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**Datasheet for the decision
of 3 June 2008**

Case Number: T 0760/05 - 3.2.07

Application Number: 98110340.1

Publication Number: 0882552

IPC: B24D 11/00

Language of the proceedings: EN

Title of invention:

Abrasive products

Patentee:

NORTON COMPANY

Opponent:

Minnesota Mining & Manufacturing Company

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

RPBA Art. 13

Relevant legal provisions (EPC 1973):

-

Keyword:

"Admissibility of late filed test report (no)"

"Novelty (yes)"

"Inventive step (no)"

Decisions cited:

T 0375/91, T 0569/02

Catchword:

-



Case Number: T 0760/05 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 3 June 2008

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

Representative: Zimmermann & Partner
Josephspitalstrasse 15
D-80331 München (DE)

Respondent: Minnesota Mining & Manufacturing Company
(Opponent) P.O. Box 33427
St. Paul, Minnesota (US)

Representative: Vossius & Partner
Siebertstrasse 4
D-81675 München (DE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 April 2005
revoking European patent No. 0882552 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: H. Meinders
Members: H. Hahn
E. Dufresne

Summary of Facts and Submissions

I. The patent proprietor lodged an appeal against the decision of the Opposition Division to revoke European patent No. 0 882 552. It requested that the decision be set aside and the patent be maintained as granted.

II. An opposition had been filed against the patent as a whole under Article 100(a) EPC on the grounds of lack of novelty and inventive step.

The Opposition Division held that the subject-matter of claims 1 and 12 as granted was novel, specifically with respect to D1 (EP-A-0 615 816). However, the subject-matter of claims 1 and 12 of the single request was considered to lack an inventive step with respect to D1. The subject-matter of the dependent claims 2-11 and 13-16 was considered to be obvious in the light of D1 or the further prior art.

III. Claims 1 and 12 as granted read as follows:

"1. A coated abrasive having a backing layer (1) and at least one abrasive layer adhered thereto, said abrasive layer comprising:

(a) a maker coat (2);

(b) abrasive grits (3) at least 25% of which have an aspect ratio greater than 2:1, and from 5 to 50% by weight, based on the abrasive grit weight, of non-abrasive particles (4) having an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits, the abrasive grits (3) and at least some of the non-abrasive particles (4)

being adhered to the backing layer by the maker coat;
and
(c) an outer layer comprising a grinding adjuvant."

"12. A process for the production of a coated abrasive which comprises:

(a) applying a maker coat (2) to a backing material (1);
(b) electrostatically depositing abrasive particles (3) at least 25% of which have an aspect ratio of at least 2:1 on the maker coat before curing thereof, and simultaneously or subsequently, depositing from 5 to 50% by weight, based on the abrasive particles' weight, of non-abrasive particles (4) having a longest dimension that is less than 75% of the average longest dimension of the abrasive particles, and thereafter at least partially curing the maker coat (2); and
(c) depositing an outer layer over the layer of abrasive and non-abrasive particles, said outer layer comprising a grinding adjuvant."

IV. With a communication annexed to the summons to oral proceedings dated 28 January 2008 the Board presented its preliminary opinion based on claims 1 and 12 of the patent as granted.

It appeared that D1 actually disclosed that the size coat used for making the examples comprised 68 wt.% sodium cryolite, i.e. it comprised a grinding aid (see page 12, lines 51 to 55), and that **no average largest dimension** of the diluent particles "DP I" was given in D1. It needed to be discussed as to how the upper value of the disclosed general ratio of the size of the shaped abrasive particles to the size of the diluent

particles in the range from 2.5:1 to 0.5:1 can be combined with the specific other parameters taken from the examples 16 or 18. The same held true with respect to a preferred aspect ratio of at least 2:1 according to claim 8 of D1 since this preferred value cannot be combined with the parameters of examples 16 and 18. Moreover, according to D1 "it is preferred that the diluent particles and the shaped abrasive particles be of approximately the same particle size range" (see page 10, lines 20 and 21) so that it did not appear to be conclusive that the average largest dimension of the non-abrasive particles is less than 75% of that of the abrasive grits as argued by the respondent. Furthermore, D1 disclosed that the (second) abrasive particles of example 16 and the (only) abrasive material of example 18 "consisted of about 480 g/m² of **grade 36 rods**" (see page 15, line 58 to page 16, line 1 and lines 8 and 9) but no further description of the particle size of said "grade 36 rods" was given in any of the examples so that **the aspect ratio of these rods appeared not to be known.**

Thus the subject-matter of claim 1 appeared to differ from the coated abrasive according to D1 at least in that the non-abrasive particles have an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits.

With respect to inventive step of the product of claim 1 and the process of claim 12 it stated among others:

It appeared that D1 represented the closest prior art for the coated abrasive of claim 1 and the process for making the same according to claim 12. The subject-

matter of claim 1 seemed to differ from the coated abrasive according to D1 not only in that that the non-abrasive particles have an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits, but also in that at least 25% of the abrasive grits have an aspect ratio greater than 2:1. The same conclusion appeared to be valid for process claim 12.

However, the patent in suit appeared to be silent with respect to any effect attributed to these features since it did not contain any examples at all, let alone a comparison with the closest state of the art. To be more specific, there were no comparative examples which demonstrated that the aspect ratio of the abrasive grits was actually critical or likewise showed that there existed an influence of the maximum average largest dimension of the non-abrasive particles to be at most 75% of that of the abrasive grit.

The test report D9 (Test report N7645-EP) submitted by the appellant with its grounds of appeal did not appear to be helpful in this respect for the following reasons. The first comparative example not containing any non-abrasive diluent appeared to only prove the statement of the prior art cited in the patent in suit (i.e. US-A-5 011 512) that coated abrasives containing blends of diluent non-abrasive particles and abrasive grit perform equal or superior to those containing 100% premium abrasive grits (see column 7, lines 17 to 24). Such an embodiment did, however, not correspond to the closest prior art D1. The second comparative example containing non-abrasive particle having an average largest dimension which is 135% of that of the abrasive

grit appeared not to be based on a specific example of D1 and thus seemed to be arbitrarily chosen. Particularly, taking account of the statement in D1 that the diluent particles and the shaped abrasive particles are of approximately the same particle size (see page 10, lines 20 and 21) this comparative example should have used an average largest dimension of at most 100%, but in order to demonstrate the criticality of said feature "at least 75%" a value somewhat outside said range should have been selected. Finally, this second comparative example used a different non-abrasive product (i.e. VICAL 1000) than the example in accordance with the patent in suit (which used ATF 40) and additionally a different amount of size coat was applied (2.8 g/m² compared to 5.1 g/m²) according to these examples.

Consequently, this example and the two comparative examples appeared not to have been made in accordance with comparative tests according to the established jurisprudence, i.e. that the comparison with the closest state of the art must be such that said effect is convincingly shown to have its origin in the distinguishing feature of the invention (see Case Law of the Boards of Appeal of the European Patent Office, 5th edition 2006, I.D.9.8).

According to the patent in suit the technical object to be solved - which allegedly is solved by the subject-matter of claims 1 and 12 - is to provide a novel way of overcoming the problem of grinding aid efficiency by permitting the placing of the grinding aid formulations at the point of maximum utility without the use of excessive amounts of the size or supersize formulations.

Thus it needed to be discussed as to which technical problem was actually to be solved by the said distinguishing features and whether or not the solution chosen was rendered obvious and/or suggested by the available prior art documents.

The parties were given the opportunity to file observations which should be filed well in advance, i.e. at least one month, before the date of the oral proceedings (3 June 2008) in order to give sufficient time to the Board and the other party to prepare for the oral proceedings.

Finally the parties were advised to take note of the Rules of Procedure of the Boards of Appeal, particularly of Article 13 RPBA.

- V. With letter dated 30 April 2008 the appellant submitted a new experimental report and comments concerning inventive step and alternatively requested to remit the case to the first instance for the examination of inventive step, in the light of said new experimental report.

- VI. By fax dated 15 May 2008 the respondent submitted that due to the shortness of time it did not have sufficient time to analyze this report thoroughly, prepare counter-arguments and, if necessary, counter-experiments.

Therefore, since this report could have been filed earlier and since the appellant did not give any reasons for the late filing, it asked the Board not to

admit the report into the proceedings. Alternatively, if it needed to be considered in the proceedings, postponement of the oral proceedings was requested to give the respondent enough time to deal with the newly filed evidence.

VII. With communication dated 23 May 2008 the Board informed both parties that said new report was filed at the very end of the time limit given in the Board's communication annexed to the summons to oral proceedings dated 28 January 2008, i.e. at a very late stage of the proceedings. Said late filing did not appear to allow the respondent to produce and present counter-experiments without postponement of the oral proceedings, which the Board, however, was not inclined to accept. Furthermore, these experiments did not seem to be particularly relevant for inventive step since the parameters of the three examples did not appear to reflect the critical features of the claims in question. Therefore it seemed that the new experimental report would have to be disregarded. The Board further referred to Article 13 RPBA and remarked that, in its communication annexed to the summons, it had advised the parties to take note thereof.

VIII. Oral proceedings before the Board were held on 3 June 2008. After discussing the admissibility of said new experimental report the issues of novelty and inventive step were discussed with respect to claim 1 on the basis of the documents D1, D4 (US-A-5 078 753) and D8 (Experimental Report submitted by the appellant [who is the applicant of D1] concerning dimensions and aspect ratios of samples of the shaped abrasive particles used in the examples of D1).

- (a) The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted.
- (b) The respondent requested that the appeal be dismissed.

At the end of the oral proceedings the Board announced its decision.

IX. The appellant argued essentially as follows:

The new experimental report was filed with letter of 30 April 2008, i.e. relatively late, because new experiments had to be carried out since the available test reports did not show the criticality of the features of claim 1. Therefore this new experimental report should be admitted.

The product of claim 1 is novel over D1 for the reasons given in the impugned decision and for the reasons given in the preliminary opinion of the Board. Furthermore, the shaped abrasive particles of D1 can have an aspect ratio of 1:1. The diluent particles could be abrasive particles and the size range of the shaped abrasive particles to the diluent particles is disclosed as 2.5:1 to 0.5:1, i.e. 40-200% with the preferred size range being approximately the same as that of the shaped abrasive particles (see page 10, lines 19 and 20). The amount of diluent can be greater than 50% (see examples 4 and 10). The aspect ratio of the grade 36 rods according to examples 16 and 18 of D1 is unclear while the description (see page 12, lines 14

and 15) of D1 only refers to the dried (unfired) rods and does not specify that they correspond to grade 36. Likewise the average size of the diluent particles is not known so that the size ratio cannot be calculated. Consequently, the product of claim 1 as granted is novel.

The size limitation feature of claim 1 is actually the distinguishing feature with respect to D1. Since the effect of this feature was denied by the respondent - the burden of proof lies with the respondent - but was never proven by it, the respondent failed to demonstrate that no effect can be attributed to this feature of claim 1. D1 includes no teaching to reduce the size of the diluent particles with respect to the average size of the shaped abrasive particles. Furthermore, the examples of D1 and particularly the examples 16 and 18, of which the results are less good than the comparative examples, do not form an incentive for the skilled person to perform this reduction. Furthermore, the patent in suit gives a clear teaching concerning the size of said diluent particles (see column 6, lines 11 to 16). Therefore the subject-matter of claim 1 involves an inventive step over D1.

X. The respondent argued essentially as follows:

The new test report of the appellant should not be admitted since the respondent was not in a position to react in an appropriate manner, having received it directly from the appellant on 2 May 2008, but proper copies of the photos of the report only as late as with communication of the EPO of 16 May 2008.

The subject-matter of claim 1 lacks novelty over D1 since it does not meet the standard criteria for a selection invention. Particularly, no novel element is present and the claimed ranges of the features according to claim 1 are not small compared to those of D1 and the values of the examples of D1 are also not far removed from the claimed ranges. The shape of the abrasive particles according to D1 is explained therein and they have an aspect ratio of 1:1, with 2:1 being preferred (see page 8, lines 48 to 55; page 9, lines 1 to 3 and lines 27 to 30). The procedure for making said shaped abrasive particles is described (see pages 11 and 12) and the triangular-shaped ones have dimensions of 0.29 cm on each side and a depth of 0.05 cm, i.e. the claimed aspect ratio of greater than 2:1 is fulfilled, while those of the fired rods still will produce an aspect ratio of greater than 2:1, even though they will have undergone a shrinkage (see page 12, line 5 and lines 14 and 15). There exists a high likelihood that 40% of said shaped rods have the said aspect ratio of 2:1. According to D1 specific types and amounts of diluent particles are used but no preference is given to the disclosed types, which include non-abrasive particles. Thus the restriction to non-abrasive particles cannot bring about novelty. Likewise the diluent particles have 40% of the size according to the abrasive particles size range of 2.5:1 to 0.5:1 and preferably they have approximately the same particle size since they may not be too small or too large (see page 10, lines 14 to 21). Thus they have the same size ratio as those according to the patent in suit (see patent, paragraph [0030]). According to examples 16 and 18 of D1 the size range of the diluent particles is 297-710 μm and their amount is about 30% by

weight (130 or 190 g/m² of non-abrasive particles as compared to 480 g/m² for the abrasive particles). There is no indication in D1 that there was a screening of the fired grade 36 rods. Furthermore, although there is a difference between the size range and the average largest dimension of abrasive or non-abrasive particles the latter is within the said size range. It is admitted that the general procedure for making the diluent particles "DP I" results in particles having a size range of 589-1350 µm being different from that according to the examples 16 and 18. The effect of a reduction of the amount of grinding aid, which is stated to be the objective technical problem, has not been shown by the patent in suit.

Relying on D1 the respondent has shown that the test report D9 of the appellant has not been produced in accordance with the standard required by the Boards of Appeal. Thus there exist no data which show a surprising effect. The patent in suit works in the general range of D1 but it is not known which problem is solved. The skilled person, when applying the teaching of D1, would choose the preferred aspect ratio of the shaped abrasive particles of at least 2:1 (see page 9, lines 1 to 3 and lines 29 and 30). Furthermore, taking account of the teaching concerning the size of the non-abrasive diluent particles, which should neither be too small nor too large relative to the shaped abrasive particles (see page 10, lines 14 to 21), he would select the size range thereof by simple trial and error. Thereby he would arrive at the subject-matter of claim 1 without any inventive merit by simply applying his common general knowledge. Said teaching concerning the size of the non-abrasive diluent

particles (agglomerates) relative to the size of the abrasive particles is also known from D4 (see column 6, lines 21 to 32). Consequently, the subject-matter of claim 1 of the single request lacks an inventive step.

Reasons for the Decision

1. *Admissibility of new experimental report*

The new experimental report was submitted by the appellant with its letter dated 30 April 2008. It was thus filed only about 5 weeks before the date of the scheduled oral proceedings and thus at the very end of the period as given in the Board's communication annexed to the summons to oral proceedings dated 28 January 2008. Hence it was filed at a very late stage of the appeal proceedings, with the only excuse that the experiments were performed in reply to the Board's communication.

1.1 Firstly, the Board wishes to note that the absence of any particular embodiment of the invention in the patent in suit as well as the lack of any test results was already noted in the decision under appeal. Thus, appropriate test results should have been filed with the appeal.

1.2 Secondly, if an experimental report is submitted as a reaction to a communication of the Board annexed to the summons to oral proceedings, in principle sufficient time should remain for the adversary to study it and perform counter experiments.

Filing an experimental report shortly before the date indicated by the Board as ultimate date for filing submissions runs counter to this principle (see e.g. T 375/91 of 17 November 1994, unpublished in OJ EPO and T 569/02 of 2 June 2004, unpublished in OJ EPO).

The report is consequently late-filed. The Board therefore has restricted itself to a prima-facie relevance test to determine whether there would be a case for admitting it and postponing the oral proceedings as a consequence.

- 1.3 The report discloses grinding performance results of abrasive disc products made according to three experiments: the first disc does not comprise any non-abrasive particles besides the abrasive particles which have an average aspect ratio of 2:1 with 56% having an aspect ratio of larger than 2:1, the second and third discs each comprise glass beads as non-abrasive particles to an amount of approx. 20% of the abrasive grain weight, the second disc presenting an average largest dimension of said glass beads of about 90.5% of the average largest dimension of the abrasive grits and the third disc presenting an average largest dimension of said glass beads of about 52.4% of the average largest dimension of the abrasive grits.
 - 1.3.1 The description of said experiments does not reveal all the details of how said three discs are made. For example, the amounts of make coat and size coat or the amount of grinding adjuvant are not specified. It is also nowhere stated that the said amounts were the same for all three discs. To the contrary, from the passage "After that, glass beads were electrostatically applied,

when needed, filling the spaces between the grains" (see the new experimental report, page 1, sixth paragraph) it could be concluded that besides said non-abrasive particles there was a further difference in the structure of the second and third discs containing glass beads, of which the performance was then compared.

- 1.3.2 The Board considers that, due to said lacking details, it is not possible to the appellant to repeat these experiments in order to verify them.
- 1.3.3 The first coated abrasive disc not containing any non-abrasive grits does not correspond to the closest prior art D1 and is thus not relevant at all as comparative example.

The other two coated abrasive discs containing 20% by weight non-abrasive particles, the first one being in accordance with D1 while the second one falls within the scope of claim 1, however, do not allow to deduce that the features of claim 1, e.g. the amount of abrasive grits "at least 25% of which have an aspect ratio greater than 2:1", the non-abrasive particles in an amount of "from 5 to 50% by weight, based on the abrasive grit weight" or having "an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits", and "an outer layer comprising a grinding adjuvant", are actually determinative for the alleged effects.

Any test report made in order to prove such criticality should have comprised more examples and particularly their parameters should have been selected accordingly to be slightly inside and/or slightly outside the

ranges and values as specified in claim 1 of the patent in suit in order to convincingly show an effect due to these specific values.

Consequently, the Board considers that the single example and the two comparative examples according to the new experimental report were also not made in accordance with the principle established for comparative tests according to the established case law, i.e. that the comparison with the closest state of the art must be such that said effect is convincingly shown to have its origin in the distinguishing feature(s) of the invention (see Case Law of the Boards of Appeal of the European Patent Office, 5th edition 2006, I.D.9.8).

- 1.4 In its communication annexed to the summons (see point IV above) the Board had also advised both parties to take note of the amended Rules of Procedure of the Boards of Appeal (RPBA), in particular Article 13 according to the new RPBA in force as from 13 December 2007 which relates to amendments to a party's case after the first exchange of the grounds of appeal and the reply of the respondent. The grounds of appeal were filed with letter of 23 August 2005, the reply of the respondent questioning inventive step in respect of the effects allegedly achieved dates from 8 March 2006. The new test report has been filed more than 2 years later, with letter of 30 April 2008.

Since the new experimental report is considered not to be relevant for the question of inventive step of the subject-matter of the independent claims 1 and 12, particularly because the parameters of the three examples do not reflect the critical features of said

claims (see point 1.3.3 above) the Board has decided not to admit the new experimental report into the proceedings.

There was therefore no need to postpone the date for the oral proceedings.

2. *Novelty (Article 54 EPC)*

The respondent's arguments that the subject-matter of claim 1 as granted would lack novelty over D1 for not meeting the requirements of a selection invention cannot be accepted for the following reasons:

- 2.1 D1 discloses a coated abrasive article which comprises a backing and at least one binder. The abrasive coating comprises diluent particles and shaped abrasive particles which are bonded to said backing via said binder and may comprise an overlying size coat (see figures 3 and 7; claims 26 to 29; page 10, lines 22 to 30). The diluent particles can comprise (1) a plurality of individual abrasive particles bonded together by an adhesive to form an agglomerate, (2) a plurality of individual non-abrasive particles bonded together by an adhesive to form an agglomerate, (3) a plurality of individual abrasive particles and a plurality of individual non-abrasive particles bonded together by an adhesive to form an agglomerate, (4) individual non-abrasive particles, (5) individual abrasive particles, or (6) combinations of the foregoing (see claims 1 and 13). The shaped abrasive particles can have shapes which can be characterized as thin bodies having faces of triangular, rectangular, including square, circular or other geometric shape and the ratio of the length of

the shortest facial dimension of an abrasive particle to its thickness is at least 1:1, preferably at least 2:1, more preferably at least 5:1, and most preferably 6:1; they can have shapes that can be characterized as rods with the ratio of length to maximum cross-sectional dimension being at least 1:1, preferably 2:1, and most preferably at least 3:1 (see page 4, lines 20 to 29; page 8, lines 48 to 50; page 9, lines 1 to 3 and lines 27 to 30). The thickness of said shaped particles preferably ranges from about 25 μm to 500 μm (see page 9, lines 24 and 25). In general the ratio of the size of the shaped abrasive particles to the size of the diluent particles is in the range from 2.5:1 to 0.5:1 and the size of the diluent particles ranges from about 50 to about 1500 μm , preferably from about 100-1200 μm ; and "it is preferred that the diluent particles and the shaped abrasive particles be of approximately the same particle size range" (see page 10, lines 14 to 21). The volume ratio of shaped abrasive particles to diluent particles can vary from 95:5 to 5:95, typically from 30:70 to 70:30, and preferably from 40:60 to 60:40 (see page 11, lines 24 and 25).

- 2.1.1 Thus the general teaching of D1 is silent with respect to any **average largest dimension** of the non-abrasive particles **being less than 75% of the average largest dimension** of the abrasive grits (particles), let alone that at least 25% of the abrasive grits should have an aspect ratio greater than 2:1. Although the average largest dimension is comprised somewhere in the range between the smallest and the largest size of the specified size range, it can be close to the largest size of the size range due to a possible particle distribution. Hence it is not conclusive that the

requirement of claim 1 of "an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits" is fulfilled. The same conclusion is valid with respect to the aspect ratio of the abrasive grits which according to D1 is at least 1:1.

Furthermore, the general disclosure of D1 does **not** teach to incorporate from 5-50% **by weight**, based on the abrasive grit weight, of non-abrasive particles into the abrasive layer, but only of 95:5 to 5-95% **by volume**.

Consequently, the general disclosure of D1 cannot be considered to be novelty destroying. The same holds true with respect to the specific embodiments of D1 for the following reasons.

- 2.1.2 D1 discloses **only** in the context of the examples a more specific procedure for making shaped abrasive particles (see page 11, lines 40 to 42). By using said procedure triangular-shaped particles were made from a gel-dispersion in a mould having dimensions of the mould cavities of 0.29 cm (= 2900 μ m) on each side and 0.05 cm (= 500 μ m) in depth wherein said dispersion underwent substantial shrinkage during drying. By extrusion of the gelled dispersion rods were produced which during drying broke into lengths and were screened to size. The dimensions of the dried rods were about 0.6 mm diameter (= 600 μ m) by about 0.6 to 2.4 mm length (= about 600 to 2400 μ m), with the median length being about 1.6 mm (= 1600 μ m)" (see page 12, lines 5 to 15). These (unfired) rods were then **fired** and collected (see page 12, lines 16 to 24).

The dimensions of the **fired** triangles or rods are nowhere specified in D1. Experimental Report D8 - which discloses measurements of average lengths and aspect ratios which are stated to be based on the shaped abrasive particles used in the examples of D1 - represents a separate, a second, document which disclosure is neither comprised in nor can it be considered as incorporated into the disclosure of D1 for novelty purposes.

In this context it is remarked that the fired triangular abrasive particles according to said general procedure should have a largest dimension smaller than 290 μm due to said described shrinkage (the examples 1 to 18 of D1 only specify the incorporation of "triangular-shaped particles" without mentioning any grade number thereof) whereas an average length of 1.44 mm (= 1440 μm) is specified in D8. Likewise an average length of 1.14 mm (= 1140 μm) is specified in D8 for the shaped abrasive rods - which are there designated "G-36 Rods" - which value, however, does not fit with an average grain size of 710 μm as specified in D4 for Grade 36 (see column 3, lines 9 and 10) but would fit to the rods described in the context of said general procedure for making shaped abrasives.

- 2.1.3 According to the procedure for making diluent particles the diluent particles referred to as "DP I" according to the examples comprised [in wt.%] 35.5 cured resole phenolic resin, 61.1 sodium cryolite, 1 wood pulp and 2.4 glass bubbles. These particles "were screened to a **size range** of about 589 to 1350 μm , such that they passed through a 16 mesh stainless steel screen, but

were retained on a 34 mesh stainless steel screen" (see page 12, lines 34 to 38; page 15, lines 57 and 58).

Thus D1 does **not** specify any **average particle size** of said "DP I" particles.

2.1.4 The same conclusion holds true for the diluent particles according to example 18 which "were screened to a **size range** of about 297 to 710 micrometers, such that they passed through a 25 U.S. standard screen, but were retained on a 50 U.S. standard screen" and for example 16, which additionally does not clearly specify the particle size of the diluent particles "190 g/m² of DP I" which thus could be that according to the described general procedure, i.e. 589-1350 µm.

2.1.5 The above "average particle size" conclusion holds also true for the abrasive particles of examples 16 and 18 which "consisted of about 480 g/m² of **grade 36 rods**" (see page 15, line 57 to page 16, line 1 and lines 5 to 9). There exists no further description in D1 of the size range or the aspect ratio of said "grade 36 rods". Therefore the **aspect ratio** of these rods is also **not** known. As already mentioned above, said "grade 36" corresponds - according to other patents assigned to the respondent, such as D4 - to an average grain size of 710 µm (see D4, column 3, lines 9 and 10) so that - taking account of said diluent particle size range of 297 to 710 µm - it is not credible that the requirement of claim 1 of "less than 75% of the average largest dimension of the abrasive grits" is conclusively fulfilled. In this context it is also considered that according to D1 "it is preferred that the diluent particles and the shaped abrasive particles be of

- approximately the same particle size range" (see page 10, lines 20 and 21) so that, also for this reason, it is not conclusive that the aforementioned requirement is actually met.
- 2.1.6 Said 190 g/m² non-abrasive DP I in combination with 480 g/m² grade 36 rods of example 16 and said 130 g/m² DP I and 480 g/m² grade 36 rods according to example 18, respectively, result in weight ratios of 38,6% and 27,1%, respectively, thus meeting the weight ratio requirement of "from 5 to 50% by weight" of claim 1.
- 2.1.7 Moreover, the **high likelihood** - as argued by the respondent - that 40% of said fired abrasive rods had an aspect ratio of at least 2:1, since such a ratio is preferred according to D1 (see e.g. claim 8) **is not sufficient** with respect to the - according to the longstanding practice of the Boards of Appeal - required standard of a clear and unambiguous explicit and/or implicit disclosure in a document in order that the document is considered to be novelty destroying. Likewise it is clear that this specific aspect ratio of at least 2:1, taken from another passage in the specification of D1, cannot be combined with the specific embodiments according to the examples 16 and 18.
- 2.1.8 According to the procedure in D1 for making coated abrasive articles the size coat for making the examples comprises 68 wt.% cryolite, i.e. it comprised a grinding aid (see page 12, lines 51 to 55).
- 2.1.9 Thus the subject-matter of claim 1 differs from the coated abrasives according to examples 16 and 18 of D1

in that at least 25% of the abrasive grits have an aspect ratio greater than 2:1 and that the non-abrasive particles have an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits.

Consequently, the subject-matter of claim 1 as granted is novel with respect to the disclosure of D1.

2.2 Since there is no document on file which discloses a coated abrasive product having all the features of claim 1 as granted the Board considers that the subject-matter of claim 1 as granted is novel (Article 54 EPC).

3. *Inventive step (Article 56 EPC)*

3.1 D1 represents the closest prior art for disclosing a coated abrasive article comprising a backing and at least one binder and an abrasive coating comprising diluent particles and shaped abrasive particles which are bonded to said backing via said binder, preferably using electrostatic coating (see figures 3 and 7; claims 26 to 29). The aspect ratio of the shaped abrasive particles is at least 1:1, preferably at least 2:1 and most preferably 6:1 (see page 9, lines 1 to 3) and if these particles are elongated, such as rods, their aspect ratio is more preferably at least 2:1 and most preferably at least 3:1 (see page 9, lines 27 to 30). Preferably the shaped abrasive particles are coated onto the make coat in an electrostatic field so that the majority thereof is oriented, i.e. with the longest dimension being perpendicular to the plane of the backing; and the applied size coat contains sodium

cryolite, i.e. contains a grinding aid (see page 10, lines 46 to 55; page 12, lines 40 to 55; claim 29; figures 3 and 7). The ratio of the size of the shaped abrasive particles to the size of the diluent particles is in general in the range from 2.5:1 to 0.5:1 (see page 10, lines 14 to 21). Thus the size range of the diluent particles is 40-200% of the size of the abrasive particles. It is preferred that the diluent particles and the shaped abrasive particles have approximately the same particle size range (see page 10, lines 20 and 21).

D1 aims to provide coated abrasive articles containing both abrasive particles having specified shapes and diluent particles which provide a cut that compares favourably with the cut provided by coated abrasive articles containing only high quality abrasive grits, but can be produced at lower costs than the latter (see page 3, lines 2 and 3 in combination with page 11, lines 35 to 39).

- 3.2 The coated abrasive product of claim 1 as granted differs from the coated abrasives according to D1 in that
- i) at least 25% of the abrasive grits have an aspect ratio greater than 2:1, and
 - ii) that the non-abrasive particles have an average largest dimension that is less than 75% of the average largest dimension of the abrasive grits.

- 3.2.1 Feature i) appears to result in that such "weak" shaped grits, i.e. those having an aspect ratio of greater than about 1.5, when being aligned with their longest dimension perpendicular to the plane of the backing,

improve on the one hand the effectiveness of the abrading process but on the other require larger amounts of size and supersize coats in order to prevent the premature fracture of the grit or even displacement of the whole grit from the backing (see patent, column 1, line 44 to column 2, line 4 and line 45 to column 3, line 1; column 3, lines 38 to 48). It is, however, not apparent from the patent in suit - which does not disclose any example, let alone a comparison with the closest prior art D1 - that said amount of "at least 25% of abrasive grits having an aspect ratio greater than 2:1" causes any different effect compared to an abrasive product of the prior art comprising abrasive grits having also such an aspect ratio but comprising not more than about 20% thereof (see patent, column 3, lines 2 to 7 and lines 24 to 29). In the patent in suit it is merely stated that the products are particularly useful when the abrasive grits have aspect ratios such that at least 40%, and even more preferably at least 75%, exceed 2:1 (see patent, column 5, lines 28 to 31).

- 3.2.2 With respect to feature ii) it is only stated in the patent in suit that the non-abrasive particles should be small enough to occupy the spaces between the abrasive grits (see patent, column 6, lines 11 to 26) and that they contribute to the more efficient operation of the abrasive particles with which they are mixed (see column 4, lines 45 to 48). Here again, the patent does not give any example of a technical effect obtained with the claimed feature, nor any evidence of the criticality of this size feature. Hence a specific effect of this feature ii) is likewise not apparent.

3.2.3 Taking account of points 3.2.1 and 3.2.2 above the Board therefore concludes that features i) and ii) need not be considered as distinguishing features for defining the objective technical problem since no effect can be attributed to them.

3.3 According to the appellant the problem underlying the patent in suit relates to the improvement of grinding aid efficiency (see column 3, lines 49 to 54) and thus to improving the grinding performance of abrasive articles.

The Board, however, cannot accept this definition of problem for the following reasons.

3.3.1 Although the aforementioned problem is identically described in the application as originally filed, on which the patent in suit is based, it is based on different prior art documents cited in the description. During the examination procedure D1 was then identified as the closest prior art in the description of the patent.

Furthermore, the patent specification does not comprise a single example, let alone a comparative one with respect to any of the cited prior art and particularly not with respect to the closest prior art D1. During the entire examination and opposition proceedings the appellant has also not submitted any results of appropriate comparative tests which would demonstrate an improvement of grinding performance of the abrasive articles according to claim 1 compared to those of D1. A reduction of the amount of grinding aid has not been shown by the patent in suit. This deficiency had

already been noted in the impugned decision (see grounds for the decision, point 3.1, last paragraph) and the Board has reiterated this point in its communication annexed to the summons to the oral proceedings. Additionally the Board gave the reasons as to why the test report D9, filed together with the grounds of appeal, does not meet the requirements for comparative tests according to the established case law of the Boards of Appeal (see point IV above).

The appellant has not replied in substance to the reasoning given in said communication. Since it does not refute or overcome these objections, the Board sees no reason to depart from its preliminary opinion. Consequently, no technical improvement can be acknowledged for the coated abrasive according to claim 1 compared to the coated abrasives of the closest prior art D1.

3.3.2 Therefore the objective technical problem can only be defined as a less ambitious one, being the provision of a further coated abrasive product.

3.4 This problem is solved by the process as defined in claim 1 as granted.

3.5 The Board, however, considers that the subject-matter of claim 1 as granted is rendered obvious for the following reasons:

3.5.1 It is considered that the skilled person starting from the examples 16 and 18 of D1 would select the recommended preferred aspect ratios of the shaped abrasive particles of at least 2:1, particularly when

considering the specified dimensions of the moulds for the triangular-shaped, square-shaped abrasive articles or the dimensions of the dried rod-shaped abrasive articles obtained according to the described general procedure (see page 12, lines 5 to 15) which in all cases result in aspect ratios well above 2:1.

- 3.5.2 Concerning the size of the diluent particles, based on the general teaching of a ratio of the size of the shaped abrasive particles to the size of the diluent particles of 2.5:1 to 0.5:1, D1 thus mentions a general range of from 40-200% of the size of the shaped abrasive particles. D1 further specifies that the diluent particles neither may be too small nor be too large relative to the shaped abrasive particles, in order not to adversely affect the coated abrasive article (see page 10, lines 14 to 20). D1 further states that it is preferred that the diluent and shaped abrasive particles be of approximately the same particle size (see page 10, lines 20 and 21).

Taking account of said general range it is, however, clear to the skilled person, particularly when reading example 18, which is the only example specifying the size range of the diluent particles (namely about 297 to 710 μm) in combination with the size (namely grade 36) of the shaped abrasive particles (see page 16, lines 5 to 9) that the two size ranges have to be matched within said general range of 40-200%. Said grade 36 corresponds to an **average** grain size of 710 μm (see point 2.1.5 above) so that implicitly the maximum value of the abrasive particle size range must be greater than the maximum value of the diluent particle size range of 710 μm . For example 18 the average grain size

of the diluent particles will thus be smaller than that of the shaped abrasive particles.

3.5.3 Consequently, the person skilled in the art has to apply his common general knowledge and select the size range of the diluent particles by trial and error, performing experiments within said general range of 40-200%. Such experiments, however, will inevitably include diluent particle sizes close to the minimum and maximum values of said range. Thereby the person skilled in the art would obtain coated abrasive articles having a diluent particle size of which the average largest dimension is less than 75% of the average largest dimension of the abrasive grits as required by claim 1 as granted. The appellant's arguments regarding the size of the shaped abrasive particles therefore cannot hold.

3.6 The appellant's further arguments cannot be accepted for the following reasons.

3.6.1 First of all, the burden of proof regarding the effect allegedly caused by the distinguishing features of claim 1 has shifted from the respondent (opponent) to the appellant, since the present case is determined by a decision of the Opposition Division, which revoked the patent (see Case Law of the Boards of Appeal, 5th edition 2006, section VI.K.5.2.).

3.6.2 Although the test results of examples 16 and 18 in D1 are less positive than the comparative examples this cannot be interpreted that the skilled person has no incentive to produce the abrasive articles according to D1 comprising such a mixture of shaped abrasive

particles and diluent particles since there exist other examples in D1 which clearly outperformed the comparative ones, e.g. examples 4, 6, 8, 10 and 11 (examples 10 and 11 except in test procedure II), 12, 14 and 20 (compare Tables 2 to 5) even though the examples 4 and 10-12 do not meet the weight ratio requirement of claim 1.

3.6.3 The argument concerning an effect caused by the distinguishing features of claim 1 - resulting in an improvement over the coated abrasive articles of D1 - therefore has not been supported by any appropriate evidence.

3.7 Therefore the subject-matter of claim 1 as granted lacks an inventive step, and thus does not meet the requirements of Article 56 EPC.

Consequently, the single request is not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders