

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) To Chairmen

D E C I S I O N
of 16 December 1997

Case Number: T 0346/93 - 3.2.1

Application Number: 85304135.8

Publication Number: 0168953

IPC: B23B 51/02, B22F 7/06, B23P 5/00

Language of the proceedings: EN

Title of invention:
Stick of composite materials and process for preparation thereof

Patentee:
Sumitomo Electric Industries Ltd

Opponent:
De Beers Industrial Diamond Division (Proprietary) Limited

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes) "

Decisions cited:
T 0201/83

Catchword:
-



Europäisches
Patentamt

European
Patent Office

Office européen
des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Case Number: T 0346/93 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 16 December 1997

Appellant:
(Opponent) De Beers Industrial Diamond Division
(Proprietary) Limited
45, Main Street
Johannesburg
Transvaal (ZA)

Representative: Jones, Alan John
Carpmaels & Ransford
43 Bloomsbury Square
London WC1A 2RA (GB)

Respondent:
(Proprietor of the patent) Sumitomo Electric Industries Limited
No. 15, Kitahama 5-chome
Higashi-ku
Osaka-shi
Osaka 541 (JP)

Representative: Calderbank, Thomas Roger
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP (GB)

Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 17 February
1993 concerning maintenance of European patent
No. 0 168 953 in amended form.

Composition of the Board:

Chairman: F. Gumbel
Members: S. Crane
V. Di Cerbo

Summary of Facts and Submissions

- I. European patent No. 0 168 953 was granted on 3 January 1990 on the basis of European patent application No. 85 304 135.8.
- II. The granted patent was opposed by the present appellant on the grounds of lack of novelty and/or inventive step (Article 100(a) EPC), insufficiency of disclosure (Article 100(b) EPC) and inadmissible extension of subject-matter (Article 100(c) EPC).

Of the prior art documents relied upon in the opposition proceedings only the following have played any significant role on appeal:

D1: EP-A-0 079 243

D2: US-A-3 743 489

D8: The magazine "INDIAQUA Industrial Diamond Quarterly" No. 35, 1983/II, page 43.

- III. With its decision posted on 17 February 1993 the Opposition Division held that the patent could be maintained in amended form. The set of amended claims on which this decision was based comprises two independent claims 1 and 6 which read as follows:

"1. A micro-drill stick or a micro-punch stick (23) of composite materials comprising a hot-pressed super-hard head member (21) containing higher than 50 vol% of a diamond powder and/or a high pressure boron nitride powder, and a supporting member (22) of predominantly tungsten carbide and a binder of an iron group metal being present in an amount of not less than 7% by weight and being bonded at one of its ends with the

hot-pressed super-hard head member (21) wherein the length of the hot-pressed super-hard member (21) is 0.3 to 2.0 mm in the axial direction of the stick (23);

the bonding between the hot-pressed super-hard head member (21) and the supporting member (22) being formed during the hot press process of said hot-pressed super-hard head member;

characterised in that:

the stick (23) after bonding and cutting in the axial direction by an electron spark method has an elongate form having a sectional diameter or an equivalent sectional diameter not larger than 3 mm;

the supporting member (22) is at least twelve times longer in its axial direction than the hot-pressed super-hard head member;

and the tungsten carbide has a mean particle size of not more than 3 μm ; and the mean particle size of the diamond and/or boron nitride powder are not more than 10 μm ."

"6. A process for preparing a micro-drill stick or micro-punch stick (23) of composite materials comprising a hot-pressed super-hard head member (21) containing higher than 50 vol% of a diamond powder and/or a high pressure boron nitride powder, and a supporting member (22) of predominantly tungsten carbide and a binder of an iron group metal being present in an amount of not less than 7% by weight and being bonded at one of its ends with the hot-pressed super-hard head member (21), the process comprising the steps of:

charging a hot press container with two layers of materials by stacking them adjacent to each other in the pressing direction, one of said layers being for preparing the hot-pressed super-hard head member (21) and, the other layer being for preparing the supporting member (22) which is to be bonded with the first-mentioned layer during the hot-pressing;

hot-pressing said layers of materials under a high pressure and at a high temperature to sinter the first-mentioned layer, to thereby provide a composite material block having a hot-pressed super-hard layer (21);

characterised in that:

the tungsten carbide has a mean particle size of not more than 3 μm ; the diamond powder and/or boron nitride powder have a mean particle size of not more than 10 μm ; and

the composite material block is cut in its axial direction by means of an electron spark method into at least two sticks of composite materials each having a diameter not larger than 3 mm;

wherein the supporting member (22) is at least twelve times longer in its axial direction than the hot-pressed super-hard head member."

Dependent claims 2 to 5 relate to preferred embodiments of the stick according to claim 1 and dependent claim 7 to 11 relate to preferred embodiments of the process according to claim 6.

IV. An appeal against this decision was filed on 14 April 1993 and the fee for appeal paid at the same time. The appellants requested that the decision under appeal be set aside and the patent revoked in its entirety.

The statement of grounds of appeal was filed on 24 June 1993. In this statement the appellants referred to three newly cited prior art documents viz. US-A-2 939 941 (D10), US-A-4 103 137 (D11) and ZA-A-821 492 (D12).

With a letter dated 17 October 1994 the appellants referred to two further additional prior art documents viz. an advertisement for syndite cutting tool blanks from the magazine "Indiaqua" No. 36, 1983, vol. III

(D13) and an article entitled "Electric Discharge Machining on Diamond Composite Material 'Almet'", Machines and Tooling 1980, vol. 51, No. 6, pages 43 and 44 (D14).

With a further letter dated 1 December 1995 the appellants filed an unsworn declaration of one of their former employees to the effect that the sticks shown in document D13 were cut from larger blanks by electric discharge machining.

V. On 26 march 1997 the Board issued a summons to oral proceedings. In a communication accompanying the summons the Board stated that it considered the newly cited documents D10 to D14 as relevant to the question of inventive step. It also queried the purpose the filing of the declaration with the letter dated 1 December 1995 was intended to serve.

VI. With a letter dated 17 November 1997 the appellants stated that they would not be attending the oral proceedings. They also stated that the purpose of the declaration was to provide background information on what was practised in the art.

VII. Oral proceedings were held on 16 December 1997.

At the oral proceedings the respondents (proprietors of the patent) requested that the appeal be dismissed and the maintenance of the patent in amended form be confirmed.

VIII. The arguments presented by the appellants can be summarized as follows:

Several of the amendments made in the course of the opposition procedure should not have been allowed. In particular, the restriction introduced into the

independent claims that the supporting member be at least twelve times longer than the head member was derived solely from one example of the original disclosure and there had been no suggestion that this feature had any inventive significance. There was therefore no basis for disassociating it from the other specific features of the example involved or other features stated in the patent specification at column 5, lines 58 to 60 and column 6, lines 54 to 57, to be essential. Furthermore, the introduction into claim 1 of the process feature concerning how the stick had been cut was clearly inappropriate since it did not restrict the product being claimed.

Even if the feature concerning the 12:1 length ratio of the supporting member to the head member were formally allowed to remain in the independent claims then it should be ignored when assessing inventive step since it made no contribution to the solution of any technical problem and was merely arbitrary. All that needed to be considered with regard to inventive step were the questions whether it was obvious to cut long thin sticks of hard composite material from larger blanks by electric spark machining and whether the particle sizes stated in the respective characterising clauses of claims 1 and 6 were conventional. As to the first question, the newly filed prior art documents established beyond any doubt that the use of electric spark machining was well-known in the relevant art. As to the second question, the Opposition Division had come to the correct conclusion on the basis of the cited prior art that the claimed particle sizes were also well-known, which had not in fact been disputed by the respondents.

IX. In reply the respondents argued substantially as follows:

It was clear from the original disclosure that the aim of the invention was to provide long, thin, micro-drill or micro-punch sticks of composite material. There could therefore be no objection to introducing into the claims a corresponding limitation on the geometric form of the sticks derived from the described examples.

The only document which disclosed a stick of remotely similar form was document D1, which was cited in the patent specification and on which the preambles of the independent claims were based. It had to be noted, however, that the disclosure of document D1 with respect to the manufacture of a micro-drill stick was very sketchy, the document as a whole being more generally concerned with the making of block-shaped composites. Nevertheless, what was clear from document D1 was that the drill shown in Figure 4 comprised a relatively short composite head/support part joined to the drill body by electron beam welding in order to provide a drill shaft of adequate length whereas in the claimed invention the supporting member itself was of sufficient length for this purpose.

It was therefore important to note that the claimed invention was not solely to be seen in the adoption of particular features to make a known product, as the appellants sought to argue it, but in the conception of a new advantageous product together with a method of making it. Thus it was not sufficient for the appellants to show that electric spark machining of hard composite materials and the particle sizes of those materials specified in the independent claims were known. They also had to demonstrate that it was

obvious, without the benefit of hindsight, both to conceive of the new product and to combine these known features to make it. This the appellants had singularly failed to do.

Lastly, the use of electric spark machining to cut the sticks from a larger block would lead to identifiable characteristics of the sticks which would enable them to be distinguished from sticks cut by other methods. The objections of the appellants in this respect were therefore unfounded.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is therefore admissible.
2. *Allowability of the amended documents (Articles 84 and 123 EPC)*

The principle objection of the appellants to the present amended claims 1 and 6 is to the incorporation of the feature that the supporting member is at least twelve times longer in its axial direction than the hot-pressed super-hard head member.

There can be no doubt that the original application was specifically directed to a stick of hard composite material which was in general terms "long" and "thin". In particular, according to the original independent claims 1 and 9 it was a requirement that the supporting member be more than five times longer than the head member. The technical reason for this requirement is stated in the paragraph bridging pages 9 and 10 of the original description where it is indicated that the

long supporting member enables the stick to be easily inserted into the shank of a drill while providing sufficiently long cutting edges. In the course of the opposition procedure the respondents found it necessary further to restrict the length ratio specified and so fell back on the examples originally disclosed. In examples 1 and 5 the length ratio is 12:1 and in examples 2, 3 and 4 the length ratio is 15:1, 36:1 and approximately 14.5:1 respectively. In a sixth example, now deleted, the ratio was approximately 11.5:1. The Board cannot accept the argument of the appellants that the value of 12:1 is so intrinsically tied up with the other features of the examples in which it occurs that it cannot be used as the new lower end point for the range originally envisaged (cf. decision T 201/83, OJ EPO 1984, 481). In fact all of the examples 1 to 5 are very similar in general terms, there being no apparent correlation between the various process variables and the support member/head member length ratios, so that the person skilled in the art would immediately recognise that the particular conditions of say example 1 could be readily adapted to produce a length ratio of greater than 12. Example 6 was significantly different from examples 1 to 5 insofar as initially a long stick having a super-hard head at both ends was produced which was then cut into two. As the Board understands it, it was for that reason that the respondents chose to delete this example.

The appellants also argue that the specific examples from which the claimed length ratio is derived reflect two features stated to be essential to the performance of the invention but which are absent from the independent claims. Here, the appellants refer to two passages of the patent specification, namely column 5, lines 58 to 60 and column 6, lines 54 to 57. In the first of these passages it is stated that the "head member of the stick must be of 0.3 to 2 mm in length

according to the present invention". That feature, which is included in claim 1 but not in claim 6, is stated to be important because with a head member shorter than 0.3 mm the cutting performance of the drill will not be improved and with a head member longer than 2 mm too much expensive material will be consumed. It can thus be seen that this feature is in no way essential to performing the process of claim 6 so that there is no reason why the claim should be incomplete without it. In the second of the passages relied upon by the appellants at column 6, lines 54 to 57, it is stated that the axial length of the composite material **block** "must not be larger than three times, preferably two times the equivalent diameter thereof". The reason given for this is that if the block is longer then there will be a tendency for the block to buckle or curve during hot pressing. In the opinion of the Board this is nothing more than a statement of what would be common general knowledge in the art and is not essential to the claimed invention in the sense of being peculiar to it. The Board can therefore see no objection to claim 6 not specifically stating this feature, since it is not the purpose of a claim to set out every technical detail which in practice might be necessary for the performance of the invention.

Another objection of the appellants is to the incorporation into claim 1 of a process feature, namely that the stick is cut in the axial direction by "an electron spark method". Here, it is not clear to the Board which provision of the EPC is supposed to be infringed by the amendment. However, since the appellants contend that the amendment has no limiting effect on the scope of the claim it could therefore be held to be redundant and thus to offend against the clarity and conciseness requirements of Article 84 EPC. Be that as it may, the Board is in any case satisfied that the substantive basis for the contention of the

appellants is unsound since taking account of the evidence and arguments presented by the respondents in this respect it would indeed appear that the use of electric spark machining to cut the sticks from a larger block would be identifiable from the surface characteristics of those sticks.

In the present claims 1 and 6 the mean particle size of the diamond and/or boron nitride has been restricted to being not more than 10 μm in comparison with the value of 30 μm in the corresponding granted claims. This restriction is not contentious.

Having regard to the above the Board is therefore of the opinion that the amended claims meet the requirements of Article 84 and 123(2) EPC. Furthermore, since the independent claims 1 and 6 contain all of the features of the respective granted claims 1 and 7, they also meet the requirement of Article 123(3) EPC.

The manner in which the description of the patent specification has been adapted to the terms of the claims has also been challenged by the appellants. They contend that the deleted passage at column 12, lines 24 to 32, which states that various high energy beam cutting methods could also be used to cut the sticks from the composite block should be retained but since this passage conflicts with the terms of the claims its deletion seems to the Board to be wholly appropriate. They also argue that the way the references to these other cutting methods have been deleted from column 5, lines 15 and 16, and column 11, lines 45 to 49, has added subject-matter but on any sensible reading of those passages this is not the case.

3. *Sufficiency of disclosure (Article 100(b) EPC)*

In the statement of grounds of appeal reference was merely made in this context to paragraphs 13 to 15 of the "facts and arguments" filed with the notice of opposition. In its communication of 26 March 1997 the Board stated that the relatively minor defects in the wording of the patent specification identified in those paragraphs would not present any obstacle for the person skilled in the art to performing the invention. Since the appellants have not made any comment on that statement of the Board or attempted to explain their objections in this respect more fully, the Board finds it unnecessary to deal with this issue in detail and prefers to rely on what has been said by the Opposition Division in point 23 of the contested decision.

4. *Technical background to the claimed invention; cited state of the art*

4.1 In the patent specification the technical background to the claimed invention is explained in detail with particular reference to a micro-drill for making holes in printed circuit boards comprised of glass fibre reinforced epoxy resin. In view of the abrasive nature of this material and the very high drill speeds needed for high production rates it is indicated that it has become known to use drills having a tip with a head member of hot-pressed diamond compact bonded to a supporting member of hard sintered alloy, which is connected to the shank of the drill. Such a drill is shown in Figure 2 of the patent specification and corresponds in essence to that shown in Figure 4 of document D1, which derives from the present respondents. Here, the tip is connected to the shank of the drill by electron beam welding. This technique is stated in the patent specification (column 2, lines 31

to 36) to be complicated and expensive. The patent specification then goes on to consider the difficulties which would be encountered if it were attempted to hot press the head member and a longer supporting member in one operation. There is however no suggestion that this technique as such belongs to the state of the art.

- 4.2 Document D1, on which the respective preambles of claims 1 and 6 are based, is concerned in general terms with the problems of connecting a component having a head member of compacted diamond or boron nitride powder bonded to a supporting member ("base") of hard sintered alloy to a substrate. With reference to Figure 4 and in example 15 there is described a drill comprising such a component as a drilling tip bonded to a drill body by means of electron beam welding. The drill is stated to have a diameter after grinding of 1 mm. No other dimensions of the head member, supporting member or the shank member of the drill body to which the composite drilling tip is bonded are given.

The respondents have contended that the reference to grinding in example 15 implies that the composite drilling tip is produced by reducing the diameter of one of the composite blanks described in more detail elsewhere in document D1. In the opinion of the Board that is not a technically realistic proposition. Equally, however, the contention of the appellants that the person skilled in the art, by virtue of the reference in example 14 to cutting a blank into three parts, would recognise that the composite drilling tip of example 15 had also been formed in this way, is also without foundation.

- 4.3 Document D2 relates to a cutting tool insert comprising a head member of compacted cubic boron nitride powder bonded to a supporting member of sintered carbide, in

particular tungsten carbide. The crystals of cubic boron nitride are in the size range of 1 to 10 μm , see for example column 4, lines 35 to 40. In column 7, at lines 15 to 18, reference is made to tungsten carbide moulding powder commercially available in grit sizes from 1 to 5 μm

4.4 Document D8 concerns drill blanks for the manufacture of rock drilling bits. The blanks comprise a head member of polycrystalline diamond integral with a carbide supporting member. The head and supporting members of the "SD-L Long Stud" have an axial length of 0.7 mm and 13.2 mm respectively. The stud has a diameter of 13.44 mm.

4.5 Documents D10, D11 and D14 relate in general terms to the use of electric spark machining (also known as electric discharge machining and spark erosion) in cutting super-hard materials such as diamond (natural and compacted synthetic) boron nitride and tungsten carbide. In document D10 tubular eroding electrodes are used to produce long thin rods of diamonds suitable for use as gramophone styli. Document D11 teaches the use of a pair of spaced wire electrodes between which the spark is struck. Document D14 is particularly concerned with the special form of a moving wire electrode for producing holes or cavities in a diamond composite. Document D12 discloses dividing a cutting tool blank having a polycrystalline diamond head member and a sintered tungsten carbide supporting layer into three segments by spark erosion. No information is given on the relative axial lengths of the head and supporting members or on the equivalent diameter of the segments.

4.6 Document D13 is an advertisement for cutting tool blanks having polycrystalline diamond head members bonded to a tungsten carbide supporting member during sintering. The cutting blanks are of various shapes and

sizes. The blank with the product number L313 has a cross-sectional areas of 3 mm^2 (ie an equivalent diameter of approximately 2 mm) and head and supporting members of axial length of 0.7 mm and 2.48 mm respectively.

5. *Novelty and inventive step*

5.1 As can be seen directly from the preceding analysis of the state of the art, none of the cited documents discloses a stick having all the features of claim 1 or a process according to claim 6. Since the novelty of the subject-matter of these claims is not in dispute, it is not necessary to go into this question further.

5.2 In the light of the technical background of the claimed invention as portrayed in the patent specification, cf. point 4.1 above, the problem which the invention sets out to solve is to be seen in the relatively inexpensive provision of sticks of composite material from which versatile and hard-wearing micro-drills or micro-punches can be produced. In essence this problem is solved by having a certain minimum ratio (12:1) of the axial lengths of the supporting member and the head member of the stick, using certain maximum mean particle sizes for the head member and the supporting member (10 μm and 3 μm) and by cutting the sticks from a larger diameter block by means of electric spark machining.

In the course of the opposition and appeal proceedings the appellants have adduced ample evidence to the effect that both the mean particle sizes required by claims 1 and 6 as well as the use of electric spark machining for cutting super-hard materials into required shapes were known per se. Indeed with respect to the use of electron spark machining this was already

designated in the patent specification as being well-known, see column 12, lines 20 to 23. Furthermore, with respect to the requirement that the diamond or boron nitride powder has a mean particle size of not more than 10 μm the Board is satisfied that this particle size was not only known but was in fact wholly conventional in the relevant field. The situation with regard to the required mean particle size of the tungsten carbide is however somewhat different, as will be explained later.

In contrast to the way in which they have dealt with the features mentioned in the preceding paragraph the appellants, when considering the required length ratio of the supporting member to the head member, have relied much more on a different line of attack which was to the effect that this feature did not solve a technical problem and therefore should be disregarded when evaluating inventive step. In the opinion of the Board that represents a significant weakness in the case presented by the appellants. It is apparent from what is said in the patent specification and from general considerations that the length of the supporting member will influence the way the ultimately resulting micro-drill or micro-punch can be used (eg ease of mounting to a tool holder, thickness of material to be operated on) and it is therefore certainly a feature of the claimed subject-matter which must be taken into account when analysing its patentability.

It is in this context that the reminder of the respondents that a stick of the relative thinness and length according to the claimed invention had not been previously proposed in the art develops its full force. Thus it is not sufficient for the appellants to show that the specified mean particle sizes and the use of electric spark machining were known per se in the

relevant art. Instead, it would have been incumbent on them to demonstrate that it was obvious for the person skilled in the art to embark upon the manufacture of a stick having a diameter not larger than 3 mm and a length ratio of the supporting member to the head member of at least 12:1, despite the technical problems associated with this, and that once having done so he would combine the required mean particle sizes and the technique of cutting the sticks from a larger diameter block, to reach his goal. On balance, the Board is of the opinion that the appellants have not succeeded in doing this. In particular, it is clear from the lengthy explanations in columns 8 to 10 of the patent specification that the method adopted for manufacturing the relatively long sticks, in which the head member is hot-pressed onto the end of a pre-sintered supporting member under extremely high pressures, involves metallurgical considerations which are not directly addressed in any of the prior art documents before the Board. It is on the basis of these considerations that the mean particle size of the tungsten carbide is restricted to a maximum of 3 μm and although it is apparent from document D2 that sinterable tungsten carbide powder of this mean particle size was known per se, the Board can find nothing in the evidence before it that would have led the skilled person to restrict the mean particle size in the manner claimed in order to solve the specific technical problems with which he was faced. Furthermore, the appellants have not shown that it was known to use electric spark machining to cut from a block of the hard composite material to which the invention relates sticks or the like having an overall length envisaged by the claims of the patent. Thus taking even the very low minimum value of 0.3 mm for the length of the head member stated in claim 1, the overall length of the stick will still be at least 3.9 mm. In comparison, the length of the blank member L313 of document D13 is only 3.18 mm. It is

apparent that the cost of the machining operation will rise in dependence on the length of the cut to be made and this could have acted as a disincentive to following the path chosen by the respondents. It is also to be noted that the only equivalent composite product of any description which has a supporting member/head member length ratio of at least 12:1 is the "SSD-L Long Stud" of document D8, which is not a blank intended to be cut into smaller diameter sticks but a product intended to be used in its own right.

The Board has therefore come to the conclusion that the subject-matter of claims 1 and 6 cannot be derived in an obvious manner from the state of the art and accordingly must be seen as involving an inventive step (Article 56 EPC).

Order

For these reasons it is decided that:

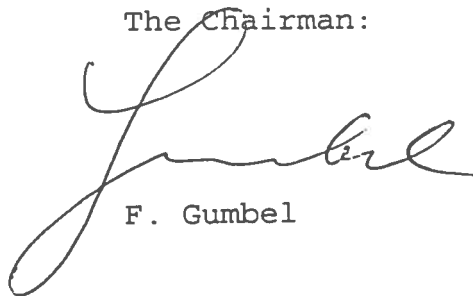
The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel

