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Datasheet for the decision of 25 January 2007

Case Number: T 1544/05 - 3.2.07

Application Number: 00943746.8

Publication Number: 1198609

IPC: C23C 14/58

Language of the proceedings: EN

Title of invention:
Process for producing a hard-material-coated component

Patentee:
CemeCon AG

Opponent:
Oerlikon Trading AG, Trübbach

Headword:
-

Relevant legal provisions:
EPC Art. 56, 84, 123(2), 123(3)

Keyword:
"Unallowable amendments (no)"
"Inventive step: main request (no), auxiliary request (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1544/05 **-** 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 25 January 2007

Appellant I/Respondent II: CemeCon AG
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Appellant II/Respondent I: Oerlikon Trading AG, Trübbach
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Representative: -

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 12 October 2005 concerning maintenance of European patent No. 1198609 in amended form.**

Composition of the Board:

Chairman: H. Meinders
Members: K. Poalas
C. Holtz

Summary of Facts and Submissions

I. Appellant I / Respondent II (Patent Proprietor), hereafter designated "Appellant/Patentee" and Appellant II / Respondent I (Opponent), hereafter designated "Appellant/Opponent" each lodged an appeal against the interlocutory decision of the Opposition Division maintaining European patent No. 1 198 609 in amended form.

II. Opposition was filed against the patent as a whole based on Article 100(a) EPC (lack of novelty and lack of inventive step) and Article 100(c) (extension beyond the content of the application as filed).

The Opposition Division held that the subject-matter of claim 1 as granted and according to the first auxiliary request filed during the oral proceedings before it did not fulfil the requirements of Article 56 EPC and that the subject-matter of claim 1 according to the second auxiliary request filed during the oral proceedings before it fulfilled the requirements of the EPC and, in particular, the requirements of Articles 83, 84, 54, 56, 123(2) and (3) EPC.

III. The following documents are mentioned in the present decision:

D0: WO-A-00 73532 (PCT-application corresponding to the application as originally filed)
D1: JP-A-2 901043
D1 neu: Official translation of Dl
D7: EP-A-0 727 510
D8: EP-A-0 603 144

D13: Paper "About #800 WA abrasive and its grain size", H. Ishii
D14: Parts of Japanese Industry Norm JIS R 6001
D18: US-A-4 776 885
D19: DIN 8200

IV. Oral proceedings before the Board took place on 25 January 2007.

(a) Appellant/Patentee requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or on the basis of claims 1 and 2 and columns 1 to 8 (auxiliary request), all submitted in the oral proceedings of 25 January 2007.

(b) Appellant/Opponent requested that the decision under appeal be set aside and that the European Patent No. 1 198 609 be revoked.

V. Independent claim 1 as granted reads as follows:

"Process for producing a hard-material-coated component, comprising the following steps:
-application of a layer of hard material to the component in a PVD coating unit; and
-structural further processing of the outer surface of the layer of hard material,
characterized in that
-for the structural further processing, the surface of the layer is blasted in a blasting device in order to smooth this surface, an inorganic blasting agent with a grain size in the range from 1 μm to 100 μm being used,
-the blasting agent having a sharp-edged grain shape."

Independent claim 1 according to the auxiliary request reads as follows (amendments when compared to claim 1 as granted are depicted in bold):

"Process for producing a hard-material-coated component, comprising the following steps:
-application of a **PVD** layer of hard material to the component in a PVD coating unit; and
-structural further processing of the outer surface of the layer of hard material,
characterized in that
-for the structural further processing, the surface of the layer is blasted in a blasting device **by pressurized liquid blasting** in order to smooth this surface, an inorganic blasting agent with a grain size in the range from **10 μm to 15 μm** being used,
-the blasting agent having a sharp-edged grain shape."

VI. Appellant/Patentee argued essentially as follows:

(a) Main request

(i) Claim 1 - Inventive step, Article 56 EPC

Although in the first three lines of page 2 of D1 neu both CVD and PVD are mentioned the entire document concentrates on PVD, see for example page 3, chapter "(3) ion plating using arc discharge". Under the title "[Problems to be Solved by the Invention]" it is stated that ion plating using arc discharge produces macro particles of approximately 1 - 5 μm on the surface of the coating film, resulting in poor surface

roughness and luster, see page 5, lines 2 to 4. Under the methods for removing the macro particles blast grinding using glass beads is mentioned on page 8, lines 4 to 7. Also barrel grinding using # 800 WA abrasive together with an alumina barrel chip of 2 mm in diameter is mentioned therein, see page 8, line 23 and page 12, line 10.

Blast grinding is only mentioned in D1 neu in combination with glass beads, said latter having spherical shape. An inorganic blasting agent with a grain size in the range from 1 μm to 100 μm is not mentioned in D1 neu at all.

From the documents filed by Appellant/Opponent in the present proceedings there is only D13, i.e. a document from a private person which discloses the expression "# 800 WA". There is no patent document or any national or international norm available disclosing this expression. The different norms filed in these proceedings, which do not use such a symbol, testify that the use of such a symbol does not correspond to an abrasive material having a standardized grain size. Therefore, the person skilled in the art has no information about the size of the grains used in the barrel grinding according to examples 1 and 2 of D1 neu.

According to D1 neu, through applying inter alia barrel grinding or blast grinding using glass beads, the macro particles projecting from the surface are removed without substantially wearing the coating layer, see page 8, lines 4 to 10. In the examples 1 and 2 barrel grinding using

800 WA abrasive is applied to a PVD layer, see page 8, line 23 and page 12, line 10.

Blasting is obviously proposed in D1 neu only in combination with glass beads so that a blasting agent heaving a sharp-edged grain shape is not known from D1 neu. Furthermore, D1 neu fails also to disclose a blasting agent with a grain size in the range from 1 μm to 100 μm.

(b) Auxiliary request

(i) Clarity, Article 84 EPC

The expressions "edged" and "sharp-edged" as far as they concern the grain shape have the same meaning defining grains having a broken shape differentiating them from grains having for example a smooth, spherical shape as it is the case for the glass beads mentioned in D1 neu. The meaning of the term "sharp-edged" is clear to the person skilled in the art. There is no obligation under the EPC for the applicant to use only technical terms mentioned in national (or international) norms.

(ii) Claim 1 - Inventive step, Article 56 EPC

Even if the person skilled in the art combined the teachings of the documents D1 neu and D8 with each other the subject-matter of claim 1 would differ from such a combination in that the grain size used for

the blasting agent lies within the range from 10 μm to 15 μm.

The fact that the coated component is further treated by being blasted using an inorganic blasting agent with a very small grain size compared to conventional blasting processes, produces a PVD-coated, after-treated component which has considerably improved roughness characteristics.

There is no hint in the state of the art present in the file that after-treatment of a PVD-coated component with an inorganic blasting agent having a very small grain size as compared to conventional blasting processes, i.e. with a grain size lying within the reduced range from 10 μm to 15 μm, produces a PVD-coated, after-treated component which has considerably improved roughness characteristics.

VII. Appellant/Opponent and argued essentially as follows:

(a) Main request

(i) Claim 1 - Inventive step, Article 56 EPC

The subject-matter of claim 1 differs from the teaching of D1 neu in that an inorganic blasting agent with a grain size in the range from 1 μm to 100 μm is used and in that the blasting agent has a sharp-edged grain shape.

According to D1 neu CVD and PVD are the two well known deposition methods for forming wear-resistant and weld-resistant hard-film coatings on tools, see page 2, lines 1 to 3.

D7 and D8 teach the person skilled in the art to wet blast a CVD alumina layer with 150 mesh Al_2O_3 powder in order to smooth said layer, see page 4, lines 22 to 23.

It is well known to the person skilled in the art that Al_2O_3 powder is an inorganic blasting agent having sharp-edged grains and that 150 mesh corresponds to a grain size of up to 118 μm. This means that the grain size range from 1 μm to 100 μm claimed in claim 1 almost entirely fulfils the dimensions necessary for 150 mesh.

Therefore, the person skilled in the art starting from the process of D1 neu and seeking to provide a further smoothened surface would apply the teaching of D8 and would arrive at the use of a blasting agent according to claim 1 without exercising any inventive activity.

(b) Auxiliary request

(i) Clarity, Article 84 EPC

In claim 1 the term "sharp-edged grain shape" is used, whereas D19 (a German

Industrial Norm) refers only to "edged grain shape (Kornform kantig)", see page 1, second line of chapter 2.2.2.2.2 and page 9, line 10. Since in the patent in suit the difference between these two kinds of grain shape is not defined, the person skilled in the art is not in a position to clearly define which prior art grain shapes are "edged" and do not fall within the scope of claim 1 and which prior art grain shapes are "sharp-edged" and fall within the scope of claim 1.

Therefore, the subject-matter of claim 1 is not clear.

(ii) Claim 1 - Inventive step, Article 56 EPC

The subject-matter of claim 1 differs from the teaching of D1 neu in the use of pressurized liquid blasting, the use of an inorganic blasting agent with a grain size in the range from 10 μm to 15 μm, whereby the blasting agent has a sharp edged grain shape.

As stated above D8 teaches the person skilled in the art to wet blast a CVD alumina layer with an inorganic blasting agent having sharp-edged grains and a grain size of up to 118 μm in order to smooth said layer, see page 4, lines 22 to 23.

Therefore, the person skilled in the art starting from the process of D1 neu and seeking to provide a further smoothened surface would apply the teaching of D8. In order to further improve the smoothening effect the skilled person would define, through trial and error, an optimum grain size range, which would be lie in the claimed range from 10 μm to 15 μm. Accordingly, the combination of the teachings of documents D1 neu and D8 together with the results of a simple trial and error optimisation leads the person skilled in the art to the subject-matter of claim 1 without the exercise of inventive activity.

Reasons for the Decision

1. *Main request*

Claim 1 - Inventive step, Article 56 EPC

1.1 The closest prior art document Dl neu discloses a process for manufacturing a wear-resistant and welding resistant hard-film-coated-tool by coating the surface of the base material by an arc-discharge ion plating and by further processing the surface by removing substantially all of the macro particles to smooth the surface, see e.g. claim 2 on page 1; page 7, last paragraph, first sentence. In the first seven lines of page 2 it is stated that as methods for forming the wear-resistant hard coating film, CVD (chemical vapor

deposition) and PVD (physical vapor deposition) have been known, whereby the latter method is preferably applied in cases where the tool should not be subjected to high temperatures.

On page 8, lines 4 to 7 of D1 neu it is stated that "the method of removing the macro particles projecting from the coating film after the ion plating is not limited to a particular one" and that "preferably, barrel grinding, such a blast grinding using glass beads for example, lapping and buffing for example is applied".

According to the first two lines of the chapter with the headnote "barrel grinding conditions" of Examples 1 and 2 (page 9, lines 23 and 24; page 12, lines 10 and 11) of D1 neu an alumina barrel chip of 2 mm in diameter and #800WA abrasive were used for barrel grinding.

From the above it follows that D1 neu describes a process for producing a hard-material-coated component by applying a PVD layer. The outer surface of said layer is smoothened, for instance through blast grinding using glass beads. As an alternative method barrel grinding is proposed, using an #800WA abrasive.

1.2 The method of claim 1 differs from the first mentioned method in that the blasting agent has a sharp-edged grain shape and a grain size specifically in the range from 1 μm to 100 μm.

The use of sharp-edged grains increases the smoothening effect, and the selection of the grain size within the

range from 1 μm to 100 μm defines the degree of refinement of the abrasive material and accordingly the degree of the surface smoothening.

The problem to be solved in respect of the method known from D1 neu can therefore be defined as improving the smoothening of the hard coating film.

1.3 D8 provides a cutting tool comprising a body with a hard alloy coating onto which a wear resistant coating in form of an Al_2O_3-layer has been deposited. Such a coated cutting tool exhibits improved wear and toughness properties, particularly if its surface has been further smoothened by wet blasting, see page 2, lines 47 to 52. In each of the 9 samples, including the control samples, used in the five examples of D8, the Al_2O_3-coated tool inserts are wet blasted with 150 mesh Al_2O_3 powder in order to smoothen the coating surface, see page 4, lines 22 to 23; see page 5, lines 3 to 4, 16 to 17 and 43 to 44; see page 6, lines 17 to 18.

The same treatment of a hard wear resistant coating layer by wet blasting with 150 mesh Al_2O_3 particles is known from D7, in which it is presented (page 3, lines 17 to 19 and line 39) as the treatment "performed as known to the skilled artisan, using, for example, alumina particles of a relatively smaller particles size, for a time sufficient to smooth the surface of the alumina coating applied under pressure".

On the basis of the above, one can conclude that wet blasting with 150 mesh alumina particles is a standard procedure for smoothening alumina coated, i.e. hard coated surfaces.

1.4 As was accepted by both parties a 150 mesh Al_2O_3 powder as used in D8 is an inorganic blasting agent having sharp-edged grains with a maximum grain size of up to 118 μm. This means that the grain size range from 1 μm to 100 μm claimed in claim 1 is almost entirely identical with the range proposed in D8 and is definitely not to be seen as a novel selection therefrom.

It is evident to the person skilled in the art that blasting a hard coated surface with grains of the same kind and having almost identical size as in the claim results in an almost identical smoothing effect.

1.5 Accordingly, the person skilled in the art starting from D1 neu and seeking to optimise the conditions for smoothening the surface of the PVD coated layer, will apply the standard procedure of the wet blasting with 150 mesh alumina powder described in D7 or D8 for obtaining improved wear and toughness properties. This is particularly so in connection with the information of D1 neu that CVD and PVD are two interchangeable methods for applying wear resistant coating layers and that blast grinding is a well known aftertreatment method for both such PVD and CVD layers.

D1 neu discloses also the information that to achieve the described smoothening effect not only the grinding processes mentioned therein are interchangeable, see page 8, lines 4 to 10, but that different abrasives may also be used, see page 8, lines 6 and 7, wherein glass beads are mentioned as an example of the abrasive to be used in blast grinding.

1.6 Appellant/Patentee's argument that the skilled person would not combine the teachings of documents D1 neu and D8 with each other since the teaching of D1 neu relates to the smoothening of PVD wear resistant layers whereas D8 focuses on the smoothening of alumina layers applied via CVD, without any reference to PVD, cannot be accepted by the Board for the following reasons:

D1 neu states that CVD and PVD are two processes well known to the person skilled in the art for applying TiC or TiN wear resistant hard coating layers on cutting tools. PVD is preferably used for coating such layers at relatively low temperatures. They are interchangeable depending on the application field of the cutting tools, see page 2, lines 1 to 9. In a situation where the skilled person is confronted with the problem of smoothening the surface of such a hard coating layer, he will apply the other techniques known to him such as blast grinding using Al_2O_3 powder as grinding agent, suggested as standard technique by D8, irrespective of whether the hard coating has been applied by CVD or PVD.

The person skilled in the art finds in D1 neu not a single hint preventing him from using the blasting agent known from D8 also for the blast grinding of a PVD layer. Appellant/Patentee's argument about the existence of a prejudice against applying a grinding method described for a CVD layer also to a PVD layer cannot therefore be followed by the Board.

The subject-matter of claim 1 therefore does not fulfil the requirements of Article 56 EPC.

The main request cannot therefore be allowed.

2. *Auxiliary Request*

2.1 Amendments, Article 123(2) and (3) EPC

The subject-matter of claim 1 has been restricted over that of claim 1 as granted by defining that:

1) the layer of hard material is a PVD-layer,
2) pressurized liquid blasting is used, and
3) the grain size is in the range from 10 μm to 15 μm.

Basis for the first amendment can be found in D0, page 1, lines 16 to 30; page 3, lines 16 to 26 and page 4, lines 10 to 23. Basis for the second amendment can be found in D0, page 5, line 6 and basis for the third amendment can be found in D0, page 4, line 35.

The above-mentioned added features also limit the scope of claim 1 as granted.

The amendments made in the description concern references to documents D1 and D2 and the adaptation of the description to the amendments in claim 1.

Thus, the requirements of Article 123(2) and (3) EPC are met. This was not disputed by Appellant/Opponent.

2.2 Clarity, Article 84 EPC

The Board considers that an objection of lack of clarity cannot be raised against the feature "sharp-

edged", as it is present in the claim as granted, i.e. the alleged unclarity does not arise from the amendments made.

2.3 Claim 1 - Inventive step, Article 56 EPC

2.3.1 The subject-matter of amended claim 1 differs from that of claim 1 of the main request discussed above for inventive step in the use of a grain size in the range from 10 μm to 15 μm for the inorganic blasting agent.

The question to be answered now is whether for the skilled person, intending to improve the result of the methods disclosed in D1 neu by applying the teaching of D8 in respect of the smoothening of the hard coating layer, which was found to be obvious by the Board, it would be obvious to substantially reduce the grain size of the particles used as blasting agent, as now claimed.

2.3.2 It is an object of the present invention to improve the roughness characteristics of the exposed surface of tools with a PVD hard coating layer, by striving for a quotient of roughness of this surface before and after the blasting treatment greater than 1,2 - preferably greater than 2 - see paragraphs [0011] and [0020] of the patent in suit. In view of the results of the examples (which were all carried out with a particle size of the blasting agent of 12.3 ± 1.0 μm), ranging from 1,23 to 3,11, the Board is convinced that this object is achieved and that these examples provide sufficient support for claiming the narrow range from 10 μm to 15 μm, now in claim 1.

2.3.3 In each of the five examples of D8 the hard layer coated tool inserts were all wet blasted with 150 mesh Al_2O_3 powder, i.e. with an inorganic blasting agent having sharp-edged grains with a grain size up to 118 μm, in order to smooth the coating surface, see page 4, lines 22 to 23; see page 5, lines 3 to 4, 16 to 17 and 43 to 44; see page 6, lines 17 to 18.

For the use of the blasting agent having a grain size in the range from 10 μm to 15 μm, i.e. a very small grain size lying within a very narrow range when compared with the grain size proposed in D8 no hint can be found in the latter.

The presently claimed grain size range for the blasting agent is also not derivable from any other of the prior art documents in the file. The board therefore considers that the limitation to the present claimed narrow range of 10 μm to 15 μm is not obvious to the skilled person.

2.3.4 The Board cannot accept the Appellant/Opponent's argument that the skilled person starting from the proposal in D8 to use 150 mesh Al_2O_3 powder as blasting agent and trying to achieve a finer smoothing of the treated surface would automatically choose very small grain sizes and would arrive, just by trial and error, at the claimed grain size range without exercising any inventive activity, for the following reason:

The claimed grain size range is a very narrow range having well-defined end points, and relates to a very small grain size. In the absence of any supporting evidence, the Appellant/Opponent's argument that

through trial and error the skilled person would arrive at the specific narrow grain range from 10 μm to 15 μm remains a mere unsubstantiated allegation.

2.3.5 It argued further that the skilled person extracting the information from the two examples of D1 neu that "#800WA" is used as abrasive material for barrel grinding and knowing according to D14, table 8 that "#800" defines a middle grain size of about 14 μm and according to D18, column 9, line 25 that "WA" is alumina, i.e. Al_2O_3, it would also use said abrasive material as blasting agent in the blast grinding, thus arriving at the subject-matter of claim 1 without exercising inventive activity. The Board cannot accept this argument for the following reason:

D1 neu refers on page 8, line 6 to barrel grinding and to blast grinding as possible surface smoothening procedures, whereby the use of glass beads for blast grinding is proposed. In examples 1 and 2 barrel grinding was applied to the treated surface, whereby particles of #800WA specifically only in combination with an alumina barrel chip of 2 mm were used as grinding material during a grinding time of 10 minutes. There is no hint in D1 neu suggesting the application of #800WA on its own, also for the blast grinding. The same applies to D7 or D8. It is therefore not obvious to the person skilled in the art to use only a specific part of the abrasives used for barrel grinding for the blast grinding.

2.3.6 The subject-matter of claim 1 fulfils therefore the requirements of Article 56 EPC.

The auxiliary request can therefore be allowed.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The appeal of the opponent is dismissed.
3. The case is remitted to the department of first instance with the order to maintain the patent with the following documents:
   - Claims 1 and 2,
   - Description: columns 1 to 8, all as submitted in the oral proceedings of 25 January 2007, and
   - Drawings: figures 1 and 2 as granted.

The Registrar: The Chairman:

G. Nachtigall H. Meinders