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D E C I S I O N
of 1 December 1994

Case Number: T 0121/92 - 3.3.3

Application Number: 85870051.1

Publication Number: 0157756

IPC: C08K 13/02

Language of the proceedings: EN

Title of invention:
Carbon black filled nylons modified for improved toughness

Patentee:
Monsanto Company

Opponent:
BASF Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes) - problem and solution - scope of the claimed subject-matter limited to the areas where the technical problem is effectively solved"

Decisions cited:
-

Catchword:

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0121/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 1 December 1994

Appellant: (Proprietor of the patent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office announced orally on 22 November 1991 and posted on 17 December 1991 revoking European patent No. 0 157 756 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: P. Kitzmantel
W. M. Schar

Summary of Facts and Submissions

I. European patent application No. 85 870 051.1 in the name of Monsanto Company, which had been filed on 3 April 1985, claiming priority from a US application filed on 4 April 1984, resulted in the grant of European patent No. 0 157 756 on 23 November 1988, on the basis of 16 claims.

Claim 1 read as follows:

"A molding composition comprising: (1) a polyamide resin; (2) a maximum of 10 percent by weight and a minimum of 0.05 percent by weight of the composition of carbon black; and (3) a maximum of 200 percent by weight and a minimum of 0.25 percent by weight of the carbon black of a copper phthalocyanine pigment."

II. Notice of Opposition was filed by BASF AG on 18 August 1989 (with letter dated 16 August 1989) requesting revocation of the patent in its entirety, on the grounds of

(i) lack of novelty, having regard to an alleged prior public use of the products "Ultramid(R) A 3K N Grau", "Ultramid(R) B 3G7 HS Grau" and "Ultramid(R) B 35G3",

and

(ii) lack of inventive step, having regard to, among others,
D7: DE-A-1 694 487.

III. By its decision announced orally on 22 November 1991 (written decision date-stamped 17 December 1991) the Opposition Division revoked the patent.

That decision was based

(i) on a main request, comprising a set of 12 claims filed on 2 November 1991, Claim 1 reading as follows:

"A molding composition comprising: (1) a polyamide resin; (2) from 0.2 percent to 10 percent by weight of carbon black; and (3) from 0.5 percent to 20 percent by weight of the carbon black of a copper phthalocyanine pigment."

and

(ii) on an auxiliary request submitted on 22 November 1991 whose subject-matter, with respect to the main request, was further restricted to an amount of copper phthalocyanine pigment of "from 0.5 to 10 percent by weight".

The decision held that the issue of prior public use must be disregarded because it was not fully substantiated during the nine month period of opposition nor thereafter; the Opponent's request to supplement the lacking information by testimony of a witness was denied. While the novelty of the claimed subject-matter (main and auxiliary request) over the cited documents was acknowledged, the appealed decision held that it did not involve an inventive step over D7, particularly Example 7, which disclosed compositions comprising the same ingredients as specified in Claim 1 of the patent in suit. The different amounts of carbon black (hereinafter "CB") and copper phthalocyanine (hereinafter "CuP") in the compositions according to present Claim 1 and according to said Example 7 of D7 did not solve any technical problem in an unexpected

manner, since the demonstrated increase of the mold shrinkage over CB-filled polyamide moldings was a deliberate worsening of the prior art, and thus an unrealistic problem, and the experimental evidence concerning Izod impact and elongation at fail did not correlate with the amounts of CB and CuP. The solution of the only remaining technical problem, i.e. the achievement of an improved weatherability, by an increase of the amount of CB was within the common technical knowledge of a skilled person and could not, therefore, contribute to an inventive step.

IV. On 5 February 1992 the Appellant (Patentee) lodged an appeal against the revocation of the patent and paid the appeal fee. The Statement of Grounds of Appeal was submitted on 21 April 1992, including a main request and an auxiliary request corresponding to the requests upon which the decision under appeal was founded.

The Board, in an interim communication, drew the parties' attention to the CB-filled polyamide compositions disclosed in

D8: US-A-4 391 936.

Oral Proceedings were held on 1 December 1994, in the course of which the Appellant abandoned all previous requests and filed as its sole request a set of 10 claims, Claim 1 reading as follows:

"A molding composition comprising: (1) a polyamide resin; (2) from 0.2 percent to 10 percent by weight of carbon black; and (3) from 2 percent to 10 percent by weight of the carbon black of a copper phthalocyanine pigment."

In this request independent Claim 6 relates to a molded article comprising a polyamide molding material as defined in Claim 1; Claims 2 to 5 and Claims 7 to 10 are dependent upon Claims 1 and 6, respectively.

V. The arguments presented by the Appellant can be summarized as follows:

V.1 On proper interpretation, the data contained in Table 1 of the patent in suit demonstrated that by addition of CuP to CB-filled polyamide compositions, within the claimed weight percentages, the following effects occurred:

(i) enhancement of the mold shrinkage, thereby restoring the shrinkage value of about 0.180 mm/cm of non-CB-filled polyamide; CB-filling reduced the shrinkage values (cf. Examples 1, 13, 17, 30 and 38), requiring the mold manufacturer to distinguish between CB-filled and not CB-filled polyamide compositions;

(ii) enhancement of Izod impact up to a maximum value, depending on the amount of CB (for instance, with 2% CB the maximum Izod value was achieved by addition of 5% CuP: cf. Examples 14 and 35);

(iii) enhancement of elongation at fail; while examples 13-15 seemed to go counter this conclusion, it could be inferred from the bulk of the data in Table 1 that the 45% value of control Example 13 (no CuP) was incorrectly high; it would be reasonable to assume that the correct elongation value of this sample was close to the values of the identical control

Examples 1 (35% elongation) and 30 (33% elongation); this conclusion was supported by the improvement of the elongation at fail data (up to a maximum) when adding small amounts of CuP to CB-filled polyamide compositions in the tests series constituted by Examples 1/2/4/5, Examples 17-19, Examples 30-35 and 38-43.

V.2 D7 would not suggest that the above effects could be achieved by simultaneously increasing, in the compositions of Example 7, the amount of CB and decreasing the amount of CuP. D7 was rather concerned with counteracting by cocondensation of caprolactam the negative effect of pigments on the thermal stability of polyamides.

V.3 While D8 addressed some aspects of the problem underlying the present invention its solution by addition of nigrosine would not suggest that the same or similar effects could be obtained with CuP.

V.4 The technical importance of the present invention would also be highlighted by the commercial success of the product, illustrated by a tripling of the Appellant's annual sales volume of CB-filled polyamide compositions when changing from nigrosine to CuP as further additive.

V.5 Concerning the Respondent's allegation of prior public use, the Appellant argued that this issue should not be admitted into the proceedings at this late stage; the Appellant furthermore held that the evidence therefor was still incomplete and could not anticipate or render obvious the claimed subject-matter.

VI. The arguments of the Respondent may be summarized as follows:

VI.1 None of the technical effects demonstrated by the data in Table 1 of the patent in suit would be indicative of an inventive step:

(i) no technical advantage could be seen in the enhancement of the mold shrinkage; since CB-filled and non-CB-filled polyamide compositions would be used for different applications, depending on the exposure or not to outdoor conditions, different shrinkage values of the compositions would not be a disadvantage for the mold manufacturer, who would anyway have to make different molds; a better predictability of the mold shrinkage of CuP-containing (as compared to CuP-free) CB-filled polyamide compositions, was unproved.

(ii) the Izod impact data determined by the method reported in the patent specification (page 4, Test Procedures (3)) would not be reliable; on the one hand, the separation between gate end (GE) and dead end (DE) test samples, instead of a "normal" single test piece, would lead to unusual test conditions, and, on the other hand, the Izod test method, even if applied properly, would allow for a 10% error margin; thus, the small variations of the test results in Table 1 would be of no practical significance.

(iii) it was well known by those skilled in the art, and even recognized in the patent in suit, that impact strength and elongation at fail should follow the same pattern; this was not the case here, as would be particularly clear from

Examples 13 and 14, where about the same elongation at fail values were reported for samples having vastly different Izod values.

VI.2 The only difference between the compositions according to Example 7 of D7 and those of the alleged invention would be the lower CB content. Since, as set out in the previous paragraph, an unexpected technical effect could not be recognized for an increase of the CB content, this measure was obvious.

VI.3 Similarly obvious was the substitution of CuP for the nigrosine of D8, since CuP was a widely known additive for polyamide compositions.

VI.4 In its written submissions the Respondent requested that, in view of its relevance, the issue of prior public use should be introduced into the proceedings under Article 114(1) EPC and, should this be denied by the Board, the question of additional substantiation of a prior public use by testimony of a witness should be referred to the Enlarged Board of Appeal. The latter request was however abandoned during the oral proceedings.

VII. The Appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of its sole request as filed during oral proceedings.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

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

Claim 1 is based, with respect to the original application and the patent as granted, on the respective Claims 1, 2 (upper limit of 10 percent of CuP), 4 (lower limit of 0.2 percent of CB) and, concerning the lower limit of 2 percent of CuP, on Examples 4, 18, 34 and 42.

Independent Claim 6 is based on Claims 9 of the original application and the patent as granted, and has otherwise been amended in the same way as operative Claim 1.

Claim 2 is based on Claim 5 of the original application and on Claim 4 of the granted patent.

Claims 3 and 7 are based, respectively, on Claims 3 and 11 and, concerning the lower limit of 2 percent of CuP, on Examples 4, 18, 34 and 42 of the original application and the patent as granted.

Claims 4, 5 and 8 to 10 are based on Claims 6 to 8 and 12 to 16 of the original application and the patent as granted.

The claims are therefore duly founded on the application as originally filed; since the percentage ranges for CB and CuP in the independent Claims 1 and 6 are narrower than in the corresponding Claims 1 and 9 as granted, the scope of these claims has not been extended.

The requirements of Articles 123(2) and (3) are therefore met.

3. *Prior public use*

Only some time after the expiration of the nine month opposition period, in the first instance proceedings, the Respondent had provided information indicating the client's name and the date of the alleged sale. The Board concurs with the Opposition Division's opinion that the substantiation of the opposition in this respect was too late and that the piecemeal completion of the substantiation after the expiry of the opposition period cannot be allowed in the light of Rules 55(c) and 56(1) EPC. In any case, this issue could only come into consideration in application of Article 114(1) EPC if the subject-matter of the alleged prior public use could jeopardize the maintenance of the patent in suit. As set out in points 4 and 5.6 below, this is not the case.

4. *Novelty*

The documents in the proceedings, particularly documents D7 and D8, do not disclose polyamide compositions, or molded articles made therefrom, comprising CB and CuP within the ranges of amounts defined in Claims 1 and 6. The subject-matter of these independent claims is therefore novel.

No other conclusion could be arrived at if the issue of the alleged prior public use would be taken into account, since the amount of CB in the only product, whose prior public sale was ultimately pursued by the Respondent, was only 0,12 percent, and thus below the lower limit of 0,2 percent in present Claim 1.

Since novelty was not no longer contested, it is not necessary to give a more detailed reasoning.

5. *Inventive step*

5.1 The patent in suit is concerned with CB-filled polyamide compositions. It was known that by incorporation of CB into polyamide molding compositions their weathering resistance may be improved, but their impact strength and elongation are adversely affected (cf. D8, column 1, lines 16 to 23).

Starting from this state of the art, the **problem underlying the patent in suit** was the provision of CB-filled polyamide molding compositions having at the same time good weathering resistance and good impact strength and elongation, i.e good toughness properties.

5.2 In order to solve this problem the patent in suit proposes the incorporation into the CB-filled compositions of 2 to 10 percent of the CB of a CuP pigment.

5.3 According to the data reported in Table 1 this measure is effective in actually solving the problem posed:

5.3.1 **Izod impact:**

As compared with the respective control Examples 13, 17, 30 and 38 (without CuP), the Izod values of those examples having an identical CB content and a CuP content of, with respect to CB, 2 to 10% is consistently improved (cf. Examples 14 and 15; 18 and 19; 34 to 36; 43 and 44).

Considering the large number of **consistent** results, the Respondent's allegation of their insignificance, based on the alleged inaccuracy of the used test method, is not convincing. Since the Respondent failed to submit proof therefor, its contention that the allegedly

"abnormal" use, in the patent in suit, of GE and DE test pieces would affect the conclusiveness of the results of the Izod measurement must be dismissed.

5.3.2 **Elongation at fail:**

Except for the test series comprising control Example 13 and Examples 14 and 15, the elongation results reported in Table 1 demonstrate an improvement of this property when CuP is added to CB-filled polyamide compositions within the claimed ranges of amounts, although the improvement diminishes towards the upper limit of 10% of the CuP range (cf. control Examples 17, 30, 38 and the corresponding Examples 18/19, 34 to 36, 43/44).

In view of this consistent tendency and considering that the control Examples 1 and 30, which are compositionally identical to control Example 13, exhibit elongation values of 35% and 33%, respectively, the Board is convinced that the elongation value of 45%, reported for said control Example 13, is incorrect and should also be in the range 33% to 35%. On that basis, the test series comprising control Example 13 and Examples 14/15 does also demonstrate an improvement of the elongation in the claimed CuP range.

5.3.3 The above analysis of the Izod impact and elongation at fail data in Table 1 shows that both these properties are improved in the claimed CB and CuP ranges. In particular, within these ranges the variation of both properties with the amount of CuP has the form of a bell shaped curve which is consistently above the level in the absence of CuP. This is in line with the knowledge of one skilled in the art, namely that Izod impact and elongation at fail both relate to the toughness of the composition and should thus follow the same pattern. The fact that the elongation values, having passed their

climax, decline more rapidly than the Izod values with increasing amounts of CuP, does not affect the credibility of these effects, since the skilled person is aware that the relative magnitude of even very similar physical properties of polymer materials is usually unpredictable and depends also largely on the test methods used. The Respondent's objection of inconsistency of the Izod impact and elongation at fail data in Table 1 is therefore unfounded.

5.3.4 Proper interpretation of the experimental data in the patent in suit shows thus that the compositions as defined in Claim 1, in particular the amount of CuP as required therein, provides an effective solution to the above defined technical problem.

5.4 It remains to be examined whether or not this solution derives in an obvious manner from the prior art relied upon by the Respondent.

5.4.1 Document D7 is concerned with the improvement of the thermal stability of fiber-proof coloured nylon 6.6 compositions by cocondensation of caprolactam (cf. paragraph bridging pages 1 and 2; page 2, penultimate paragraph). While the composition according to Example 7 contains, as referred to polyamide, 0,06% CB and 0,42% CuP, there is nothing in D7 which could incite a skilled person to improve the toughness of this composition by enhancing the amount of CB to the range of amounts required by present Claim 1 (0,2 to 10% by weight of the composition).

5.4.2 Document D8 solves the same problem underlying the present invention (enhancement of impact strength and elongation) by incorporation of nigrosine into CB-filled polyamide compositions (cf. Claim 1; column 1, lines 10 to 39). Since nigrosine, which is the product of

oxidation of aniline with nitrobenzene or nitrophenol, is structurally unrelated to CuP (copper phthalocyanine), and since there is no hint in D8 or any other known document that CuP or similar colorants may be used in lieu of nigrosine for the same purpose, its replacement by CuP was non-obvious; the fact that the use of CuP **as a pigment** for polymers and especially for polyamides was known (cf. specification of the patent in suit: page 2, lines 30 to 37; D7: Examples 1 to 3, 6 and 7), was no incentive for one skilled in the art to use it for the completely different purpose headed for in the patent in suit, i.e. **to counteract the loss in toughness** caused in polyamides by the use of CB.

5.5 Since, for the acknowledgement of an inventive step, the non-obviousness of a claimed feature (here addition of CuP in a certain range of amounts) with respect to solution of **one** technical problem (here toughness as represented by Izod impact and elongation at fail) is sufficient, there is no need to decide on the relevance (with regard to inventive step) of the enhancement of the mold shrinkage caused by the admixture of CuP to CB-filled polyamide compositions.

5.6 The issue of the alleged prior public use could have no influence on the assessment of inventive step, since the selling of the composition did not comprise any information concerning its toughness properties; the mere sale of a product, without an at least implicit indication of its relevant properties, cannot render obvious an improvement of this product related to these properties.

5.7 The subject-matter of Claims 1 and 6 does therefore comply with the requirements of Article 56 EPC and the same applies, by virtue of their appendancy, to Claims 2 to 5 and 7 to 10.

Order

For these reasons it is decided that:

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 Appellant's request as filed during the oral proceedings and a description yet to be adapted.

The Registrar:

E. Görgmaier

The Chairman:

C. Gérardin