Examples 1 and 2 of the patent specification the resulting oxygen content is not below 100 ppm because lower temperatures and shorter times are employed. Example 3 shows that when heating takes place at a

sufficiently high temperature and for a sufficient length of time, the claimed process leads to a powder having the required oxygen content.

In summary, compared with D1, the claimed process has different starting materials and results in a different product, and this cannot be derived from the available state of the art in an obvious manner.

(c) Appellant II's Case:

Appellant II submitted that both the contested patent and D1 have the same purpose, namely reducing the oxygen content of tantalum and niobium powders. According to the process of D1, this is achieved by heating powders of tantalum, niobium and their alloys in the presence of an oxygen active metal.

The difference between the claimed process and that of D1 lies in the definition of the final oxygen content: less than 100 ppm in claim 1 and less than 300 ppm in D1. A tantalum powder having an oxygen content of 135 ppm, which is close to 100 ppm, is disclosed in D1.

The oxygen content of the final tantalum powder is, however, linked to its surface area, and if this is taken into consideration, the object of preparing a tantalum powder having a minimum oxygen content has already been solved in D1. Consequently, the problem to be solved is to find an alternative process for reducing the oxygen content.

The proposed solution of using a hydride instead of a metal as the starting material is not associated with an inventive step.

- Firstly, tantalum hydride is disclosed as a starting material in D3, and hence is an obvious alternative.

- Secondly, in the production of tantalum powders, it is conventional in the art to conduct a hydriding/dehydriding step followed by a deoxidation step (eg D4). According to the process of claim 1, these steps are conducted simultaneously. However, whether the steps are carried out in sequence or simultaneously is irrelevant.

This is because the metal hydride decomposes above 600°C into metal and hydrogen, with the removal of oxygen taking place in a subsequent step at a higher temperature. Hence, the claimed process is equivalent to that of D1, in that oxygen reduction is performed on the tantalum powder, irrespective of using a hydride starting powder.

- Thirdly, the process of claim 1 results in a product that is worse than that disclosed in the prior art. The values for compressibility and strength presented in the contested patent are comparable to those of D1 for a powder having 135 ppm oxygen. To reduce the oxygen content further to below 100 ppm would lead to a less favourable material, hence there is no advantage in starting with a hydride and reducing the oxygen content below that of D1.

- Fourthly, it had not been shown that the technical problem is solved over the whole ambit of claim 1 of the main request, ie that a powder having less than 100 ppm oxygen can be obtained for all the alloys and metals having a higher affinity for oxygen covered by the claim. Examples 1 and 2, both of which involve mixing a tantalum hydride starting powder, follow the steps defined in claim 1, but do not result in a powder having an oxygen content of less than 100 ppm; the desired result is only achieved in Example 3; thus it is evident that the object of the disputed patent is not obtained over the whole claimed range.

Reasons for the Decision

1. The appeals are admissible.
2. Article 76(1) EPC
 - 2.1 Appellant II and the opposition division were of the opinion that the step of mixing a metal hydride with a metal having a greater affinity for oxygen is only disclosed in the parent application for the production of a specific metal powder - tantalum - by mixing the hydride with magnesium, and by employing specific amounts and process conditions. Since there is no disclosure in the parent application of mixing hydrides of metals other than tantalum, they concluded that claim 1 of the main request contravenes Article 76(1) EPC.
 - 2.2 Although, as argued by appellant II, the description of the parent application is directed principally to

producing powders having an oxygen content of less than about 300 ppm, starting with a hydride having an oxygen content of less than 1000 ppm, the disclosure nevertheless also includes the claims.

Claim 1 defines a process in which the starting material is a hydride powder of a given metal having an oxygen content of under 300 ppm. Dependant claim 3 refers to claim 1 and states that the final oxygen content of the metal powder is less than 100 ppm. Hence, a process starting with a hydride having less than 300 ppm oxygen and finishing with a metal powder having less than 100 ppm is expressly disclosed in the parent application.

2.3 The board therefore agrees with appellant I, that the only amendment to be considered is whether mixing of the hydride and metal having a higher affinity for oxygen can be derived from the parent application when considered as a whole.

2.4 The step of mixing or blending is disclosed in Example 3 in the context of preparing tantalum powder having an oxygen content as defined in dependent claim 3 and granted claim 1. A further example is mentioned in the "Summary of the invention", which concerns the preparation of a tantalum powder with a oxygen content of less than 300 ppm. Examples 1 and 2 also refer to mixing.

Appellant II argued that it is not necessary to introduce the metal having higher affinity for oxygen by mixing; it could be in sheet or sponge form, situated in the chamber near to the hydride powder.

However, none of these techniques are mentioned in the parent application, only mixing is described. For the skilled person reading the parent application with a view to determining how the powder is to be made, it is mixing that would most readily spring to mind.

It is also clear that the mixing step is merely a general step that is not just limited to tantalum hydride and magnesium or calcium, but could be used for blending other hydrides and metals - irrespective of the particular process parameters that might subsequently be applied. There is no teaching in the parent application that, for certain combinations of hydrides and metals, mixing is unsuitable or cannot be carried out. Consequently it is reasonable for the skilled person to assume that it is also used for all of the hydrides and metals defined in claim 1.

2.5 The skilled person is generally aware that powder components can be mixed together at the start of a process, irrespective of the process conditions to be used. For example, mixing is used in Examples 1 and 2, although the process conditions are different to those of Example 3. Hence, incorporating a step of mixing into the process of claim 1 does not necessitate definition of the further process parameters given in the examples, as was argued by appellant II.

2.6 The amendments therefore meet the requirements of Article 76(1) EPC.

3. Inventive Step (Article 56 EPC)

3.1 Appellant II submitted that the alleged inventive effect of producing a powder with an oxygen content of less than 100 ppm cannot be achieved simply by following the steps defined in claim 1, and that it has not been shown that the effect is obtained for all the alloys covered by the claim, hence the requirements of Article 56 EPC have not been met. It was argued that, although the basic process steps are defined in claim 1, many specific details, such as quantities, particle sizes, temperatures, times etc, which influence the oxygen content, are not present. In particular, Examples 1 and 2 of the patent specification show that, despite following the steps defined in the claim, an oxygen content of below 100 ppm is not obtained. Even Example 3, which results in 75 ppm oxygen, fails to give details of the hydride starting material, which would be important for the desired effect.

3.1.1 The board agrees that there are many parameters that influence the final oxygen content of the powder. Examples 1 and 2, which are not cited as examples of the invention, show that an oxygen content above 100 ppm is obtained when lower temperatures and shorter times are employed. This, however, does not mean that the technical effect underlying the invention is not achieved. Example 3 demonstrates that when heating takes place at a sufficiently high temperature and for a sufficient length of time, the claimed process leads to a powder having the required oxygen content.

3.1.2 It may or may not be the case that there is insufficient information, such as details about the

tantalum hydride starting material or about other process parameters, for the skilled person to achieve the required oxygen content, but this relates to sufficiency of disclosure (Article 83 EPC), which is not an issue in these proceedings.

3.1.3 Appellant I has shown that the decision under appeal regarding the ground according to Article 76 EPC is wrong. In addition, appellant I can rely on Example 3 as demonstrating that the inventive effect is plausible, particularly as the skilled person is aware that the properties of tantalum and niobium are similar, as evidenced by D9, page 1, first four lines. Consequently, it was for appellant II to put forward reasons as to why the invention could not be worked over the entire scope of the claim. However, that the required effect cannot be achieved for all metals and alloys falling within the scope of the claim has not been substantiated. Hence the board sees no reason to conclude that the invention cannot be worked over the entire scope of the claim.

3.2 The opposition division agreed with the above submission of appellant II that the claimed subject-matter does not meet the requirements of Article 56 EPC. It reasoned (points 3.3 and 3.5 on pages 4 and 5 of the contested decision) that the claimed process was inventive over the disclosures of D1 and D3 but, citing T 939/92 ("the Agrevo decision"), concluded that the technical problem of reducing the oxygen content to below 100 ppm had not been solved over the whole ambit of the claim.

- 3.2.1 As submitted by appellant I, the reasoning of the opposition division is incorrect. As set out in T 87/08 (point 6.3), T 306/09 (point 4) and T 2375/10 (point 2), the requirement of inventive step, as defined in Article 56 EPC, is based on the "state of the art". Hence the mere statement that the technical problem is not solved over the whole scope of the claim without reference to prior art amounts to insufficient reasoning for a lack of inventive step. If the conclusion was that the objective problem had not been solved, then the problem should have been re-defined and inventive step assessed on the basis of the re-defined problem.
- 3.2.2 T 87/08, T 306/09 and T 2375/10 are consistent with T 939/92 which, despite saying that there was a lack of technical effect, analysed inventive step in light of prior art (points 2.5 and 2.6). In T 939/92 the claim concerned a group of chemical compounds and, on the basis of the prior art, the problem to be solved was to provide alternative compounds having herbicidal activity; since the claim included compounds not having his property, it extended to compounds that were not inventive.
- 3.2.3 In T 87/08, T 306/09 and T 2375/10 the opposition or examining divisions gave no analysis whatsoever of inventive step based on the prior art, but merely stated that the purported effect was not achieved over the scope of the claim. This is not quite the same situation as in the present case, where the opposition division considered the prior art before it, and concluded that the claimed process was inventive (see point 3.2 of the contested decision), but then went on

decide that the claimed process nevertheless did not meet the requirements of Article 56 EPC.

3.3 So, in assessing inventive step correctly, the prior art must be taken into account, which in the present case means taking D1 into consideration. As with the contested patent, D1 relates to the production of powders of tantalum, niobium and their alloys having low oxygen contents (column 1, lines 16 to 18). This is the same objective as the disputed patent, hence D1 is a suitable starting point for determining inventive step.

3.3.1 According to the process of D1, metal powders are heated in the presence of an oxygen-active metal, ie a metal having a higher affinity for oxygen; this results in a powder having less than 300 ppm oxygen (column 2, lines 39 to 44).

3.3.2 The process of claim 1 differs in that a metal hydride containing a lower amount of oxygen is used as the starting powder, and in that the resulting powder has a lower oxygen content (less than 100 ppm).

3.3.3 Appellant II argued that the first step in the claimed process is the reduction of the hydride to metal, which then reacts at a higher temperature with the metal having a higher affinity for oxygen, hence is indistinguishable from the process of D1. This may well be the case, but as argued by appellant I, a different starting material is used in the claimed process, and this has a different structure and morphology which, on the face of it, has an effect, namely it results in a lower oxygen content.

3.3.4 Irrespective of the magnitude of the specific oxygen contents of the powders of the patent and D1, the oxygen content is defined in claim 1 as being less than 100 ppm, whereas the lowest oxygen content achieved by the process of D1 is 135 ppm (column 7, lines 3 to 5). The problem to be solved starting from D1 is thus not merely to provide an alternative process, as argued by appellant II, but to reduce the oxygen content yet further to below 100 ppm.

3.3.5 According to appellant II, this results in a powder having worse properties than that of D1. However, appellant I has argued convincingly that the purpose of the invention is to produce a powder with a very low oxygen content, and this is itself desirable, irrespective of the fact that may have some disadvantages.

3.3.6 Appellant II submitted that the solution to the problem can be found in D3, which discloses a process for reducing the oxygen content of tantalum and niobium powders. At column 2, lines 41 to 42 of D3 it is said that any tantalum or niobium (columbium) containing material can be treated.

Although Examples 1 to 10 and 12 all concern metallic tantalum, Example 11 discloses a process in which tantalum hydride is used as the starting material. The tantalum hydride powder is heated in hydrogen gas, and the water vapour formed by the reaction of hydrogen with the oxygen in the powder is then "gettered" by a more oxygen-active metal than tantalum, in this example, zirconium. However, the oxygen content is not reduced

to less than 100 ppm by the process; it is 1140 ppm in the hydride starting powder and present in a comparable amount in the tantalum powder end product (see the Table in column 11, lines 30 to 37).

Unlike D3, the process of D1 does not involve heating a hydride powder in a hydrogen atmosphere, so the board agrees with the opposition division that D1 and D3 concern different processes and it is unreasonable to combine the teachings. Consequently, tantalum hydride is not an obvious alternative to tantalum metal as a starting material for the process of D1. Even if D1 and D3 were to be combined, there is no indication that use of a hydride starting powder results in an oxygen content below 100 ppm.

3.4 Consequently, the subject-matter of claim 1 is not obvious in light of D1 and D3.

4. Since claim 1 of the main request is found to be allowable there is no need to consider the claims of the auxiliary request file by appellant I.

Appellant II filed documents D4 to D7 in response to claim 1 of the auxiliary request, which required the mixture to be heated under a positive pressure of argon. Since the auxiliary request is not under consideration, there is no reason to admit these documents into the proceedings.

Order

For these reasons it is decided that:

1. The appeal of the opponent is dismissed.
2. The decision under appeal is set aside.
3. The patent is maintained as granted.

The Registrar:

The Chairman:

C. Spira

U. Krause