**BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS**

**BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE**

**CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS**

**Internal distribution code:**
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

# D E C I S I O N
# of 23 March 1999

**Case Number:** T 0755/95 - 3.2.2

**Application Number:** 87850205.3

**Publication Number:** 0257004

**IPC:** B23B 27/06

**Language of the proceedings:** EN

**Title of invention:**
Turning insert

**Patentee:**
Sandvik Aktiebolag

**Opponent:**
Widia GmbH

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 84, 56

**Keyword:**
"Inventive step (yes)"

**Decisions cited:**
-

**Catchword:**
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 0755/95 - 3.2.2

**D E C I S I O N**
**of the Technical Board of Appeal 3.2.2**
**of 23 March 1999**

**Appellant:** (Proprietor of the patent)
Sandvik Aktiebolag
811 81 Sandviken (SE)

**Representative:**
Dr W. Lieke
Gustave-Freytagstrasse 25
65189 Wiesbaden (DE)

**Respondent:** (Opponent)
Widia GmbH
Münchener Strasse 90
45145 Essen (DE)

**Representative:**
Vomberg, Friedhelm, Dipl.-Phys.
Schulstrasse 8
42653 Solingen (DE)

**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office posted 17 July 1995 revoking European patent No. 0 257 004 pursuant to Article 102(1) EPC.**

**Composition of the Board:**

**Chairman:** W. D. Weiß
**Members:** M. Bidet
C. Holtz

## Summary of Facts and Submissions

I. The appellant is proprietor of the European patent No. 0 257 004.

II. The patent was opposed by the respondent on the grounds of Article 100(a) EPC (lack of an inventive step). The opposition division revoked the patent in a decision dispatched on 17 July 1995, because, having regard to the documents

D1: US-A-3 705 447 (cited in the patent in suit)

D2: DE-A-2 845 211

D3: EP-A-0 152 729

D10: DE-C-2 518 395

D14: Hertel-Katalog 3500-3

the claimed invention as granted lacked an inventive step.

III. On 6 September 1995, the appellant (patent proprietor) filed an appeal and paid the fee for appeal. The statement of grounds was filed on 22 November 1995.

IV. Oral proceedings took place before the Board on 23 March 1999, during which the appellant filed a new request, Claim 1 of which reads as follows:

"A turning insert for parting and grooving comprising plane-parallel side surfaces (11,12) an upper and a

lower longitudinally extending surface (13, 14) a cutting portion (18), a front end surface (16) in the front end of the insert, a rear end surface (15) in the rear end of the insert, said side surfaces connecting to said longitudinally extending surfaces and said end surfaces, said cutting portion (18) carrying a cutting edge (19) defined by the intersection of a rake face end and a clearance face (21) of the insert, the cutting edge (19) being arched and having a diameter (D) which exceeds the perpendicular distance (t) between the side surfaces (11, 12), wherein a stop means (17) is arranged between the cutting portion (18) and the upper longitudinally extending surface (14), said stop means projecting relative to a plane (P) defined by the cutting edge (19), that the cutting edge (19) has identical curvature along its entire length, the ends of said cutting edge connecting to lines of intersection between the side surfaces (11,12) and the rake face in front of said stop means (17), and in that the rake face is provided with a chip forming device (20) arranged radially inside the cutting edge which device has a mainly circular shape, wherein the diameter (D) of the cutting edge (19) is 1 to 75% larger than the distance (t) between the side surfaces (11,12), preferably 10 to 40% larger and in that the cutting edge (19) describes a curve defined by an angle of at least 200 degrees, preferably of at least 220°."

V. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 to 7 submitted at the oral proceedings of 23 March 1999 and the description and drawings as granted.

The respondent requested that the appeal be dismissed.

VI. The appellant, in its written submission and at the oral proceedings, presented the following arguments:

The amendment made to Claim 1 met the requirements of Article 123(2) and (3) as well as Article 84 EPC.

As disclosed in document D10, the circular insert according to Figures 1 and 2 had a diameter which was identical to the distance (t) (thickness of the cassette or holder carrying the insert). For this reason, there was no possibility to use any cutting edge during outward movement of the insert. Small pockets provided on the sides of the insert were not suited for deeper grooving operations since the lower parts of the cassette would have contacted the surface of the groove cut by further feeding the insert. Deeper grooving would then only be obtained by changing the circular insert for the second insert according to Figures 3 and 4 which widened the groove attained by the circular insert according to Figures 1 and 2. Since two inserts were needed for parting a work piece, there was not disclosure in document D10 of a (single) turning insert for parting and grooving according to Claim 1. Consequently, document D10 did not disclose the type of insert referred to in the patent in suit.

Document D1 disclosed a single insert with the same result as D10. To this purpose the round cutting edge according to document D1 extended over an angle of 200 degrees, had a diameter larger than the distance t of the side surfaces of the body portion of the insert. These features provided for a clearance between the

wall of the groove and the side surfaces of the insert during deeper grooving or parting and enable the rear portion of the cutting edge to groove radially outwardly. However, the straight segment of the cutting edge resulted in a tendency to vibrations and, due to the geometrical shape at the junction with the arcuate segment, in a weakening of the turning insert. This document disclosed the features which were in the preamble of Claim 1 of the patent as granted and therefore, represented the closest prior art.

Document D3 was not pertinent as far as inventive step was considered, since it related to the problem of clamping a cutting tool to a holder body - including the use of a stop means. Consequently its object was different of that of the patent in suit and it did not disclose the structure of the cutting insert or cutting edges.

Since the turning insert according to Claim 1 of the patent in suit had a cutting edge which was circular, had curvature which was identical along its entire length extending over an angle of at least 200 degrees, and comprised the stop means and a chip forming device the subject-matter of Claim 1 involved an inventive step in view of the above prior art.

VI. The respondent (opponent) argued as follows:

Claim 1 was not allowable on the ground of lack of clarity arising from a discrepancy between the minimal value of the diameter (D) of the cutting edge and the minimal value of the cutting edge (200 degrees), because, having a diameter of 1% larger than the

distance (t) between the side surfaces (thickness of the insert), it was mathematically not possible to have a curve with an angle of at least 200 degrees.

As regards inventive step, document D10 was the most relevant document, since it described a circular cutting edge for grooving extending from the two pockets or side surfaces 2. The cutting edge had an identical curvature along its entire length. The requirement of novelty was met by the provision of the stop means and the chip forming device at least. The cutting edge always protruded from the two parallel side surfaces 2 so that the insert was able to work the walls of the groove by reverse feed. It was within the general knowledge of the skilled person to determine the dimension of the cutting edge.

The problem to be solved was therefore to provide such an insert with a good chip control independently of the feed direction. The solution without departing from the usual knowledge of the skilled person consisted merely in the provision of a chip forming device which was well known from document D14, page 7 (under the reference RCMM-63) and in the turning tool having a circular cutting edge which corresponded to that of document D10.

The skilled person would also have arrived at the turning insert according to Claim 1 by the teaching of documents D1 (if taken as the nearest prior art) and D14 (leaving a circular cutting edge).

## Reasons for the Decision

1. The appeal is admissible

2. *Amendments*

The subject-matter of Claim 1 is based on the combination of the features of Claims 1 and 4 of the patent as granted. The subject-matter of Claim 4 is that of Claim 4 of the application as filed. Moreover, the scope of Claim 1 as granted is now restricted by the introduction of the added features. Consequently, the amendments meet the requirements of Articles 123(2) and (3) EPC.

These added features relate firstly to the diameter of the cutting edge being 1 to 75% larger than the distance (t) between the side surfaces of the insert and secondly to the angle of the curve described by the cutting edge being of at least 200°. Measurement of the distance (t), the diameter (D) of the curved cutting edge of the insert as well as the curve angle and calculations of the percentage of protrusion of the cutting edge over the side surfaces are readily obtainable. Since the two added features have to be fulfilled for each insert, only the inserts having the percentage value **and** the angle value within the two claimed ranges are within the scope of Claim 1 and as mentioned above the insert claims are clearly and easily determined. Claim 1 is therefore also clear as required by Article 84 EPC.

3. *Novelty*

After examination of the cited prior art, the Board reaches the conclusion that the subject-matter of Claim 1 is novel. Since novelty of the subject-matter was not disputed in the proceedings, it is not necessary to give detailed reasons for this finding.

4. *Inventive step*

4.1 The patent in suit relates to an insert which is able to perform a plurality of turning operations having different feed directions such as by transversal and longitudinal machining followed by reverse transversal machining during grooving.

4.2 Of all the cited documents, only document D1 relates to an insert (curved cutting edge) of the type above. This insert for parting (and grooving) comprises plan-parallel side surfaces, an upper and a lower longitudinal extending surface, a front end surface in the front end of the insert, and a rear end surface in the rear end of the insert. The side surfaces connect the longitudinally extending surfaces and the end surfaces. A cutting portion carrying a cutting edge is defined by the intersection of a rake face and a clearance face of the insert. The arched cutting edge has a diameter (D) which exceeds the perpendicular distance (t) between the side surfaces. The ends of the cutting edge connect the lines of intersection between the side surfaces and the rake face. The diameter (D) of the cutting edge is larger than the distance (t) of the side surfaces and the curved part of the cutting edge describes angle up to 220°.

However, the cutting edge of this known insert includes - in continuation of the semicircular cutting edge for usual inward transversal machining - an arcuate segment and a straight segment for machining in the reverse outward transversal direction.

4.3 Consequently, the insert according to Claim 1 differs from that disclosed in document D1 by a cutting edge with identical curvature along its entire length, by a stop means arranged between the cutting portion and the upper longitudinally extending surface, by a chip forming device of circular shape and by the geometrical ranges relating to the percentage of extension of the diameter of the cutting edge over the distance (t) of the side surfaces and relating to a value of at least 200° of the angle of the cutting edge.

4.4 The straight segment provided in the cutting edge of the known turning insert of D1 forms an angle of inclination varying within a range 22° to 45° with the line of retrograde movement of the insert. This creates a discontinuity at its junction with the arcuate segment and provides for a constant value of the setting angle of the straight cutting edge. At that junction, the sharp edge weakens the insert and causes scratches on the machined surface. With the constant value of the setting edge, for a same feed, the forces on the straight segment are higher than that on the arcuate segment during rearward feed direction, which results in vibrations.

There is therefore a need for a turning insert of the type according to document D1 which performs a plurality of turning operations independently of the

feed directions and for which a better machined surface is obtained during the retrograde feed direction. The technical problem underlying the patent in suit is thus to provide an insert which avoids the drawbacks of the known insert.

4.5 The solution is given by the features mentioned in the above section 4.3.

With the cutting edge being identical along its entire length on the circular cutting edge, the cross-section of the chip is that of a half crescent moon as compared to the essentially rectangular cross-section of the chip resulting from the straight segment of the known insert. When turning inwardly at a low speed, the stop means facilitates breaking the chips (see column 2, lines 54 to 56). When turning outwardly transversally, the continuously curved cutting edge has a continuously changing setting angle along its curved segment resulting in changes of the chip thickness. The variation of thickness causes a variation of the forces along the cutting edge, which tends to reduce the vibrations during turning, as compared to the constant thickness of chip resulting from the rectangular cross-section of the straight segment according to D1. Due to the cutting edge being identical along its entire length, the sharp edge between the arcuate segment and the straight segment according to document D1 is avoided and not only the weakening effect is reduced, but a further effect relying on a machined surface having a smoothness better than that obtained by the straight segment is expected.

4.6 Document D10 discloses two cutting inserts, one

(Figures 1 and 2) with a circular cutting edge having a diameter equal to the thickness of the support element and a second one (Figures 3 and 4) having a prismatic form, the width of which is larger than the diameter of the first insert. The cutting edges of these two inserts are located in the front surface for grooving. The insert according to Figures 1 and 2 does not protrude from the side surfaces of the cassette 1. Consequently, there is no turning insert able to groove or to widen the groove by inward and outward transversal feed. Furthermore, the two different inserts have to be used successively to obtain a groove and only one turning operation can be performed by each turning insert.

4.7 Both documents D3 and D2 disclose a cutting edge having a non-circular form on its entire length, and not having a diameter greater than the thickness of the insert in order to turn in a reverse feed direction. According to document D3, the problem to be solved is to provide a well-defined position of the cutting edge and to clamp it with equal clamping forces. The problem according to document D2, is to provide for better removal of the chips and the solution is not based on the provision of a continuous cutting edge with only a circular form.

4.8 Document D14 disclosed only a reversible turning insert having cutting edge all around the circular shape. Even if the skilled person used such reversible insert in a cutting insert according to D10, he would still not arrive at cutting edge able to turn outwardly, since the diameter of the insert according to Figures 1 and 2 disclosed in document D10 as mentioned in the above

point 4.8, is not able to exceed the thickness of the side surfaces. Since the greater length of cutting edge available in these circumstances was 180 degrees, there was no possibility to machine in the outward feed.

5. Since these documents do no point to a circular continuous cutting edge of at least 200 degrees, the subject-matter of Claim 1 is considered to involve an inventive step as required by Articles 52(1) and 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 first instance with the order to maintain the patent in amended form on the basis of Claims 1 to 7, submitted at the oral proceedings, and the description and drawings as granted.

The Registrar: The Chairman:

N. Maslin W. D. Weiß