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Datasheet for the decision of 29 November 2012

Case Number: T 2372/10 - 3.2.08

Application Number: 08165499.8

Publication Number: 2050831

IPC: C22C 29/08, C23C 30/00

Language of the proceedings: EN

Title of invention:
Coated cutting tool insert for milling

Applicant:
Seco Tools AB

Headword:
-

Relevant legal provisions:
EPC Art. 83

Keyword:
"Sufficiency of disclosure (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 2372/10 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 29 November 2012

Appellant: (Applicant)
Seco Tools AB
SE-737 82 Fagesta (SE)

Representative:
WSL Patentanwälte
Partnerschaftsgesellschaft
Postfach 6145
D-65051 Wiesbaden (DE)

Decision under appeal:
Decision of the Examining Division of the European Patent Office posted 15 July 2010 refusing European patent application No. 08165499.8 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
D. T. Keeling

Summary of Facts and Submissions

I. In its decision dated 15 July 2010 the examining division refused European application No. 08165499.8.

The examining division found that method claim 6 then on file was defined exclusively by the structure and/or various physical properties of the multiple components of the cutting tool to be obtained by the method. However, for at least three of these structural features, the coercivity of the cemented carbide body, the S-value of the binder phase and the α-Al_2O_3 layer texture coefficients, neither the original application nor the prior art documents cited in the application disclosed the method steps which were required for achieving these product features. The examining division further noted that, in its response to the division's communication addressing these deficiencies, the applicant failed to provide any evidence in support of its opinion that the person skilled in the art using conventional powder metallurgical technique would know how to produce the claimed cemented carbide body exhibiting the desired properties. The examining division, therefore, held that the application did not disclose the invention to which it related in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 83 EPC).

II. The appellant (applicant) lodged an appeal against this decision. The appeal was received at the European Patent Office on 9 September 2010 and the appeal fee was paid on the same date.

The statement setting out the grounds of appeal was received on 23 November 2010. Enclosed therewith, the appellant submitted nine documents (E1 to E9) in order to prove the technical background knowledge of a person skilled in the field of hardmetals production.

III. In its response dated 29 October 2012 to the official communication annexed to the summons for oral proceedings, wherein the Board gave its provisional view on the case, the appellant referred to 24 further documents (E10 to E33) to establish the common knowledge and understanding of the person skilled in the art of hardmetals production. An additional document (E34) was submitted in that respect on 25 November 2012.

IV. Oral proceeding before the Board took place on 29 November 2012.

At the oral proceedings, the appellant requested that at least the following documents should be considered to support its position about the background knowledge of a skilled person:

E10: S. Ruppi: "Deposition, microstructure and properties of texture-controlled CVD α-Al_2O_3 coatings", International Journal of Refractory Metals & Hard Materials, 23 (2005), page 306-316;

E27: R. Kieffer und F. Benesovsky: "Hartmetalle", Springer Verlag 1965, Wien New York, pages 36 to 42, 130 to 133; 180, 181;

E28: EP-A-0 403 461

E31: "A national measurement good practice guide No 20, Mechanical Tests for Hardmetals", National Physical Laboratory, Teddington, Middlesex, UK, TS11 0LW; ISSN 1368-6550, pages 1 to 74;

E34: W. Schedler: "Hardmetall für den Praktiker", Plansee Tizit (Editor), ISBN 3-18-400803-7, VDI Verlag, 1988, pages 124 to 127, 130 to 133, 180 and 181.

The appellant further requested that
- the decision under appeal be set aside and
- the patent be granted on the basis of the request underlying the decision of the first instance department.

V. Independent claims 1 and 6 read as follows:

"1. A cutting tool insert, comprising a cemented carbide body and a coating, particularly useful for wet or dry milling of steels at high cutting speeds, milling of hardened steels and high feed copy milling of tool steel characterized in said body having a composition of 7.5-8.6 wt% Co, preferably 7.7 -8.4 wt% Co; 0.5-2.5% wt-%, preferably 0.8-2.0 wt-%, total amount of the metals Ti, Nb and Ta and balance WC, with a coercivity of 12.0-15.5, preferably 12.5-15.0 kA/m, the binder phase alloyed with W corresponding to an S-value of 0.81-0.95, preferably 0.82-0.93, and that said coating comprises

- a first (innermost) layer of $TiC_xN_yO_z$ with $0.7 \leq x+y+z \leq 1$, preferably $z<0.5$, more preferably $y>x$ and

z<0.2, with equiaxed grains and a total thickness < 1 µm, preferably >0.1 µm;

- a layer of $TiC_xN_yO_z$ with $0.7 \leq x+y+z \leq 1$, preferably with z<0.2, x>0.3 and y>0.2, most preferably x>0.4, with a thickness of 2-4 µm with columnar grains;

- a layer of Al_2O_3 consisting of the α-phase with a thickness of 2-4 µm strongly textured in the $(10\bar{1}4)$-direction, with a texture coefficient $TC(10\bar{1}4)$ larger than 1.2, preferably between 1.4 and 4, or in the (0006)-direction, with a texture coefficient TC(0006) larger than 1.2, preferably between 1.4 and 4.3, or in the $(10\bar{1}2)$-direction with a texture coefficient $TC(10\bar{1}2)$ larger than 2.5, preferably larger than 3, most preferably larger than 3.5

the texture coefficient (TC) being determined according to the following formula:

$$TC(hkil) = \frac{I(hkil)}{I_0(hkil)}\left[\frac{1}{n}\sum_{n=1}^{n}\frac{I(hkil)}{I_0(hkil)}\right]^{-1}$$

where
I(hkil) = measured intensity of the (hkil) reflection
I_o(hkil) = standard intensity according to JCPDX card no 46-1212
n = number of reflections used in the calculation

(hkil) reflections used are: $(10\bar{1}2)$, $(10\bar{1}4)$, $(11\bar{2}0)$, (0006), $(11\bar{2}3)$, $(11\bar{2}6)$.

"6. A method of making a cutting tool insert comprising a cemented carbide body and a coating, characterized in

- preparing by conventional powder metallurgical technique, a cemented carbide body having a composition of 7.5-8.6 wt% Co, preferably 7.7-8.4 wt% Co; 0.5-2.5 wt-%, preferably 0.8-2.0 wt-%, total amount of the

metals Ti, Nb and Ta and balance WC, with a coercivity of 12.0-15.5, preferably 12.5-15.0 kA/m, the binder phase alloyed with W corresponding to an S-value of 0.81-0.95, preferably 0.82-0.93, and

- coating the cemented carbide body with
- a first (innermost) layer of $TiC_xN_yO_z$ with $0.7 \leq x+y+z \leq 1$, preferably $z<0.5$, more preferably $y>x$ and $z<0.2$, with equiaxed grains and a total thickness < 1 µm, preferably >0.1 µm using known CVC techniques,

- a layer of $TiC_xN_yO_z$ with $0.7 \leq x+y+z \leq 1$, preferably with $z<0.2$, $x>0.3$ and $y>0.2$, most preferably $x>0.4$, with a thickness of 1-5 µm, preferably 1.5-4.5 µm with columnar grains using MTCVD technique with acetonitrile as the carbon and nitrogen source for forming the layer in the temperature range of 700-950°C and,

- a layer of Al_2O_3 consisting of α-phase with a thickness of 2-4 µm strongly textured in the $(10\bar{1}4)$-direction, with a texture coefficient $TC(10\bar{1}4)$ larger than 1.2, preferably between 1.4 and 4, or in the (0006)-direction, with a texture coefficient TC(0006) larger than 1.2, preferably between 1.4 and 4.3, or in the $(10\bar{1}2)$-direction with a texture coefficient $TC(10\bar{1}2)$ larger than 2.5, preferably larger than 3, most preferably larger than 3.5

the texture coefficient (TC) being determined according to the following formula:

$$TC(hkil) = \frac{I(hkil)}{I_0(hkil)}\left[\frac{1}{n}\sum_{n=1}^{n}\frac{I(hkil)}{I_0(hkil)}\right]^{-1}$$

where

I(hkil) = measured intensity of the (hkil) reflection

I_o(hkil) = standard intensity according to JCPDX card no 46-1212

n = number of reflections used in the calculation

(hkil) reflections used are: $(10\bar{1}2)$, $(10\bar{1}4)$, $(11\bar{2}0)$, (0006), $(11\bar{2}3)$, $(11\bar{2}6)$ using known CVC technique

- possibly depositing a thin TiN top layer on the α-Al_2O_3 layer using known technique.

VI. The appellant's arguments are summarized as follows:

The skilled person's common general knowledge

Documents E10, E27, E28, E31 and E34 all reflected the common general knowledge of a person skilled in the art of hardmetals. In order to follow the latest developments in the technical field of chemical vapour deposition of α-Al_2O_3 and in particular the growth of specific textures, the person skilled in the art was required to read also published patent applications and scientific publications since there was considerable development in this field, which was not likely to be published in handbooks or scientific textbooks.

Sufficiency of disclosure; Article 83 EPC

The person skilled in the art of hardmetals was familiar with the specific metallurgy which is related to the production of cutting tools made of cemented carbide having specific physical and mechanical properties. Such cutting tools were for instance made of tungsten carbide (WC) having a cobalt binder phase and coatings of Ti($C_xN_yO_z$)- and Al_2O_3-layers provided by chemical vapour deposition (CVD) on the cemented carbide.

As to the coercivity, it was well known from textbook E34, page 123 that in WC-Co hardmetals this parameter was strongly governed by the grain fineness of the WC-phase and the ramification of the Co-binder phase. By carrying out some routine experiments to check whether the final sintered product exhibited the required coercivity of 12.0-15.5 kA/m, the skilled person would manage to select the appropriate milling time in order to provide the suitable grain size of the WC powder and to combine it with the Co-binder phase in an amount falling within the claimed range.

Likewise the S-value (or relative magnetic moment $\sigma_X/\sigma_{pure\ Co}$) was well known to the expert from textbook E34, pages 124, and more specifically from 125, second paragraph, where the S-value was described as representing a suitable parameter for expressing the contents of tungsten and carbon dissolved in the Co-binder phase.

The technique of depositing intermediate $Ti(C_xN_yO_z)$ coatings and an outer α-Al_2O_3 layer by CVD on the cemented carbide substrate was practised for many years and, therefore, was well known to those skilled in the art. It was not disputed that, depending on the individual equipment in which the CVD process was carried out, the skilled person was required to have a high degree of practical experience so that the desired equiaxed or columnar grain of the $Ti(C_xN_yO_z)$ coatings and texture coefficients (TC) for the Al_2O_3 coating, respectively, were obtained. Because of the individualities of the equipment, the skilled practitioner could not be provided with "one" specific recipe since the process conditions to be chosen must

be elaborated for every reactor. Specific handbooks describing such a "recipe" were not available either. Despite the particularities of the process, it was simply a matter of trial and error for the skilled practitioner to determine the appropriate CVD conditions for the reactor at his disposal. After having carried out some routine test runs, the person skilled in the CVD technique would succeed in figuring out the optimum process conditions in order to deposit $Ti(C_xN_yO_z)$ and Al_2O_3 coatings, respectively, exhibiting the desired structure and TCs.

Based on his or her general technical knowledge and practical experience, the skilled person would be able to carry out the claimed method for producing the claimed cutting tool insert. Accordingly, the application fulfilled the requirements of Article 83 EPC.

Reasons for the Decision

1. The appeal is admissible.

2. Admission of prior art documents submitted on appeal

At the oral proceedings, the appellant argued that the general technical knowledge of the skilled person was described in documents E10, E27, E28, E31 and E34. It therefore requested that these documents should be admitted to the appeal proceedings.

Firstly, the Board notes that none of these documents was enclosed with the statement of grounds of appeal.

Rather, they were submitted either about one month before the oral proceedings or even later. According to Article 12(2) of the Rules of Procedure of the Boards of Appeal (RPBO) of the EPO, the statement of grounds of appeal shall contain a party's complete case, and not only a part of it. The grounds shall set out clearly and concisely the reasons why it is requested that the decision under appeal be reversed, amended or upheld, and should specify expressly all the facts, arguments and evidence relied on. Therefore, these documents are late-filed and could be disregarded already for this reason.

Secondly, it is noted that the common general technical knowledge of a person skilled in the art has been defined by the Boards of Appeal as being normally represented by textbooks, encyclopaedias, dictionaries and handbooks. Contrary to the appellant's position, scientific publications such as document E10 or patent specifications such as E28 do not form part of the common general technical knowledge. The "Measurement Good Practice Guide No. 20" (E31) is essentially concerned with methods for the measurement of the mechanical properties of hardmetals rather than with method steps for producing CVD-coated hardmetals having a specific coercivity and magnetic moment. Consequently, documents E10, 28 and E31 do not represent the general technical knowledge of a skilled person.

Thirdly, the appellant could not present plausible reasons as to why these documents had not been submitted earlier during substantive examination of the application at the first instance. It is noted that the appellant did not submit any document at all when

responding to the examining division's objection of insufficiency of disclosure under Article 83 EPC, an objection the examining division had communicated beforehand in an official communication in detail to the appellant.

Given this situation and having regard to Article 12(4) RPBA of the EPO, according to which the Board may hold inadmissible facts and evidence which could have presented in the first instance proceedings, the Board decides that documents E10, E28 and E31 are not admitted to the appeal proceedings.

Only textbooks E27 and E34 satisfy the above mentioned criteria for the common general knowledge of a skilled person and, therefore, these documents are admitted to the appeal proceedings.

3. Sufficiency of disclosure; Article 83 EPC

3.1 The objections of the examining division under Article 83 EPC with respect to independent claims 1 and 6 concerned the coercivity of the cemented carbide body, the S-value of the binder phase and the texture of the $Ti(C_xN_yO_z)$ and α-Al_2O_3 layers.

The Board agrees with the findings of the examining division that the application as filed does not mention or suggest a method for obtaining these features. The application merely states in paragraphs [0023] to [0025] that the coercivity and S-value depend on the grain size of the starting powder and sintering conditions and have to be determined by experiments. It further

mentions that the $Ti(C_xN_yO_z)$ and α-Al_2O_3 layers are deposited according to known techniques.

3.2 The patent application is addressed to a person who is skilled in the art to which the invention pertains. It therefore has to be examined whether the skilled person resorting to his common general knowledge and taking into account the prior art acknowledged as technical background in the application, would be able to carry out the claimed process.

The textbook E34, which undoubtedly describes the common general knowledge of a person skilled in hardmetals, discloses that the coercivity and S-value are typical and well known parameters for monitoring and controlling the hardmetal properties (E34, page 131, paragraph 5: Magnetische Untersuchung). As to coercivity, E34 mentions on page 133, fourth and fifth paragraphs that this parameter is strongly dependent on the distribution degree of the carbide-phase and, therefore, is an indicator of the mean grain size of WC crystals in hardmetals. In practice, coercivity is determined in a "coercimeter" which is suitable for carrying out measurement series. Moreover, in paragraph 3.2.2.3 on pages 122, 123, document E34 refers to a standard test for determining the magnetisation coercive field strength (coercivity) which is described in ISO documents 3326 and 4489 and enables the skilled person to find out the optimum grain size and sintering time and to determine the hardness of the hardmetal.

Turning to the S-value, E34 teaches on pages 124, 125 and 181, first paragraph, that the magnetic saturation or S-value results from the composition of the Co-

binder phase and the grain size. Specifically, this parameter is linked with the amounts of tungsten and carbon in the cobalt-binder phase. According to the formula given in E34, page 124, second paragraph, the amount of tungsten dissolved in the Co-binder phase could be calculated on the basis of the magnetic saturation or S-value which is measured for example in a "sigmameter" (E34, page 123, in the middle).

In conclusion, coercivity and S-value per se represent physical parameters which are well known to the skilled person, as is their use for non-destructive controlling and monitoring variations in the tungsten and carbon contents, the microstructure and, in consequence thereof, the overall properties and performance the hardmetal properties. Given this situation it does not pose a problem for the skilled person to produce a cutting tool which exhibits a coercivity and S-value satisfying the claimed ranges.

3.3 When discussing the technical background underlying the claimed cutting tool, the application cites four pre-published patent documents which are concerned with coated cemented carbide inserts comprising innermost layers of $Ti(C_xN_yO_z)$ with equiaxed or columnar grains (A-publication, paragraphs [0003] to [0007]). At least two of these prior art documents also disclose the deposition of an outermost α-Al_2O_3 layer. The Board therefore concludes that coating cemented carbide inserts with such layers is well known to those skilled in the art.

As regards the production of "textured" α-Al_2O_3 layers exhibiting specific texture coefficients, as required

by the claimed process, the appellant admitted at the oral proceedings that a high level of operating experience and expert knowledge was necessary to obtain such layers, all the more so since different reactors necessitate type-specific conditions which the operator must adhere to in order to achieve the structure aimed at. Notwithstanding the high demands made on the operator's skill, the appellant made convincing statements to the Board that the skilled practitioner, faced with the problem of providing "textured" α-Al_2O_3 layers, would be able to work out the optimum conditions in the reactor at his disposal without having to engage in "undue experimentation". The mere fact that some experimentation is required does not mean that the disclosure of the application fails to satisfy the enabling requirement under Article 83 EPC.

3.4 Under these circumstances and in the absence of concrete evidence or verifiable facts to the contrary, the Board must accept the explanations provided by the appellant during the oral proceedings that finding the optimum CVD conditions for depositing an α-Al_2O_3 layer having specific texture coefficients belongs to the normal competence of a person skilled in the production of coated hardmetals and does not constitute an undue burden.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance for further prosecution.

The Registrar: The Chairman:

V. Commare T. Kriner