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D E C I S I O N
of 23 January 2002

Case Number: T 0809/00 - 3.3.3

Application Number: 93305665.7

Publication Number: 0583086

IPC: D04H 1/64

Language of the proceedings: EN

Title of invention:

Curable aqueous composition and use as fiberglass nonwoven binder

Patentee:

ROHM AND HAAS COMPANY

Opponent:

BASF Aktiengesellschaft, Ludwigshafen

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0809/00 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 23 January 2002

Appellant: BASF Aktiengesellschaft, Ludwigshafen
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Representative: -

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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office dated 23 May 2000
and issued in writing on 5 July 2000 concerning
maintenance of European patent No. 0 583 086 in
amended form.

Composition of the Board:

Chairman: R. Young
Members: C. Idez
U. Tronser

Summary of Facts and Submissions

I. The grant of European patent No. 0 583 086 to Rohm and Haas Company in respect of European patent application No. 93 305 665.7 filed on 19 July 1993 and claiming priority from the US patent applications Nos 926262 and 75715 dated respectively 6 August 1992 and 11 June 1993, was announced on 26 November 1997 (Bulletin 1997/48) on the basis of 9 claims.

Claim 1 as granted read as follows:

"A curable aqueous composition comprising

(a) a polyacid comprising at least two carboxylic acid groups, anhydride groups, or salts thereof;

(b) a polyol comprising at least two hydroxyl groups; and

(c) a phosphorous-containing accelerator;

wherein the ratio of the number of equivalents of said carboxylic acid groups, anhydride groups, or salts thereof to the number of equivalents of said hydroxyl groups is from about 1/0.01 to about 1/3, and wherein said carboxylic acid groups, anhydride groups, or salts thereof are neutralized to an extent of less than about 35% with a fixed base."

Dependent Claims 2 to 8 referred to specific embodiments of the curable composition according to Claim 1.

Independent Claim 9 read as follows:

"A method for binding a heat-resistant nonwoven or heat

resistant fibers thereof comprising:

(a) contacting said nonwoven or fibers thereof with said a curable aqueous composition according to claims 1-8; and

(b) heating said curable aqueous composition at a temperature of from about 120°C to about 400°C."

II. On 20 August 1998, a Notice of Opposition was filed by BASF Aktiengesellschaft in which revocation of the patent in its entirety was requested on the grounds of lack of novelty within the meaning of Article 54 EPC and inventive step within the meaning of Article 56 EPC.

The objections were supported by the following documents:

D1: NTIS Government Report of February 1, 1992 referring to US-Application Ser. No. 07/769,288,

D2: EP-A-445 578,

D3: US-A-4 820 307,

D4: US-A-4 076 917,

D5: US-A-4 101 606, and

D6: DE-C-2 509 237.

III. By an interlocutory decision which was given at the end of oral proceedings held on 23 May 2000 and issued in writing on 5 July 2000, the Opposition Division found that the patent in suit could be maintained in amended

form on the basis of a set of Claims 1 to 8 filed at the oral proceedings.

Claim 1 differs from Claim 1 as granted solely by the insertion of the word "polymeric" immediately before "polyacid" in sub-paragraph (a) of the claim. Claims 2 to 8 correspond respectively to granted Claims 3 to 9.

According to the decision, the subject-matter of Claim 1 was novel over document D1, since this document did not disclose a polymeric polyacid. As to inventive step, document D2 was considered as the closest prior art. It related to binder systems for heat resistant fibers, such as glass fibers. These binders were curable aqueous compositions comprising a polymeric polycarboxylic acid having at least two carboxylic acid groups and a polyol having at least two hydroxyl groups. It failed, however, to disclose the limited neutralization of the carboxylic acid groups with a fixed base and the use of phosphorus containing catalysts. The decision held that the presence of such catalysts improved the performance of the cured compositions and gave rise to enhanced curing when compared with compositions not including the phosphorus containing catalyst as shown by Example 4 of the patent in suit. It indicated that documents D1 and D3 disclosed the use of phosphorus containing catalysts for accelerating the esterification reaction between the hydroxyl groups of cellulose materials with monomeric polycarboxylic acids in order to improve the wrinkle resistance and the drying properties of these materials. The decision stated that there was, however, no hint in either of these documents that a phosphorus containing catalyst would also react with polymeric acids and improve the performance of binders for heat

resistant fibers comprising polymeric polyacids according to document D2. Thus, it concluded that the subject-matter of Claims 1 to 8 of the main request was novel and involved an inventive step.

IV. On 5 August 2000, a Notice of Appeal was filed, together with payment of the prescribed fee.

The arguments of the Appellant (Opponent), presented in the Statement of Grounds of Appeal filed on 5 September 2000 and at the oral proceedings held on 23 January 2002 may be summarized as follows:

- (i) The subject matter of document D2 differed from the subject-matter of the patent in suit only in that the binder composition disclosed therein did not comprise a phosphorus containing catalyst. Document D2 also dealt with the mechanical properties of nonwovens coated by the binder compositions.
- (ii) Starting from D2, the technical problem underlying the patent in suit was to improve the mechanical resistance of the fibers, which were bound by the aqueous composition, in particular the tensile strength thereof.
- (iii) During the curing of the aqueous composition, which provided an increase of the mechanical resistance, an esterification of the polycarboxylic acid with the hydroxyl groups of the polyol occurred.
- (iv) Thus, starting from D2 and looking for improvements in curing properties and mechanical

resistance, it would have been obvious for a chemist, independently of his specific technical field, to use catalysts for the esterification reaction.

- (v) Documents D1 and D3 disclosed, in particular, the use of hypophosphites as catalysts for the reaction between a polyol (i.e. cellulose) and a polycarboxylic acid. It was also known from D3, that the use of a binder composition comprising a phosphorus catalyst led to less tearing strength loss of the treated fibers (cf. D3, column 3, lines 62 to 66).
- (vi) The fact that D1 and D3 disclosed only monomeric acids was not pertinent, since it was of no relevance for the mechanism and the progress of an esterification reaction as whether the acid groups were bound to low or high molecular weight compounds.
- (vii) Thus, the subject-matter of the patent in suit was obvious in view of the combination of D2 with D1 or D3.
- (viii) The use of a catalyst in compositions comprising a polymeric acid and a polyol and used as binders for nonwovens should also be considered as an obvious feature in view of documents D4, D5, and D6.
- (ix) Furthermore, the low tensile strength value in the wet state disclosed in "Comparative Example E" of the patent in suit, in which a phosphorus catalyst (i.e. disodium hydrogen

phosphate) has been used, showed that the technical problem was not solved over the whole area claimed.

V. The arguments presented by the Respondent in his letter dated 11 January 2001 and at the oral proceedings of 23 January 2002 may be summarized as follows:

- (i) Novelty of the subject-matter of the patent in suit had been accepted by the Appellant.
- (ii) Document D2 was considered as the closest state of the art. The compositions of D2 did not use any accelerator and consequently did not use a phosphorus containing accelerator.
- (iii) Documents D1 and D3 related to textile finishings imparting high level of wrinkling resistance and smooth drying properties to fabrics. They focussed on crosslinking reactions between a cellulose substrate and monomeric polycarboxylic acids. Furthermore, D1 and D3 pointed out that, in such a reaction, the cellulosic fibers lost strength.
- (iv) There was no connection between crosslinking a reactive substrate with a monomeric polyacid to improve wrinkle resistance and improving the wet tear resistance of a nonwoven by affecting the reaction in the cured layer around the substrate fibers using a binder comprising polymeric acids.
- (v) The invention had nothing to do with the esterification of the substrate as in D1 and D3

but dealt with the formation of a layer of cured resin around a chemically inert fiber.

(vi) The objective of using the accelerator in D1 and D3 (i.e. improving the wrinkle resistance, albeit at the cost of losing strength) had nothing to do with the objective of the patent in suit (i.e. improving the wet tear resistance of nonwovens).

(vii) Thus, the subject-matter of the patent in suit did not arise in an obvious manner from the combination of D2 with either D1 or D3.

(viii) The tensile strength value indicated in comparative Example E should likely be the result of a typing error. Furthermore, even if this value were correct, the comparison made with comparative Example D, which represented a variant lying much closer than document D2, could not constitute convincing evidence that no relevant effect would be obtained according to the patent in suit in comparison with D2. Therefore, it could not be concluded that the technical problem was not solved over the whole area claimed.

VI. The Appellant requested that the decision of the Opposition Division be set aside and the European patent No. 583 086 be revoked.

The Respondent requested that the appeal be dismissed and the patent maintained.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

Novelty of the subject-matter of Claim 1 has been recognized by both parties as well as the Opposition Division. The Board sees no reason to deviate from that view.

3. *The patent in suit; the technical problem*

The patent in suit is concerned with curable aqueous compositions and use thereof as binders for heat resistant nonwovens.

3.1 Such compositions are known from document D2, which the Board, in common with the parties and the Opposition Division, regards as the closest state of the art.

3.2 According to D2, there are disclosed curable aqueous compositions comprising a polymeric polycarboxylic acid and a polyfunctional alcohol wherein the ratio of carboxylic acid groups to hydroxyl groups is from 1:4 to 4:1. These compositions are used as binders for fibers such as glass fibers, mineral fibers, synthetic polymeric fibers or cellulosic fibers. The obtained articles show good structural stability and tear resistance in a wet atmosphere (cf. D2; column 1, lines 25 to 42; column 2, line 17 to column 3, line 10; column 3, line 44 to column 4, line 4; column 4, lines 34 to 40; column 5, lines 1 to 33).

3.3 Compared with this state of the art, the technical

problem objectively arising may be seen as to provide aqueous curable binder compositions enabling the manufacture of nonwoven articles made of heat resistant fibers having improved mechanical properties in the wet state.

- 3.4 The solution proposed according to the patent in suit is to incorporate a phosphorus containing accelerator in the aqueous curable composition as specified in Claim 1.
- 3.5 The patent in suit provides data in respect of the effect of a phosphorus containing accelerator. Examples 6 to 9 in comparison with comparative Example C of Table 4.1 as well as Examples 18 to 21 of Table 7.1 in comparison with Examples 14 to 17 of Table 6.1 of the patent in suit show an increase of the tensile strength of the nonwoven materials in the wet state in relation to the use of a phosphorus containing accelerator. It is true, contrary to the above trend, that the phosphorus accelerator used in comparative Example E of Table 5.1 (presented as comparative although falling under the scope of Claim 1) does not lead to an increase of the tensile strength in the wet state compared with, say, comparative Example D, wherein the catalyst used is p- toluene sulfonic acid. The latter is, however, a variant lying closer than document D2, which does not use a catalyst at all. Consequently, an inferior performance compared with such a variant does not itself constitute convincing evidence that no relevant effect is obtainable by the patent in suit in comparison with D2. Since the experimental results were not otherwise challenged, and the onus of proof in any case lies with the Appellant, the Board finds it credible that the technical problem

is effectively solved over the whole range claimed by the claimed measures.

4. *Inventive step*

It remains to be decided whether the claimed subject-matter is obvious having regard to the cited prior art.

- 4.1 There is no mention in document D2 of the use of an accelerator, let alone the use of a phosphorus containing accelerator in order to catalyse the reaction between the polyacid and the polyol. Thus, D2 itself cannot suggest the solution of the technical problem.
- 4.2 Document D3 relates to curable aqueous compositions comprising a polyacid and a phosphorus containing accelerator for treating cellulosic textile fabrics. According to D3, the phosphorus compound accelerates the esterification and the crosslinking of the cellulose with the polycarboxylic acid. Quite apart from the fact that the aqueous binder compositions used in D3 do not contain a polyol in the generally understood sense but on the contrary result only in a crosslinking reaction between the hydroxyl groups on the fibers and the polycarboxylic acid and not in a crosslinked coating on the fibers as in the patent in suit, D3 is concerned with a totally different technical problem, i.e. improving the wrinkle resistance, the shrinkage and the drying properties of cellulosic textile fabrics. Furthermore, D3 clearly indicates that such treatments necessarily involve a decrease in the strength of the fibers compared with the untreated fabric, and it cannot, therefore, provide any incentive for the skilled person wanting, on the

contrary, to improve the strength of the fibers (cf. D3, column 3, lines 14 to 66; column 4, lines 28 to 64). While it is true (cf. D3, Table II; column 9, lines 51 to column 10, line 21), that the tear strength and breaking strength of the fabrics treated with the compositions according to D3 (i.e. based on the esterification of the cellulosic fibers) are better than those of fabrics treated with conventional finishings such as N-methylol compounds, the latter are based on the etherification of the cellulose fibers and do not represent a valid comparison basis with the system of D2 which is one of esterification. In particular, it cannot suggest that phosphorus containing accelerators would increase the tensile strength in the wet state of nonwovens coated by a composition comprising a polymeric polycarboxylic acid and a polyol. Consequently, D3 cannot lead to the solution of the technical problem.

4.3 Document D1 deals, like document D3, with esterification systems for crosslinking cellulosic materials as a means of imparting them wrinkle resistance and smooth drying properties and, as document D3, it also states that these treatments result in a loss of strength of the fibers (cf. D1, page 6, line 12 to page 7, line 4). It represents therefore an equally fruitless source of incentive as document D3 for the skilled person seeking a net increase in strength of the fibers. Thus, the teaching of D1 cannot be regarded as relevant to the solution of the technical problem.

4.4 Documents D4, D5, and D6 are closely related to each other, since they are either continuations in part (D4, D5) or the corresponding German application (D6) of the

same US patent application US Ser. No. 454645, filed on 25 March 1974. They all deal with beta-hydroxyalkylamide compounds as curing agents for polymers containing one or more carboxy or anhydride functions (cf. D4, Claim 1; cf. D5, Claim 1; cf. D6, Claim 1). According to these documents, curable compositions prepared on that basis can be used as binders for nonwovens (cf. D4, column 4, lines 18 to 27; cf. D5, column 5, lines 26 to 34; cf. D6, page 4, lines 47 to 52). They state, however, that a catalyst is not necessary for curing the compositions (cf. D4, column 4, lines 3 to 4; cf. D5, column 4, lines 45 to 46; cf. D6, page 4, lines 39 to 40) and they are, furthermore, totally silent on the effect of a catalyst, let alone a phosphorus containing catalyst, on the mechanical properties of the treated nonwovens. Consequently, they would not provide any assistance to the solution of the technical problem.

- 4.5 It follows that the solution of the technical problem does not arise in an obvious way from the cited prior art. Thus, the subject-matter of Claims 1 to 8 involves an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young