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D E C I S I O N
of 18 April 1996

Case Number: T 0902/93 - 3.2.2

Application Number: 87901226.8

Publication Number: 0255834

IPC: C23C 14/34

Language of the proceedings: EN

Title of invention:
Formation of hard coatings on cutting edges

Applicant:
THE GILLETTE COMPANY

Opponent:
-

Headword:
Cutting edges/GILLETTE

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - (yes) after amendment"

Decisions cited:
-

Catchword:
-

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Case Number: T 0902/93 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 18 April 1996

Appellant: THE GILLETTE COMPANY
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Boston
Massachusetts 02199 (US)

Representative: Baillie, Iain Cameron
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 14 June 1993 refusing European patent application No. 87 901 226.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: H. Seidenschwarz
Members: R. Lunzer
- J. De Preter

Summary of Facts and Submissions

I. European patent application No. 87 901 226.8 resulting from Euro-PCT patent application No. PCT/US 87/00162 (publication No. WO 87/04471) filed on 20 January 1987, claiming a priority date of 23 January 1986 derived from GB Application No. 8 600 829, was refused by a decision of the Examining Division dated 14 June 1993. That decision dealt with Claim 1 in accordance with a main and two auxiliary requests. Claim 1 in accordance with the main request took the following form:

"1. A method of making a cutting edge, which comprises coating a substrate cutting edge having a suitable cross-section geometry which is such that:

$$w \leq ad^n$$

where w is the tip width in µm of the cutting edge at a distance d in µm from the ultimate tip, a is a factor of proportionality of greater than 0 and up to 1, and n is an exponent having a value in the range 0.65 to 0.75, with a material which is harder than the material of the substrate cutting edge by a vapor deposition or sputtering process, if necessary in the presence of geseous or vaporized molecules of another element or a compound of another element where it is desired to form the coating of a compound, at a pressure of less than 10^{-2}m bar, while simultaneously subjecting the cutting edge to ion bombardment with ions of sufficient mass and energy to cause sputter removal of the deposited material at a rate which is less than the rate of deposition, whereby a cutting edge formed of the deposited material and having a cross-sectional geometry defined by the equations:

$$ad^n \geq w \geq \frac{1}{\sqrt{m}} ad^n$$

and

$$w^3 \geq (w-2f)a^2d^2n$$

where w, d, a and n have the above-stated meanings, m is the ratio of the yield strength of the deposited coating material to that of the substrate material, and f is the thickness in µm of the deposited coating at the distance ds from the ultimate tip, and an ultimate tip radius of less than 500 Å, is obtained."

II. The ground for refusal was that although the subject matter of the Claim was novel, it lacked any inventive step having regard to the combined effects of documents

(1) GB-B-2 130 955, and
(2) US-A-3 761 374,

the latter being referred to in document (1) at page 5, line 30. Document (1) was regarded as the closest prior art. It disclosed an uncoated blade configuration which corresponded to that of Claim 1 in suit. Document (2) disclosed coating an underlying steel blade edge with a hard coating, and in particular it disclosed the use of a combination of simultaneous shaping and depositing of the coated layer. There was therefore no inventive step involved in applying the coating technique of document (2) to the blade substrate disclosed in document (1). On similar grounds, the two auxiliary requests were also rejected.

III. An appeal against that decision was filed on 11 August 1993, the appeal fee was paid on the same day, and the statement of grounds of appeal was filed on 14 October 1993. In that statement the Appellant contended that an important feature of the alleged invention was that the coating had to be at least 2,000 Å thick on the facets, have an aspect ratio of between 4.5 and 7, and have a tip radius within the normal range for conventional blades.

IV. Together with a summons to attend oral proceedings the Board sent a communication questioning the inventiveness of the main Claims as then on file, but suggesting that the introduction of a limitation requiring the coating to have an aspect ratio between 4.5 and 7.8, these being limits disclosed in the application as filed, might overcome the objection to inventiveness based on the combination of documents (1) and (2).

In response to that communication, the Appellant filed an amended Claim 1 which was identical to Claim 1 set out above, save that before the full stop the following words were included:

"and wherein the coating and simultaneous bombardment are so conducted that a coating of aspect ratio in the range of 4.5 - 7.8 is formed."

V. The Appellant requested that the decision under appeal be set aside, and a patent granted on the basis of the amended Claim 1 in accordance with the sole request.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of amendments*

The proposed amendment to Claim 1 involves the addition of the feature defining the aspect ratio of the coating as being in the range of 4.5 to 7.8. This feature was disclosed in the application as filed at page 5, lines 18 and 19. As the inclusion of this feature in Claim 1 has the effect of restricting its scope, the amendment is admissible for the purposes of Article 123(2) EPC.

3. *Novelty*

3.1 Novelty was not in issue, the Examining Division having accepted that none of the cited prior art disclosed a method of making a cutting edge as then claimed. Claim 1 as now amended limits the coating to an identified aspect ratio, which is defined (page 5, lines 15 to 17) as the thickness of the coating on the ultimate tip of the substrate, T, divided by the thickness of the coating on the facets of the cutting edge, F, that is T/F.

3.2 The introduction of this feature distinguishes the subject-matter of Claim 1 from the disclosure of document (2), in which Figure 3 shows an entirely different tip geometry from that of the application in suit. In accordance with Figure 3 and the corresponding Examples of document (2) at column 4, lines 21 to 70, and at column 4, line 71 to column 5, line 33, there is simultaneous shaping and deposition to create a layer 36 of deposited material located on the flanks of the

cutting edge, and tapering to zero at the tip. After the layer 36 has been deposited, in accordance with the second Example of document (2) there is a further stage of deposition of a layer 38. That further layer is deposited (column 5, lines 18 to 23) by turning off the DC voltage on the blades and reducing the RF power to 0.4 kilowatt. It consists of a chromium-platinum alloy of about 250 Angstroms in thickness, which thickness is shown by Figure 3 to be uniform over the tip and the flanks.

3.3 The method of producing that layer is to be contrasted with the method used in the application in suit. In accordance with the application in suit, satisfactory geometry for the coating was obtained when using a bias voltage of 4.0 kV, whereas a zero bias voltage was used for the second coating applied in the second Example of document (2). The difference in the end results is to be seen in Figure 1 of the application in suit, showing the coating extending to the height T above the tip of the substrate cutting edge 10 as contrasted with the uniform thickness coating shown in document (2) as mentioned above. This difference in the physical shape of the coating is expressed in the limitation now introduced into Claim 1 which specifies the aspect ratio.

3.4 Document (1) discloses a blade tip having the geometry specified in Claim 1 in suit, but without any coating. Having reviewed the prior art, the Board is satisfied that neither document (1) nor document (2) discloses a method of making a cutting edge having all the features specified in Claim 1 as amended. The alleged invention is therfore novel for the purposes of Article 54 EPC.

4. *Inventiveness*

4.1 The alleged invention possessing novelty, the question remaining to be decided is whether document (2), which describes a vacuum coating process for coating blades as described above, affords any pointer towards the coating shaped as now defined in Claim 1, with its limitation as to the aspect ratio of the coating.

4.2 As the shape of the two coatings disclosed by document (2) are fundamentally different from that disclosed in the patent in suit, the first coating 36 having zero height above the blade tip, and increasing in thickness on the flanks, whereas the second coating 38 has uniform thickness on both the tip and the flanks, the Board is not satisfied that the skilled worker, given the combination of document (1), which discloses a blade tip having the geometry specified in Claim 1 of the application in suit, and document (2) which discloses simultaneous shaping and deposition of a coating which has a different configuration, would have known whether, and if so how, it might be possible on the basis of common general knowledge and routine experiment so to adapt the disclosure of document (2) to produce by deposition and sputter removal of deposited material a coating which conserved the desired geometry of the underlying substrate cutting edge. The shape of the coatings shown in document (2) are very different from that which has to be obtained in accordance with the application in suit, and document (2) gives the skilled reader no pointers as to how the contour of the coatings there disclosed might be modified.

4.2 The Board therefore concludes that it was not obvious to have modified the teaching of document (2) so as to arrive at a coating having the characteristics specified

in the amended Claim 1 of the application in suit, and that the requirements of Article 56 EPC are therefore satisfied.

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 that a patent be granted on the following basis:

Description:
Pages 1, 2, 4, 6 to 10 as considered during the examination proceedings with the replacement of the word "then" by "than" at line 1 on page 10.
Pages 3, 5 and 11 of the description as modified and sent accompanying the Appellant's letter of 4 March 1996, the word "term" at the end of line 33 on page 5 being replaced by "turn", and the letters "lv" replaced by "kv" on page 11, line 5.

Claims:
Nos. 1 to 5 in accordance with the Appellant's sole request, which was filed as the first auxiliary request accompanying its letter of 19 February 1996.

Drawings:
Sheets 1/3 to 3/3 as considered during examination.

The Registrar: The Chairman:

S. Fabiani H. Seidenschwarz