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D E C I S I O N
of 23 September 2003

Case Number: T 0182/01 - 3.2.6

Application Number: 94905902.6

Publication Number: 0682584

IPC: B23C 5/20

Language of the proceedings: EN

Title of invention:

Cutting insert with twisted chip surface

Patentee:

SANDVIK AKTIEBOLAG

Opponent:

Widia GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes) - after amendment"

Decisions cited:

-

Catchword:

-



Case Number: T 0182/01 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.2.6
of 23 September 2003

Appellant: SANDVIK AKTIEBOLAG
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Respondent: Widia GmbH
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 December 2000
revoking European patent No. 0682584 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: P. Alting van Geusau
Members: G. Pricolo
M. J. Vogel

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division posted on 15 December 2000 to revoke European patent No. 0 682 584, granted in respect of European patent application No. 94905902.6.

In the decision under appeal the Opposition Division considered that the subject-matter of claim 1 of the main and first auxiliary requests was novel over the disclosure of document

D1: DE-C-22 58 448,

but did not involve an inventive step because it was obvious in the light of the teaching of documents

D3: US-A-4 940 369, and

D5: US-A-5 052 863.

The second auxiliary request was rejected for lack of compliance of claim 1 with the requirements of Article 123(2) EPC.

II. The appellant (patentee) lodged an appeal against this decision, received at the EPO on 8 February 2001, and simultaneously paid the appeal fee. The statement setting out the grounds of appeal was received at the EPO on 4 April 2001.

III. In a communication dated 17 April 2003, the Board expressed its preliminary opinion that it would appear that claim 1 as amended in accordance with the new main

request filed with letter dated 7 February 2003 did not meet the requirements of Article 84 EPC. Considering the technical content of the claim it would appear that novelty was given but inventive step was to be discussed in particular having regard to the disclosure of documents D3, D5 and

D2: US-A-3 781 956,

which was a member of the patent family of D1.

IV. Oral proceedings took place on 23 September 2003.

The appellant (patentee) requested that the decision under appeal be set aside and that the patent be maintained with claims 1 to 5 and the description columns 1 to 4 filed during the oral proceedings, together with the figures 1 to 3c as granted.

The respondent (opponent) requested that the appeal be dismissed.

V. Claim 1 reads as follows:

"A cutting insert for milling cutters comprising an upper surface (11); a lower bottom surface that can be placed into abutment with a cooperating bottom support surface of a machining tool, wherein a rake surface (10) adjacent to and extending along a main cutting edge is helically twisted along its length in such a way that its rake angle is largest adjacent to the operative cutting corner (6) characterised in that said cutting insert is made by form-pressing and sintering of an insert-forming powder in that the rake angle is

smallest adjacent to the next cutting corner, at least three side surfaces (2,3,4) extending between said two surfaces are provided between two adjacent cutting corners, of which side surfaces at least one adjoins to the upper surface along a line that constitutes the main cutting edge (5), and that each side surface (2,3,4) is constituted by a planar surface, one of which forms a perpendicular or an acute angle with the upper surface (11), and in that said cutting insert is provided with four cutting corners (6), a main cutting edge (5) and a secondary cutting edge being provided on either sides of each cutting corner (6) one of said side surfaces (3) constituting a relief surface for the main cutting edge (5), another one of said side surfaces (4) constituting a relief surface for said secondary cutting edge (8)."

VI. In support of its requests the appellant relied essentially on the following submissions:

Document D3, which represented the closest prior art, disclosed a cutting insert in which both the rake surface and the relief surface adjacent to the main cutting edge were helically twisted in order to provide a wedge angle which remained constant along the cutting edge. A helically twisted rake surface was also present in the insert of the patent in suit, but in combination with a planar relief surface along the main cutting edge. The result of this combination was that the wedge angle and thus the strength of the cutting edge increased in the direction of increasing cutting depth, whereby the object underlying the patent in suit of minimizing the risk of chipping and breakage at a level of the cutting edge that corresponded to the maximal

cutting depth was effectively achieved. The claimed insert was more economical than that of D3 because it was provided with four main cutting edges which were all available to work, rather than two. Moreover, in accordance with the patent in suit, the insert was made by form-pressing and sintering of an insert-forming powder, thereby excluding cutting tools of cemented carbide obtained by injection moulding. D3 was silent about the method for producing a cutting insert and thus did not disclose that the insert was obtained by form-pressing and sintering of an insert-forming powder.

D5, like D3, disclosed an insert having only two main cutting edges and two cutting corners, and in which the wedge angle remained constant along the cutting edge due to the fact that both the rake surface and the relief surface adjacent to the main cutting edge were continuously curved.

Document D2 related to a cutting insert which was intended for turning and not for milling. In view of the different nature of the metal cutting operations of turning and milling, the skilled person would not turn to document D2 when dealing with the technical problem underlying the patent in suit of minimizing the risk of chipping and breakage in an insert intended for milling cutters.

Finally, the patent in suit overcame the technical prejudice that in milling only inserts having two cutting corners, such as that of D3 and D5, could be used.

Therefore, the subject-matter of claim 1 involved an inventive step.

VII. The respondent essentially argued as follows.

Although D3 did not explicitly refer to a cutting insert made by form-pressing and sintering of an insert-forming powder, it was clear for the skilled person that hard-metal inserts such as that of D3 were manufactured by such method. The known cutting insert was provided with a helically twisted rake surface but not with a planar relief surface. However, the latter feature was irrelevant for the achievement of the technical object underlying the patent in suit of minimizing the risk of chipping and breakage, as it clearly appeared from the disclosure in the granted patent according to which the relief geometry was not essential and could also be made up of a curved surface. The alleged economical advantage obtainable with the insert according to the patent in suit, that each time a main cutting edge and its corresponding cutting corner were worn out the insert could be indexed in the support of the tool to present a fresh main cutting edge and corner to the work, whereby a same insert could be indexed four times rather than two as in D3 before replacement, did not exist in practise, because during milling a whole flank of the insert was used for metal cutting whereby two cutting corners wore out simultaneously. Thus, also the insert according to the patent in suit could in fact be indexed only two times before replacement. The fact that claim 1 of the patent in suit referred to a secondary cutting edge with a corresponding relief surface being one of the three side surfaces did not necessarily imply any

further features of the cutting insert, because the claim did not exclude that such secondary cutting edge and relief surface were coincident, respectively, with a portion of the main cutting edge and its corresponding relief surface. Thus, claim 1 was to be regarded as including the case of an insert having only a main cutting edge and two side surfaces. Moreover, it was not clear how the insert could be clamped on a milling tool if only one cutting corner was to be used for cutting a workpiece.

The same person that was skilled in milling was also skilled in turning. This skilled person would obviously consider to provide the milling insert of D3 with a wedge angle which increased in the direction of increasing cutting depth as disclosed by D1 for a turning insert.

Furthermore, D5 disclosed the provision, in an insert for a milling cutter, of a side divided into two surfaces, one of these surfaces being planar and forming a relief surface for the main cutting edge.

Therefore, since the cutting insert according to claim 1 of the patent in suit did not provide any technical effect over the cutting insert of D3 but was only distinguished therefrom by other known, mere technically equivalent means, its subject-matter did not involve an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

Basis for the amendments made to claim 1 can be found in claims 1, 3, 8 and 9 of the original application, taken in combination with the disclosure on page 3 (lines 14 ff.) and in Figure 1 of the drawings.

Claim 1 includes all the features of claim 1 of the patent as granted. Since it also includes further limiting features, it restricts the extent of protection conferred by the European patent.

Dependent claims 2 to 5 correspond to claims 2 to 5 as granted, which are essentially based upon the disclosure of claims 2, 4, 6, 7 of the application as filed.

The description of the patent in suit is adapted to be consistent with the claims as amended and to acknowledge document D3 as prior art.

Hence, the amendments neither introduce subject-matter which extends beyond the content of the application as filed nor result in an extension of the protection conferred.

It follows that none of the amendments gives rise to objections under Article 123 (2) and (3) EPC.

3. *Novelty*

Since none of the cited documents discloses a cutting insert having all the features defined in claim 1, its subject-matter is found to be novel.

Novelty was in fact not in dispute.

4. *Inventive step*

4.1 The problem underlying the patent in suit is to minimize, or even eliminate, the risk of chipping and breakage at a level of the cutting edge that corresponds to the maximal cutting depth.

4.2 Document D3 represents the closest prior art because it relates to a cutting insert conceived for the same purpose of being used in a milling cutter as the insert according to the patent in suit and has the most relevant technical features in common therewith. In fact, using the wording of claim 1 of the patent in suit, D3 discloses (see Figure 6; see column 3, lines 22 to 43) a cutting insert for milling cutters comprising an upper surface (13); a lower bottom surface that can be placed into abutment with a cooperating bottom support surface of a machining tool, wherein a rake surface (14) adjacent to and extending along a main cutting edge (10) is helically twisted along its length in such a way that its rake angle is largest adjacent to the operative cutting corner (12).

D3 does not mention the material of the insert or the method of manufacturing the insert. Since form-pressing and sintering is not the only known method for

manufacturing cutting inserts (for instance if the insert is made of high-speed steel then it can be produced by casting) it cannot be inferred from D3 that the insert is made by such method.

The insert of D3 has only two cutting corners (12). The main cutting edge and its relief surface are curved (column 3, lines 44 to 50), and therefore there is no planar side surface which adjoins to the upper surface along a line that constitutes the main cutting edge. A secondary cutting edge (11) with a corresponding relief surface is provided adjacent to the main cutting edge (10).

Therefore, the subject-matter of claim 1 is distinguished from the cutting insert of D3 in that the cutting insert is made by form-pressing and sintering of an insert-forming powder, in that the rake angle is smallest adjacent to the next cutting corner, at least three side surfaces extending between said two surfaces are provided between two adjacent cutting corners, of which side surfaces at least one adjoins to the upper surface along a line that constitutes the main cutting edge, and that each side surface is constituted by a planar surface, one of which forms a perpendicular or an acute angle with the upper surface, and in that said cutting insert is provided with four cutting corners, a main cutting edge and a secondary cutting edge being provided on either side of each cutting corner, one of said side surfaces constituting a relief surface for the main cutting edge, another one of said side surfaces constituting a relief surface for said secondary cutting edge.

- 4.3 By providing a planar relief surface for the main cutting edge in combination with a helically twisted rake surface extending along the main cutting edge and having a rake angle which is largest adjacent to the operative cutting corner and smallest adjacent to the next cutting corner, the wedge angle and therefore the strength of the main cutting edge increases with increasing cutting depth, whereby the risk of chipping and breakage at a level of the cutting edge that corresponds to the maximal cutting depth is reduced as compared to the insert of D3 according to which the wedge angle is constant along the main cutting edge (see column 3, lines 37 to 43).
- 4.4 D5 does not suggest the above-mentioned combination because, like D3, it relates to a cutting insert for a milling cutter wherein the main cutting edge (22) and its associated relief surface (24a) are curved (see column 6, lines 10 to 21) and the wedge angle (δ) is constant along the cutting edge (see column 6, lines 21 to 24 and column 7, lines 16 to 23).
- 4.5 Document D2 relates to a cutting insert used for turning rather than milling operations (see column 1, lines 15 to 17; Figure 1). D2 aims at the provision of a cutting insert which produces a shearing rather than a tearing action on the work (see column 1, lines 18 to 23 and 30 to 34). In order to achieve this object, D2 teaches to provide an insert having a rake surface (26) adjacent to and extending along a main cutting edge which is helically twisted along its length in such a way that its rake angle is largest adjacent to the operative cutting corner and smallest adjacent to the next cutting corner (see column 3, lines 7 to 27;

column 2, lines 32 to 44). Since the relief surface of the main cutting edge is constituted by a planar surface, the wedge angle of the main cutting edge increases with increasing cutting depth. However, D2 is silent about any effects obtained by means of this latter feature.

D1, which is a member of the patent family of D2 and relates to the same cutting insert, further explains (see column 1, lines 40 to 68) that the provision of a helically twisted rake surface (26) results in that the cutting insert is adapted for cutting chips of varying thickness. However, also D1 is silent about any effects obtained by the provision of a wedge angle which increases with increasing cutting depth.

In fact, in both D1 and D2 the emphasis lies in the provision of a helically twisted surface; how the relief surface is formed and consequently how the wedge angle should be shaped is not described as playing any particular role in these documents. Therefore, there is no reason for the skilled person to provide, in the cutting insert of D3, a planar relief surface for obtaining a wedge angle which increases with increasing cutting depth as known from D1 or D2.

4.6 The remaining available prior art does not suggest the combination of features defined in claim 1. Therefore, its subject-matter is found to involve an inventive step.

4.7 Finally, the Board wishes to note that inserts intended for milling cutters having four main cutting edges and four cutting corners are generally known, especially

for face millers (which are referred to in the patent in suit on column 1, line 9). Therefore, neither the argument of the appellant based on an alleged prejudice in the art with respect to inserts having more than two cutting corners for milling cutters, nor the argument of the respondent, that it was not clear how inserts having four cutting corners could be clamped on a milling tool, can be considered pertinent.

Also the respondent's argument based on the submission that during milling a whole side of the insert was used for metal cutting whereby two cutting corners wore out simultaneously cannot be followed because this does not necessarily apply to every milling operation, in particular not when face milling is concerned.

5. Therefore, independent claim 1 together with the dependent claims 2 to 5 and the description as filed during oral proceedings of 23 September 2003, and the drawings of the patent as granted, form a suitable basis for maintenance of the patent in amended form.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

claims: 1 to 5 filed during oral proceedings of 23 September 2003;

description: columns 1 to 4 filed during oral proceedings of 23 September 2003;

drawings: figures 1 to 3c of the patent as granted.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau