

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen

D E C I S I O N
of 14 December 1999

Case Number: T 0521/98 - 3.2.1

Application Number: 92918860.5

Publication Number: 0598843

IPC: F16D 69/02, C09K 3/10, C08J 5/14

Language of the proceedings: EN

Title of invention:
Aramid particles as wear additives

Patentee:
E.I. Du Pont de Nemours and Company

Opponent:
Akzo Nobel N.V.

Headword:
-

Relevant legal provisions:
EPC Art. 56, 123(2)

Keyword:
"Addition of subject-matter (no)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Europäisches
Patentamt

European
Patent Office

Office européen
des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Case Number: T 0521/98 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 14 December 1999

Appellant: Akzo Nobel N.V.
(Opponent) Patent Department
Velperweg 76
P.O. Box 9300
6800 SB Arnhem (NL)

Representative: Kraak, Hajo (NL)
Patent Department Pharma
N.V. Organon
P.O. Box 20
Weth. Van Eschstraat 1
5340 BH Oss (NL)

Respondent: E.I Du Pont De Nemours and Company
(Proprietor of the patent) 1007 Market Street
Wilmington
Delaware 19898 (US)

Representative: Abitz, Walter, Dr.-Ing.
Patentanwälte Abitz & Partner
Poschingerstrasse 6
81679 München (DE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 30 March 1998
concerning maintenance of European patent
No. 0 598 843 in amended form.

Composition of the Board:

Chairman: F. Gumbel

Members: S. Crane
J. Willems

Summary of Facts and Submissions

- I. European patent No. 0 598 843 was granted on 20 March 1996 on the basis of European patent application No. 92 918 860.5.
- II. The granted patent was opposed by the present appellants on the basis that its subject-matter lacked novelty and/or inventive step (Article 100(a) EPC).

The state of the art relied upon by the appellants was represented by the following pre-published documents:

(D0) EP-A-0 034 258

(D1) JP-A-57 063 376

(D2) JP-A-62 032 123

(D3) JP-A-02 274 741

(D4) JP-A-01 113 435

(D5) JP-A-02 185 563

(D6) JP-A-59 227 924

(translations into English of documents D1 to D6 were also filed).

- III. With its decision posted on 30 March 1998 the Opposition Division held that the patent could be maintained in amended form. This decision was based on

independent claims 1 and 8 which read as follows:

"1. A composite friction material comprising

- (a) 10 to 95 percent by weight matrix resin;
- (b) 1 to 40 percent by weight fiber reinforcing material;
- (c) 1 to 65 percent by weight pulverized non-pulp-like aramid particles having an average diameter of 75 to 250 microns

wherein the weight ratio of aramid particles to fiber reinforcing material is greater than 1 to 4."

"8. A process for making a composite friction material comprising the steps of homogeneously combining pulverized non-pulp-like aramid particles 75 to 250 microns in average diameter and fiber reinforcing material from 1 to 6 mm in long dimension in a weight ratio of greater than 1 to 4 and blending that combination with a matrix resin to yield a composite having

- (a) 10 to 95 percent by weight matrix resin;
- (b) 1 to 40 percent by weight fiber reinforcing material;
- (c) 1 to 65 percent by weight pulverized non-pulp-like aramid particles."

Dependent claims 2 to 7 and dependent claim 9 relate to preferred embodiments of the friction material of claims 1 and the process of claim 8 respectively.

IV. A notice of appeal against this decision was filed on 20 May 1998 and the fee for appeal paid at the same time. The Statement of grounds of appeal was filed on 10 July 1998.

V. Oral proceedings before the Board were held on 14 December 1999.

The appellants requested that the decision under appeal be set aside and the patent revoked in its entirety.

The respondents (proprietors of the patent) requested that the appeal be dismissed and the patent maintained amended in the form agreed by the Opposition Division.

VI. The arguments advanced by the appellants in support of their request can be summarised as follows:

The requirement added to the present independent claims 1 and 8 that the aramid particles be "non-pulp-like" could not be derived from the application as originally filed and therefore constituted an inadmissible addition of subject-matter contrary to Article 123(2) EPC. In fact, all that was explicitly disclosed about the nature of the aramid particles was their average diameter and the most that could be implicitly derived from the original disclosure was that these aramid particles were in some way different to the aramid pulp described as being suitable as a fibre reinforcing material. But that difference could

simply lie in the specified size of the aramid particles as compared to the size of the particles of aramid pulp; accordingly it was not excluded that the aramid particles in question were also pulp-like. Furthermore, the conditions which would allow the introduction of the requirement in question as a disclaimer did not exist, in particular the closest state of the art on which the disclaimer would be based, document D0, could not be considered as an accidental disclosure.

In the event that the independent claims were allowed to stand with their present wording then their subject-matter in any case lacked inventive step. The obvious nature of this subject-matter could be derived from various different starting points, especially when taking proper account of the fact, as demonstrated by the experimental results submitted with the statement of grounds of appeal, that the technical effect on which the claimed invention was allegedly based did not actually exist. In particular, it could be seen from these experimental results that the combination of non-pulp-like aramid particles of an average diameter in the range specified in the claims with reinforcing fibres did not lead to a better dispersion of those fibres in the matrix resin. Thus this combination had to be considered merely as an aggregation of known ingredients without any synergetic effect. One obvious route to the claimed invention was the addition of fibre reinforcing material to the composite materials known from documents D2 to D6, which all contained non-pulp-like aramid particles of the required average diameter incorporated as a heat and wear-resistant filler. A second route was the replacement of the pulp-

like aramid particles of document D0 by more conventional and cheaper non-pulp-like aramid particles. A third route (argued in the statement of grounds of appeal but not pursued at the oral proceedings) was the replacement of the powdered polyimide filler of document D1 by cheaper non-pulp-like aramid particles.

VII. In reply the respondents argued substantially as follows:

There were a number of clear indications for the person skilled in the art reading the original application, in particular the examples thereof, that the aramid particles of an average diameter of 75 to 250 microns which were being used could only be non-pulp-like. If this were not the case then the original application would lose all of its technical sense.

Even if it were accepted, which it was not, that the appellants had demonstrated that the addition of aramid particles of the required average diameter did not improve the dispersion of the reinforcing fibres in the matrix they had in no way demonstrated that the synergetic effect discussed in the patent, whatever its underlying cause may be, did not in fact exist. All of the arguments of the appellants with regard to lack of inventive step were therefore without any proper foundation.

Reasons for the Decision

1. The appeal complies with the formal requirements of

Articles 106 to 108 and Rules 1(1) and 64 EPC; it is therefore admissible.

2. *Considerations under Articles 123(2) and (3) EPC*

The only differences between granted claim 1 and claim 1 as originally filed is that the aramid particles have been specified as having an average diameter of 75 to 250 microns and as being "pulverized". These limitations were taken respectively from the first paragraph of page 9 and the first full paragraph of page 11 of the original application and as such have not been criticised by the appellants. It is apparent from the pre-grant examination file that the addition of the term "pulverized" was seen as appropriate to distinguish the claimed invention clearly from the state of the art according to document D0.

During the opposition proceedings the distinction between the claimed subject-matter and the disclosure of document D0 again became the subject of discussion. In order to provide a further limitation claim 1 was amended to include the restriction that the aramid particles are "non-pulp-like". It is this amendment which, before both the Opposition Division and the Board, has been strongly challenged as constituting an inadmissible addition of subject-matter.

In order to evaluate this objection it is necessary to consider the whole of the original disclosure, as this would be understood by the person skilled in the art. It must be noted in the first place that the US family equivalent of document D0 (US-A-4 324 706) is already

mentioned in the introductory description of the original application (page 1, lines 26 to 33) where it is stated to disclose a friction product which includes aromatic polyamide (i.e. aramid) pulp-like particles and the other heat resistant fibrous materials. This is then followed by the somewhat contradictory statement that there is no disclosure in the document of "particles of aromatic polyamides" in the friction material. In the penultimate paragraph of page 5 there is a discussion of the beneficial use of short reinforcing fibres in the form of pulp and an example of the manufacture of aramid pulp is given by reference to US-A-5 028 372. This is immediately followed by a discussion of the chemical composition of aramids, "the preferred material for fibres and particles" in the practice of the invention. In the second full paragraph of page 8 it is stated that "the element of the composite of this invention which is believed to yield a surprising benefit and which results in a composite which has not before been known, is particulate aramid polymer". An explanation for the improved performance of the composites according to the invention is offered in the paragraph bridging pages 8 and 9 is that the combination of fibres and particles disperses in the matrix polymer better than fibres alone. In the first full paragraph of page 11 the manufacture of the aramid particles of the required average size by communiting aramid polymer, in particular an aramid polymer finished in the form of a water-wet crumb according to US-A-3 063 966 and US-A-4 308 374 is discussed. Subsequently, in the last paragraph of the same page, it is explained that the first step in compounding the composite material is to combine the aramid particles with the fibres in such a way that the particles are

intermingled with or coated on the individual fibres.

In the opinion of the Board there is already a clear implication from the terms of the introductory and general description of the original application, the most relevant passages of which are quoted or discussed above, that the aramid particles must have a different physical form to the fibrous reinforcing material and, since the preferred form of that fibrous reinforcing material is a pulp, must be non-pulp-like. That impression is unambiguously confirmed by the description of the preferred embodiments. Here, for instance in Examples 1 and 2, comparisons are drawn between friction materials according to the claimed invention, comprising aramid pulp and aramid particles, and friction materials comprising only one of these constituents. None of this would seem to make any genuine technical sense if, as argued by the appellants, the aramid particles in question could also be pulp-like.

Having regard to the above the Board has therefore reached the conclusion that the person skilled in the art would necessarily understand the aramid particles identified in part (c) of original claim as being non-pulp-like. The incorporation of this feature into granted claim 1 does not therefore constitute an inadmissible addition of subject-matter contrary to Article 123(2) EPC.

Furthermore, since the scope of the claim has been restricted by the amendment made, there is no objection to it under Article 123(3) EPC.

The same considerations apply *mutatis mutandis* to independent claim 8.

The amendments made to the description are directed solely to bringing this into line with the amended claims and are unobjectionable.

3. *State of the art*

3.1 Document D0 relates to a composite friction material having good heat resistance and comprising 5 to 40% by weight of a thermosetting resin, 1 to 70% by weight of a fibrous reinforcing material, 5 to 70% by weight of pulp-like particles consisting essentially of heat resistant aromatic polymer material and 1 to 35% by weight of a friction regulating agent. The pulp-like particles have an amorphous shape and are capable of joining with each other to form aggregates. They may be in the form of fibres, films, flakes or ribbons each provided with a plurality of tentacle-like projections, see page 11, lines 18 to 23. A particularly preferred polymer for making the pulp-like particles is aromatic polyamide (i.e. "aramid"). In Example 1 the friction material comprises 20% by weight of pulp-like aramid particles of a size between 10 and 200 mesh (i.e. approximately 74 to 2000 microns) and 40% by weight of potassium titanate fibres.

3.2 Document D1 is concerned with a composite friction material comprising (by volume) 15 to 30% binder resin, 10 to 50% reinforcing fibres and 5 to 40% cured polyimide dust. The resulting material has high strength, good wear resistance and a high coefficient of friction, The function of the cured polyimide dust

is to act as a wear-adjusting agent.

- 3.3 In document D2 there is disclosed a method for producing very fine aramid particles for use as a reinforcing filler for plastics and rubbers. The particles have a maximum size of 200 microns, preferably less than 100 microns.

Document D4, emanating from the same source as document D2, also discloses a method of making aramid particles for use as filler for improving the dimensional stability, heat resistance and mechanical characteristic of plastics.

- 3.4 Document D3 is concerned with a rubber composition comprising 3 to 50% by weight of aramid particles and 50 to 97% by weight cross-linkable rubber. The particles have a mean size of 3 to 300 microns, preferably 5 to 200 microns. The resulting products have good sliding properties under high load and high speeds, a low coefficient of friction and excellent wear and heat resistance.

- 3.5 In document D5 there is disclosed a thermosetting resin composition made from 5 to 300 parts by weight of aramid particles to 100 parts by weight thermosetting resin. A particle diameter of 100 microns or less is preferred. The composition is useful for making strong, lightweight, heat resistance mechanical parts with a low coefficient of friction.

- 3.6 Document D6 relates to a moulding resin composition comprising 30 to 70% by weight of a particular thermosetting resin defined in terms of its chemical

structure together with 70 to 30% by weight of a filler containing 50 to 83% by weight fluorine resin and 38 to 5% by weight of aramid powder. The aramid powder has a particle size of 30 mesh or larger, i.e. approximately 600 microns or larger. Articles moulded from the composition have good heat and wear resistance and a low coefficient of friction.

4. *Novelty and inventive step*

Of the cited prior art document D0 is the only one which discloses a composite friction material comprising the three essential constituents (considered in general terms) defined in present claim 1, namely a matrix resin, fibre reinforcing material and aramid particles. Furthermore there is a broad overlap between the relative proportions of these constituents as disclosed in document D0 and as defined in the claim. A clear distinction between the subject-matter of claim 1 and the disclosure of document D0 is however the requirement that the aramid particles be non-pulp-like whereas it is an essential features of the composition taught in the prior art that pulp-like aramid particles are used. A second distinction resides in the average particle diameter of 75 to 250 microns specified in claim 1 whereas a much broader range of particle size of 10 mesh to 200 mesh (74 to 2000 microns) is given in document D0. In this context the Board cannot accept the argument of the appellants that the claim does not exclude the presence of an indefinite quantity of aramid particles of larger average diameter than that given so that by reverse analogy a quantity of aramid particles with an average size of 75 to 2000 microns must be seen as "comprising" aramid particles having an

average diameter of 75 to 250 microns as claimed. The subject-matter of present claim 1 is therefore novel. In these circumstances it is not necessary to investigate further the contention of the appellants that the term "pulverized" as used in the claim should be given the very general meaning of "reduced to fine particles" and as such could also be applied to the methods of producing pulp-like aramid particles disclosed in document D0.

The technical problem which the claimed invention sets out to solve is the provision of a composite friction material with good resistance to wear and high temperature stability. On the basis of the information contained in the patent specification the Board is satisfied that this problem has been solved by the combination of fibre reinforcing material and the particularly defined type of aramid particles in the matrix resin of the composite material. Furthermore, at least over the substantial part of the aramid particle diameter range specified in claim 1, the Board is also satisfied that the combination of the fibre reinforcing material and the aramid particles results in characteristics of the composite material which do not merely correspond to a simple summation of the contributions of the individual constituents, namely that there is an unexpected synergetic effect. The explanation offered for this effect in the patent specification is that the aramid particles in some way improve the dispersion of the fibre reinforcing material in the matrix resin.

With their statement of grounds of appeal the appellants submitted experimental results which in

their view showed that the incorporation of non-pulp-like aramid particles of the claimed size in no way improved the dispersion of the fibre reinforcing material. The respondents queried a number of details concerning the experimental procedures but did not themselves file any experimental evidence to back up their point of view. It must be noted here however that the appellants were essentially relying on their experimental results to contradict one of the reasons given by the Opposition Division for allowing the restriction of the claims to "non-pulp-like" aramid particles; the contended absence of a dispersion effect of these particles on the fibre reinforcing material did not at that stage form a central part of their arguments on inventive step. In the view of the Board the presence or absence of this dispersion effect is in any case not determinative for the issue at hand. The appellants have not demonstrated that the synergetic effect recognisable from the information contained in the patent specification, whatever its cause may be, does not actually exist. Thus it would be wrong, when evaluating inventive step, to follow the line of argument of the appellants and ignore this effect.

As a consequence of the Board finding against them on the question of the admissibility of present claim 1 under Article 123(2) EPC the appellants shifted their main line of attack on the inventive step of the subject-matter of the claim onto taking the disclosures of documents D2 to D6 as the most appropriate starting point. They argued that since fibre reinforcing material was a very well known constituent of the type of composite material in question it would be obvious to add this to the materials of documents D2 and D6,

which already comprised matrix resin and non-pulp-like aramid particles of the required size. However, none of the documents D2 to D6 relate to a composite friction material within the meaning of claim 1, which materials are typically use as brake pads or clutch linings. As can be seen from the summary in points 3.3 to 3.6 above these documents are much more concerned with composite materials which will exhibit a low coefficient of friction in service. The addition of fibre reinforcing material to such a composite cannot be seen as being a conventional measure. For this reason alone this attack on the inventive step of the subject-matter of claim 1 must fail. Accordingly there is no further need to go into the detailed requirements of claim 1 concerning the various proportions of the constituents of the composite material and the average diameter of the aramid particles.

An alternative approach advance by the appellants to the question of inventive step was to take document D0 as the starting point. In their view it would be obvious for the person skilled in the art to replace the pulp-like aramid particles taught by this document by equivalent non-pulp-like particles, since the latter were cheaper and readily obtainable. This argument was largely predicated on the contention of the appellants that the replacement of pulp-like particles by non-pulp-like particles had been demonstrated as having no technical effect, which for the reasons explained above the Board cannot accept. It further relied on the contention that the average aramid particle diameter specified in the claim was effectively disclosed in document D0, which contention has also been rejected by the Board. In any case, the Board cannot accept that it

would be an obvious measure not to use the pulp-like aramid particles specifically taught by document D0 since these are clearly considered there as an essential element of the composite friction materials to which the document relates.

Lastly, in a line of argument mentioned in the statement of grounds of appeal but not pursued at the oral proceedings, the appellants have contended that it would be obvious to replace the polyimide dust in the composite friction material taught by document D1 by non-pulp-like aramid particles. This approach however overlooks the fact that the whole thrust of this document is specifically directed to the question of how the excellent mechanical properties of polyimides can be brought to practical effect in the context of a composite friction material. The replacement of polyimide particles by aromatic polyamide (aramid) particles cannot be seen therefore as an obvious measure for the person skilled in the art. Furthermore, document D1 is in any case silent as to the size of the particles to be used.

For the above reasons the Board has come to the conclusion that the subject-matter of claim 1 cannot be derived in an obvious manner from the state of the art and therefore involves an inventive step (Article 56 EPC).

Analogous considerations apply to the novelty and inventive step of the subject-matter of independent claim 8, which relates to a process for making a friction material with a composition corresponding to that defined in claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel