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D E C I S I O N
of 4 July 2005

Case Number: T 0197/03 - 3.2.6

Application Number: 98850133.4

Publication Number: 0982093

IPC: B23D 61/12

Language of the proceedings: EN

Title of invention:
Saw blade and tooth configuration

Applicant:
Håkansson, Bengt Erik William, et al.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - yes, after amendment"

Decisions cited:

-

Catchword:

-

Case Number: T 0197/03 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.2.6
of 4 July 2005

Appellant:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted 19 August 2002
refusing European application No. 98850133.4
pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P. Alting van Geusau
Members: G. Pricolo
K. Garnett

Summary of Facts and Submissions

- I. European patent application No. 98 850 133.4 published under No. 0 982 093 was refused by the Examining Division by decision posted on 19 August 2002.
- II. The Examining Division held that the subject-matter of claim 1 as originally filed differed from the saw blade disclosed by:
- D1: WO-A-96/05931;
- only in that it was a "band" saw blade. The use of the tooth structure according to D1 in a band saw blade would be obvious for a skilled person and therefore the subject-matter of claim 1 did not involve an inventive step. Claim 1 according to the applicant's auxiliary request additionally defined the tooth edge as extending in a straight line. However, this additional feature did not solve any technical problem and thus did not make the claimed saw blade inventive.
- III. On 16 October 2002 the appellant (applicant) lodged an appeal against this decision, paid the prescribed appeal fee and filed the statement setting out the grounds of appeal on the same day.
- IV. In a first communication dated 9 October 2003, the Board informed the applicant that in respect of the main request the decision of the Examining Division appeared to be correct, and that in respect of the auxiliary request the introduction in claim 1 of the feature that the tooth edge extended in a straight line appeared to contravene Article 123(2) EPC.

V. In its letter of reply dated 1 December 2003, the applicant withdrew the main request and filed a second auxiliary request.

VI. In a second communication dated 7 April 2005, which was annexed to the summons for oral proceedings, the Board drew the applicant's attention to the fact that document

D2: US-A-1 649 864,

appeared to be relevant for the claimed subject-matter because it disclosed a band saw blade having knife edges similar to those of the band saw blade according to the present patent application.

VII. Oral proceedings took place on 4 July 2005.

The applicant filed a new set of claims together with a revised description and corrected figures, and requested that the decision under appeal be set aside and that a patent be granted on the basis of the application documents as filed during oral proceedings.

VIII. Claim 1 reads as follows:

"1. A band saw blade with teeth having a tooth point with a tooth edge (E1, E2), a tooth face on the front side of the tooth as viewed in the direction of sawing, a tooth back behind the tooth edge, and a tooth bottom between the tooth face on each tooth and the tooth back on the next tooth in front of said each tooth, and tooth gullets, wherein a tooth gullet (G1, G2) is

defined as the space between the tooth edges of two adjacent teeth, said saw blade having two planar sides; a right hand side (R) and a left hand side (L) when the saw blade is viewed obliquely from above in the direction of sawing, wherein said tooth edge (E1, E2) extends between a right hand tooth corner (A1, A2) and a left hand tooth corner (B1, B2) with reference to said viewing direction, wherein the saw blade within a region of a first tooth gullet between the tooth edge (E1) of a first tooth (T1) and the tooth edge (E2) of the next tooth (T2) in front of said first tooth is bevelled at an obtuse angle towards the left hand side (L) of the saw blade, forming a bevelled region with a sloping surface (S1), said bevelled region with said sloping surface (S1) extending from a first tooth edge (E1) in the rear end of the first tooth gullet, downwards the tooth face and to at least the tooth bottom, said region being bordered to the right by a first line (K1) which extends from a rear foot point defined by the right hand tooth corner (A1) on the first tooth edge (E1) or by a point (A1') on the first tooth edge, which point is nearer the right hand tooth corner (A1) than the left one (B1), to a front foot point (C,C') which borders on the left hand side of the saw blade in the region of the first tooth gullet or is a point on the tooth edge (E2) on the next tooth (T2) in front of said first tooth, thereby forming a first longitudinal knife edge (X1) starting from the rear foot point, and said region being bordered to the left by the border line against the left planar side of the saw blade, and forwards by said first line (K1) and/or by the tooth edge (E2) of said next tooth (T2) when the front foot point of said first line lies on said next tooth edge; that the saw blade, within a region of a

second tooth gullet (G2) between a second tooth and a next tooth in front of said second tooth is bevelled in the same way as in the first tooth gullet but instead to the right, thereby forming a second longitudinal knife edge (X2) starting from the rear foot point, and that the saw blade within the region of first and second tooth gullets between first or second teeth, on one hand, and teeth in front thereof, on the other hand, along the length of the saw blade are bevelled in the said mode alternately to the left and to the right in said first and second tooth gullets."

IX. The arguments of the appellant in support of its request can be summarized as follows:

Document D2, which represented the closest prior art, disclosed a band saw blade in which the bottom of the tooth gullet was not bevelled. In order to solve the problem underlying the patent application, consisting of providing a band saw blade which sawed very silently, did not give rise to inconvenient vibrations, gave surfaces having a good smoothness and thin, material saving kerfs, it was essential to provide a bevelled region extending at least to the tooth bottom. Indeed, the bevelled surface of the saw blade according to claim 1 provided a kind of a passage on the opposite side of the "knife edge" that allowed saw dust to exit rearwardly and downwardly in a smooth manner away from the gullet, thereby surprisingly totally eliminating vibrations when in use. D1, which generally related to saw blades but was silent about band saw blades, did not teach another feature essential for solving the above-mentioned problem, namely the provision of teeth

with longitudinal knife edges. Finally, the teaching of document

D3: WO-A-94/26451,

was restricted to the provision, in a band saw blade, of sideways bevelled tooth gullets. Accordingly, the subject-matter of claim 1 was not suggested by the prior art and consequently involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*
 - 2.1 Claim 1 is based upon claim 1 of the application as filed. It differs therefrom in that the wording according to which the bevelled surface S1 slopes towards the left hand side of the saw blade forming an obtuse angle with said left hand side is replaced by the wording according to which the saw blade is "bevelled at an obtuse angle" towards the left hand side of the saw blade, forming a bevelled region with a sloping surface. This amendment, which is supported by the disclosure in the description (see column 4, lines 53 to 57 of the application as published) and in claim 7 of the application as filed, makes clear that the bevelled region having a surface S1 - which in the absence of a specific claimed tooth shape can be flat or curved - is at a given obtuse angle with respect to the (planar) left hand side of the saw blade. In this respect it is noted that the schematic representation

in Figure 1B may give the impression that the surface S1 is part of a flat surface, inclined at an angle with respect to the left hand side L of the saw blade. However, it is clear for the skilled person that for the tooth shape represented in this figure the bevelling always leads to a curved surface S1 along the edge of which the bevel angle remains constant towards the left hand of the saw blade, otherwise it would not be possible to form a tooth edge E1 at the intersection between such a constantly inclined surface S1 and an immediately adjacent surface, also constantly inclined but towards the opposite side of the saw blade.

Furthermore, claim 1 includes the additional features according to which first and second longitudinal knife edges are formed starting from the rear foot point of, respectively, a first and second tooth. These features are clearly derivable from the disclosure of the application as filed. Reference is made in particular to the passages in column 2, lines 12 to 17 and in column 5, lines 8 to 20 of the application as published.

- 2.2 Dependent claims 2 to 6 correspond to claims 6 to 9 and 11, respectively, of the application as filed.
- 2.3 The description has been amended to take into account the relevant state of the art (documents D2 and D3) and has been adapted to the new claims.
- 2.4 Finally, the Figures 1A and 1B have been amended to correctly show the position of the longitudinal knife edge X1.

2.5 Therefore, the amendments made do not give rise to objections under Article 123(2) EPC.

3. *Novelty*

3.1 The Board agrees with the view of the Examining Division that document D1 does not mention a band saw blade. Furthermore there is no disclosure in D1 of a knife edge formed starting from a rear foot defined by the right hand tooth corner on the first tooth edge or by a point on the first tooth edge, which point is nearer the right hand tooth corner than the left one. Having regard in particular to the embodiment of Figure 5 referred to in the decision under appeal (see point A)2)), there is shown a tooth profile with a curved cutting edge 120 (page 5, line 16) having a higher, rearward trailing tip 138 which contacts the workpiece first (page 5, lines 25 to 27) and a forward leading tip 139 which contacts the workpiece last (page 5, lines 27, 28). At the location which contacts the workpiece first (trailing tip 138) the cutting edge makes an angle greater than 90° , as is clearly apparent from Figure 5, and thus no knife edge is formed (i.e. an edge which works like a wedge to divide the material; see column 1, line 24, of the application as published). In contrast thereto, since in the band saw blade of claim 1 the bevelled region which at an obtuse angle with a side of the saw blade extends from the tooth edge, and thus the tooth edge itself follows the profile of the bevel, the portion of the tooth edge that contacts the workpiece first corresponds to the knife edge. It is noted that this also applies in the case where the bevelled region extends from a rear foot point defined as a point on the first tooth edge which

is nearer the right hand tooth corner than the left one. Indeed, although in such a case the portion of the tooth edge that contacts the workpiece first is not bevelled, in practice, due to the fact that band saw blades are very thin, as submitted by the appellant, the non-bevelled portion of the tooth edge is of such limited extent that a knife edge is also formed.

- 3.2 Using the wording of claim 1 of the present application, D2 discloses (see Figures 1,2) a band saw blade with teeth (11,12) having a tooth point with a tooth edge (a-a, 23), a tooth face on the front side of the tooth as viewed in the direction of sawing, a tooth back behind the tooth edge, and a tooth bottom between the tooth face on each tooth and the tooth back on the next tooth in front of said each tooth, and tooth gullets, wherein a tooth gullet is defined as the space between the tooth edges of two adjacent teeth, said saw blade having two planar sides; a right hand side and a left hand side when the saw blade is viewed obliquely from above in the direction of sawing, wherein said tooth edge (a-a, 23) extends between a right hand tooth corner and a left hand tooth corner with reference to said viewing direction, wherein the saw blade within a region of a first tooth gullet between the tooth edge (a-a) of a first tooth (11) and the tooth edge of the next tooth (12) in front of said first tooth is bevelled at an obtuse angle towards the left hand side (rear side of the blade as seen in Figure 2) of the saw blade, forming a bevelled region (13) with a sloping surface, said bevelled region with said sloping surface extending from a first tooth edge in the rear end of the first tooth gullet, downwards the tooth face, said region being bordered to the right by a first line (K1)

which extends from a rear foot point defined by the right hand tooth corner on the first tooth edge (a-a) to a front foot point, thereby forming a first longitudinal knife edge starting from the rear foot point, and said region being bordered to the left by the border line against the left planar side of the saw blade, and forwards by the tooth bottom. Furthermore the saw blade, within a region of a second tooth gullet between a second tooth (12) and a next tooth (11) in front of said second tooth is bevelled in the same way as in the first tooth gullet but instead to the right, thereby forming a second longitudinal knife edge (X2). The teeth of the saw blade are bevelled in the said mode alternately to the left and to the right.

According to the teaching of D1, the bevelled region 13 is provided in the tooth gullet so as to extend, in a direction perpendicular to the planar sides of the saw blade, over the whole thickness of the tooth (see Figure 1). In a direction parallel to the sides of the saw blade, the bevelled region 13 extends from the tooth edge up to a line immediately adjacent to the tooth bottom. A further bevelled region 15 is formed in the gullet in correspondence with the tooth back of the next tooth. In contrast thereto, claim 1 of the present application requires that the bevelled region extends to at least the tooth bottom and is bordered to the right by a first line (K1) which extends from a rear foot point defined by the right hand tooth corner on the first tooth edge, or by a point on the first tooth edge, to a front foot point which borders on the left hand side of the saw blade in the region of the first tooth gullet or is a point on the tooth edge on the next tooth in front of said first tooth. In other

words, in accordance with the wording of claim 1, the bevelled region either extends from one tooth edge to the next tooth edge, but then in contrast to D2 it includes at least part of the tooth bottom, or, if it does not extend to the next tooth edge, in contrast to D2 the bevelled region does not extend over the whole thickness of the tooth because said first line (K1) extends in such case from a rear foot point at or close to the right hand tooth corner up to a front foot point which borders on the left hand side of the saw blade and thus is a line which, when viewing the saw blade from above, is obliquely inclined with respect to the longitudinal direction of the saw blade thus traversing the tooth gullet.

3.3 D3 discloses (see Figure 1 and claim 1) a band saw blade with teeth (1) and sideways bevelled tooth gullets (2). The bevelled region (b) is essentially provided only in correspondence with the tooth bottom and does not extend up to the tooth edges. Moreover, the bevels are either provided on a same side of the saw blade (Figure 1) or on both sides of each tooth gullet (Figure 3). D3 does not disclose bevels being provided alternately to the left and to the right of the saw blade.

3.4 Accordingly, it is found that the subject-matter of claim 1 is novel over the available prior art (Article 52(1), 54(2) EPC).

4. *Inventive step*

4.1 Document D2 represents the closest prior art because it relates to an object of the same type as the claimed

object, namely a band saw blade, and is concerned with the problem of providing a smooth clean cut (see page 1, lines 5 to 9 and 80 to 86), which at least in part corresponds to the problem underlying the present application, namely to provide a band saw blade which saws very silently, which does not give rise to inconvenient vibrations, which gives surfaces having a good smoothness and thin, material-saving kerfs when sawing in e.g. wood, plastic, meat, frozen victuals, and metal (see paragraph [0004] of the application as filed).

Document D1 is less appropriate than D2 as a starting point for arriving at the claimed invention, since it does not relate to a **band** saw blade and it discloses a saw blade in which no knife edge in the sense of the present application is provided (see the explanations under point 3.1 above).

- 4.2 The applicant submitted that the particular bevelled surface provided on the teeth of the saw blade according to claim 1 allowed saw dust to exit efficiently away from the gullet, thereby reducing vibrations when the saw was in use. In fact, it can be agreed that due to the differences existing between the bevelled region (13) of the saw blade of D2 and the bevelled region of the saw blade according to claim 1 (see point 3.2 above), the manner in which saw dust exits the gullet will be different for these two saw blades. D2 does not give any hint that the provision of a differently shaped bevelled region might also provide a smooth cut or reduce the vibrations when the saw is operated. The teaching of D2 is indeed restricted to the provision of teeth whose front faces are ground at

oblique angles (see claims 1 to 3, see Figure 1) so as to provide a cutting edge which in operation cuts with a drawing or shearing effect (page 1, lines 80 to 86). The back faces of the teeth are also ground, to provide a suitable clearance for the cutting edges (see page 2, lines 1 to 8).

D1 is concerned with the problem of improving the strength of a saw blade(see page 3, first paragraph). As explained above (point 3.1), in the saw blade of D1 the bevelled region is not such as to provide a tooth edge which first contacts the workpiece in correspondence with a knife edge formed by said bevelled region. Therefore, the provision of the tooth structure known from D1 in the saw blade of D2 would imply that the presence of a knife edge is dispensed with. Therefore, even if the skilled person would combine the teachings of D2 and D1, he would not arrive at the subject-matter of claim 1.

Finally, although D3 discloses the provision of bevelled regions in the tooth gullets, it does not suggest that these regions should be alternately bevelled to the left and to the right of the saw blade (see point 3.3 above). Therefore, document D3 would not lead the skilled person in an obvious manner to the subject-matter of claim 1 of the present application.

- 4.3 For these reasons, the subject-matter of claim 1 could not be derived in an obvious manner from the available prior art. It follows that the subject-matter of claim 1, and of claims 2 to 6 dependent therefrom, involves an inventive step (Article 52(1), 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 grant a patent on the basis of the following documents filed during the oral proceedings held on 4 July 2005:

Description: columns 1 to 6 with insertion A (three additional pages) in column 1;

Claims: 1 to 6;

Drawings: Figures 1 to 3B.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau