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**Datasheet for the decision
of 19 April 2016**

Case Number: T 0580/12 - 3.2.08

Application Number: 01926281.5

Publication Number: 1276580

IPC: B23C5/20

Language of the proceedings: EN

Title of invention:

MILLING TOOL

Patent Proprietor:

Sandvik Intellectual Property AB

Opponents:

Iscar Ltd
KENNAMETAL INC.

Headword:

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - main request and 1st auxiliary request - no
Inventive step - 2nd auxiliary request - yes

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0580/12 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 19 April 2016

Appellant: Sandvik Intellectual Property AB
(Patent Proprietor) 811 81 Sandviken (SE)

Representative: WSL Patentanwälte Partnerschaft mbB
Kaiser-Friedrich-Ring 98
65185 Wiesbaden (DE)

Respondent 1: Iscar Ltd
(Opponent 1) P.O. Box 11
IL-Tefen 24959 (IL)

Representative: Vossius & Partner
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

Respondent 2: KENNAMETAL INC.
(Opponent 2) 1600 Technology Way
Latrobe, PA 15650-0231 (US)

Representative: Prinz & Partner mbB
Patent- und Rechtsanwälte
Rundfunkplatz 2
80335 München (DE)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 9 January 2012
revoking European patent No. 1276580 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman M. Alvazzi Delfrate
Members: P. Acton
 D. T. Keeling

Summary of Facts and Submissions

- I. With decision dated 9 January 2012 the opposition division revoked European Patent no. 1 276 580.
- II. The appellant (patent proprietor) filed an appeal against this decision. The notice of appeal and the statements setting out the grounds of appeal were filed within the prescribed time limits and in due form.
- III. Oral proceedings took place before the Board of Appeal on 19 April 2016.

The appellant requested that the decision under appeal be set aside and the patent maintained on the basis of the claims of the Main Request filed with the grounds of appeal or on the basis of the 1st or the 2nd Auxiliary Request both filed at the oral proceedings, or on the basis of the claims of the 3rd Auxiliary Request, filed with letter of 21 March 2016.

Respondents 1 and 2 requested that the appeal be dismissed.

- IV. Independent claim 1 according to the main request reads:

"Milling tool including a body (1) rotatable around a geometrical centre axis (C) and having an envelope surface (4) along which at least one set of tangentially spaced-apart cutting members (5, 5', 5'') is arranged, each one of which having a chip forming edge (8) formed adjacent to a flank surface (10), which edge extends between axially spaced apart ends, whereas the flank surface (10) for at least a first cutting member (5) of said set extends at a first clearance angle (α)

in relation to a conceived tangent line (T) through the edge (8), and in that the flank surface (10) for the other cutting member or members (5', 5'') of the set extend at a second clearance angle (β), which is smaller than said first clearance angle (α)

characterized in, that

the first clearance angle (α) is within the range of 5-25° and the second clearance angle (β) is within the range of 0.5-5°."

Independent claim 3 according to the main request is not relevant for the present decision.

Independent claim 4 according to the main request reads:

"Milling tool including a body (1) rotatable around a geometrical centre axis (C) and having an envelope surface (4) along which at least one set of tangentially spaced-apart cutting members (5, 5', 5'') is arranged, each one of which having a chip forming edge (8) formed adjacent to a flank surface (10), which edge extends between axially spaced apart ends, whereas the flank surface (10) for at least a first cutting member (5) of said set extends at a first clearance angle (α) in relation to a conceived tangent line (T) through the edge (8), and that the flank surface (10) for the other cutting member or members (5', 5'') of the set extend at a second clearance angle (β), which is smaller than said first clearance angle (α)

characterised in that

the individual cutting member (5) having the larger clearance angle (α) has the cutting edge (8) thereof situated at a larger radial distance (L) from the centre axis (C) of the milling body than the other cutting member or members (5', 5")."

Independent claim 5 according to the main request reads:

"Milling tool including a body (1) rotatable around a geometrical centre axis (C) and having an envelope surface (4) along which at least one set of tangentially spaced-apart cutting members (5, 5', 5") is arranged, each one of which having a chip forming edge (8) formed adjacent to a flank surface (10), which edge extends between axially spaced apart ends, whereas the flank surface (10) for at least a first cutting member (5) of said set extends at a first clearance angle (α) in relation to a conceived tangent line (T) through the edge (8), and that the flank surface (10) for the other cutting member or members (5', 5") of the set extend at a second clearance angle (β), which is smaller than said first clearance angle (α)

characterised in that

the number of cutting members (5) having the maximum clearance angle (α) is smaller than the number of cutting members (5', 5") having the smallest clearance angle (β)."

The 1st auxiliary request comprises only two independent claims: Claim 1 and claim 2. Claim 1 differs from claim 1 according to the main request in that the characterising portion has been replaced by the feature according to which:

"the first clearance angle (α) is within the range of 7-15°, and the second clearance angle (β) is within the range of 1-4°".

Independent claim 2 of the 1st auxiliary request is the same as independent claim 4 according to the main request.

The 2nd auxiliary request comprises only one independent claim, which is the same as claim 4 of the main request.

The 3rd auxiliary request is not relevant for the present decision.

V. The appellant's arguments on the points relevant to the present decision can be summarised as follows:

(a) Main request

Claim 1 - novelty

D1 did indeed disclose the preamble of claim 1 but not its characterising portion. No explicit values of the angles were cited in the description and since Figure 16 could not be considered a technical drawing but was just a diagrammatic representation, no values could be derived from it either.

Hence the subject-matter of claim 1 was novel.

Claim 1 - inventive step

D1 disclosed a milling tool specifically aimed at reducing the vibrations caused by the resonance of the

system consisting of the face milling cutter and the machine tool. This was achieved by using cutting members with different clearance angles.

In contrast, the invention underlying the patent in suit dealt with the reduction of vibrations caused by the impact of every single cutting member. The problem was solved by the provision of cutting members with such small clearance angles that the flank of the cutting member remained in contact with the machined material, damping the vibrations and giving the tool the required stability (see [0016]).

Admittedly, clearance angles in the range of 5 to 25° were commonly used for milling tools, but this was not the case for clearance angles in the range of 0.5° to 5°. D3 disclosed angles in the range 0° to 3°. However, these values referred to angles of the cutting tool itself and not those of the cutting tool as inserted in its pocket, i.e. the clearance angles. Hence, contrary to the respondents' submissions, D3 did not disclose clearance angles in the claimed range. Therefore, the choice of clearance angles in the range of 0.5° to 5° implied an inventive activity.

Claim 4

The invention underlying D1 aimed at reducing vibrations by distributing the forces uniformly on all cutting members and achieved this by adopting cutting members with cutting edges lying all on the same circumference. Since positioning the cutting edges on different circumferences led to unequally distributed forces, it would go against the teaching of D1 to position the cutting edges on different circumferences as required by claim 4.

Hence the subject-matter of claim 4 involved an inventive activity.

Claim 5

Using a higher number of cutting members with the smallest clearance angle than of those with the maximum clearance angle led to an increased stabilisation of the milling tool. It was not obvious, starting from D1, which disclosed an equal number of cutting members with the maximum clearance angle and with the smallest clearance angle, to modify the respective number of cutting members.

Hence the subject-matter of claim 5 involved an inventive activity.

(b) 1st auxiliary request

Since the claimed range of angles was narrower than that of claim 1 of the main request, claim 1 of the 1st auxiliary request involved even more an inventive activity.

(c) 2nd auxiliary request - Admissibility

The request was limited to the claims held allowable by the Board during the oral proceedings and should be admitted into the proceedings.

VI. The respondents' arguments on the points relevant to the present decision can be summarised as follows:

(a) Main request

Claim 1 - novelty

D1 disclosed not only the preamble of claim 1 but also the range of angles as defined in the characterising part. Figure 16 represented a technical drawing because it was drawn with a technical drawing program; hence angles could be measured directly from it. The measured values were 12° and 4.5° respectively and fell in the claimed range so that the subject-matter of claim 1 was not novel.

Claim 1 - inventive step

It was not proven that the specific choice of the claimed clearance angles led to an additional technical effect with respect to that obtained just by using different not further specified clearance angles for different cutting members as disclosed by D1.

Not only was the claimed range of 0.5 to 5° broad, but - as disclosed in D3, page 5, lines 2 to 4 in combination with page 6, line 26 - the use of such small clearance angles had already been suggested in order to damp vibrations. Hence the claimed values represented an arbitrary choice which could not motivate an inventive activity.

Claim 4

Starting from the cutting tool with cutting members having different clearance angles of D1 there were only

two possibilities for locating them with respect to the centre axis, namely either providing all cutting edges on one and the same circumference or on different circumferences. Hence, choosing one of the two alternatives could not motivate an inventive activity.

Moreover, the broad wording of claim 4 did not specify how big the difference in distances from the centre axis was supposed to be. Hence it could not be assumed that a technical effect could be derived from the different radial positions of the cutting edges.

Furthermore, since the different clearance angles for cutting members were achieved by "tilting" the pockets containing the cutting members, different positions of the cutting edges with respect to the centre axis of the milling body were obtained automatically and could not motivate an inventive activity.

Finally, positioning the cutting edges on different circumferences was trivial also because it was known to do so with cutting and finishing members mounted on the same milling tool.

Hence the subject-matter of claim 4 did not involve an inventive activity.

Claim 5

No technical effect of the claimed choice of relative number of cutting members was proved in the patent in suit. Hence the claimed ratio between the number of cutting tools with the smallest clearance angle and those with the maximum clearance angle was to be considered as an arbitrary choice between a limited

number of alternatives and the subject-matter of claim 5 did not involve an inventive activity.

(b) 1st auxiliary request

Since there was no proof of a technical effect of the choice of angles according to claim 1 of the 1st auxiliary request either, this claim likewise did not involve an inventive activity.

(c) 2nd auxiliary request - Admissibility

This request should not be admitted into the proceedings since it was late filed.

Reasons for the Decision

1. Main request

1.1 Claim 1 - Novelty

It was undisputed that D1 disclosed all features of the preamble of claim 1.

Respondent 1 submitted that specific values of the clearance angles could be derived from the drawings of D1, since these could be considered to be technical drawings. As the values of the measured angles lay in the claimed range, the subject-matter of claim 1 was not novel.

Normally, dimensions obtained merely by measuring a diagrammatic representation in a document do not form part of the disclosure. It is probably correct that - as stated by respondent 1 - the figures of D1 were

drawn with a technical drawing program. However, they still represent schematic drawings, which were indeed sufficient to indicate the essential elements of the invention but - contrary to scaled construction drawings - were not sufficient to manufacture the product. In such a case no absolute measures can be derived from the drawing, the more so since the measurement of angles from such small illustrations is subject to major measurement errors.

Since the feature of the characterising portion of claim 1 cannot be derived clearly and unambiguously from D1, the subject-matter of claim 1 is novel.

1.2 Claim 1 - Inventive step

1.2.1 As stated above, D1 undisputedly discloses a milling tool with the features of the preamble of claim 1, particularly with different cutting members having different clearance angles. It was further undisputed that the reason for using different clearance angles was the reduction of vibrations.

1.2.2 The appellant argued that while D1 aimed at reducing the vibrations caused by the resonance of the system consisting of the face milling cutter and the machine tool, the invention underlying the patent in suit dealt with the reduction of those vibrations which are caused by the impact of every single cutting member and that it was the specific choice of the smaller clearance angle which allowed a successful dampening.

While the appellant conceded that the use of clearance angles ranging from 5° to 25° is common in the art, he stated that clearance angles in the range 0.5° to 5° were not commonly used and that it was that low value

which allowed the tool's flank to stay in contact with the work-part and hence damp the vibrations.

However, no proof of the alleged effect of the small angles can be found in the patent in suit, nor did the appellant file any document in support of this alleged effect.

Hence the problem to be solved by the claimed range has to be regarded merely as the selection of specific values of the smaller clearance angles for the tool of D1.

- 1.2.3 The appellant argued that the small angles α_1 (0° to 3°) disclosed in D3 were not clearance angles of the cutting member in its working positioning i.e. as mounted in the pockets of the milling tool, but described the geometry of the cutting tool on its own. Depending on the mounting position of the cutting tool, the effective clearance angle could differ from the angles described with respect to the cutting tool. Hence this document could not prove that the use of clearance angles in the claimed range was known in the art.

It is correct that the angles used in D3 define the cutting tool itself and not the cutting tool in the mounted condition. However, it would be unreasonable to assume that the cutting tool was mounted in such a way as to attain a clearance angle which differs from the angle α_1 disclosed in Figure 4. This is particularly the case since D3 describes on page 5, lines 2 to 4 that it is the use of the small angles of the flank surface i.e. the clearance angle in the mounted position, which leads to the reduction of vibrations. If the cutting members were mounted in such a way that

the clearance angle were different from that disclosed in Figure 4 in combination with page 6, line 21, then the whole idea underlying the invention of D3 would fail. Moreover, the last two lines of page 7 explain that in case of shoulder milling the cutting members are positioned at a 90° angle so that both the main and the subsidiary cutting edges are used. In this position the facet angle of the cutting member is the same as the clearance angle in the working position.

Hence D3 discloses indeed clearance angles in the range of 0° to 3° which fall within the claimed range of 0.5° to 5°.

1.2.4 Accordingly, the use of angles with values falling within the range claimed for the smaller clearance angles in order to reduce vibrations was known in the art. Therefore, it was obvious to choose such angles to solve the problem above.

Hence the subject-matter of claim 1 according to the main request does not involve an inventive step.

1.3 Claim 4 - Inventive step

1.3.1 Undisputedly, D1 discloses a milling tool with all the features of the preamble of claim 4. However, in D1 all cutting edges are positioned at the same radial distance from the centre axis of the milling body, i.e. on the same circumference.

1.3.2 The respondents argued that only two possibilities existed for positioning the cutting edges: either all on the same circumference or on different circumferences. Choosing one of the two alternatives could not justify an inventive activity.

The damping activity as described in D1 is based on the uniform distribution of the forces amongst all cutting members. This is possible only if all cutting members and their cutting edges are positioned on the same circumference, i.e. have the same radial distance from the centre axis. Since placing the cutting edges on different circumferences leads to forces unequally distributed amongst the different cutting members, the skilled person would not depart from the arrangement shown in D1, since it is contrary to the very principle underlying the invention claimed in D1.

Hence, even if no technical effect has been proven, the claimed position of the cutting edges is a non-obvious change of the milling tool geometry of D1 which is sufficient to justify an inventive activity.

- 1.3.3 The respondents further argued that since different clearance angles for the different cutting members were obtained by "tilting" the pockets containing the cutting members, the provision of different clearance angles led automatically to different distances of the cutting edges with respect to the centre axis as required by claim 4.

This statement, however, has no basis either in D1 or generally in the underlying technical field. Given the same cutting member, different clearance angles can indeed be obtained by changing the inclination of the pockets where they are inserted. However, there is no reason to "tilt" the pockets around one of their two edges, thereby changing the position of the cutting edge. Rather the skilled person would normally aim at keeping the cutting edges in the same position and would build the pockets accordingly.

Moreover, it is also possible to obtain different clearance angles by providing cutting members of different types which are mounted in identically formed and placed seats as disclosed in column 5, lines 37 to 40 of the patent in suit.

1.3.4 It is correct that normally the cutting edges of cutting members and finishing members are disposed on different circumferences. However, the respondents could not provide any convincing arguments why the skilled person would apply the teaching relating to a milling tool with two different types of inserts to another which is provided only with cutting members.

1.3.5 For these reasons, the subject-matter of claim 4 according to the main request involves an inventive activity.

1.4 Claim 5 - Inventive step

The characterising part of claim 5 requires that "the number of cutting members (n) having the maximum clearance angle (α) is smaller than the number of cutting members (n' , n'') having the smallest clearance angle (β)".

Given two sets of objects (in the present case cutting members), only three possibilities as to their relative number are possible. Either the number of the objects of the first set is equal to that of the second or it is bigger or it is smaller. D1 does not teach for or against any of these alternatives, which are equally viable. The appellant was not able to prove that the claimed choice had any technical effect, or that it went against the teaching of D1. Hence, the claimed

ratio between the number of cutting members with the maximum clearance angle and the number of those with the smallest clearance angle corresponds to an arbitrary choice amongst a limited number of equally viable options which cannot justify an inventive activity.

2. 1st auxiliary request

Claim 1 of the 1st auxiliary request differs from claim 1 of the main request in that the range of the larger clearance angle is reduced to 7-15° and that of the smaller clearance angles is reduced from 0.5-5° to 1-4°. It is undisputed that clearance angles in the range 7-15° are common in the art. Moreover, as explained above, D3 discloses clearance angles ranging between 0° and 3°. Since this range still broadly overlaps with the claimed range for the smaller clearance angle, the same arguments as set out for claim 1 of the main request apply for claim 1 of the 1st auxiliary request as well. Hence the 1st auxiliary request does not comply with the requirements of the EPC either.

3. 2nd auxiliary request

Auxiliary request 2 was filed during the oral proceedings and as such is late filed. It is limited to one single independent claim which is the same as claim 4 according to the main request and to claims dependent thereon.

Therefore, no new subject-matter has been introduced by this late submission and it does not raise any issue of procedural economy. On the contrary, this request has to be considered as the logical reaction to the opinion

expressed by the Board during the oral proceedings on the independent claims of the main request and its submission could not take the respondent by surprise. Hence the 2nd auxiliary request is admitted into the proceedings.

Since - as stated above - claim 1 of this request is the same as claim 4 of the main request, which was considered to involve an inventive step (see point 1.3 above) and since the dependent claims comply with the requirements of the EPC, this request is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent on the basis of the following documents:
 - Claims 1 to 5 of the 2nd auxiliary request filed at the oral proceedings on 19 April 2016
 - Description, columns 1, 2 and 5 as granted, and columns 3 and 4 as filed at the oral proceedings on 19 April 2016
 - Figures 1 to 3 as granted.

The Registrar:

The Chairman:



C. Moser

M. Alvazzi Delfrate

Decision electronically authenticated