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D E C I S I O N
of 16 April 2002

Case Number: T 1047/00 - 3.2.7

Application Number: 96920332.2

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Language of the proceedings: EN

Title of invention:
Cutting tool having textured cutting surface

Applicant:
NORTON COMPANY

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 111(1)

Keyword:
"Main request: Novelty (yes)"
"Main request: Inventive step (no)"
"Auxiliary request: Remittal to first instance"

Decisions cited:
T 0241/88, T 0896/92

Catchword:
-

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Case Number: T 1047/00 - 3.2.7

D E C I S I O N
of the Technical Board of Appeal 3.2.7
of 16 April 2002

Appellant: NORTON COMPANY
1 New Bond Street
Box No. 15138
Worcester
Massachusetts 01615-0138 (US)

Representative: Richebourg, Michel François
Cabinet Michel Richebourg
"Lee Clos du Golf"
69, rue Saint-Simon
F-42000 Saint Etienne (FR)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 2 June 2000 refusing European patent application No. 96 920 332.2 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. Burkhart
Members: P. A. O'Reilly
U. J. Tronser

Summary of Facts and Submissions

I. The Appellant (Applicant) filed an appeal against the decision of the Examining Division to refuse the application.

II. The Examining Division refused the application for lack of novelty of claim 1 of the only request in view of the document

D1: US-A-5 011 511 (in particular Fig. 4).

III. At oral proceedings held on 16 April 2002 the Appellant requested in accordance with his letter of 15 March 2002 that a patent be granted on the basis of claim 1 filed with that letter together with claims 2 to 15 filed with letter of 27 April 1999. He further requested as a single auxiliary request that the application be remitted to the first instance for further prosecution on the basis of claims 1 to 13 filed in the oral proceedings.

IV. Claim 1 of the main request, which is the only independent claim, reads as follows:

"An abrasive tool comprising:
a) a core (6) having at least one cutting surface plane (4);
b) superabrasive grain (1) having at least one flat surface (2) and being arranged in a single layer on the cutting surface plane (4); and
c) a metal bond (3) brazed to the cutting surface plane (4) of the core (6) and the superabrasive grain (1);
characterised in that the cutting surface plane (4) of the core (6) has textured indentations (5, 7), the textured indentations (5, 7) being sized to contain the single layer of superabrasive grain (1) having an

average radius (r) oriented such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4), and the textured indentations (5, 7) have a maximum depth (D) such that $r/2 \leq D \leq 3r/2$."

V. Claim 1 of the auxiliary request is a combination of claims 1, 2 and 3 of the main request and reads as follows:

"An abrasive tool comprising:
a) a core (6) having at least one cutting surface plane (4);
b) superabrasive grain (1) having at least one flat surface (2) and being arranged in a single layer on the cutting surface plane (4); and
c) a metal bond (3) brazed to the cutting surface plane (4) of the core (6) and the superabrasive grain (1);
characterised in that the cutting surface plane (4) of the core (6) has textured indentations (5, 7), the textured indentations (5, 7) being sized to contain the single layer of superabrasive grain (1) having an average radius (r) oriented such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4), and the textured indentations (5, 7) have a maximum depth (D) such that $r/2 \leq D \leq 3r/2$, and in that a majority of the superabrasive grain (1) consists of particles having at least one opposing set of flat surfaces (2) and in that the superabrasive grain (1) is a diamond grit of 25 to 1,000 microns in diameter."

VI. In support of novelty in the main request the Appellant in the written and oral proceedings essentially argued with respect to Fig. 4 of document D1 as follows:

Document D1 does not disclose a single flat surface plane since the surface disclosed in document D1 is a complex surface. Document D1 does not disclose a single layer of grain. The cutting surface of the device contains more than one layer since the grains towards the sides of the core are not on the same level as the inner grains. Document D1 does not disclose the feature of claim 1 that any surface of the grain is inclined at an angle of at least 15° relative to the plane of the cutting surface. Also document D1 does not disclose the geometric formula at the end of the claim since document D1 does not discuss the geometry of the indentations. In accordance with decisions T 241/88 and especially T 896/92 only features whose structure is clearly shown may be considered to be disclosed. Fig. 4 is only one of several figures and the grains shown therein are randomly oriented so that the structure is hidden. G 2/88 and G 6/88 require that the feature is made available to the public. Document D1 is directed to the form of bonding the grains to the surface. Since document D1 does not discuss the geometry of the indentations, the formula at the end of claim 1 was not made available to the public by document D1.

VII. With respect to inventive step in claim 1 the Appellant in the written and oral proceedings essentially argued as follows:

Document D1 is concerned with a different problem to that of the application in suit. The application in suit is concerned with the problem of providing an improved orientation of the abrasive grains. Document D1 however is concerned with improving the attachment of the grains to the core, in particular by the use of active solder. Document D1 does not therefore teach how to improve the orientation of the grains. The skilled person would want to have grains orientated such that their faces formed angles to the cutting surface plane.

Document D1 does not however teach how to achieve this orientation since this is the result in the invention of providing textured indentations which conform to the formula stated at the end of the claim and document D1 does not disclose this formula.

Reasons for the Decision

1. *Main request*

1.1 Amendments

Claim 1 has been amended to refer to "at least one cutting surface *plane* (4)" and to define the grain as "*being arranged in a single layer on the cutting surface plane (4)*".

A basis for the amendments may be found in the description as originally filed on page 5, lines 15 and 18 which refers to the plane of the cutting surface and in claim 1 as originally filed which refers to a single layer of grain.

Therefore, the amended claim 1 does not contravene Article 123(2) EPC.

1.2 Novelty

1.2.1 Fig. 4 of document D1 discloses:

An abrasive tool (a rock drill) comprising:
a) a core 1 having at least one cutting surface plane (the surface in which are set the grains which have been indicated by 3b in Annex II of the decision of the Examining Division);

b) superabrasive grain (said grains 3b) having at least one flat surface (visible in the figure) and being arranged in a single layer on the cutting surface plane (the grains 3b are all at the same level to form a single layer); and
c) a metal bond 4 brazed to the cutting surface plane of the core and the superabrasive grain;
wherein the cutting surface plane of the core has textured indentations (column 6, lines 20 to 24, claim 11 and visible in the figure), the textured indentations being sized to contain the single layer of superabrasive grain having an average radius (r) (column 6, lines 20 to 24, claim 11 and visible in the figure) and the textured indentations (5, 7) have a maximum depth (D) such that $r/2 \leq D \leq 3r/2$ (see below).

Document D1 must be considered as disclosing feature a) since at least the surface shown in Fig. 4 in which grains 3b are inserted in indentations must be considered to be planar. The fact that there are further planes at an angle to the plane of this surface is not relevant, since the wording of the claim - "at least one surface" - does not exclude this possibility. For this reason the argument of the Appellant that the cutting surface disclosed in Fig. 4 is complex is not based on the wording of the claim which specifically includes the possibility of further surface planes. In this respect the Board is of the opinion that the cutting surface disclosed in document D1 is the surface into which the indentations are made. This is consistent with the wording of claim 1 which specifies first a surface plane and then that the surface plane has indentations. The cutting surface thus does not pass through the bases of the indentations (which do not form a surface) but through the surface formed before the indentations are made. The grains pass partly through this surface when they are placed in the indentations.

The grain and the indentations disclosed in Fig. 4 of document D1 must be considered as fulfilling the conditions set out in the formula at the end of claim 1, i.e. $r/2 \leq D \leq 3r/2$. In the figure exactly half of each grain fits into its corresponding indentation. This means that for each of the grains r equals D. This is a value which is exactly within the middle of the range set out in the formula. Moreover, the description in column 6, lines 19 to 26, 32 and 55 indicates that this value in the middle of the range is not merely a chance representation in the drawings. The said parts of the description indicate that the indentations receive parts of the grains and that the indentations and corresponding grain parts then form a form-locking connection. A form-locking connection requires that the relevant parts of the grain, i.e. those that fit the indentation, must be within the indentation. The parts of the grains which fit in the indentations depicted in Fig. 4 are those parts where the width of the grains becomes less, i.e. the lower half. This results in a situation where $r = D$. The disclosure of this feature is thus not a result of taking measurements from drawings which may, at least in part, be schematic, but rather it is the combined teaching of the description and drawings as to how the grains are arranged in the indentations.

The Appellant has referred to the jurisprudence of the Boards of Appeal with respect to the disclosure that may be derived from drawings. The Appellant mentioned T 241/88 and especially T 896/92. Those decisions form part of the constant jurisprudence of the Boards of Appeal whereby features may be deduced from drawings only when the skilled person can also deduce the relevant technical teaching. The present case does not diverge from those decisions since the relevant feature is not just derived from the figure, but rather from the figure together with the pertaining description

which indicates the function of the feature. This function leads to a conclusion concerning certain relative sizes in the drawings which is consistent with the actual relative sizes shown in the drawings. Thus, there is no divergence from the above mentioned decisions.

1.2.2 The feature "such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4)" is not in the opinion of the Board disclosed in Figure 4 of document D1.

The figure shows a grain which in cross-section has an approximately square shape which is orientated such that all the sides have an angle of approximately 45° to the plane of the cutting surface. This would imply that the flat surfaces through which the cross-section cuts also have an angle of at least approximately 45° to the plane of the cutting surface. However, there may be other flat surfaces of the grain projecting in a different plane to that of the cross-section and which do not traverse the cross-section. These surfaces which would not appear in the cross-section could be inclined at an angle relative to the cutting surface plane which is not greater than 15°. In this respect it may be noted that the Board understands the expression "any flat surface" as used in the context of claim 1 to mean every flat surface. It is not therefore possible from the drawings and description to draw any definite conclusions regarding every flat surface of the grain. For this reason the Board considers that feature "such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4)" is not disclosed in document D1.

Since document D1 does not disclose all the features of claim 1 the novelty of the subject-matter of the claim must be recognised.

2. *Inventive step*

2.1 State of the art

The nearest state of the art for the assessment of inventive step is also considered to be document D1. As explained above with respect to novelty document D1 discloses all the features of claim 1 except the feature "such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4)".

2.2 Problem underlying the invention

The invention solves the problem of ensuring that all cutting edges cut effectively and that the grains are securely anchored in the indentations.

2.3 Solution to the problem

In accordance with claim 1 of the application in suit the above problem is solved by the feature "such that any flat surface (2) of the superabrasive grain (1) is inclined at an angle of at least 15° relative to the cutting surface plane (4)". By having an angle of at least 15° to the cutting surface plane the apices formed by the intersections of such surfaces will also have at least this angle relative the cutting surface plane. Such apices which are not within the indentation will then be able to cut effectively. The apices that are within the indentation will form an effect form-lock with the indentation.

2.4 The Board considers that this solution is obvious for the following reasons:

The surfaces visible in Fig. 4 of document D1 already have angles greater than 15°, in fact approximately 45°. This applies both to the surfaces outside the indentation and within the indentation. The skilled person is aware that a steep angle is required for cutting edges and this has been admitted by the Appellant. The skilled person therefore when considering Fig. 4 and considering how to construct such a device would wish to ensure that all cutting edges have an angle suitable for cutting, so that the cutting is most effect. In order to ensure that all the cutting edges have such a suitable angle he would arrange that all the flat surfaces also have a suitable angle to form suitable cutting edges. The angle of 15° merely defines that angle at which a cutting effect starts to be achieved. The skilled person would thus ensure that all the flat surfaces forming cutting edges would have at least such an angle and indeed more suitably the angle of approximately 45° degrees already disclosed for some surfaces in Fig. 4 of document D1. When considering the flat surfaces within the indentation the skilled person would realise that only such surfaces that have a reasonable angle to the cutting surface would actually ensure a form-lock with the indentation to resisted transverse forces. The skilled person would therefore wish to ensure that all the flat surfaces have an angle similar to those shown in Fig. 4 so that the form-lock is effective in all directions. In providing the same surface angle for those surfaces not visible in Fig. 4 as for those that are visible the skilled person would arrive at surfaces having an angle greater than 15° to the cutting surface

plane. Thus, the skilled person would arrive in an obvious manner at every flat surface of the grain having an angle of more than 15° to the cutting surface plane.

The Appellant has argued that whilst the skilled person may desire the result of having any flat surface of the grain inclined at an angle of at least 15° relative to the cutting surface plane he would not know how to achieve the result, i.e. by the use of indentations. However, the provision of indentations is already known from document D1 and cannot therefore contribute to the inventive step. Moreover, it is perfectly clear from Fig. 4 of document D1 that when indentations are provided a specific orientation of the grain is enabled. In Fig. 4 it is quite clear that all the grains fit into their respective recesses such that they each provide a specifically angled grain.

The Appellant has also argued that the application in suit deals with a different problem to the problem dealt with in document D1. The description of the application in suit indicates that the problem to be solved is how to orientate grains suitably, see page 2, line 30 to page 3, line 1. The description indicates a further problem that the bond holding the grain to the support is the weakest component, see page 3, lines 4 to 9. The solution to both of these problems is considered to be the provision of suitable indentations, see page 3, lines 10 to 14 and 33 to 38. However, document D1 already discloses the solution to these problems, i.e. the provision of appropriate indentations. Since the solution to the problems stated in the application is already disclosed in document D1 the fact that document D1 is mainly concerned with another aspect of the attachment of the grains is not relevant.

2.5 Since it would be obvious to the person skilled in the art to provide the distinguishing feature of claim 1 in a device known from Fig. 4 of document D1, the subject-matter of the claim does not involve an inventive step.

3. *Auxiliary request*

3.1 Claim 1 of the auxiliary request comprises a combination of claims 1, 2 and 3 of the main request. The Examining Division have not yet examined such a claim in detail with regards to inventive step. In accordance with Article 111(1) EPC, the Board therefore considers it appropriate to remit the case to the first instance for further examination so as to give the Appellant the possibility to argue his case before two instances.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division with the order to continue substantive examination on the basis of the auxiliary request filed in the oral proceedings.

The Registrar: The Chairman:

R. Schumacher A. Burkhart

P.O.R.

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