Commissioner’s Decision # 1363

Décision du Commissaire # 1363

TOPICS: A -20, F-01, O -00, C-00

SUJECTS: A - 20, F-01, O -00, C-00

Application No : 2,423,099

Demande no : 2,423,099

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,423,099, having been rejected by the Examiner under subsection 30(3) of the *Patent Rules*, was reviewed by the Patent Appeal Board and by the Commissioner of Patents. The recommendation of the Board and the decision of the Commissioner follow.

Agent for the Applicant

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Introduction

[1] Application number 2,423,099 was filed on 05 September 2001 and is entitled "HIGH VOLUME DENSITY POLYCRYSTALLINE DIAMOND WITH WORKING SURFACES DEPLETED OF CATALYZING MATERIAL". The Applicant is CAMCO INTERNATIONAL (UK) LIMITED and the inventors are Nigel Dennis Griffin and Peter Raymond Hughes.

[2] The application was rejected because certain claims were found to be either anticipated and/or obvious, and because a claim overlapped (obviousness double patenting) with a claim of a related patent also owned by the Applicant.

[3] Examination was requested on 17 June 2005 and 3 reports were issued beginning on 28 May 2007. The Examiner issued a Final Action on 12 January 2011. On 09 July 2012, new claims were submitted in response to the Final Action, and the Examiner forwarded the application to the Patent Appeal Board (PAB) along with a Summary of Reasons (SOR). The SOR maintained the grounds for rejection and identified a new defect in the description.

Invention

[4] The invention concerns a polycrystalline diamond (PCD) or diamond-like element for use in cutting or drilling tools, with improved wear resistance without loss of impact strength. These elements are formed with a binder-catalyzing material in a high-temperature, high-pressure (HTHP) process. The PCD element has a body with a plurality of partially

bonded diamond or diamond-like crystals forming a continuous diamond matrix that has a diamond volume density greater than 85%. Interstices among the diamond crystals form a continuous interstitial matrix containing a catalyzing material. The diamond matrix table is formed and integrally bonded to a metallic substrate containing the catalyzing material during the HTHP process. The diamond matrix body has a working surface, where a portion of the interstitial matrix in the body adjacent to the working surface is substantially free of the catalyzing material, and the remaining interstitial matrix contains the catalyzing material.

Procedural matters and review before the hearing

[5] The SOR was forwarded to the Applicant along with an invitation to attend a hearing and/or to make a written submission. In addition to the defects in the Final Action, the SOR further notes that the description does not correctly and fully describe the invention and does not comply with subsection 27(3) of the *Patent Act*. The SOR explains that page 29, lines 24-26 includes an impermissible statement that the claims are to be viewed as broader than the teachings of the description. Identifying this defect reflects an Office practice change which occurred after the Final Action was sent.

[6] Three Board members ("the panel") reviewed the written record. The panel requested the examiner to update the obviousness grounds using the four-step approach for assessing obviousness set out in *Sanofi-Synthelabo Canada Inc. v. Apotex Inc.*, 2008 SCC 61 [*Sanofi*]. The examiner provided a Supplemental Analysis (SA) which was forwarded to the Applicant on 19 July 2013, along with questions from the panel. The Applicant was invited to provide a written submission including a proposed set of claims.

[7] The Applicant provided a written submission on 26 September 2013. A hearing was held on 18 October 2013.

Claim Construction

[8] We begin our analysis with a purposive construction of the claims. During purposive construction, the elements of the claimed invention are identified as either essential or non-essential: *Free World Trust v Electro Santé Inc*, 2000 SCC 66 [*Free World Trust*]. Also see Practice Notice 2013-02 *"Examination Practice Respecting Purposive Construction"* dated 8 March 2013 [PN2013-02] which outlines Office practice for performing a purposive construction of claims. Where an element will be considered "non-essential", "it must be shown either (i) that on a purposive construction of the words of the claim it was clearly not intended to be essential, or (ii) that at the date of publication of the patent, the skilled addressees would have appreciated that a particular element could be substituted without affecting the working of the invention" (*Free World Trust* at para. 55). Purposive construction is performed through a balanced and informed approach, considering the specification as a whole against the background of the common general knowledge (CGK), including an understanding of the meaning of terms used in the claims, and the problem and solution addressed by the application. Once identified, the solution then informs the determination of which elements are essential to the claimed invention. While some elements in a claim may have a material effect on the operation of the embodiment defined by the claim, they may not be essential (i.e. they may be omitted or varied) to the operation of the invention in achieving the solution to the problem.

The Person Skilled in the Art and the Relevant Common General Knowledge

[9] The SA characterized the skilled person as follows:

> a team of scientists, engineers or technologists faced with developing or improving polycrystalline diamond elements useful in the fields of excavation, mining, cutting, working, or drilling of rocks, stone, concrete and similar hard materials employing a

variety of tools.

[10] There is no disagreement from the Applicant in this regard and in our opinion this definition of the skilled person is correct. Accordingly, it is adopted for the purposes of these reasons.

[11] The SA further sets out the common general knowledge (CGK) of that skilled team, which is paraphrased below:

> (a) that a preform polycrystalline diamond (PCD) element comprises a body of superhard polycrystalline material comprising a plurality of bonded diamond crystals integrally formed with a metallic substrate, such as tungsten carbide with an iron group binder material, a plurality of interstitial regions among the diamond crystals and a catalyzing material.
> (b) that PCD elements were commonly known to be used for cutting elements, for example, as fixed cutter or rolling earth boring bits when received in sockets used for drill bits, or when fixed to a post in a machine tool for machining. Various patent documents were referenced to illustrate this including a reference of interest.
> (c) that diamond powder with various particle sizes may be used in the manufacture of PCD elements to enhance wear properties (in view of page 2 of the instant application citing various patent documents).
> (d) that it was commonly known that the wear-resistance can be varied by varying the grain size distribution, and thus the packing density of the diamond particles; and that the diamond particle size ranging from 10 to 100 microns had been thoroughly studied. The SA cites US5468268 and US5135061 (at column 4, lines 38-58,

also referred to in the instant application) in support, and also refers to page 2 of the instant application which states that "wear resistance is varied by changing the average size of the diamond particles, there is an inherent trade-off between impact strength and wear resistance in these designs".

(e) in PCD embodiments where the diamond body constitutes 85-95 vol% and the binder-catalyzing material 5-15 vol% of the cutting element, it was known that such elements may be subject to thermal degradation due to: (i) differential thermal expansion between the binder-catalyzing material and diamond matrix at a temperature of 400°C, and (ii) the presence of the binder-catalyzing material which promotes the diamond-to-graphite conversion at a temperature of 750°C.

(f) to reduce the thermal degradation, thermally stable PCD elements have been produced in the art using the acid leaching method (see page 4, line 16-24 of current description). The SA further states that it was also known that there are two issues arising from thermally stable PCD elements: (i) a lack of impact strength, and (ii) a lack of suitable bondable substrate for mounting to tools.

[12] In response, the Applicant stated that they do not accept that the teachings of specific patents necessarily constitute "common general knowledge". No specific reasoning was provided to establish what is CGK, or to refute the examiner's statements. While we agree that specific patents do not necessarily constitute CGK, the documents referenced appear to us to be sufficiently well known and to have passed into general knowledge. This is particularly apparent from the description of the related art on pages 1 to 8 of the instant application, which supports the CGK statements in (a) to (f) above. As noted by Pelletier J. in *Illinois Tool Works Inc. v. Cobra Fixations Cie / Cobra Anchors Co.*, 2002 FCT 829 at paras 97-100, "common general knowledge may include knowledge of particular patents

which are sufficiently well known to have passed into general knowledge but does not include knowledge of all patents in the domain of the invention".

[13] We also note that in response to our question (in our letter dated 19 July 2013) concerning the 0.1 mm depth specified in claim 7 and what the corresponding required depth would have to be in claim 1 (the depth which is substantially free of catalyzing material), the Applicant stated (on page 10 of its letter) that "the specification gives sufficient information for the skilled person to choose the appropriate depth depending on the specific application". On page 12 of the response, the Applicant explained the interrelationship with the depth, removal of catalyzing material, and volume density in that these "various parameters need to be selected by the person skilled in the art". This is consistent with CGK (c) and (d) above, and the known constraints or problems in CGK (e) and (f).

[14] In our opinion, this skilled person the Applicant speaks of will necessarily have the CGK in (a) to (f) above, and having reviewed the specification (and the description of related art on pages 1 to 8), we conclude that the statements of CGK are correct and they are adopted for the purposes of these reasons.

[15] At the hearing, the Applicant was requested to clarify how the skilled person reading the applied prior art (Shuji *et al.*) would remove the catalytic material, and whether or not this was different from the instant application. The Applicant stated that the basic method is the same, and it was a matter of the amount of care or time the skilled person would take to remove the catalytic material. Thus, we consider that on the claim date it was well known for the skilled person to, when instructed or required, either remove all of the catalytic material, or a portion thereof. Since the instant application does not specify any preferred or unique manner for depletion, the method or mode of depletion to use would also be well known to the skilled person and one of a number of finite design choices.

The problem addressed

[16] Pages 1-8 of the instant application identify several problems in the art, which point to the need for a thermally stable PCD with sufficient impact strength (wear resistance) and a PCD body having a bondable substrate.

[17] As we noted in CGK (e) and (f), some issues (or problems) in the art would have been known to the skilled person, namely: the problem of (i) differential thermal expansion between the binder-catalyzing material and diamond matrix and (ii) the presence of the binder-catalyzing material which promotes the diamond-to-graphite conversion at a temperature of 750°C. Further, per CGK (f) and the instant application, the skilled person is aware of certain constraints or problems with respect to thermally stable PCD elements: (i) a lack of impact strength, and (ii) a lack of suitable bondable substrate for mounting to tools.

[18] The SA outlines these problems or issues as being well known to the skilled person. The Applicant did not make any submission addressing the problem being solved nor challenge the examiner's conclusions regarding these known issues in the art.

The claims and the essential elements

[19] Claims 1 to 11 submitted in response to the Final Action are on file and will be reviewed. Claim 1 is illustrative of the invention:

> 1. A preform polycrystalline diamond cutting element comprising:
> a body of superhard polycrystalline material comprising a plurality of bonded diamond crystals integrally formed with a metallic substrate, a plurality of interstitial regions among the diamond crystals and a catalyzing material; the body

having at least a 85% by volume diamond density and a working surface wherein a first interstitial region adjacent to at least a portion of the working surface is substantially free of the catalyzing material to a depth and a second interstitial region in a portion of the body in contact with the substrate contains the catalyzing material;

wherein the first interstitial region extends beneath the working surface and the second interstitial region has an average thickness greater than 0.15 mm, and the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth.

[20] The solution or invention recited in claim 1 relates to the aforementioned problems. The recited features in claim 1 such as 85% by volume diamond density, a first interstitial region substantially free of the catalyzing material to a depth, a second region with the catalyzing material and the bonded diamond crystals exhibiting a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth, are material to solving the problems addressed by the instant application. As we noted earlier, these problems are differential thermal expansion between the binder-catalyzing material and diamond matrix, diamond-to-graphite conversion at a temperature of 750°C, and avoiding issues such as a lack of impact strength and a lack of suitable bondable substrate for mounting to tools.

[21] Therefore, the person skilled in the art would find that the elements in claim 1 are essential because each of these features has a material effect on the working of the invention, and cannot be substituted or omitted without impacting the working of the invention.

[22] There are no disagreements in the prosecution as to claim interpretation except that the Applicant considers “substantially free of the catalyzing material” is distinguishing over the prior art. Before the hearing, the panel requested the Applicant to clarify certain

aspects of the claims, for example, the following features in claim 1: “at a depth”; “substantially free”; and any particular structural limitations imposed by the thermal characteristics recited in claim 1. These clarifications and the Applicant’s responses will be addressed below and in the context of particular issues, as the need arises.

[23] On page 20 of the instant application, “substantially free” is defined as follows:

> In this specification, when the term 'substantially free' is used referring to catalyzing material 64 in the interstices 62, the interstitial matrix 68, or in a volume of the body 8, it should be understood that many, if not all, the surfaces of the adjacent diamond crystals 60 may still have a coating of the catalyzing material 64. Likewise, when the term 'substantially free' is used referring to catalyzing material 64 on the surfaces of the diamond crystals 60, there may still be catalyzing material 64 present in the adjacent interstices 62.[emphasis added]

[24] In the SOR, the Examiner notes this and further notes that the Applicant’s correspondence dated 09 July 2008 characterized substantially free as being “free of most but not all” of the catalyzing material. We find that the skilled person reading the claims of the instant application would adopt this definition for “substantially free”. The Applicant’s submissions with regard to “substantially free” will be considered in the obviousness analysis.

[25] As to the feature: “the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth”, certain structural limitations would be imposed, for example, on the depth in claim 1. As noted earlier with respect to the CGK of the skilled person, there is an interrelationship with the depth, removal of catalyzing material, and volume density and these parameters would be selected by the person skilled in the art, without undue effort or

inventive skill, to achieve the thermal characteristic set out in claim 1.

[26] Claims 2-6 and 8-9 are ultimately dependent upon claim 1, and recite additional features such as:

- the cutting element is mounted upon a cutting face of a fixed cutter rotary drill bit;
- the cutting element is mounted upon a body of a rolling cutter drill bit;
- the cutting element with the cutting surface adapted for use as a cutting insert in a machining operation;
- the substrate is tungsten carbide with an iron group binder material;
- the first interstitial region extends beneath the working surface to a depth of at least an average diameter of the diamond crystals;
- the diamond crystals have an average particle size in the range of about 30 microns to about 60 microns; and
- a majority of the catalyzing material remaining in the second interstitial region of the body adheres to surfaces of diamond crystals.

[27] Claim 7 stipulates that "the first interstitial region extends beneath the working surface to a depth of at least about 0.1 mm." In view of the requirement for consistency between independent and dependant claims, the panel requested the Applicant to clarify the required depth of the first interstitial region in claim 1 in view of this limitation. The Applicant's response noted that there must be sufficient depth in the second region (main body) to bind the crystals i.e. 0.15 mm is sufficient; and for the first interstitial region 0.1 mm is a typical minimum, though the depth could be less if the diamond density in the body approaches 99%.

[28] In response to the Final Action, claim 10 was made dependant upon claim 1 only, as follows:

> 10. A preform polycrystalline diamond cutting element according to claim 1, wherein an amount of catalyzing material within the first interstitial region of the

body continuously decreases with increasing distance from the second interstitial region.

[29] Our letter to the Applicant requested explanation as to the construction to be given to the term "substantially" in the context of claim 10 which is dependent on claim 1. This is because on the one hand, claim 10 stipulates that "an amount of catalyzing material within the first interstitial region of the body continuously decreases with increasing distance from the second interstitial region". On the other hand, claim 1 requires that the "first interstitial region . . is substantially free of the catalyzing material to a depth". The two requirements are inconsistent. The response from the Applicant acknowledged this inconsistency and proposed deleting claim 10 because it was inconsistent with the correct and overriding interpretation of claim 1. Accordingly, claim 10 will not be assessed any further in this review as it would not be compliant with subsection 27(4) of the *Patent Act* and because this defect will be remedied by deleting this claim, as proposed by the Applicant.

[30] Therefore, our analysis considers claim 1 as it currently stands independently of the limitation set out in claim 10, namely: "an amount of catalyzing material within the first interstitial region of the body continuously decreases with increasing distance from the second interstitial region".

[31] Claims 11 specifies that in any of the embodiments set out in claims 1 to 10, at least 30% of the body comprises the second interstitial region.

References Cited

[32] In the Final Action, the Examiner relied on the following references:

Canadian Patent: obviousness double patenting

2 423 102	28 March 2002	Griffin *et al.*

Japanese Patent publication: anticipation and obviousness

59-219500	10 December 1984	Shuji *et al.*

Rejection under Review - Issues

[33] As noted earlier, the grounds for rejecting this application set out in the Final Action are obviousness double patenting, non-compliance with section 28.3 of the *Patent Act* (obviousness) and non-compliance with paragraph 28.2(1)(*b*) of the *Patent Act* (lack of novelty). Further, the SOR alleges that the description does not correctly and fully describe the invention and does not comply with subsection 27(3) of the *Patent Act.*

[34] In response to the SA on 26 September 2013, the Applicant proposed an amended claim 1 and argued for inventiveness in view of the proposed claims.

[35] The review below is based on the set of claims 1-11 submitted in response to the Final Action, as is required by the *Patent Rules*. Once the claims as they stand have been reviewed, we will assess the proposed set of claims as needed.

Double Patenting

[36] The Final Action and the SOR state that claim 10 of the present application defines a polycrystalline diamond cutting element that is not patentably different from claims 1, 4, 5 and 6 of the CA2423102 (hereafter ‘102) patent.

[37] As we noted earlier, our letter to the Applicant requested explanation as to the construction to be given to the term “substantially” in the context of claim 1 and claim 10. The Applicant acknowledged that claim 10 was inconsistent with the correct and overriding interpretation of claim 1. It is for that reason, the Applicant stated, that it was proposed to

delete claim 10 - see "Claim Construction". Therefore, no assessment is needed to determine whether or not there is obviousness double patenting of claim 10 in view of claims 1, 4, 5 and 6 of the '102 patent.

[38] In view of claim 2 of the '102 patent, in our letter the panel further requested the Applicant to address double patenting of claims 1 and 7, in the context of the arguments in the Final Action. Our analysis below considers claims 1 and 7 in view of claims 1, 2, and 4-6 of the '102 patent.

Legal principles of "obviousness" double patenting

[39] The prohibition against double patenting is a judicially recognized doctrine intended to prevent the issuance of more than one patent to an applicant for the same invention or obvious variations of the same invention. The leading authority on double patenting is considered to be *Whirlpool Corp. v. Camco Inc.*, 2000 SCC 67 [*Whirlpool*]. In *Whirlpool*, the Supreme Court clearly explained the rationale behind the rule against double patenting and reviewed the two branches under which the rule could be applied.

[40] The first branch is called "same invention" double patenting and applies in situations where the claims under comparison are considered identical or conterminous.

[41] The second branch is called "obviousness" double patenting and is "a more flexible and less literal test" which applies in situations where the claims are not "patentably distinct" (*Whirlpool* at para. 66). To avoid a finding of obviousness-type double patenting requires that a claim exhibit inventive ingenuity over the claim under comparison (*Bayer Schering Pharma Aktiengesellschaft v. Canada (Attorney General)*, 2010 FCA 275 at para. 30).

Are claims 1 and 7 of the instant application patentably distinct from claims 1, 2, 4, 5 and 6 of the '102 patent?

[42] On page 4 of the Applicant's response to the Final Action, features (f), (k) and (l) in claim 1 are pointed out as contributing to a patentable distinction over the '102 patent. However, we only need to consider the Applicant's submission in response to our letter to resolve this question.

[43] As we discussed under claim construction, the meaning of "substantially free" in the first interstitial region of claim 1 does not denote the same requirement as in claim 1 of the '102 patent which stipulates "the remaining catalyzing material within the second volume of the body continuously decreases with distance from the first volume". This corresponds to the feature set out in claim 10 of the instant application and is an essential feature of claim 1 of the '102 patent.

[44] Responding to our letter and addressing the proposed claim set, the Applicant argued this point, stating that "claim 1 of the '102 patent specifically includes the limitation that the second volume (corresponding to the first interstitial region in the present application) contains remaining catalyzing material that decreases with distance . . ." and being an essential element thereof it could not give rise to obviousness double patenting since claim 10 was now deleted. The panel agrees with this reasoning as it applies to the issue of double patenting of claim 1 of the instant application in view of claim 1 of the '102 patent.

[45] In view of the Applicant's submission and the need to delete claim 10, we find that there is no double patenting of claim 1 in view of claims 1, 2 and 4-6 of the '102 patent. It follows that there is no double patenting of claim 7 in view of these claims of the '102 patent.

Obviousness

[46] The Examiner considers that claims 1-9, and 11 do not comply with section 28.3 of the *Patent Act*.

Principles of law (obviousness)

[47] Section 28.3 of the *Patent Act* sets out the information against which a claim is assessed in an obviousness inquiry:

> 28.3 The subject-matter defined by a claim in an application for a patent in Canada must be subject-matter that would not have been obvious on the claim date to a person skilled in the art or science to which it pertains, having regard to
>
> (a) information disclosed more than one year before the filing date by the applicant, or by a person who obtained knowledge, directly or indirectly, from the applicant in such a manner that the information became available to the public in Canada or elsewhere; and
>
> (b) information disclosed before the claim date by a person not mentioned in paragraph (a) in such a manner that the information became available to the public in Canada or elsewhere.

[48] A four-step approach for assessing obviousness is set out in *Sanofi*, as follows:

> (1) (a) Identify the notional "person skilled in the art";
> (b) Identify the relevant common general knowledge of that person;
> (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;
> (3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;
> (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

Analysis

Step 1: Notional "person skilled in the art" and the relevant common general knowledge of that person

[49] This first step is common to claim construction above - see "Claim Construction" - paragraphs 9-15.

Step 2: Inventive concept

[50] Based on the record before us, we accept the inventive concept identified in the following passage from the SA, as follows:

> . . . improving the heat resistance (i.e. reducing thermal degradation) of a preform polycrystalline diamond cutting element comprising at least 85% by volume diamond density without loss of impact strength by removing the catalyzing material (substantially free) within a first interstitial region adjacent to the working surface to a depth and maintaining the catalyzing material within a second interstitial region in a portion of the body in contact with the substrate, wherein the second interstitial region has an average thickness greater than 0.15 mm, and the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth.

[51] The inventive concept above is a paraphrase of claim 1 and applies to all of the claims. Any additional distinguishing features in the dependant claims argued by the Applicant will be addressed, as needed.

[52] The Applicant's submission did not address the inventive concept, however, the Applicant emphasized that the text added to the proposed claim 1 (an additional limitation related to catalytic graphitization) was inventive and distinguishing over Shuji *et al.* As noted earlier, the proposed claims will be addressed after the analysis of the claims as they currently stand.

Step 3: Differences between the "state of the art" (Shuji et al.) and the inventive concept

[53] The assessment in the SA concludes that the differences between the inventive concept and the teaching of Shuji *et al.* are:

I. the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth as recited in independent claim 1;

II. the preform cutting element of claim 1 is mounted upon a body of a rolling cutter drill bit as recited in dependent claim 3;

III. the diamond crystals of claim 1 have an average particle size in the range of about 30 microns to about 60 microns as recited in dependent claim 8;

IV. a majority of the catalyzing material remaining in the second interstitial region of the body adheres to the surface of diamond crystals as recited in dependent claim 9.

[54] Our assessment will take into account at least these differences given the absence of a submission on whether or not these differences are complete. However, we also note the following differences over Shuji *et al.* were pointed out by the Applicant in response to the Final Action, albeit under anticipation:

V. Shuji *et al.* do not disclose depletion of the catalyzing material from the part of the element adjacent to the working surface to result in that part of the element being "substantially free" of catalyzing material.

VI. Although Shuji *et al.* make reference to treatment of a surface of the diamond layer to remove some catalyzing material therefrom, Shuji *et al.* teach only of removing a proportion of the catalyzing material and thus, a significant portion of catalyzing material remains in place.

VII. Shuji *et al.* refers to a "majority" or "most" of the catalyst being removed and even though the Examiner identified reference to "nearly all" of the catalyst being removed in the teachings of Shuji *et al.*, it is not accurate considering the whole of the teachings of the Shuji *et al.* reference.

VIII. The technique as taught in Shuji *et al.* to remove the catalyzing material is incapable of removing substantially all of the catalyzing material. The use of an electric discharge machining (EDM) technique as described by Shuji *et al.* would be inappropriate for cutting an element from which substantially all of the catalyzing material has been removed from a part thereof. Therefore, if EDM cutting techniques will not work in cutting elements from which all or nearly all of the catalyst material has been removed, the Shuji *et al.* reference cannot be viewed as being clear, but rather is inconsistent.

[55] The above arguments V to VIII are interrelated in that the Examiner and the Applicant disagree as to whether or not "substantially free of the catalyzing material to a depth" in the inventive concept is different from Shuji *et al.*, which states:

- "a composite sintered diamond layer, from which the binder phase has been removed from the surface layer."
- "The majority of the ferrous metal binder is removed from an area that is at least 0.2 mm of the surface layer of the sintered diamond layer."
- "Embodiment 1 . . . nearly all of the metal Co binder phase in an area 0.5 mm away from the surface of the sintered diamond object had been removed."
- "Embodiment 2 . . . a sintered object from which most of the metal Co binder phase had been removed."

[56] The skilled person reading Shuji *et al.* and understanding the plain meaning of these words would conclude that the underlined phrases require that substantially all of the catalyzing material is removed. The fact that the catalyzing material in Shuji *et al.* must be removed from the surface portion is the solution directed at the problem being solved in Shuji *et al.*, namely improved performance of diamond based machine tools with sufficient wear resistance while controlling or preventing thermal expansion and conversion of diamond into graphite.

[57] Further, as we noted under claim construction, a purposive construction of "substantially free" in claim 1 would be that it is "free of most but not all" catalyzing material. This accords with the description on page 20 stating that there may still be "a coating of the catalyzing material" and "there may still be catalyzing material present in the adjacent interstices".

[58] Therefore, we disagree with the Applicant's position on "substantially free" in V to VIII above because the skilled person would understand that "substantially" in claim 1 has no material distinction over "removed", "majority" and "most" as disclosed in Shuji *et al.*

[59] The argument in VIII as to the electric discharge machining (EDM) technique used by Shuji *et al.* was presented to explain that removing substantially all of the catalyzing material would be inconsistent with using the EDM technique for cutting the elements described by Shuji *et al.* The Applicant further submitted the expert testimony of Mr. Hall, which on page 17 explains that the sintered diamond devices in Shuji *et al.* that were subjected to the electrolytic leaching process could not be substantially free of the catalyzing material because EDM requires a conductive path and that this was well known at the time.

[60] On pages 9a-10 and 18 of the instant application, it is explained that one method of depleting the catalyzing material is to leach it from the interstices, and a method of removing the catalyzing material from the surface may also be by electrical discharge or

other electrical or galvanic process, or by evaporation. As we noted earlier, these techniques would have been well known to the skilled person before the claim date, and no particular technique is highlighted in the instant application for assuring that the region is "free of most but not all" catalyzing material - see "Claim Construction".

[61] At the hearing, the Applicant stated that the EDM explanation by the expert in the response would stand as is without any further explanation.

[62] While the use of EDM by Shuji *et al.* may be a distinction because the instant application is silent on the cutting technique used, we find that there is no difference with respect to "substantially free" as claimed, and such a distinction would not be apparent to the skilled person. The skilled person reading the instant application on the claim date would apply his CGK to ensure sufficient catalyzing material is depleted for it to achieve the claimed solution (sufficient wear resistance while controlling thermal expansion and conversion of diamond into graphite). The skilled person would use appropriate well known cutting techniques, as needed. Also, the skilled person reading Shuji *et al.* would understand the teaching to remove most but not all (i.e. "substantially" all) of the catalyzing material.

[63] In light of the analysis above, we do not consider the Applicant's points V to VIII set out in paragraph 54 to be differences. We conclude that I to IV as identified at paragraph 53 represent the differences between the inventive concept and the state of the art as understood by the skilled person reading Shuji *et al.*

Step 4 - Claim 1: Would the difference "constitute steps which would have been obvious to the person skilled in the art" (Difference I above)?

[64] The difference over the state of the art for claim 1 is that the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth as recited in independent claim 1 (Difference I).

Examiner's contention as to obviousness

[65] The Supplemental Analysis relates that Shuji *et al.* recognized the degradation problems associated with bonded diamond crystals at 750°C, and expressly disclose that the preform cutting elements disclosed therein are designed to overcome this problem. The SA further argues that Shuji *et al.* disclose exactly the same problem as the instant application, specifically to improve the heat resistance of a cutting element without sacrificing its strength, and solve the problem in exactly the same way.

Applicant's view as to why the difference is not obvious

[66] The Applicant's submission did not directly address the Examiner's arguments about solving the same problem in exactly the same way, however the proposed claims and arguments expand upon this difference.

Is there inventive step in Difference I, in view of Shuji et al.?

[67] Our letter to the Applicant asked if the skilled person would understand that the depth in claim 1 could be less than 0.2 mm, given a temperature gradient of 1000°C per mm (i.e. the depth needed for a 200°C drop in temperature from the working surface). The Applicant responded that there is interplay between depth, diamond density, and removal of catalyzing material which the skilled person would select. This is the CGK of the skilled team we identified under claim construction (and noted in step 1) above.

[68] Per embodiment 1 described in Shuji *et al.*, nearly all of the metal binder phase in an area 0.5 mm away from the surface of the sintered diamond object is removed electrolytically. The embodiment described has an overall structure that is a sintered composite made by joining a sintered diamond object that was 1 mm thick with a base material that was 2.5

mm thick. Thus, removal of metal binder in a region of 0.5 mm from the surface leaves the remaining 0.5 mm in the sintered diamond with the metal binder intact.

[69] We noted earlier that Shuji *et al.* recognize the problem of inferior tool performance due to different thermal expansion coefficients which can cause thermal stress at around 750°C, and that a diamond's surface turns to graphite at temperatures of 900°C and higher. Since Shuji *et al.* explain that the thermal resistance of their tool is such that the thermal conductivity does not decline, which is effective in dispersing the heat that is generated at the tip of the tool, the skilled person reading Shuji *et al.* would understand that it teaches the removal of catalytic material in a region extending to 0.5 mm from the surface, in order to achieve a temperature of 750°C at that depth.

[70] Therefore, the skilled person applying his CGK and reading Shuji *et al.* would see no inventive step in providing a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at a depth.

[71] We have reviewed the specification of the instant application and there does not appear to be any particular technical basis disclosed to achieve this, other than what the skilled person reading Shuji *et al.* would already know before the claim date.

[72] Shuji *et al.* also state that ferrous metals have the effect of promoting the conversion of diamond into graphite, which will be discussed in relation to the proposed changes to claim 1.

Step 4 - Claims 3, 8 and 9: Would the difference "constitute steps which would have been obvious to the person skilled in the art" - Differences II (claim 3), III (claim 8), and IV (claim 9)?

[73] The additional features in claims 3, 8 and 9 would be within the common general knowledge of the person skilled in the art, namely: the preform cutting element of claim 1

is mounted upon a body of a rolling cutter drill bit (claim 3); the diamond crystals of claim 1 have an average particle size in the range of about 30 microns to about 60 microns (claim 8); and a majority of the catalyzing material remaining in the second interstitial region of the body adheres to the surface of diamond crystals (claim 9).

[74] The Applicant did not argue any particular inventive aspects of these claims. Considering these facts, claims 1-9, and 11 do not comply with section 28.3 of the *Patent Act*, in view of Shuji *et al.*

Proposed changes to claim 1

[75] The proposed claim 1 submitted by the Applicant in response to the Supplemental Analysis will now be considered. We must assess whether or not the changes made would render claim 1 unobvious. Claim 1 proposed by the Applicant in response to our letter reads as follows [emphasis added to show the proposed change]:

> 1. A preform polycrystalline diamond cutting element comprising:
>
> a body of superhard polycrystalline material comprising a plurality of bonded diamond crystals integrally formed with a metallic substrate, a plurality of interstitial regions among the diamond crystals and a catalyzing material;
>
> the body having at least a 85% by volume diamond density and a working surface wherein a first interstitial region adjacent to at least a portion of the working surface is substantially free of the catalyzing material to a depth and a second interstitial region in a portion of the body in contact with the substrate contains the catalyzing material;
>
> wherein the first interstitial region extends beneath the working surface and the second interstitial region has an average

thickness greater than 0.15 mm, and the bonded diamond crystals exhibit a thermal characteristic such that a 950°C temperature at the working surface results in a temperature of less than 750°C at the depth and catalytic graphitization of the crystals in the first interstitial region as result of the catalyzing ability of the catalyzing material does not occur as the temperature exceeds 750°C.

[76] According to the Applicant, the additional feature regarding catalytic graphitization has support from page 19 of the description and addresses a mode of thermal degradation other than differential thermal expansion, namely graphitization. The Applicant considers this is inventive over Shuji *et al.* because

a. it imposes an additional constraint on the amount of material between the crystals that are removed, namely what is meant by "substantially free" in claim 1;

b. the improved thermal degradation resulting from the lack of catalytic graphitization allows a very high temperature gradient in the first interstitial region and permits the second region (main body) to remain at a temperature at which this mode of thermal degradation does not occur.

c. it would permit an extremely high temperature gradient through the material, possibly 1000°C per mm or higher and would enable the working surface to reach 950°C, and not cause significant thermal degradation since the surfaces of the diamond crystals adjacent to the working surface of the diamond crystals are substantially free of the catalyzing material to a depth of just 0.2 mm from the source of heat.

[77] The Applicant's submission is that support for this limitation is found in the instant application which explains that "even a coating of a few microns of the catalyzing material on the surfaces of the diamond crystals can enable this mode of thermal degradation" (page 19, lines 11-13). Thus, in the Applicant's view, this limitation imposes an additional constraint on the amount of material between the crystals that is removed, namely what is meant by "substantially free".

[78] It is notable that claim 1 does not stipulate a 0.2 mm depth limitation as argued by the Applicant in the submission. As we discussed earlier, the skilled person would not view Shuji *et al.* as removing less than "substantially all of the catalytic material". Nevertheless, proposed claim 1 construed as a whole does stipulate that "a portion of the working surface is substantially free of the catalyzing material to a depth" and, as well, "catalytic graphitization of the crystals in the first interstitial region as a result of the catalyzing ability of the catalyzing material does not occur as the temperature exceeds 750°C". Shuji *et al.* do not claim or explicitly state that in their cutting tool that there is no catalytic graphitization as the temperature exceeds 750°C. Thus, this is a difference over Shuji *et al.*

[79] In our understanding, having no catalytic graphitization of the crystals in the first interstitial region would be desired by the skilled person facing the known problem in *Shuji et al.* that "ferrous metals have the effect of promoting the conversion of diamond into graphite". That problem is also noted as being CGK (e) above. As noted by the Applicant, this imposes an additional constraint on the amount of material between the crystals that is removed.

[80] However, a constraint on removal of material is that as more material is removed, it degrades the strength or hardness of the PCD element or tool, noted in CGK (f) above as well as in *Shuji et al.* As noted by the Applicant, and per CGK (c) and (d) above, the various parameters (the depth, removal of catalyzing material, volume density) need to be selected by the person skilled in the art to achieve the desired performance. The desired performance is a tradeoff between avoiding thermal degradation and catalytic graphitization on the one hand and having acceptable tool hardness on the other hand.

[81] We consider that this tradeoff in design would have been well known to the skilled person when reading Shuji *et al.*, and therefore achieving no catalytic graphitization of the crystals in the first interstitial region would have been a design option available to the skilled

person, using a suitable choice of parameters. Indeed, the benefits of preventing the back conversion of diamond to graphite on the performance limit of insufficient heat resistance is specifically recognized by Shuji *et al.* Further, if significant graphitization were occurring in the Shuji *et al.* tool, there would be a negative effect on the tool, and this problem is noted in Shuji *et al.* Thus, the skilled person would understand that for the Shuji et al. invention to work, removal of catalytic material would eliminate or minimize catalytic graphitization.

[82] At the hearing, the Applicant argued that the following statement in Shuji *et al.* only recognizes the problem of differential expansion: "During heating, the amount of thermal stress in the sintered object increases and the structure breaks down. Additionally, ferrous metals have the effect of promoting the conversion of diamond into graphite." The emphasized portion, the Applicant stated, does not relate the problem of graphitization to the additional (second) mode of thermal degradation which only the Applicant recognizes, and it does not recognize the criticality of the few microns of material on the surface of the diamond remaining which cause degradation as the temperature exceeds 750°C.

[83] The Applicant clarified this difference further and proposed that additional amendments consistent with this difference could be made. The Applicant noted the desirability of achieving a very high temperature gradient and that substantially free refers both to the surfaces of the diamond crystals and the interstices. The Applicant pointed to page 21, which states:

> In these tests, care was taken to assure the depletion process removed the catalyzing material 64 from both the interstices 62 and from the surfaces of the diamond crystals 60.

[84] Although Shuji *et al.* do not explicitly state that the removal of material occurs from both the interstices and surfaces of the diamond crystals, the skilled person applying the well known or conventional techniques for removal of the material in the 0.5 mm region, would

know that this result inevitably occurs. The skilled person applying the acid etching process, for example, would understand these limitations to be lacking any degree of invention. Pages 9a-10 of the instant application discuss methods of removing the catalyzing material and there is no particular or unique method explained which would ensure that the material is specifically removed from both the interstices and the surfaces of the diamond crystals.

[85] Our conclusion is supported by the description of U.S. Patent 4,224,380, which is cited on page 4 of the instant application under "Background of the Invention". This patent relates to a thermally stable PCD element from which the cobalt or other binder-catalyzing material in conventional polycrystalline diamond is leached out from the continuous interstitial matrix after formation". Acid leaching is used for penetrating the diamond layer and removes the metallic cobalt phase substantially uniformly throughout (See Examples 1-4). As demonstrated using cobalt sintered diamond compacts, removal of up to 99% by weight of the cobalt phase could be achieved using this technique. The resulting diamond compact was able to withstand exposure to temperatures up to 1200°C to 1300°C without substantial thermal degradation. The improved thermal resistance achieved makes it clear that the amount of residual metallic cobalt phase remaining was not sufficient to catalyze thermal back conversion or cause differential thermal expansion.

[86] As we noted earlier, Shuji *et al.* not only recognize that ferrous metals have the effect of promoting the conversion of diamond to graphite, but also expressly state that dissolving the ferrous metal binders out from the diamond "is said to allow the sintered diamond to withstand temperatures of up to 1200°C." In our opinion, the results achieved in Shuji *et al.* and U.S. Patent 4,224,380 would be impossible to achieve if the diamond surfaces were not "substantially free" of catalyst material.

[87] Therefore, the skilled person reading Shuji *et al.* would understand that removal of material in an area 0.5 mm away from the surface of the sintered diamond would include both the

interstices and the surfaces of the diamond crystals. While this clarifies the feature of no catalytic graphitization of the crystals as the temperature exceeds 750°C proposed by the Applicant, the skilled person reading Shuji *et al.* would understand these limitations to be lacking any degree of invention as explained in paragraphs 84-86 above. Therefore, the proposed changes to claim 1 would not render it compliant under section 28.3 of the *Patent Act*.

[88] The proposed replacement claims 1-10 are not accepted, and instant claims 1-9 and 11 do not comply with section 28.3 of the *Patent Act* in view of Shuji *et al.*

Compliance under subsection 27(3) of the *Patent Act*

[89] The Examiner considers that the description does not correctly and fully describe the invention and does not comply with subsection 27(3) of the *Patent Act*. The SOR notes that statements such as those found at page 29, lines 24-26 indicating that the claims are to be viewed as broader than the teachings of the description do not correctly describe the invention and should be removed.

[90] The SOR notes that this new defect arises due to a recent change in Office practice.

Office practice

[91] On 13 May 2011, the Office released PN2011-02, "Practice Regarding Certain Description Informalities". On page 2 of that notice, it is stated:

> As noted by the Supreme Court in *Free World Trust v. Électro Santé Inc.* (2000 SCC 66), the language of the claims [...] defines the monopoly, and there is no recourse to such vague notions as the "spirit of the invention" to expand it further.

> Statements in the description that suggest that the scope of the claims may go beyond what has been described imply that the description does not fully describe what the applicant has defined in the claims. Consequently, such statements suggest that the description does not comply with subsection 27(3) of the *Patent Act*.

Analysis

[92] Page 29, lines 24-26 states:

> Whereas the present invention has been described in particular relation to the drawings attached hereto, it should be understood that other and further modifications apart from those shown or suggested herein, may be made within the scope and spirit of the present invention.

[93] We find that the suggestion that the invention may include things not "shown or suggested" by the description but fitting within "the scope and spirit of the present invention" implies that the scope of the claims may go beyond what has been described and implies that the description does not fully describe what the applicant intends its claims to cover. Therefore, the description does not correctly and fully describe the invention as required under subsection 27(3) of the *Patent Act*.

Anticipation

[94] The examiner states that claims 1-2, 4-7, 9, and 11 do not comply with paragraph 28.2(1)(*b*) of the *Patent Act*, based on Shuji *et al.* In view of our findings as to obviousness, there are no patentable claims remaining on file in the application as it currently stands and therefore we will not address the issue of anticipation for these claims.

[95] As to the proposed claims, they do not overcome the obviousness defect and thus are not considered for the assessment of anticipation by Shuji *et al.*

Recommendation of the Board

[96] In view of the above findings, the Board recommends that the application be refused on the following grounds: claims 1-9 and 11 are not compliant with subsection 28.3 of the *Patent Act*, claim 10 is inconsistent with claim 1 and is not compliant with subsection 27(4) of the *Patent Act,* and the description does not correctly and fully describe the invention as required under subsection 27(3) of the *Patent Act*.

[97] The proposed changes to claim 1 would not render it compliant under section 28.3 of the *Patent Act*. As a result, there are no proposed amendments remaining that would make the application compliant with the *Patent Act* and *Rules*.

Paul Sabharwal	Andrew Strong	Christine Teixeira
Member	Member	Member

Decision of the Commissioner

[98] I concur with the Patent Appeal Board's finding that the application does not comply with section 28.3 and its recommendation that the application be refused in accordance with section 40 of the *Patent Act*.

[99] Accordingly, I refuse to grant a patent on this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Sylvain Laporte
Commissioner of Patents

Dated at Gatineau, Quebec,
this 31st day of March, 2014