BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 608/91 - 3.3.3

Application No.: 85 903 524.8

Publication No.: 0 185 757

Title of invention: Dual Functional Additive

Classification: C08K 3/22

D E C I S I O N
of 18 March 1992

Applicant: THE BUDD COMPANY

Headword:

EPC Article 56

Keyword: "Inventive step acknowledged after amendment and submission of appropriate comparative tests"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 608/91 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 18 March 1992

Appellant : THE BUDD COMPANY
3155 W. Big Beaver Road
Troy, MI 48084 (US)

Representative : Schaumberg, Thoenes & Englaender
Mauerkircherstrasse 31
Postfach 86 07 48
W - 8000 München 86 (DE)

Decision under appeal : Decision of Examining Division of the European Patent Office dated 19 February 1991, posted on 2 April 1991, refusing European patent application No. 85 903 524.8 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : F. Antony
Members : C. Gérardin
R. Schulte

Summary of Facts and Submissions

I. European patent application No. 85 903 524.8, having an international (WIPO) filing date of 24 June 1985, claiming priority of 25 June 1984 from an earlier application in the United States and published on 16 January 1986 under the international publication No. WO86/00324, was refused by a decision of the Examining Division dated 19 February 1991, issued in writing on 2 April 1991.

That decision was based on a set of five claims filed on 19 February 1991, of which Claim 1, after two minor editorial amendments ("und" changed into "and" between meta and para twice) read as follows:

"Maturated moldable sheet molding compound suitable for molding under heat and pressure, said molding compound having inert fillers and fibrous reinforcing materials admixed in a thermosetting resin composition, said resin being comprised of an unsaturated polyester resin having a ratio of hydroxyl groups to carboxyl groups of 5.7 to 0.8, an acid number of at least 14 and an average molecular weight of 800 to 5,000, said resin including an ethylenically unsaturated monomer, a free radical polymerization catalyst and a mold release agent, said resin composition further containing a dual thickening system for modifying the viscosity of the resin composition, said dual thickening system comprising an oxide or hydroxide of magnesium or calcium and a polyisocyanate, and optionally a linear polymer of 10,000 to 50,000 molecular weight; whereby said oxides and hydroxides are present in an amount sufficient to react with at least 30 percent, but not more than 75 percent of the carboxyl groups present, and said polyisocyanate is present in an amount sufficient to react with at least 10 percent, but not more than 105 percent of the hydroxyl

groups present; the improvement comprising: using as the polyisocyanate an isocyanate terminated prepolymer having an NCO to OH ratio of from 1.2/1 to 5/1 said isocyanate terminated prepolymer being the reaction product of one equivalent of a polyol having an average molecular weight of 600 to 4,000 and an average functionality between 2 and 6 with from 1.2 to 5 equivalent weights of a polyisocyanate selected from the group consisting of toluene diisocyanate, ethylene diisocyanate, propylene diisocyanate, meta and para phenyl diisocyanate, 4,4'-diphenyl methane diisocyanate (MDI), a mixture of 4,4'-diphenyl methane diisocyanate and its trifunctional cyclic adduct containing carbodiimide linkages, 1,5-naphthalene diisocyanate, meta and para xylene diisocyanate, tetramethylene diisocyanate, and hexamethylene diisocyanate."

Claims 2 to 5 were dependent claims directed to preferred maturated mouldable sheet moulding compounds according to Claim 1.

II. The ground for this decision was non-compliance with the requirements of Article 56 EPC with regard to the teaching of mainly the following document:

(5) US-A-4 067 845.

More specifically, it was stated in the decision under appeal that the claimed subject-matter only differed from the compositions exemplified in document (5) by the fact that a polyisocyanate prepolymer was used instead of Isonate 143L, which was a carbodiimidised 4,4'-diphenyl methane diisocyanate. This citation further specified that the exact polyisocyanate was in fact not critical and even mentioned "polyisocyanate prepolymers of aromatic type" as equally suitable. Furthermore, the prepolymers used in the

application in suit were well known in the art, as evident from Polyurethane, Kunststoff-Handbuch, Volume 7, pages 19 to 21 and 611 to 613, Carl Hanser Verlag, München 1983. In the absence of appropriate comparative data showing unexpected advantages over the compositions known from document (5) as the result of using such polyisocyanate prepolymer, the problem underlying the application in suit reduced itself to the definition of alternative compositions, for which no inventive step could be acknowledged.

III. The Appellant (Applicant) thereafter lodged a Notice of Appeal against this decision on 3 June 1991 and paid the prescribed fee at the same time. Together with the Statement of Grounds of Appeal an amended main claim was filed on 30 July 1991, wherein it had been specified that the polyol used to prepare the isocyanate terminated prepolymer was a polyether polyol. In support of the patentability of the claimed subject-matter the Appellant argued that the problem underlying the application in suit was not to provide merely alternative compositions, but to improve the low shrinkage properties of the mouldable sheet moulding compounds known from document (5). The results of comparative tests based on the use of Isonate 143L and a urethane prepolymer derived from a polyether polyol within the terms of Claim 1 were submitted for that purpose.

IV. The Appellant requested that the impugned decision be set aside and that a patent be granted on the basis of Claims 1 to 5 filed on 30 July 1991.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.

2. The wording of the claims does not give rise to any objections under Article 123(2) EPC.

The basis for Claim 1 is to be found in original Claim 19, which was directed to a sheet moulding composition comprising as first ingredient an unsaturated polyester resin, whose definition has been maintained unamended. Although the original application refers throughout to an "ethylinically" unsaturated monomer as second component, this obviously is a misspelling for "ethylenically" in view of the monomers mentioned as suitable in the description (page 12, line 30 to page 13, line 5; Claim 27) and actually used in the worked examples. The use of an oxide or an hydroxide of magnesium or calcium as part of the dual thickening system finds its basis in original Claim 24. The fact that the linear polymer serving as conventional low shrinkage additive is only an optional ingredient is disclosed on page 11, lines 23 to 28. The relative amount NCO:OH is mentioned in original Claim 1. The general definition of the polyether polyol is supported by original Claim 12; as to the specific polyisocyanates, they are quoted in Claims 1 and 2 as well as on page 9, lines 8 to 15, from where it also appears that toluene diisocyanate is suitable not only as specific isomer mixtures.

As to the dependent Claims 2 to 5, they correspond respectively to original Claims 10, 9, 27 and 31.

3. The application in suit, as defined by the present wording of the claims, concerns a maturated sheet moulding compound suitable for moulding under heat and pressure. Such mouldable sheet moulding compound is known from document (5), which the Board, like the Examining

Division, regards as the closest state of the art. This citation describes maturated compositions which are the reaction product of (A) an unsaturated polyester resin having (1) a ratio of hydroxyl groups to carboxyl groups between 5.7 and 0.8, (2) an acid number of at least 14, and (3) an average molecular weight between 800 and 5,000, (B)(1) an organic polyisocyanate in an amount sufficient to react with at least 30 percent, but nor more than 105 percent of the hydroxyl groups present, and (B)(2) a metallic oxide or hydroxide selected from the group consisting of calcium and magnesium oxides and hydroxides in an amount sufficient to react with at least 30 percent, but not more than 75 percent of the carboxyl groups present, said reaction product containing dispersed therein (C) an aliphatically-unsaturated monomer, (D) a free radical polymerisation catalyst, and (E) an internal mould release agent (Claim 1). According to Claim 15, the moulding compositions additionally comprise (F) a low-shrink additive consisting essentially of a thermoplastic polymer soluble in monomer (C). These moulding compositions exhibit a desirable combination of advantageous properties, in particular improved viscosity index, lower moulding pressures, less severe or even non-existent flashing, reduction or even elimination of porosity, pit and flow lines, as well as more uniform physical properties in general (column 4, lines 15 to 30). However, even when a low-shrink additive (F) is incorporated into these compositions, the shrinkage resistance upon moulding and curing cannot be regarded as optimal.

In the light of this prior art shortcoming the technical problem underlying the application in suit may thus be seen as the provision of a sheet moulding composition which exhibits improved shrinkage characteristics upon moulding and curing.

According to Claim 1 of the application in suit this problem is solved by using as component (B)(1) an isocyanate terminated prepolymer derived from a polyether polyol, which has to meet certain requirements in terms of molecular weight and functionality, and a molar excess of a specific polyisocyanate selected among ten different compounds.

The comparative data submitted together with the Statement of Grounds of Appeal, as amended in accordance with the submission of 11 September 1991, provide evidence that the above-defined technical problem is effectively solved. More specifically, the comparison of the shrinkage values obtained in the reference examples 8, 11, 14 and 15, wherein a urethane prepolymer within the terms of the application in suit has been used, and in the corresponding comparative examples, wherein Isonate 143L has been used in the same equivalent weight, all other compositional features being identical, shows that the use of such urethane prepolymer reduces shrinkage significantly.

4. After examination of the documents cited in the search report, the Board has come to the conclusion that this technical teaching is not disclosed in any of them and that the subject-matter of the application in suit as defined in present Claim 1 is, therefore, novel. Since the issue of novelty of the claims directed to sheet moulding compositions has not been raised by the Examining Division, it is not necessary to consider this matter in further detail.

5. It still remains to be decided whether the claimed subject-matter involves an inventive step with regard to the cited documents.

5.1 Although document (5) addresses the problem of low-shrinkage properties, its teaching cannot lead to the solution as claimed in the application in suit.

5.1.1 As stated above, a low-shrink additive (F) may be incorporated into the basic moulding composition (Claim 15). This additive is defined as being a thermoplastic polymer, which is incorporated dissolved in the monomer (C) in an amount of 10 to 55 parts by weight per one hundred parts of polyester resin (A); it is suitably added to the combination of resin (A) and monomer (C) in the form of a thermoplastic powder solubilised in part or all of the polymerisable liquid monomer (column 8, lines 55 to 67). According to a typical embodiment illustrated in most examples, the low-shrink additive is a product sold under the trademark P-701, which is a solution of 33% methylmethacrylate copolymer in styrene, the copolymer containing 9 to 10 percent by weight of ethylacrylate (see footnote to Table of Example I).

This method to improve the shrinkage characteristics corresponds in fact to the optional feature mentioned in Claim 1 of the application in suit, wherein the additive is defined as a linear polymer having a molecular weight between 10,000 and 50,000. According to the description (page 11, lines 23 to 28) this conventional additive can be in particular a methylmethacrylate polymer called "acrylic syrup" in the examples, which is most likely identical with the product P-701 referred to above.

It is self-evident that the incorporation of such a well known low-shrink additive has nothing to do with the structural requirements concerning the isocyanate component as now defined.

5.1.2 These structural features are not even mentioned in document (5), let alone their correlation with low-shrinkage properties. In this citation it is first indicated that the exact polyisocyanate is not critical (column 7, lines 10 to 12). However, MDI as well as the mixture of MDI and its trifunctional cyclic adduct containing carbodiimide linkages, in particular the product sold under the trademark Isonate 143L, are said to be preferred and actually used in all the worked examples. Moreover, with the exception of "polymeric MDI containing an average of from two to three isocyanate groups per molecule" (column 7, lines 20 to 22), all the common representative polyisocyanates quoted are low molecular weight compounds. Even the vague reference to "polyisocyanate prepolymers of aromatic type" (column 7, lines 24/25) cannot be interpreted as a urethane prepolymer within the terms of the application in suit, since, on the one hand, that generic term does not necessarily suggest a polyether type prepolymer, and, on the other hand, the polyisocyanates quoted in the application in suit are not all aromatic. This means that the specific isocyanate terminated prepolymer now required by Claim 1 of the application in suit is not even encompassed within the large group of polyisocanates identified as being suitable according to the disclosure of document (5).

5.1.3 For these reasons the teaching of document (5) cannot provide any element of solution to the above-defined problem.

5.2 As long as the problem underlying the application in suit could be defined as the preparation of further matured sheet moulding compositions, as was the case in the decision of refusal (see Reasons for the Decision, point 4), just any polyisocyanate compound could be

regarded as suitable, since it provided an acceptable solution. The reference to a polymer encyclopedia to find such alternative compounds was therefore legitimate, and the resulting solution obvious.

It is thus not disputed that the particular isocyanate terminated prepolymers now required according to the valid version of Claim 1 are well-known compounds in the polyurethane chemistry. However, the question crucial to the issue of inventive step is now no longer whether the skilled man could have used such prepolymers when looking for alternative compositions, but whether he would have chosen them in order to improve the shrinkage characteristics. In the Board's view, in the absence of any reference to this specific property in the pages of the polymer encyclopedia quoted in the decision under appeal, there was no incentive to control it by the structural features of the polyisocyanate component. It follows that these features were non-obvious in the light of the existing problem.

5.3 For these reasons, the subject-matter of the application in suit as defined in Claim 1 involves an inventive step.

6. Claim 1 being allowable, the same applies to dependent Claims 2 to 5, which are directed to preferred embodiments of the subject-matter of Claim 1 and whose inventiveness is supported by that of the main claim.

7. Although the claims meet the requirements of Article 56 EPC, a patent cannot yet be granted, since it remains to adapt the description in order to bring it in line with the claims as amended, in particular with the more specific definition of the polyisocyanate (Article 84 EPC). For that purpose the case is remitted to the first instance.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division with the order to grant a patent on the basis of Claims 1 to 5 filed on 30 July 1991 and a description yet to be adapted.

The Registrar: The Chairman:

E. Görgmaier F. Antony