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# Datasheet for the decision of 30 January 2018

**Case Number:** T 0253/14 - 3.2.03

**Application Number:** 00126315.1

**Publication Number:** 1122226

**IPC:** C23C30/00, C04B41/52

**Language of the proceedings:** EN

**Title of invention:**
COATED PCBN CUTTING TOOLS

**Patent Proprietor:**
Sumitomo Electric Industries, Ltd.

**Opponent:**
OC Oerlikon Balzers AG

**Headword:**

**Relevant legal provisions:**
EPC Art. 54, 56, 83, 84, 123(2)

**Keyword:**
Novelty - main request (yes)
Inventive step - reasonable expectation of success (yes) - main request (no) - auxiliary request (yes)
Sufficiency of disclosure - (yes)
Amendments - extension beyond the content of the application as filed (no)

**Decisions cited:**
T 1054/05

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**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 0253/14 - 3.2.03**

# D E C I S I O N
## of Technical Board of Appeal 3.2.03
## of 30 January 2018

| | |
|---|---|
| **Appellant:** (Opponent) | OC Oerlikon Balzers AG<br>SRLP<br>P.O. Box 1000<br>9496 Balzers (LI) |
| **Representative:** | Troesch Scheidegger Werner AG<br>Schwäntenmos 14<br>8126 Zumikon (CH) |
| **Respondent:** (Patent Proprietor) | Sumitomo Electric Industries, Ltd.<br>5-33, Kitahama 4-chome<br>Chuo-ku<br>Osaka-shi,<br>Osaka 541-0041 (JP) |
| **Representative:** | Grünecker Patent- und Rechtsanwälte<br>PartG mbB<br>Leopoldstraße 4<br>80802 München (DE) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 25 October 2013 concerning maintenance of the European Patent No. 1122226 in amended form.** |

**Composition of the Board:**

**Chairman** G. Ashley
**Members:** C. Donnelly
E. Kossonakou

## Summary of Facts and Submissions

I. The appeal lies from the interlocutory decision of the opposition division maintaining European Patent No. 1 122 226 in amended form.

In its decision the opposition division held that the patent met the requirements of the convention, but allowed an obvious error in Table 2 to be corrected. The correction was not challenged by the opponent. Therefore, in effect, the opposition was rejected, since the claims as granted were maintained.

II. The opponent (hereinafter: the "appellant") filed an appeal against this decision.

III. The appellant relied on the following documents and evidence in the grounds of appeal to support its case:

D1: US 5 776 588
D1A: US 5 597 272
D3: EP 0 709 353
D4: US 5 961 729
D5: EP 0 798 399 B1
D5A: EP 0 798 399 A1
D6: L.J. Smith et al., "Dry cutting performance of HSS twist drills coated with improved TiAIN", Surface Coatings and Technology 90 (1997), 164- 171
D8: WO 98/28464
D13: EP 0 874 063
D17: "Experimental relationships between surface roughness, glossiness and color of chromatic colored metals"; Materials transactions, Vol. 45; No. 4 (2004), 1027- 1032.

Wl: http://cn.wikipedia.org/wiki/Gloss (optics) „Gloss(optics)", (Not in the opposition proceedings)
W2: https://sg.misumi-ec.com/pdf/tech/prcss/prl 167 1168.pdf. "Definition Ra" (Not in the opposition proceedings)
W3: http://www.advancedaquarist.eom/2Q03/3/aafeature. „Feature Article: Analysing Reflectors"
W4: http://earth.co.csa.int/polsarpro/Manuals/2 Rough Surface Scattering Models.pdf. .Rough surface scattering models"
W5: http://www.thefreedictionary.com/shiny. "shiny"
W6: http://dictionary.reference.com/browse/shiny
W7: http://www.merriam-webster.com/dictionary/shiny
W8: http://www.oxforddictionaries.com/definition/english/shiny
W9: http://dictionary.cambridge.org/dictionary/british/shiny
W10: http://www.vocabulary.com/dictionary/shiny
Wl1: US 2011/0207283 A1

The appellant also included the following:

V: Test report, dated 15 September 2013; Dr. C. Pinero
G: Ra v Duration

By letter of 1 October 2014, the appellant submitted:

X1: DE693 06 089;

By letter of 20 February 2015, the appellant also submitted:

X1SE: SE Patent 501 527
X1SEü: English translation of X1SE

Finally, during the oral proceedings before the board, the appellant handed over a graph plotting "Duration of surface" against "hard coated layer surface roughness Ra" based on the values given in the patent.

IV. The patent proprietor (hereinafter: the "respondent") submitted counter-arguments and auxiliary requests 1 to 4 dated 8 July 2014 with the response to the statement of the grounds of appeal. Further submissions were made in letters of 9 June 2015 and 13 November 2015.

V. In a communication dated 2 November 2017, pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA), annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion.

VI. The respondent commented on the board's preliminary opinion in its letter of 27 December 2017 and submitted further documents:

Annex 1: Information concerning the influence of substrate roughness on the constitution and quality of the hard coated layer of a CBN tool;
Annex 2: Various test results of blasting experiments and the relationship between substrate strength and film strength.

VII. Oral proceedings were held as scheduled on 30 January 2018. At the end of the debate the parties confirmed the following requests:

The respondent requested that the decision under appeal be set aside and the European patent No. 1122226 be revoked.

The patent proprietor requested that the appeal be dismissed or that the patent be maintained in amended form on the basis of one of the auxiliary requests 1 to 4 filed with letter of 9 June 2014.

VIII. Claim 1 as granted (main request) reads as follows:

"A coated PCBN cutting tool, comprising a substrate (21) and hard coated layer on said substrate
(a) said substrate containing not less than 35 volume % and not more than 85 volume% of CBN;
(b) said hard coated layer comprising at least one compound layer consisting of at least one element selected from group 4a, 5a, 6a elements of the periodic table and Al and at least one element selected from C, N and O;
(c) thickness of said hard coated layer being not less than 0.3μm and not more than 10μm;
(d) center-line mean roughness Ra of the hard coated layer being not more than 0.2μm."

Claim 1 of auxiliary request is identical to claim 1 of the main request except that feature (d) has been amended to read:

"(d) center-line mean roughness Ra of the hard coated layer being not more than 0.1μm."

Claim 1 of auxiliary request 2 is identical to the main request with the exception that it comprises the further feature reading:

"wherein said substrate (21) is polished to control the surface roughness of said hard coated layer."

Claim 1 of auxiliary request 3 reads:

"A method of manufacturing a coated PCBN cutting tool, comprising a substrate (21) and a hard coated layer on said substrate
providing said substrate containing not less than 35 volume % and not more than 85 volume% of CBN;
polishing said substrate (21) to control the surface roughness of said hard coated layer;
depositing said hard coated layer comprising at least one compound layer consisting of at least one element selected from group 4a, 5a, 6a elements of the periodic table and Al and at least one element selected from C, N and O;
wherein a thickness of said hard coated layer being not less than 0.3µm and not more than 10µm;
and a center-line mean roughness Ra of the hard coated layer being not more than 0.2µm."

IX. The arguments of the appellant relevant to the decision can be summarised as follows:

*(a) Admissibility of X1SE and X1, Test report "V"*

X1SE is referred to in D8, therefore it forms part of the disclosure of D8 and should be admitted into the proceedings. Since X1 is the German version of EP 0 603 144 which claims priority from application no. SE 9203852 which led to Swedish patent Nr. 501 527 (X1SE), then X1 is also part of the disclosure of D8 and should also be admitted into the proceedings.

Test report "V" was submitted in response to the decision under appeal.

*(b) Main request, Novelty*

D8 implicitly discloses feature (d) since it states that the coated inserts can be treated by brushing or blasting so that they become "smooth and shiny" (see page 7, line 5 onwards). Since the word "shiny" must be given a meaning relevant to the particular technical field, it would be implicit to the skilled person that, in order to be "shiny", light must be reflected in a special manner which would only occur if the surface roughness meets the specification of claim 1 and as shown by the calculations based on reflecting visible light with a wavelength of 0,38 to 0.78 µm (also see W1).

Further, since X1 must be seen as part of the disclosure of D8 and the parameter table at page 4 of X1 indicates that the surface roughness of the $Al_2O_3$ layer is 0.2µm, D8 discloses feature (d) of claim 1 as granted.

Thus, claim 1 as granted is not new with respect to D8.

*(c) Main request, Inventive step*

The subject-matter of claim 1 does not involve an inventive step in view of:

(i) D8 alone or in combination with the skilled person's general knowledge.

(ii) D8 in combination with D1

(iii) D8 in combination with D5

(iv) D8 in combination with D6

(v) D1 in combination with D8

(vi) D1 in combination with D3.

D8 suggests a surface treatment by "blasting using 160 mesh alumina grit and a blasting pressure of 2.2bar" (see example 3). The skilled person would see that this produces a surface roughness of less than 0.2µm as shown by the test results given in document V.

Feature (d) is also suggested by documents D1, D5 and D6 since they all report that smoother tool surfaces improve performance and disclose Ra values of less than 0.2 µm

*(d) Auxiliary request 1, Inventive step*

Merely specifying a lower center-line mean roughness Ra of the hard coated layer of not more than 0.1µm does not involve an inventive step since it is just a further step in the same direction as specifying a value of 0.2µm. The technical effects of such a measure are known and unsurprising.

*(e) Admissibility of auxiliary requests 2 to 4*

These requests should not be taken into consideration since they were not filed during the opposition proceedings and are based on subject-matter taken from the description which necessitates further searches to be carried out.

*(f) Auxiliary request 2, Lack of clarity, Article 84 EPC*

The subject-matter of claim 1 is unclear since the feature:

"wherein said substrate is polished to control the surface roughness of said hard coated layer."

does not characterise the final product. No techniques are available which allow the substrate surface to be examined without damaging it. Therefore, it is impossible to distinguish between products with polished and unpolished substrates.

*(g) Auxiliary request 3*

*(i) Article 83 EPC*

The skilled person would not know how to control the surface roughness of said hard coated layer by polishing the substrate alone since it is also dependent upon the type of method used to apply the hard-coated layer up to the maximum claimed thickness of 10 µm.

Paragraph [0024] of the patent states that "The hard coated layer can be prepared by the physical vapor deposition (PVD) technique such as sputtering and ion plating and chemical vapor deposition (CVD) technique such as plasma-CVD. Arc ion-plating is especially preferable to form the smooth hard coated layer."

Paragraph [0032] with reference to figure 2, states that "the inserts were coated with a hard coated layer by vaporizing and ionizing the metal targets 2 and 3

using vacuum-arc discharge". However, the only process parameters given are the pressure and bias voltages. The skilled person would immediately recognise that, with such a set-up, there is localised melting of the target material. The consequent spattering inevitably leads to a rough surface. Annex "V" also shows that the roughness of hard coated layers deposited by Arc-ion plating is not determined by the roughness of the substrate.

*(ii) Article 84 EPC*

It is also not clear whether further surface treatments are necessary in order to obtain the desired surface roughness.

*(iii) Article 123(2) EPC*

The subject-matter of claim 1 is an unallowable generalisation since it does not specify the same parameters as disclosed in Example 1 to which paragraph [0034] refers.

Further, a process in which the surface roughness of the substrate influences that of the hard-coated layer which then undergoes a further post-coating treatment is not disclosed.

X. The arguments of the respondent relevant to the decision can be summarised as follows:

*(a) Admissibility of X1SE and X1, Test report V*

Since X1SE is mentioned in D8, it could be accepted that this document is referred to regarding a process for applying the $Al_2O_3$ layer. However, its further

content is not so relevant since it relates to a tool with a cemented carbide substrate rather than one from PCBN. However, X1 should not be admitted since its subject-matter is not directly analogous with that of X1SE and is anyway not relevant since it concerns a body or substrate of sintered carbide.

Furthermore, the test report V should not be admitted into the proceedings since it is a late submission and all the circumstances of the testing have not been made clear.

*(b) Main request, Novelty*

D8 does not implicitly disclose feature (d) since it is not possible to imply any specific numerical value from the word "shiny" alone. The appellant's calculations are based on a purely theoretical ideal surface.

Since the content of X1 is not part of D8, the reference to the table at page 4 of X1 is irrelevant.

Thus, claim 1 as granted is new with respect to D8.

*(c) Main request, Inventive step.*

*Combination invention*

The inventive step underlying the subject-matter of claim 1 is to be seen in the combination of the claimed features. Thus, the achievement of good cutting results depends not only on the surface roughness of the hard coated layer, but also on the other features of the claim. From the comparative examples given in Table 1 of the patent, the influence of the thickness of the

hard coated layer and the CBN content in the substrate can be seen.

In view of this the combination of D8 with one of the documents D1, D5 or D6, is not suitable in an inventive step assessment, since none of these documents discloses a tool based on a CBN substrate.

*Presence of cooling cracks in D8*

Example 3 of D8 was prepared in the same manner as Example 1 except that the tool was subjected to post-coating mechanical treatment (page 9, lines 32 to 34). However, the tool of example 1 is reported as showing a network of cooling cracks (see page 9, line 12). This is caused by the difference in the coefficients of thermal expansion between the $Al_2O_3$ layer and CBN substrate amplified by the use of chemical vapor deposition (CVD) which requires higher temperatures compared with the physical deposition (PVD). It is not possible to eliminate such cracks using the blasting parameters applied in example 3 (also see Annex 2). Therefore, feature (d) cannot be realised starting out from the examples given in D8.

*Test report "V"*

The results given in test report "V" are of no relevance since the exact test conditions are not provided and nor are they given in D8.

*(d) Auxiliary request 1*

The specification of an Ra value of less than 0.1µm leads to a tool with even better performance properties.

*(e) Admissibility of auxiliary requests 2 to 4*

These requests should be taken into consideration since, in view of the fact that the opposition was effectively rejected, they were filed at the earliest opportunity with the reply to the grounds of appeal.

*(f) Auxiliary request 2, Article 84 EPC*

It is possible to see whether the substrate has been polished by using testing techniques, such as selective etching, which would leave the substrate surface intact. The requirements of Article 84 EPC are therefore met.

*(g) Auxiliary request 3*

*Article 83 EPC*

The skilled person is well aware of how to carry out the step of polishing the substrate since this uses standard techniques.

*Article 123(2) EPC*

The step of polishing the substrate to control the surface roughness of the hard coated layer is disclosed in paragraph [0022] of the patent specification (corresponding to paragraph [0025] of the published application) and is not exclusively related to one of the examples.

*Article 84 EPC*

Since a method is now claimed, the objection made against auxiliary request 2 is no longer valid. Further surface treatments are possible as disclosed in paragraph [0025].

*Inventive step, Article 56 EPC*

The effect of polishing a CBN substrate is shown in Annex 1. Conventionally the tool substrates were not polished so as to maintain adherence with the hard coating.

## Reasons for the Decision

1. *Admissibility of late filed documents and evidence. (Articles 12(4), 13 RPBA)*

1.1 X1SE is directly referred to in D8 which was considered by the opposition division to be the nearest prior art, therefore the board is prepared to accept it into the proceedings. X1 on the other hand is not admitted. Merely because the two documents claim the same priority does not necessarily mean that both provide the same disclosure. This is borne out not only by the fact that the Ra value of 0.2µm is additionally given in X1, but also because the layers specified in the tool of Example 1 of D8 are not the same as the layers defined in Example 1 of X1. Furthermore, as the respondent has pointed out, X1 is no more relevant than other documents already in the proceedings since it concerns a body or substrate of sintered carbide.

1.2 The test report "V" was filed with the grounds of appeal in response to the opposition division's remark in the decision under appeal that the opponent carries the burden of proof to show that a roughness Ra lower than 0.2 µm can be achieved by the blasting process disclosed in D8 (see example 3). Therefore, this evidence, despite its shortcomings, is admitted into the proceedings.

1.3 Annex 1 and Annex 2 were submitted with the respondent's letter of 27 December 2017 in response to the Board's preliminary opinion. They provide similar data to that of test report "V" and useful technical clarifications. In view of this they will also be taken into consideration.

1.4 Although in the written proceedings the respondent challenged the admissibility of W1 to W10, it did not pursue this objection in the oral proceedings since it became clear these documents were primarily intended to lend support to the appellant's assertions concerning the skilled person's general knowledge of optics and the meaning of the word "shiny".

*2. Main request, novelty*

2.1 The parties agree that D8 explicitly discloses all the features of claim 1 except for feature (d), according to which the center-line mean roughness Ra of the hard coated layer is not more than 0.2 µm. The board also shares this opinion.

2.2 However, it is not considered that the passage at page 7, line 5 onwards, stating that the coated inserts can be treated by brushing or blasting so that they become

"more smooth and shiny", would inevitably lead the skilled person to conclude that the Ra value of the hard coated layer must be less than 0.2 µm.

2.3 The word "shiny" is a subjective adjective which in this case is used in a relative sense in the phrase "which make the inserts not only more smooth and shiny". Therefore, in this context the word "shiny" itself does not have any exact meaning from which a numerical value can be directly and unambiguously derived, but is just used in the sense that the mechanical treatments suggested would result in a surface which is comparatively more smooth and shiny than before it was treated.

2.4 In conclusion, the board does not consider it feasible to derive directly and unambiguously a specific numerical value of a surface's roughness starting out from an ambiguous description of the surface's appearance and for which no initial numerical surface roughness value is given.

2.5 Since X1 is not considered to be part of the disclosure of D8 the arguments based on the parameter table at page 4 of X1 cannot be used to attack the novelty of the subject-matter of claim 1.

Thus, the subject-matter of claim 1 as granted is novel.

*3. Main request, Inventive step*

*3.1 Closest prior art*

D8, which relates to a CBN cutting tool, is considered to be the closest prior art since D1 discloses a cutting tool based on a hard alloy rather than CBN.

3.1.1 As discussed in relation to novelty, the subject-matter of claim 1 only differs from the disclosure of D8 by feature (d). The objective technical problem to be solved can be seen in general terms as one of trying to improve tool performance.

3.1.2 D8 suggests that the "so coated inserts may be mechanically treated in order to further improve tool performance" and to make them "more smooth and shiny" (see page 7, lines 5 to 13). The patent itself also acknowledges that it is generally known that tool performance is improved by reducing the surface roughness (see paragraph [0006]).

*3.2 Test report "V" and Annex 2*

3.2.1 D8 mentions that blasting is a suitable post-treatment for the surface (see page 7, lines 5 to 8) an example of which is given in Example 3. However, as the respondent has pointed out, all the blasting conditions, such as the blasting distance, are not specified in D8. Since such parameters may affect the Ra values obtained and it is not possible to be certain that the blasting conditions used to post-treat example 3 in D8 were the same as those used in the "V" report, no firm conclusions can be drawn with respect to the values of Ra that example 3 of D8 might exhibit.

However, the results of this testing support the appellant's assertion that roughness values in the order of 0.2 µm can be obtained by a post-treatment with blasting whereas the results presented by the respondent in Annex 2 show this not to be the case because of the presence of cooling cracks.

*3.3 Presence of cooling cracks in D8*

3.3.1 The respondent submits that the tool of example 1 of D8 exhibits a network of cooling cracks (see page 9, line 12) which is caused by the difference in the coefficients of thermal expansion between the $Al_2O_3$ and CBN substrate layers. This problem is amplified by the use of chemical vapor deposition (CVD) which requires higher temperatures than physical vapour deposition (PVD). Consequently, since it is not possible to eliminate such cracks using the blasting parameters applied in example 3 of D8, feature (d) cannot be realised starting out from the examples given in D8.

3.3.2 However, as the appellant points out, cooling cracks are barely discussed in D8 and are not attributed any importance. Furthermore, $Al_2O_3$ is specifically mentioned as an example material for the hard coated layer at page 3, line 35 of the patent and is covered by claim 1. The patent also specifies (see paragraph [0024]) that both CVD and PVD techniques can be used to form the hard coated layer. If cooling cracks were a problem, then the skilled person would see it as obvious to use a PVD, as opposed to a CVD process, to deposit the hard coating in D8 in the same way that the respondent suggested the skilled person would do when depositing the $Al_2O_3$ layer in the patent should the cooling crack problem manifest itself.

3.3.3 In view of this the board sees no reason to change its provisional opinion that a value of 0.2µm for centre-line mean roughness is typical of the surface finish attainable by standard application of industrial processes such as grinding, honing, polishing and lapping. Thus, in an overall industrial context the requirement that the surface has a roughness of less than 0.2µm is not a particularly demanding specification.

*3.4 D8 alone, or in combination with D1, D5 or D6*

3.4.1 The influence of surface roughness on tool performance of various types is also discussed in other documents. D1 emphasises the influence of surface irregularities as represented by surface roughness on tool life (see column 3, lines 52 to 60, column 5, lines 23 to 30), and concludes that smoother surfaces (i.e. lower Ra values -see table 13) correlate with extended tool life. D1 specifically claims an upper limit for Ra of 0.05µm (see claim 6). D5 also confirms that surface roughness plays an important role in tool life (see paragraphs [0026] and [0037]. D6 also concludes that "The surface roughness of the coatings clearly influences the cutting performance of the coated drills." (see 4. Conclusions, point 1). No reasons have been given as to why the skilled person should doubt that this holds true for tools based on a CBN substrate.

3.4.2 The respondent argues that the features of claim 1 must be seen in combination and that the surface roughness value Ra cannot be considered in isolation. Accordingly, since documents D1, D5 and D6 all concern different types of tools with different substrate

materials, the skilled person would not take them into consideration.

3.4.3 The board does not accept this point of view. The only difference between the subject-matter of claim 1 and the cutting tool known from D8 is feature (d). In decision T1054/05, referred to by the respondent, several distinguishing features are identified and discussion concentrates on whether these can be analysed separately or whether there is a synergistic effect between them. However, in this case there is a single distinguishing feature and the question boils down to one of whether the skilled person faced with the problem of improving the performance of the known cutting tool from D8 would be incited to provide a surface finish on the hard coated layer with an Ra value of less than 0.2 µm in the expectation of success.

3.4.4 The answer to this question is undoubtedly "yes", since not only does D8 itself point the skilled person in this direction, but there is also a considerable and consistent wealth of evidence supporting the idea that tool performance of all types is directly related to the roughness of the hard coated layer.

3.5 Thus, the subject-matter of claim 1 of the main request does not meet the requirements of Article 56 EPC since it would not require any inventive activity for the skilled person, faced with the problem of improving tool performance, to specify a surface roughness Ra value of less than 0.2 µm for the tool of D8.

*4. Auxiliary request 1 (AR1)*

4.1 As has been established when discussing the main request, there is a considerable and consistent wealth of evidence indicating that tool performance is directly related to the roughness of the hard coated layer. In view of this, the board agrees with the appellant that simply specifying an even lower value of 0.1 µm for the Ra value does not involve an inventive step, since it is just a matter of the skilled person going further down the same path along which he has already been incited to go by the available prior art.

*5. Admissibility of auxiliary requests 2 to 4.*

Auxiliary requests 2 to 4 were filed with the response to the grounds of appeal which comprised new arguments and evidence. Since the opposition was effectively rejected by the opposition division, auxiliary requests were not needed at that stage. Although the subject-matter introduced into the auxiliary requests is based on the description, the appellant has had adequate time since the filing of the response to the grounds of appeal, to react and prepare its case, including carrying out any further searches. In view of this auxiliary requests 2 to 4 will be taken into consideration.

*6. Auxiliary request 2 (AR2), Article 84 EPC*

6.1 Claim 1 of AR2 introduces the feature:

"wherein said substrate (21) is polished to control the surface roughness of said hard coated layer"

This feature is based on the disclosure at paragraph [0025] of the published application.

6.2 Claim 1 is directed to a product, whereas the amended feature concerns the process by which the required surface roughness is obtained. However, the requirements of Article 84 EPC are not met since the newly introduced feature does not constitute a recognisable distinguishing constructional characteristic of the finished product. Once the tool has been manufactured it is not feasible for the skilled person to analyse reliably how the substrate surface was prepared, since common investigation techniques, including selective etching, incur the risk of affecting the very surface to be analysed.

*7. Auxiliary request 3 (AR3), Articles 83, 84, 123(2) EPC*

7.1 AR3 is directed at a "method of manufacturing" comprising the step of "polishing said substrate layer (21) to control the surface roughness of said hard coated layer".

7.2 This feature is based on the disclosure in paragraph [0025] of the patent application as published which states that "It is preferable that at least one surface of both the substrate and the coated layer is polished

in order to control the surface roughness of the hard coated layer in the prescribed range". In view of the disclosure at paragraph [0025] of the application there is no need to specify any further parameters including those of Example 1.

7.3 Since a method is now claimed, the objection under Article 84 EPC regarding the use of method steps to define a device is overcome. Also, it is clear from the passage in paragraph [0025] that a further treatment of the coated layer is disclosed since reference is made to "at least one surface" being polished and the wording of the claim does not exclude this.

7.4 Thus, the requirements of Articles 84 and 123(2) EPC are met.

7.5 The requirements of Article 83 EPC are also met. There is no doubt that the skilled person would certainly know how to carry out the step of polishing the substrate since this is a standard manufacturing procedure (also see page 4, lines 57 to 58 of the patent specification). Therefore, the only discussion concerns whether the skilled person is taught how to carry out the polishing in order to control the surface roughness of the hard coated layer.

7.6 It is evident that the surface roughness of a thin top layer will be influenced by the roughness of the substrate to which it is applied (also see Annex 1). However, the appellant is correct in pointing out that the surface roughness of the hard coated layer is also dependent upon the method used to apply the hard-coated layer up to the maximum claimed thickness of 10 µm.

7.7 The skilled person is aware of the advantages and disadvantages of the various deposition techniques available, such as PVD and CVD, as specified for example in paragraph [0024] of the patent, as argued above when considering the possible problem of cracking in D8. Therefore, the skilled person is in a position to select the process best suited to the method now claimed to minimise localised melting or spattering should this be a problem.

7.8 Consequently, the skilled person is in a position to carry out the step of "polishing said substrate layer (21) to control the surface roughness of said hard coated layer".

*8. Auxiliary request 3, Inventive step*

8.1 The closest prior art is D8. The method according to claim 1 is distinguished from this disclosure by:

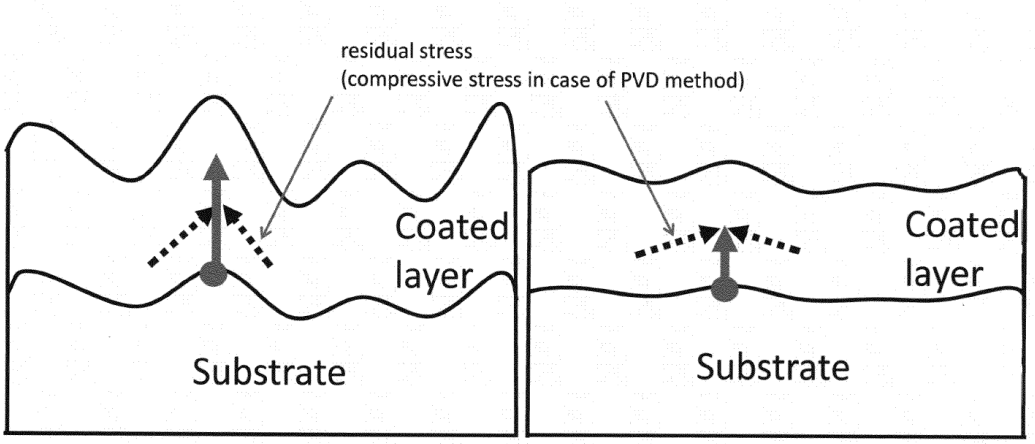
- polishing said substrate to control the surface roughness of said hard coated layer; and
- a center-line mean roughness Ra of the hard coated layer being not more than 0.2µm.

The objective technical problem can still be seen in general terms as one of how to improve tool performance.

8.2 Although it is intuitive that the surface roughness of a thin top layer is influenced by the roughness of the substrate to which it is applied (see for example figure 1 of Annex 1), it is also accepted that there must be adequate adhesion between the hard coated layer and the substrate.

8.3 As mentioned at paragraph [0002] of the contested patent, it has been proposed to "roughen the surface of the substrate (CBN sintered body) considerably by ion etching, and then coated, in order to improve the adherence between the substrate and coated layers".

8.4 The step of polishing the substrate to control the surface roughness of the hard coated layer, therefore goes against the accepted concept that the substrate must present some roughening to provide adequate adhesion. It is also plausible that a smoother substrate results in a more favourable residual stress pattern which provides an anti-peeling effect, as illustrated in figure 2 of Annex 2 reproduced below.




8.5 Further, by polishing the substrate, the tool life is extended since as the hard coating wears down during use, a smooth, as opposed to a rough, substrate surface is exposed, which in the case of hard CBN substrate can function as part of the cutting tool surface.

Therefore, the useful cutting life of the tool is prolonged.

8.6 None of the available prior art documents discloses or suggests the step of polishing the substrate in order to control the surface roughness of the hard coating layer.

8.7 The subject-matter of claim 1 according to auxiliary request 3 therefore involves an inventive step (Article 56 EPC).

## 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 on the basis of claims 1 to 6 of auxiliary request 3, a description adapted thereto and the figures of the patent specification.

The Registrar: The Chairman:

C. Spira G. Ashley

Decision electronically authenticated