BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 18 November 1993

Case Number: T 0522/91 - 3.3.3

Application Number: 84300744.4

Publication Number: 0121984

IPC: C08G 69/26

Language of the proceedings: EN

Title of invention:
Polyamide compositions

Patentee:
Amoco Corporation

Opponent:
Hüls Aktiengesellschaft

Headword:
-

Relevant legal norms:
EPC Art. 54, 56

Keyword:
"Novelty (affirmed); interpretation of claim language"
"Inventive step (affirmed)"

Decisions cited:
-

Catchword:
-

BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 18 November 1993

Case Number: T 0522/91 - 3.3.3

Application Number: 84300744.4

Publication Number: 0121984

IPC: C08G 69/26

Language of the proceedings: EN

Title of invention:
Polyamide compositions

Patentee:
Amoco Corporation

Opponent:
Hüls Aktiengesellschaft

Headword:
-

Relevant legal norms:
EPC Art. 54, 56

Keyword:
"Novelty (affirmed); interpretation of claim language"
"Inventive step (affirmed)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0522/91 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 18 November 1993

Appellant I: (Opponent)
Hüls Aktiengesellschaft
Patentabteilung/PB 15
D - 45764 Marl (DE)

Representative:
-

Appellant II: (Proprietor of the patent)
Amoco Corporation
200 East Randolf Drive
Chicago
Illinois 60601 (US)

Representative:
Ritter, Stephen David
Mathys & Squire
10 Fleet Street
London EC4Y 1AY (GB)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office of 18 March 1991, issued on 31 May 1991 concerning maintenance of European patent No. 0 121 984 in amended form.**

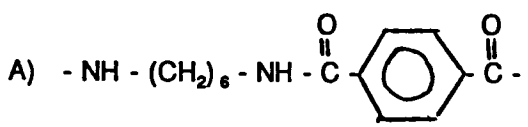
Composition of the Board:

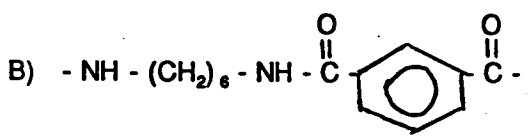
Chairman: F. Antony
Members: P. Kitzmantel
G. Davies

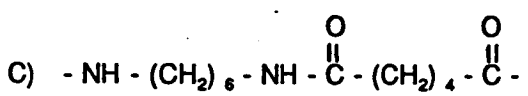
Summary of Facts and Submissions

I. European patent application No. 84 300 744.4, which had been filed on 7 February 1984, claiming priority from a US application filed 16 February 1983, was granted as European patent No. 0 121 984 on 18 January 1989, with nine claims, independent Claim 1 reading as follows:

"A crystalline polyamide copolymer comprising substantially the following recurring moieties:

A) 

B)  and

C) 

wherein the mole ratio of A:B:C units is 60-90 : 25-0 : 35-5."

Granted Claim 4 related to an injection moulding composition comprising the polyamide of Claims 1 and 10 to 60 percent of certain fillers; granted Claim 6 related to a composition comprising the polyamide of Claim 1 and Nylon 6,6; and granted Claims 7, 8 and 9 related to the copolyamide of Claim 1 in the form of a fibre, a laminate or a moulded object, respectively.

Granted Claims 2, 3 and 5 were dependent claims.

II. Notice of opposition was filed by Hüls AG on 3 May 1989, requesting revocation of the patent in its

entirety, on the ground of lack of inventive step, having regard to

D1: DE-A-2 651 534, and

D2: Dolden, "Structure-property relationships in amorphous polyamides", Polymer, 1976, Vol. 17, 875 to 892.

III. In an interlocutory decision announced orally on 18 March 1991, and posted on 31 May 1991, the Opposition Division held that the subject-matter of granted Claim 1 (then the main request) was not novel; that the first auxiliary request was not formally admissible having regard to Article 123(2) EPC, and moreover was open to objections under Articles 83 and 84 EPC; but that the opposed patent could be maintained on the basis of the then second auxiliary request, whose subject-matter differed from that of the main request only by substitution of the term "consisting of" for "comprising substantially". According to the Opposition Division the term "comprising substantially" did not exclude the presence of considerable amounts of comonomers not specified in the claim, thereby causing a novelty conflict with polymer No. X in Table 1 of D2. The subject-matter of the second auxiliary request was considered novel and also inventive over D1 and D2, considering the surprising enhancement of the heat distortion temperature (HDT) of the filled polyamide compositions.

IV. Appellant I (Opponent) lodged an appeal, received on 6 July 1991, against the interlocutory decision of the Opposition Division and paid the appeal fee on the same date. A Statement of Grounds of appeal was received on 31 August 1991.

V. Appellant II (Proprietor of the patent) likewise lodged an appeal, received on 30 July 1991, and paid the appeal fee on the same date. A Statement of Grounds of appeal was received on 2 October 1991.

In response to a communication of the Board, Appellant II on 14 October 1993 submitted a new main request, corresponding to the granted claims with Claims 7 to 9 deleted, and a new auxiliary request, both dated 15 October 1993.

VI. Oral proceedings before the Board were held on 18 November 1993.

Appellant I requested that the decision under appeal be set aside and the patent revoked.

Appellant II (erroneously referred to as Respondent in the minutes of the oral proceedings) requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request or the auxiliary request dated 15 October 1993.

VII. Appellant I essentially argued as follows:

Starting from D1, only a minor variation of the monomer proportions was required to arrive at the subject-matter of the patent in suit, which variation was obvious in view of D2 which taught that terephthalic acid (TA), adipic acid (AA) and hexamethylenediamine (HMD) provided crystalline polyamides having high softening points and which taught also the maximum amount of isophthalic acid (IA) to be added without losing the crystalline structure. Melting point and melt enthalpy data provided by Appellant I supported the information in D2 and showed that only a few experiments were

necessary to arrive at crystalline polyamides. Moreover, even if the heat distortion temperature (HDT) of glass fibre filled holdings could be accepted as evidence for a property of the copolyamides *per se* (which was contested by Appellant I), this effect could not provide an inventive step, since it was known from:

D3: Handbook of Fillers and Reinforcements for Plastics, H.S. Katz and J.V. Milewski, Van Nostrand Reinhold Company, page 43, 1978

that the HDT of crystalline polymers was close to their melting point and that fillers increased the HDT.

In view of the inconsistency in the HDT results of Examples B/D and J/P, the evidence submitted by Appellant II during the opposition proceedings (letter of 11 May 1990) was considered inconclusive.

VIII. Appellant II essentially argued as follows:

The Opposition Division's finding of lack of novelty of the subject-matter of Claim 1 was misconceived, since polymer No. X in Table 1 of D2 used a TA/AA molar ratio of 50/50 being outside the respective TA/AA molar ranges of present Claim 1. Concerning inventive step, neither D1 nor D2 were appropriate starting points for developing filled polyamide mouldings having the desired high HDT, since both documents were silent about fillers and about HDT. D3 was misquoted by Appellant I and did not disclose that crystalline thermoplastics have a high HDT.

Reasons for the Decision

1. *Admissibility*

Both appeals are admissible.

2. *Main request*

2.1 Compliance with Article 123(2) and (3) EPC

The only amendment in the granted claims has been the deletion of Claims 7 to 9. There is thus no contravention of Article 123(2) or (3) EPC.

2.2 Interpretation of Claim 1

Considering that the term "comprising substantially" in Claim 1 lacks clear explicit boundaries, its scope needs interpretation, there being no legal basis for objection to this lack of clarity under Article 84 EPC at the present stage of the proceedings.

While in common language the word "comprise" may have both, the meaning "include" or "comprehend" and "consist of" ("The Concise Oxford Dictionary of Current English", 8th Ed. by R.E. Allen, Clarendon Press, Oxford, 1990), in drafting patent claims legal certainty requires its interpretation to be normally restricted to the broader meaning "include" or "comprehend".

The word "substantially", imposes a restriction on the word "comprising", in the sense that "to a large extent only that is comprised which is specified". The boundaries of the term "comprising substantially" are therefore to be drawn where the essential

characteristics of the specified subject-matter cease. The scope of the term "comprising substantially" is therefore interpreted as being identical to that of "consisting essentially of" (see T 472/88 of 10 October 1990, not published in OJ EPO, point 3 of Reasons). However, due to the unequivocal character of the words "consisting of" as compared to "comprising" the expression "consisting essentially of" is to be given preference.

2.3 Novelty

2.3.1 Since, as explained in the preceding paragraph, the term "comprising substantially" does not totally exclude the presence of unspecified recurring units, polyamide copolymers having units A, B, C according to present Claim 1 and having further units of a nature and in amounts not affecting the essential characteristics of the polyamides, would come under the scope of Claim 1. It is in this respect that the question of a novelty conflict with D2 has arisen in the opposition proceedings.

2.3.2 D2 is a scientific paper investigating structure-property relationships in polyamides. The authors discovered that the factor having the greatest impact on the properties of the polyamides is their morphology, amorphous or crystalline, which is in turn determined by the symmetry of the monomers. In contrast to symmetrical monomers enhancing crystallinity, asymmetrical monomers promote an amorphous structure. Dependent on their degree of asymmetry, D2 distinguishes between asymmetrical monomers of types AM1, AM2 and AM3, isophorone diamine (IPD) being classified as an AM3 monomer (page 880, third paragraph).

As regards novelty, polymer No. X in Table 1 on page 877 is the most pertinent specific disclosure in D2. It contains the asymmetrical monomer IPD together with the symmetrical monomers terephthalic acid (TA), adipic acid (AA) and hexamethylene diamine (HMD) in equimolar amounts of 25% each. To be comparable with the mole % figures of the patent in suit the figures in D2 have to be multiplied by 2.

2.3.3 In the judgment of the Board, polyamides comprising an additional 50 mole % of IPD are not covered by the term "comprising substantially" in present Claim 1, since such a high proportion of an unspecified comonomer, in the absence of proof to the contrary, must be considered to essentially affect the properties of the polyamides devoid of such moieties. Polymer No. X does not, therefore, anticipate the subject-matter of Claim 1. The reasons for the opposite conclusion given in section II/2 of the decision under appeal are too artificial to be convincing and lead to an incorrect result.

2.3.4 Novelty over D1 and D3 is uncontested.

2.3.5 Consequently, the subject-matter of Claim 1 of the patent in suit is novel.

2.4 Closest prior art

Because of the close structural similarity to the present subject-matter of the polyamides used in D1, this document is regarded as representing the nearest prior art. Therein polyamide fibres made from TA (terephthalic acid), IA (isophthalic acid), AA (adipic acid) and HMD (hexamethylene diamine) are disclosed. The molar amount of units derived from IA is from 30 to 40% and hence above the maximum IA amount of

25 mole % in the patent under appeal. The extruded fibres are amorphous, but are made crystalline by stretching and annealing. The purpose of D1 was the prevention of heterogeneous domains in the batchwise production of TA/IA/HMD copolyamides, which object is accomplished by co-condensation of AA. D1 is silent about crystalline mouldings, either filled or unfilled, and their HDT.

2.5 Problem to be solved

As can be inferred from the original application papers of the patent in suit (cf. page 2, lines 22 to 26; granted patent page 2, lines 32 to 34) it was the original subjective problem underlying the patent in suit to provide polyamides which, when filled and moulded, have a HDT (ASTM D-648, 264 psi) of from 240° to 305°C.

Since D1 and D2 (the only documents in the proceedings relating to polyamides) are silent about crystalline mouldings (filled or unfilled) and their HDT, there is no reason in formulating the objective problem to depart from the original subjective problem, which - for the purpose of assessing an inventive step - is therefore recognised as the one the skilled person set out to solve when starting from the closest prior art in D1.

In view of the HDT results reported in Tables 4, 5, 9, 11 and 12 in the patent in suit and in Table 4, Examples J to W submitted by Appellant II with his letter of 11 May 1990, the Board is satisfied that this object has indeed been solved by the provision of the particular TA-IA-AA-HMD copolyamides according to Claim 1.

The argument of Appellant I that the HDT property of the **filled** mouldings was inappropriate to account for a property of the copolyamides *per se* (and that consequently in view of the HDT-problem Claim 1 was lacking the filler as an essential feature) is inconclusive, since the enhanced HDT of a filled moulding must stem from a property inherent to the polyamide itself though becoming manifest only in the presence of fillers.

2.6 Inventive step

2.6.1 The acknowledgement of an inventive step turns on whether there was an incentive in the state of the art for the skilled person to decrease the IA content of the TA-IA-AA-HMD copolyamides of D1 in the expectation of thereby enhancing the HDT of filled mouldings made from these polyamides to a range of from 240°C to above 300°C.

2.6.2 D1 discloses crystalline polyamides but is silent about mouldings made therefrom, about the incorporation of fillers, and about the HDT of the polyamides. As set out below in detail, the general common knowledge available to the skilled person did not comprise, at the priority date of the patent in suit, any complementary information enabling the skilled person to solve the present problem. There was therefore no reason, for the skilled person starting from D1 and wishing to solve the problem set out in section 2.5, to reduce the IA content below the values recommended in D1.

2.6.3 In the Board's judgment, the argument of Appellant I that it was to be expected that the present problem could be solved by turning to crystalline polyamides, because these - in view of their high softening points

(Vicat >200°C: D1, page 879, left-hand column, half way down) - must have correspondingly high HDTs, is inconclusive. It is disproved by the uncontested fact that the crystalline polyamides of Examples J to W in Table 4 of the letter dated 11 May 1990 of Appellant II have HDTs (unfilled) of from 113 to 149°C, which is considerably below their melting points (cf. Table 1 of the patent in suit: Tm of 310°C for TA-IA-AA-HMD polyamide of molar ratio 65-25-10-100); only by incorporating glass fibres into these polyamides their HDT is enhanced to 249 to >304°C. The allegation of Appellant I that the softening point and the HDT can be put on a par is therefore not tenable.

2.6.4 The Board is not convinced either by the contention of Appellant I, that the choice of filled crystalline polyamides was obvious, because it had been within the common general knowledge of the skilled person (as evidenced by D3) that fillers increased the HDT and that the HDTs of crystalline polymers were near to their melting points.

2.6.4.1 While the first assertion is in agreement with D3, the second is not, since this conclusion is not founded on the actual disclosure in D3, reading as follows: "**Because of the manner** in which deflection tests are conducted, ... for highly crystalline polymers, deflection temperatures are near**er** to their melting points." (emphasis by the Board). On a fair reading said statement can only be interpreted to mean that "because of some influence of the method of measuring the deflection temperature, the values measured are closer to the melting points than the actual deflection temperature." So, there is no information in this statement concerning the **absolute** distance between the HDT and the melting point.

Consequently, the relevant information in D3 is reduced to the statement that fillers increase the deflection temperature (HDT) and the question can therefore only be whether this information results in a pointer to the skilled person that HDTs of from 240°C to above 300°C could be achieved by selecting TA-IA-AA-HMD molar ratios in accordance with the present Claim 1.

2.6.4.2 For answering the above question, the evidence submitted by Appellant II as Table 4 with his letter of 11 May 1990 is relevant. A comparison of Examples J ("inventive": 25 mole % IA, 65 mole % TA) and A ("comparative": 30 mole % IA, 60 mole % TA) reveals in the case of Example J a HDT difference between glass fibre filled and unfilled mouldings of 125°C, whereas the analogous difference in the case of Example A is only 19°C - an increase so moderate that it could not provide an incentive, for the skilled person seeking to solve the above-defined problem, to search for a solution, along those lines; if anything, it would discourage the said skilled person from further experimentation in that direction. Moreover, there was no information in D1 or D2, nor within the common general knowledge, on the basis of which the effect evidenced by the above comparison, i.e. a solution to the existing technical problem, could have been expected.

2.6.4.3 The findings of the preceding paragraph are not affected by certain inconsistencies concerning the HDT enhancement of some examples of said Table 4 having the same monomer compositions (Examples B and D: HDT difference filled/unfilled: 37° and 104°C, respectively; Examples J and P: HDT difference filled/unfilled: 125° and 165°C, respectively), which were explained by Appellant II as resulting from an

"erratic character" of the samples (unrefuted). These inconsistencies do not detract from the fact that there is in each case a significant enhancement of the HDT-difference between unfilled and filled mouldings when the IA content does not exceed the maximum value according to Claim 1 of the patent in suit.

2.6.4.4 In the Board's judgment, the allegation of Appellant I that the low HDT values of the "filled" comparative Examples A to F of said Table 4 was inconclusive, because it was due to an amorphous structure of the polyamides as opposed to the crystalline polyamides of Examples J to W, is equally unconvincing, since the knowledge that crystallinity was a prerequisite for achieving HDT's of up to more than 300°C was not derivable from the cited literature. The respective conclusions are therefore the result of an inadmissible ***ex post facto* analysis**.

2.6.4.5 The conclusions of the preceding paragraph are not invalidated by the argument of Appellant I that the strong HDT enhancement in the present case could have been expected in view of the considerable HDT enhancement resulting from the incorporation of glass fibres into Nylon 6.6 as demonstrated in Table 12 of the patent in suit. Even leaving aside the fact that these data are not proved to belong to the state of the art under Article 54(2) EPC, the HDT effect exhibited therein is not *prima facie* recognisable as a consequence of the (partly) crystalline character of nylon 6.6.

2.6.4.6 In the opinion of the Board the melting point and melt enthalpy data submitted by Appellant I in order to demonstrate that the high HDT achieved by the filled mouldings of the patent in suit went together with high melting points and crystalline character have no

persuasive character, but are again mere *ex post facto* explanations of the combined effect of crystallinity and filler content on the HDT of mouldings, which effect was unknown prior to the patent in suit.

2.6.5 In the Board's judgment, therefore, Appellant I has failed to discharge the burden of proving the obvious character of the claimed solution for the technical problem underlying the patent in suit. Hence the subject-matter of Claim 1 is patentable.

2.6.6 The above conclusions apply equally to the subject-matter of Claim 4 pertaining to filled moulding compositions and to the subject-matter of Claim 6.

The same applies to the dependent claims.

The main request is therefore allowable.

3. Since the main request is allowable, there is no need to discuss the auxiliary request.

4. Adaptation of the description to the claims as now maintained will have to include deletion of Example G and of the corresponding runs with the sample code ZP-1205 in Tables 13 and 14. Reference to "TMA" in Table 13 should also be avoided. Example E (no AA) should be deleted or designated "comparative".

Order

For these reasons, it is decided:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the main request and a description to be adapted.

The Registrar: The Chairman:

E. Görgmaier P. Antony

13.1.94