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**D E C I S I O N**  
**of 8 December 1999**

**Case Number:** T 1005/96 - 3.2.6

**Application Number:** 88850342.2

**Publication Number:** 0313534

**IPC:** B23B 27/14

**Language of the proceedings:** EN

**Title of invention:**

Method for chip removing machining

**Patentee:**

SECO TOOLS AB

**Opponent:**

Widia GmbH

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 113(1)

**Keyword:**

"Inventive step (yes)"

**Decisions cited:**

-

**Catchword:**

-



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Boards of Appeal

Chambres de recours

Case Number: T 1005/96 - 3.2.6

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.6**  
**of 8 December 1999**

**Appellant:**  
(Opponent)

Widia GmbH  
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**Representative:**

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**Respondent:**  
(Proprietor of the patent)

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**Representative:**

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**Decision under appeal:**

**Decision of the Opposition Division of the  
European Patent Office posted 19 September 1996  
rejecting the opposition filed against European  
patent No. 0 313 534 pursuant to Article 102(2)  
EPC.**

**Composition of the Board:**

**Chairman:**

**Members:** P. Alting van Geusau  
M. Bidet  
R. Menapace



## Summary of Facts and Submissions

- I. The respondent is proprietor of European patent No.0 313 534.

Claim 1 as granted reads as follows:

"Method for chip removing machining, preferably turning or drilling, said method including simultaneous cutting by two separate cutting edges located on the same cutting insert (10), said cutting edges including a main cutting edge (13) carrying out a relatively seen rough machining and a further cutting edge (14) carrying out a relatively seen fine machining, the further cutting edge (14) being located behind the main cutting edge (13) seen in the feeding direction of the cutting insert (10),

characterised in that the cutting depth ( $h_2$ ) of the further cutting edge (14) is in the interval of 0.03 - 0.5 mm, and that said further cutting edge (14) is followed by a clearance surface in feeding direction, said clearance surface having a clearance angle ( $\alpha$ ) in the interval of  $0.25^\circ - 2^\circ$ , said further cutting edge (14) carrying out the final machining."

- II. The patent was opposed by the appellant on the grounds of lack of inventive step (Article 100(a) EPC).

The following state of the art was *inter alia* relied upon:

D2: DE-A-3 109 176

D3: DE-A-2 610 097

D11: EP-B-0 133 168.

III. The Opposition Division rejected the opposition by decision posted on 19 September 1996. It took the view that the subject-matter of claim 1 of the patent as granted differed from the disclosure of D2 in that the further cutting edge was followed by a clearance angle comprised in the interval of  $0.25^{\circ}$  to  $2^{\circ}$  and that it was not obvious to the skilled person to provide such a distinguishing feature in view of the remaining prior art documents and therefore an inventive step was necessary to arrive at the claimed chip removing method.

IV. On 19 November 1996 the appellant (opponent) lodged an appeal against this decision, the appeal fee having been paid the day before.

The statement of the grounds of appeal was filed on 10 January 1997.

During the written proceedings of the appeal the appellant filed the following documents:

D13: US-A-4 552 492 and

D14: Pages 6 and 7 of a catalogue "Drehwerkzeuge" of Sandwick Coromant, published in 1981.

V. In a communication dated 22 November 1999, issued together with the summons to attend oral proceedings, the Board expressed the provisional opinion that, when

comparing the subject-matter of claim 1 of the patent in suit with the machining methods derivable from documents D2 or D11, the distinguishing feature appeared to be that the further cutting edge was followed by a clearance surface having an angle in the interval of  $0.25^{\circ}$  to  $2^{\circ}$ , as was referred to by the Opposition Division. However, a clearance interval of  $0.25^{\circ}$  to  $2^{\circ}$  appeared to be implied by the cutting insert disclosed in D11.

It was also noted that document D13, cited for the first time during the appeal proceedings, appeared to be less relevant than the above cited prior art documents, so that the Board intended to disregard it pursuant to Article 114(2) EPC.

VI. Oral proceedings took place on 8 December 1999. As announced with letter of 5 November 1999, the appellant did not appear. In accordance with the provisions of Rule 71(2) EPC the oral proceedings were held in the absence of the appellant.

VII. The appellant (opponent) requested that the decision under appeal be set aside and the patent be revoked in its entirety.

The arguments submitted in support of that request can be summarised as follows:

When compared to the method for chip removing machining derivable from D2, the subject-matter of claim 1 was novel in that the clearance surface of the further cutting edge had a clearance angle between  $0.25^{\circ}$  to  $2^{\circ}$ .

However, considering the technical problems involved in the known machining method, it was clear that a reduction of friction was completely independent of the specific value of the clearance angle ( $\alpha$ ) since any selected clearance angle avoided contact of the area of the cutting insert lying behind the cutting edge with the workpiece. Therefore, any angle greater than  $0^\circ$  would have met the above condition and therefore reduction of friction was not limited to the claimed ranges.

Consequently, no inventive step could be seen in the selection of a specific clearance angle range.

Furthermore, although the cutting inserts known from D2 or D3 did not have a clearance angle within the meaning of the patent in suit, the skilled person wanting to obviate the drawback arising from the friction of the clearance surface edge with the machined part of the workpiece, would find in document D11 a cutting insert with two separate cutting edges located on the same insert and that because of the round nosed second cutting edge an increasing clearance angle was present behind the cutting edge. Applying this teaching to the cutting insert of D2 or D3 would be an obvious choice to the skilled person, so that also for this reason the subject-matter of the granted claim 1 lacked an inventive step.

VIII. The respondent (patentee) contested the appellant's arguments and requested dismissal of the appeal.

The claimed method led to reduced tool wear and improved surface finish by the claimed combination of

features, in particular the combination of the selected cutting depth and the clearance angle.

Due to the workpiece material elastically springing back behind the cutting nose, generally the clearance angle was chosen to be much larger than 2°- typically more than 7°- to avoid any contact of the clearance surface with the workpiece.

The insert disclosed in D2 did not have a clearance angle at all and this resulted from the specific use for machining rods or bars with very large lateral feeding movements. In view of the specific use of the insert, D2 did not suggest any other clearance angle value.

D3 in fact showed in the drawing a typical clearance angle of 7° or more, whereas D11 did not have a clearance surface at all. The late cited D13 only related to a cutting insert for dividing the chips and thereby diminishing the risk for vibrations.

Therefore, the combination of claimed method steps was neither disclosed in, nor suggested by the available documents and thus an inventive activity was necessary to arrive at the subject-matter of claim 1 of the patent in suit.

## **Reasons for the Decision**

1. The appeal is admissible.



2. *Late filed documents*

2.1 The appellant introduced D13 essentially in support for the allegation that the claimed value of the cutting depth was known in connection with cutting inserts having main and secondary cutting edges. However, D13 concerns an insert for simultaneously removing a plurality of chips thereby improving chip disposal and at the same time reduces chatter. It neither relates to the particularities of rough and fine machining with the same insert nor to the problems of cutting depth and clearance angle involved in the present patent.

Therefore, as was already noted in the communication dated 22 October 1999, the Board disregards this late filed document pursuant to the provisions of Article 114(2) EPC because of lack of relevance.

2.2 Pages 6 and 7 of the catalogue (D14) Sandwick mentioned under section IV were filed to support the anticipation of a specific feature of an auxiliary request which was no longer relied upon by the respondent during the oral proceedings.

Also this document is disregarded pursuant to the provision of Article 114(2) EPC, because of lack of relevance.

3. *Novelty*

After examination of the cited prior art, the Board is satisfied that the subject-matter of Claim 1 is novel. Since novelty has not been in dispute during the opposition and appeal proceedings there is no need to

expand in detail on this matter.

4. *Inventive step*

4.1 Document D3 acknowledged in the introductory part of the European patent in suit is considered the most suitable starting point for the assessment of inventive step. According to this document a main cutting edge is separated from a further cutting edge, both cutting edges being located on the same cutting insert. The main cutting edge carries out a rough machining. The further cutting edge located behind the main cutting edge in the feeding direction of the cutting insert simultaneously carries out a fine machining with a curve-nosed cutting corner. This corner is followed by a straight part (20) of the further cutting edge having a length greater than the value of the lateral feeding movement. This straight part (20) of the further cutting edge, extending parallel to the feed direction (or parallel to the axis of rotation of the workpiece) is intended to only remove the peaks that are created by the rough machining.

Consequently, there is neither a clearance angle at this straight part (20) following the curved nose of the further cutting edge, nor any further cutting depth setting because in the areas between the peaks the further cutting edge mainly carries out a polishing function. In so far a clearance angle is shown this concerns the extension indicated by reference numeral 21 in Figure 1 of D3.

4.2 The drawback of this kind of further cutting edge is that the straight part of the cutting edge lying

parallel to the axis of rotation generates heat to a greater extent than a true cutting action and consequently negatively affects the life of the cutting insert.

Consequently, starting from this prior art document, the technical problem to be solved by the present invention is to provide a method which overcomes this disadvantage by preventing the friction on the machined surface and in which the method simultaneously carries out rough and fine chip removing machining.

This problem is solved by the features stated in claim 1.

- 4.3 As was submitted by the respondent during the oral proceedings, cutting a workpiece involves a mechanical cutting and deformation process resulting from the penetration of the cutting edge into the workpiece material. This creates in the front of the nose of the cutting edge a primary shearing zone forming the actual area of the formation of chip. In a secondary shearing zone located before the cutting surface and at the clearance surface immediately following the nose of the cutting tool in the feed direction, friction forces are applied between the tool and the workpiece which plastically and elastically deform the workpiece. At the clearance surface immediately following the nose of the tool, the workpiece material springs back due to the pressure release in this area. The Board follows the respondent in that such behaviour of the workpiece material is well-known to the skilled person.

On the basis of this knowledge, a plastically and at

the same time resiliently deformed zone of the workpiece is thus created after the nose of each cutting edge of the cutting insert according to the preamble of claim 1 based on the prior art disclosed in D3. At the nose of the cutting edge, at the beginning of the free cutting angle the resilient zone of the workpiece springs back to a released state since there is no longer a cutting force or friction force working on the material. In accordance with the explanation provided by the respondent usually a large clearance angle (more than 7°) from the nose is chosen to avoid the material that has sprung back coming into contact with the cutting nose extending on the clearance surface. If, on the contrary, there is no clearance angle, the edge of the clearance surface lying behind the cutting nose remains in contact with the machined surface, so that high friction is induced. Between these limits, the invention as defined in the method of claim 1 shows that an additional cutting step at the very beginning of the clearance surface takes place when both the further cutting depth and the clearance angle of the clearance surface are in the intervals specified in the characterising part of claim 1.

- 4.4 The main issue arising in the present case is whether the subject-matter of claim 1 is inventive over the teachings of the prior art disclosed in documents D2, D3 and D11.

The appellant argued that any clearance angle greater than 0° would avoid the drawback due to the friction so that there is no inventive step in claim 1 in view of D2 alone. Furthermore, he submitted that no exercise of inventive skill would have been required by combining

the known cutting insert according to Figure 5 of D2 or of Figure 1 of D3 with a clearance angle according to the insert disclosed in Figure 2 of D11.

- 4.5 Document D2 shows in Figure 5 a method in which a bar peeling insert is provided with two main cutting edges and corresponding two second cutting edges. The distance  $b$  - representing the cutting depth  $h_2$ - between the main cutting edge and its associated second cutting edge is determined by the relationship  $b = 0.1 \text{ to } 0.5 + K$ , in which the  $K$  value is a function of the hardness of the material as shown in Figure 6.

In view of the intended use of this known insert, the skilled person using this cutting insert would not choose a small cutting depth -for instance 0,15 mm- for which the hardness value is very high -about 340 HV because such conditions would lead to unnecessary wear of the second cutting edge. On the contrary, in view of the graph according to Fig.6, he would choose a  $K$  value falling within the zone defined as not being hardened ("unverfestigte Zone"), namely the part of the graph for which the  $K$  value is above 0.4 mm. The consequential  $b$  value is in the interval of 0.5 to 0.9 mm, which is fully outside the claimed interval.

Furthermore, the second cutting edge is parallel to the axis of the workpiece, so that the clearance value is  $0^\circ$ . There are no suggestions derivable from D2 to change the position of the cutting edge since it is essential that the second cutting edge be parallel to the axis of rotation in order to obtain a finished smooth surface (see page 5, penultimate paragraph) when applying the intended large lateral feeding movement.

Therefore, since the cutting conditions according to D2 are completely different from those of the patent in suit, there is no lead to either select the cutting depth or the clearance angle within the ranges claimed.

4.6 The same applies to the teaching of D3 according to which, as mentioned in section 3.1, the further cutting edge must be parallel to the axis of rotation of the workpiece in order to remove the peaks created by the rough machining of the main cutting edge.

4.7 D11 discloses a cutting insert for length turning, inwards turning and outwards transversal turning with a main cutting edge, a minor cutting edge and a transversal turning edge. The transversal turning edge is arranged to cut and break coarse but short chips and the main cutting edge is at the same time arranged to cut fine and continuous chips to obtain a good surface fineness during the transversal turning operation.

However, there is no specific cutting depth or the value of a clearance angle derivable from this document. There is therefore no hint regarding the values specified in the characterising part of claim 1.

4.8 Furthermore, because of the different uses as intended respectively, the skilled person had no reason to combine teaching of the documents D2, D3 or D11. However, even if the skilled person had thought of combining an insert according to Figure 1 of D3 or Figure 5 of D2 with the Figure 2 of D11, he would not have arrived at the subject-matter of the patent in suit because no suggestions are derivable from either D2 or D11 in respect of a particular combination of

cutting depth and clearance angle values leading to improved conditions for the additional cutting operation when taking account of the release of material at the beginning of the clearance surface.

- 4.9 The other documents cited but no longer relied upon by the appellant do not disclose more than what was already known from D3, D2 or D11 and therefore the Board sees no reason to discuss these citations in detail.
- 4.10 The appellant further argued that any clearance angle of the second cutting edge on the right side point (17) of the clearance surface greater than  $0^\circ$  would be enough to perform the claimed method. There would be no more friction of the cutting edge on the workpiece.

It is true that when applying clearance angles greater than  $2^\circ$  there will be no more friction in the insert according to claim 1. However, as was convincingly argued by the respondent, in the small clearance interval according to claim 1, a fine cutting step takes place which, in view of the resilient behaviour of the workpiece material provides a better quality of the machined surface.

5. The present decision was based on evidence known and dealt with in the written proceedings. The explanations given by the appellant during oral proceedings on the plastic and resilient deformation of the workpiece in the cutting area and the action at the very beginning of the clearance surface during cutting, are thus also based on facts and evidence which have already been put forward during the written procedure. More

particularly, they support the argument submitted in response to the statement of grounds of appeal, that the claimed interval 0.25° to 2° was the most appropriate to achieve a fine surface finishing without generating friction, so that they do not constitute new grounds or evidence to which the appellant had not had an opportunity to present his comment. In these circumstances, and in line with the decision of the Enlarged Board of Appeal G 4/92 (OJ 1994, 149), the requirements of Article 113(1) EPC are satisfied even if the appellant, chose not to appear at the oral proceedings.

6. Summarising, the subject-matter of the method according to claim 1 of the patent as granted involves an inventive step (Article 56 EPC).

The Board concludes that the grounds for opposition pursuant to Article 100 EPC do not prejudice the maintenance of the European patent as granted.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



M. Patin

P. Alting van Geusau