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D E C I S I O N
of 11 December 2001

Case Number: T 0244/98 - 3.2.3

Application Number: 90117665.1

Publication Number: 0418738

IPC: B24D 3/28

Language of the proceedings: EN

Title of invention:

Abrasive article and method of making same

Patentee:

NORTON COMPANY

Opponent:

Minnesota Mining & Manufacturing Company
Noritake Company Ltd

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 114(2)

Keyword:

"Novelty - no (main request)"

"Inventive step - no (auxiliary request)"

Decisions cited:

-

Catchword:

-



Case Number: T 0244/98 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 11 December 2001

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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 12 December 1997
revoking European patent No. 0 418 738 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: C. T. Wilson

Members: U. Krause
M. K. S. Aúz Castro

Summary of Facts and Submissions

I. The appeal contests the decision of the Opposition Division, dated 9 October 1997 and issued in writing on 12 December 1997, revoking European Patent No. 0 418 738.

II. The Appellant (Proprietor of the patent) filed the notice of appeal on 12 February 1998 and paid the appeal fee on the same day. A statement of the grounds of appeal, including a new set of claims 1 to 8, was submitted on 22 April 1998.

In response to a communication issued by the Board pursuant to Article 11(2) RPBA as an annex to the summons to attend oral proceedings, the Appellant submitted with letter of 9 November 2001 amended sets of claims according to a main request and first, second and third auxiliary requests. Respondent 01 submitted a declaration of Mr Duwell.

In oral proceedings held on 11 December 2001 the Appellant amended claim 8 of the main request and replaced the three auxiliary requests by a single auxiliary request.

III. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of claims 1 to 8 filed on 9 November 2001 whereby the word "sintered" was added in claim 8 after the word "seeded", or, as auxiliary request, on the basis of claims 1 to 7 filed in oral proceedings. The Respondents (Opponents) requested that the appeal be dismissed.

IV. The single independent claim 1 of the main request has the following wording:

- "1. Abrasive wheel, comprising an uniform mixture of:
- (a) sintered sol-gel aluminous abrasive particles of irregular shape,
 - (b) friable filler particles providing from 20% to 70% of the volume of particulate matter selected from the group consisting of hollow oxide spheres, friable silicate particles, and hollow or solid organic polymer spheres, and
 - (c) a resinous bond in which all the said particles are mounted and held."

In claim 1 of the auxiliary request the sol-gel aluminous abrasive particles (a) are defined as being "seeded" sintered sol-gel aluminous abrasive particles.

V. Concerning the issues of novelty and inventive step the following patent documents cited during the procedure before the first instance were considered as particularly relevant and discussed in the oral proceedings:

D0: US-A-4 314 827

D1: US-A-2 806 772

D2: EP-A-0 228 856

D3: US-A-4 799 939

D7: EP-A-0 293 164

D9: EP-A-0 293 163

D12: US-A-4 744 802

D20: EP-A-0 395 087

With his letter of 9 November 2001 the Appellant referred *inter alia* to the following further documents:

D27: W. Perkins, Ceramic Glossary 1984, The American Ceramic Society, Inc.

D28: W. Ault, "SG abrasive: When to choose it", Tooling and Production magazine, May 1988

D29: P. Kendall, "Cubitron Ceramic Alumina Abrasive Grain", article reproducing a talk given on a conference in Marco Island, Florida, December 10-12, 1989

D30: 2 Noritake web pages "CX Wheel"

D31: US-A-1 983 082

During the oral proceedings the Appellant submitted copies of documents US-A-3 079 243, US-A-3 387 957, US-A-3 909 991 and US-A-4 786 292 (in the following referred to as "sintered abrasive documents"), and the Respondents filed two drawings showing straight and curved filaments ("filament drawings"), seven sheets analysing the examples of the patent and of US application No. 07/406487 which is one of the priority documents of the patent ("analysis sheets") and nine tables comparing the G-ratio of grinding wheels taken from the patent and D6 ("tables").

VI. The relevant arguments of the Appellant can be summarized as follows:

Main request:

The terms "particles" and "pellets" were used in the original application in an interchangeable manner to define the friable filler. Moreover, the term "silicate particles" used in claim 1 was supported by the broad definition of the invention on page 3, lines 10 to 12, of the published application. A basis for the restriction of the abrasive particles to those having an irregular shape was to be found on page 4, line 12 of the published application, where this term was used to distinguish from typical regular shapes such as spherical, pyramidal, cylindrical and cubic configurations. Whereas the original claims included the term "mixture", as used in claim 1 to define a uniform distribution of the particles and the bond, only in combination with the method of making the abrasive wheel, it was evident that this mixture should persist in the finished wheel, i.e. after forming and curing. A further basis for the uniform mixture was found in original claim 13 referring to the uniform structure of the wheel. The omission of the lower limit for the amount of abrasive particles from original claim 1 was allowable in view of fact that original independent claims 9 and 15 defined a different lower limit and the more general definition of the invention on page 3, lines 27 to 33, included no lower limit at all. The filler particles of claim 3 were selected from the list originally disclosed on page 3, lines 35 to 38 of the published application.

There was no lack of disclosure as to how abrasive

particles of irregular shape could be produced because this was set out in detail in documents US-A-4 623 364 (Cottringer), US-A-4 314 827 (Leitheiser, D0) and US-A-4 744 802 (Schwabel, D12) mentioned on page 2 of the patent. Guidance as to how the amount of filler particles defined in feature (b) of claim 1 could be obtained was given in the examples. The wheel density specified in the examples would allow transformation of the batch weights of Tables 1, 3 and 5 into the volume percentages given in Tables 2, 4 and 6, based on an appropriate bulk density of the filler particles.

Claim 1 was not anticipated by document D3, mentioning "modified ceramic aluminum oxide" as a possible abrasive in column 3, lines 59 and 60, because neither the term "modified" nor the term "ceramic" was an indication for sol-gel alumina. There were all kinds of "modifiers" in the art, and the description of the "ceramic process" in D27 made clear that the term "ceramic" includes all abrasives obtained by sintering, such as the different types of abrasives disclosed in the "sintered abrasive documents". It was evident from D7 originating from the same applicant as D3 that the term "sol-gel" was used if this was meant. Further, D3 described agglomerates having regions with a high concentration of bonding agent, rather than a uniform mixture of abrasives and bond, and the reference to US patent No. 4 314 827 (document D0) in column 5, lines 57 to 59, was limited to the method of manufacturing the grinding wheels and did not include the abrasive material. Document D9 disclosed grinding wheels comprising sol-gel abrasive grits blended with an unspecified amount of glass. However, there was no description of hollow glass spheres which would be included in the hollow oxide spheres listed in claim 1,

and glass, having an amorphous structure, would also not fall under the term "silicate particles" which have a crystalline structure. Moreover, claim 1 was distinguished from document D20 by the irregular shape of the abrasive particles which could not be obtained by extrusion, as described in D20, even if curved or twisted afterwards. Consequently, D20 mentioned only regular shapes on page 4, lines 30 to 32. The second abrasive described in the paragraph bridging pages 5 and 6 of D20 was not a sol-gel abrasive.

Auxiliary request:

A basis for adding the feature that the sol-gel abrasive was a seeded sol-gel abrasive was provided by original claim 3. Since neither document D3 nor D0 nor D9 referred to seeded sol-gel aluminous abrasives, D7 mentioned such an abrasive only in Example 102 for a coated product without specifying any amounts of filler, and D20 disclosed only regular extruded seeded abrasive grits or, as a second abrasive, non-seeded abrasives, the subject-matter of claim 1 was new. As to inventive step, Example 47 of D0, rather than D3, was the correct starting point and the problem to be solved was to be seen in reducing the costs of the abrasive wheel without having to sacrifice performance. The results presented in Table 1 submitted on 9 November 2001 showed a surprising superiority of wheels denoted 3R,3Q having a portion of bubble alumina over wheels 4R,4Q including no such fillers. It is admitted that this conclusion was not derivable from the examples in the patent which did not compare wheels including fillers with those having seeded sol-gel alumina without fillers. However, the prior art did not provide any guidance towards the inventive concept because no

performance data could be derived from D1 disclosing hollow friable fillers and D3 was primarily concerned with coated agglomerates rather than grinding wheels.

VII. The Respondents submitted essentially the following counterarguments:

Main request:

The omission of the lower limit for the amount of abrasive particles from original claim 1 was unallowable under Article 123(2) EPC because it was evident from the definition of the invention on page 2, lines 47 to 49 of the published application that this was an essential feature. Further, the original application disclosed the silicate fillers only in the form of pellets, defining a particular shape of particles, which could not form a basis for the more general expression "particles". The uniform mixing was originally disclosed only as a step in the method of forming the abrasive particles which did not allow to draw any conclusions as to the uniformity of the distribution of the components in the finished wheel. In any case, the term mixture was inappropriate as defining the distribution in a powder or the like, whereas the finished wheel is an agglomerate of particles and voids, as shown in D31. Likewise, the term "irregular shape" was unclear and unable to distinguish the claimed particles from e.g. a selection of spheres of different diameter or of filaments having different lengths. Moreover, claim 3 defined a selection of fillers which was originally disclosed on page 3, lines 35 to 38, as an alternative to the fillers defined in claim 1, rather than as an addition, and the deletion of zirconium oxide bubbles and glass

beads from the list in granted claim 3 was not allowable as not being occasioned by grounds for opposition.

A person skilled in the art could not carry out the invention of claim 1 because the patent did not teach how to prepare the abrasive grits of irregular shape and how to obtain the filler amount of 20% to 70% by volume. The examples were silent about the shape of the grits, and the volume fractions were inconsistent with the batch weights if the density ratio of sol-gel alumina to bubble alumina was 0.26, as specified by the Appellant. Further, it could not be derived from the application, in particular from the examples, that the claimed effect of enhancing the grinding performance by substituting friable filler particles for part of the sol-gel abrasive grains was obtained throughout the whole range of the fraction of the filler particles as defined in claim 1.

Novelty was lacking in view of documents D3, D9 and D20. Concerning the abrasive grits, D3 mentions "modified ceramic aluminum oxide" which is understood by the skilled person, as demonstrated by the reference to D0 in column 5, lines 57 to 59, and by the declaration of Mr Duwell, as meaning sol-gel aluminous oxide with modifying additives such as zirconia. It was evident from D2 and D28 to D30 that different names were used in the art to define such sol-gel abrasives. The friable fillers were glass bubbles, which fell under the term hollow oxide spheres, in an amount corresponding to the range defined in claim 1. A uniform mixture of the particles, as shown in figure 1 of D3, would be obtained by the mixing step described in column 4, lines 48 to 61. In D9, the sol-gel ceramic

abrasive grits may be blended with glass which was a friable filler as defined in claim 1. The extrusion of the abrasive filaments through orifices of any shape whatsoever, as described in D20 on page 4, lines 30 to 32, possibly with the optional bending and twisting, would produce grits of irregular shape, as shown in the "filament drawings". Furthermore, claim 1 did not exclude the mixture of irregular and regular shaped grits which resulted from the addition of a second, non-filament shaped abrasive described in the paragraph bridging pages 5 and 6 of D20. A blocky, i.e. irregular shaped sol-gel abrasive with pores was for example described in Example IV of D20. According to page 5, lines 27 to 35, the pores could be produced by hollow glass beads or bubbled alumina, both being filler particles covered by claim 1.

Auxiliary request:

There was still a lack of novelty since the abrasive grains of Example 102 of D7, which otherwise corresponded to D9, and of several examples of D20, e.g. Examples I and IV, were described as being seeded sol-gel alumina. As to inventive step, D0 disclosing sol-gel alumina abrasive grits without filler could be taken as a starting point but D1 or D3 were more appropriate because both documents disclosed abrasive wheels comprising a mixture of abrasive particles and hollow fillers such as balloons of vitrified clay material or heat hardened resin (D1) or glass bubbles (D3) in a resinous binder, the only difference being the type of abrasive material. A disclosure of sol-gel alumina particles was already derivable from D3 by reference to D0. It was impossible to draw any conclusions from either the examples given in the

patent or the amended results on Table 1 submitted on 9 November 2001 by the Appellant as to any beneficial effects of the only remaining difference, i.e. the choice of seeded sol-gel alumina. Rather, it was shown in the "analysis sheets" and the "tables" that a performance increase was due to the replacement of fused alumina by sol-gel alumina and to the type of binder used for the resinous bond, whereas a comparison between the data for the wheels D/E and G/J, as shown in Table 2 of the patent, suggested that a partial substitution of the sol-gel alumina by syenite as a friable filler, at least in the range specified for these wheels, would even lower the G-ratio. Thus, the problem to be solved vis-à-vis D3 could only be seen in providing grinding wheels using other abrasives. Since the seeded sol-gel alumina was known at the priority date of the patent, for example from D12 or document US-A-4 623 364 discussed in the patent, as being a particularly effective abrasive, the skilled person would consider using this type of abrasive for the grains in D3, especially as the beneficial effects of the filler material described in the text bridging columns 2 and 3 of D3 was independent of the particular type of abrasive grain and could, therefore, also be expected for seeded sol-gel alumina. In view of these advantages and the cost reduction to be expected it was also obvious to substitute, in the grinding wheel of D0 as closest prior art, a friable filler for part of the expensive sol-gel grains.

Reasons for the Decision

1. The appeal meets the requirements of Articles 106 to 108 EPC and of Rules 1(1) and 64 EPC and is, therefore,

admissible.

2. *Main request*

2.1 Amendments

Feature (a) of claim 1 defines the abrasive particles without giving a lower limit for the amount thereof. Granted claim 1 was likewise devoid of any such lower limit and its omission cannot, therefore, extend the scope of protection conferred by claim 1. Original claim 1 specified that an amount of at least 30% of the total particular volume was provided by abrasive articles comprising particles of sol-gel alumina, and an amount of sol-gel abrasive particles of at least 10% by volume of the "particulate matter" was specified in claim 1 of the second and third auxiliary request dealt with in the decision under appeal and in claim 1 as submitted by the Appellant together with the statement of the grounds of appeal. The latter definition gave rise to an objection in the communication issued by the Board, whereupon it was entirely deleted from the claim. Such a deletion can be allowed under the terms of Article 123(2) if there is a clear basis in the original application that the deleted feature is not an essential part of the invention. In the present case this basis is formed by the general definition of the invention on page 3, lines 27 to 33, of the published application (corresponding to the text on page 5, line 23 onwards, of the original application and, at least in this relevant respect, to page 3, lines 41 to 49, of the patent) which does not include any lower or upper limit for the sol-gel abrasive particles. In view of this general definition it was, therefore, evident that the limit specified in original claim 1 and the

limit values of 10% to 50% by volume of the abrasive particles given in the examples would be considered by a skilled reader as practical data, without intending to limit the invention or defining a particular effect within the range of original claim 1.

A further amendment to claim 1 concerns the additional definition of the abrasive particles as being of "irregular shape". This amendment is based on the description of the abrasive particles on page 4, lines 12 to 17 of the published application (corresponding to page 6, lines 16 to 22 of the original application) where a distinction is made between particles of irregular shape and other configurations such as spherical, pyramidal, cylindrical, cubic "or other" shapes. This distinction follows the general understanding of the terms "regular" vs. "irregular" and the Board therefore concludes that the term "irregular" is intended to distinguish from any configuration which is generally considered regular or derived from such a regular configuration so as to retain the relevant regular characteristics. Thus, the term "irregular shape" is regarded as being sufficiently clear to define the claimed subject-matter.

The Respondents further object to the omission of two examples for the filler particles in claim 3 as being not allowable in view of Rule 57a EPC. This Rule, which according to Rule 66(1) EPC also applies to the appeal proceedings, requires that the amendments are occasioned by grounds for opposition specified in Article 100 EPC. The Appellant argues that this amendment was made in order to overcome a potential objection under the ground of lacking novelty, since

the deleted filler zirconium oxide bubbles and glass beads were known as fillers in the art. The Board follows this argument because the deletion of the two examples in dependent claim 3 could at least in principle have a limiting influence on the understanding of the terms "hollow oxide spheres" in claim 1. It should be borne in mind that this potential suitability is sufficient for an amendment to be allowable under the terms of Rule 57(a) as a fair attempt to overcome a potential objection, irrespective of whether the attempt is successful or not.

Thus, the amended claims of the main request meet the requirements of Articles 123(2), 123(3) and 84 EPC.

2.2 Insufficient disclosure

The objections raised under the terms of Article 100(b) EPC (corresponding to Article 83 EPC) concern the questions of how to prepare abrasive grits of irregular shape and how to obtain the filler amount of 20% to 70% by volume.

Regarding the first question the patent indicates, in line 26 of page 4, that the irregular shape results from the way of preparing the abrasive particles. Further, explicit reference is made in the patent (on page 3, lines 23 to 25 in combination with the two first paragraphs of page 2) to a number of documents describing the abrasive particles to be used in the invention and their preparation (documents US-A-4 623 364, US-A-4 314 827 (D0) and US-A-4 744 802 (D12)). The preparation either by giving the particles a desired shape before drying or by drying in any convenient form followed by crushing or breaking is disclosed for

example in D0, column 4, lines 53 to 57. The latter preparation method will clearly result in abrasive particles of irregular shape. Thus, the skilled person will only have to turn to one of the US patent documents referred to in the patent to find out how such particles of irregular shape could be prepared.

Regarding the second question the Respondents did not seriously challenge that an abrasive wheel having an amount of filler particles from 20% to 70% of the volume of particular matter could be produced by routine work of a skilled person. Rather, the argument was that the volume fractions given for example in Tables 2 and 4 were inconsistent with the batch weights given in Tables 1 and 3, respectively, if the bulk density ratio of bubble alumina to sol-gel alumina was 0.26, as specified by the Appellant in his letter of September 9, 1997. However, the Board cannot follow this argument because there is no evidence that it was impossible, or required undue efforts, to obtain volume fractions of the friable filler within the specified range on the basis of the corresponding batch weights. If a particular value of the density ratio does not give the desired results, the value is incorrect and should be amended or changed. No problem arises in this respect because the bulk density ratio is, *inter alia*, a function of the wall thickness of the bubble alumina which can be freely selected.

Thus, the Board comes to the conclusion that the claims according to the main request meet the requirements of Article 83 EPC.

2.3 Novelty

Novelty is in dispute with respect to documents D3, D9 and D20. Document D20, which is prior art according to Article 54(3) EPC, was filed after the expiry of the opposition period and disregarded by the first instance as being irrelevant. The Board cannot share this view because the grinding wheels disclosed in D20 comprise a uniform mixture of sintered sol-gel alumina abrasive particles and bubbled alumina or hollow or solid resin beads as pore inducing media in a range of from 0% to 73% held in a resinous binder (see in particular page 3, lines 6 to 8, and page 5, lines 27 to 50) and, therefore, correspond to those claimed in the independent claim 1 underlying the decision under appeal. Concerning claim 1 of the present main request, however, a difference can be seen in the fact that the abrasive articles of D20 are filaments produced by spinning or extrusion, thus having a constant cross-section along their length as a characteristic of a regular shape, whereas the irregular shape of the abrasive particles, as now defined in claim 1, excludes such a constant cross section. Thus, document D20 is not considered to destroy the novelty of the subject-matter of claim 1.

As set out in detail in the decision under appeal document D3 discloses an abrasive product in the form of a coated abrasive product or a grinding wheel comprising abrasive grains mixed with glass hollow bodies and retained in a resinous binder. Based on the weight fractions of the three components specified in column 4, lines 17 to 22, in combination with a bulk density of the hollow bodies in the range from 0.1 to about 0.6 g/cc, as given in column 3, lines 15 to 20, and a known density of the alumina abrasive particles of about 3.9 g/cc, typical values for the volume

fraction of the glass hollow bodies will be between about 10% and 50% which is largely within the range defined in claim 1. The mixture of the components is described in column 4, lines 48 to 68, to be stirred until it is homogeneous before being solidified by curing. Thus, a homogeneous or uniform mixture will persist in the solidified mixture in the same manner as in the abrasive wheel of claim 1. The Appellant holds that this mixture is defined only for agglomerates which are then used for preparing grinding wheels, rather than to the grinding wheels proper, and that it cannot, therefore, be concluded that the same homogeneous mixture should be present in the grinding wheels. This argument does not take due account of the reference, in column 5, lines 57 to 59, to the manner of preparing grinding wheels described in Example 47 of document US-A-4 314 827 (D0). According to this example a mixture of abrasive grains, friable filler and resin binder is thoroughly mixed and thereafter evenly distributed in a wheel mold, compacted and cured. In the Board's view, the only technically meaningful manner of applying this method to the mixture of D3 for producing grinding wheels would be to mix the abrasive particles, the glass hollow bodies and the binder of D3, rather than a mixture of previously produced agglomerates, further fillers and further binder, before compacting and curing this mixture, thereby obtaining the "agglomerates" as integral components of the grinding wheel and a uniform distribution of the abrasive particles and filler particles in the bond.

Thus, it remains to be decided whether the use of sintered sol-gel aluminous abrasive particles can be derived from D3. Several suitable examples of abrasive grains are listed in column 3, lines 54 to 61, and one

of them is "modified ceramic aluminum oxide". It is stated in the decision under appeal that this term may, as a generic term, include sol gel aluminum oxide but that there was no conclusive evidence that this term is equivalent to or defines a sol-gel aluminum oxide. The Board follows this opinion insofar as this expression alone cannot teach the use of sol-gel alumina abrasive. In fact, the term "modified" undisputedly defines additives, for example zirconia or derivatives thereof, for modifying the abrasive grains to enhance some desirable property of the finished product to increase the effectiveness of the sintering step (see for Example D2, page 5, lines 13 to 16, and D7, lines 26 to 28, where the modifiers are added to sol-gel abrasive material), rather than a particular method of producing the abrasive material such as by the sol-gel process. Likewise, it is evident from D2, page 3, lines 12 and 13, and from the description of the prior art ceramic abrasives on pages 2 and 3 of D7 that the term "ceramic" defines the result of a firing operation which could be applied to dried solid base materials such as oxides or nitrides irrespective of whether these base materials were produced by a sol-gel process or in a different manner. The declaration of Mr Duwell, on which the Respondents mainly rely, cannot be seen as convincing evidence for the submission that 3M company, the author of D3, referred to sol-gel derived abrasive grains as "modified ceramic aluminum oxide", because D7, which is from the same company and which was written at about the same time as D3, makes use of the expression "sol-gel" and clearly distinguishes between such abrasive grains and other ceramic grains. Earlier documents demonstrating the use of the expression "sol-gel" by 3M company are D0 and D2.

However, it cannot be disregarded that, according to column 5, lines 57 to 59 of D3, Example 47 of document D0 is incorporated into D3. Whilst the reference to document D0 is made in connection with the manner of preparing grinding wheels, it clearly is not only this manner of preparation, as argued by the Appellant, but the entire Example 47 which is incorporated. This example includes, in addition to a description of the preparation of a grinding wheel by mixing the components, compacting and curing, a reference to Example 11 regarding the type of abrasive grain used in the wheel. This type is the sintered sol-gel aluminum oxide prepared according to Example 1 of D0. Thus, in the Board's judgment, the incorporation of D0 into D3 includes the advice to the skilled person to consider, as a specific named example of the "modified ceramic aluminum oxide", the sintered sol-gel aluminum oxide abrasives of D0 for use in the mixture of abrasive grains, hollow friable fillers and resin bond of D3. The sintered sol-gel aluminous abrasive particles of D0 are therefore to be considered as part of the disclosure of D3.

As a consequence, the Board comes to the conclusion that an abrasive wheel as defined in claim 1 of the main request is known from D3. Hence, claim 1 of the main request does not meet the requirement of novelty and the main request cannot be allowed.

3. *Auxiliary request*

3.1 Amendments

Claim 1 of the auxiliary request is restricted to seeded sintered sol-gel aluminous abrasive particles.

Apart from further restricting the scope of the patent this amendment is based on original claim 3 and, therefore, meets the requirements of Articles 123(2) and (3) EPC.

3.2 Novelty

Novelty with respect to D3 is undisputed as the sintered sol-gel aluminous abrasive particles of D0 incorporated in D3 are not described as being of the seeded type. It is true that, as argued by the Respondents, documents D7 (Example 102) and D20 (Examples I and IV) disclose abrasive particles of this type in a resin bond. However, there are further differences distinguishing the subject-matter of claim 1 from both documents. Example 102 of D7 refers to a coated abrasive fiber disc rather than to an abrasive wheel, and filler materials are only generally mentioned on page 7, lines 24 and 25, without specifying the amount to be used in the abrasive product. The abrasive wheels described in D20 comprise filament-shaped seeded sol-gel alumina abrasive particles, i.e. particles of regular shape, which are mixed with fillers such as bubbled alumina and a resin binder and may include a second abrasive of irregular shape which, however, is not described as being of the seeded sol-gel alumina type. For comparison, some of the examples (e.g. Examples IV and VI) refer to grinding wheels comprising a blocky sintered sol-gel abrasive and pores up to 18% by volume without, however, specifying the manner of how, and by the use of which material, the pores were produced.

The Board therefore comes to the conclusion that claim 1 of the auxiliary request meets the requirement

of novelty.

3.3 Inventive step

The Appellant submits that document D0, in particular Example 47 of this document, was the appropriate starting point for assessing inventive step, and the problem to be solved was to be seen in reducing the costs of the abrasive wheel without sacrificing grinding performance. The Board cannot accept this argument but considers document D3 to represent the closest prior art because it discloses the mixture of abrasive grains, friable filler and resin bond in combination with the sintered sol-gel aluminous abrasive particles of Example 47 of D0 which is incorporated in D3 by reference. The only feature of claim 1 which is not derivable from D3 is the use of seeded sol-gel aluminous abrasive particles. This type is known for example from document D12 as exhibiting a greater fracture toughness and increased performance than the unseeded type as an abrasive grain (see for example column 2, lines 7 to 13 of D12). Thus, it is an enhanced grinding performance, rather than a cost reduction, which forms the objective problem to be solved. The solution by incorporating the abrasive grains of D12 is straightforward. In fact, document D12 published shortly before the priority date of the patent discloses not only the enhanced grinding performance of the seeded sol-gel abrasive grains but also the production of such grains of irregular shape, as required in claim 1, by the same drying and crushing or breaking steps as in documents D3 and D0. The skilled person will therefore be aware that this seeded type can be substituted for the more conventional sol-gel grains in D3 and D0 without requiring any further

modifications of the wheels and their manner of preparation. Further, the beneficial effect of the hollow friable filler, as described for example in the text bridging columns 2 and 3 of D3, will not be lost since it is evident from the description of this effect and from the enumeration of suitable abrasive grits in column 3, lines 54 to 61, of D3 that these advantages do not depend on any particular type of abrasive grain. This enumeration will even be understood as an invitation or teaching to use any available abrasive. The Board, therefore, concludes that a person skilled in the art would consider substituting the conventional sol-gel aluminous abrasive grains of D3 by the seeded type described in D12 because improvements concerning the grinding performance could be expected, although, as correctly pointed out by the Respondents and admitted by the Appellant, such improvements are not derivable from the patent. It should be noted that similar considerations would apply to a substitution of the seeded sintered sol-gel alumina abrasive particles of document D12 for the fused alumina abrasive grains in the grinding wheels of document D1, comprising a mixture of abrasive particles, hollow friable silicate filler particles up to 30% of the total volume and a resin binder.

Since the appropriate starting point is document D3 rather than document D0, the arguments of the Appellant concerning an unexpected performance improvement obtained when substituting friable fillers for part of the sol-gel abrasive grains of D0 do not have to be considered.

The Board therefore comes to the conclusion that the auxiliary request cannot be allowed because claim 1

does not meet the requirement of inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

C. T. Wilson