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Datasheet for the decision of 11 February 2019

Case Number: T 0687/16 - 3.3.05

Application Number: 10744635.3

Publication Number: 2464772

IPC: D04H1/64, C08B37/00, C08L5/00, C03C25/32

Language of the proceedings: EN

Title of invention:
CURABLE FIBERGLASS BINDER COMPRISING AMINE SALT OF INORGANIC ACID

Patent Proprietor:
Johns Manville

Opponent:
Knauf Insulation

Headword:
Curable Fiberglass Binder/Johns Manville

Relevant legal provisions:
RPBA Art. 13(1)
EPC Art. 123(2), 123(3), 84, 54, 56

Keyword:
Late-filed request - request clearly allowable (yes)
Amendments - allowable (yes)
Claims - clarity (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:
G 0004/93, G 0001/99

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0687/16 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 11 February 2019

Appellant: (Opponent)	Knauf Insulation Rue de Maastricht 95 4600 Visé (BE)
Representative:	ARC-IP ARC-IP sprl Rue Emile Francqui 4 1435 Mont-Saint-Guibert (BE)
Respondent: (Patent Proprietor)	Johns Manville 717 Seventeenth Street Denver, CO 80202 (US)
Representative:	Mai Dörr Besier European Patent Attorneys European Trademark Attorneys Patentanwälte Kreuzberger Ring 64 65205 Wiesbaden (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 28 January 2016 concerning maintenance of the European Patent No. 2464772 in amended form.**

Composition of the Board:

Chairman	E. Bendl
Members:	G. Glod
	S. Fernández de Córdoba

Summary of Facts and Submissions

I. The present appeal from the opponent (appellant) lies from the decision of the opposition division finding that amended European patent No. EP 2 464 772 B1 based on the then second auxiliary request met the requirements of the EPC.

The following documents cited in the decision are of relevance for the present decision.

O1: DE 1 905 054 A1
O3: US 3 513 001 A
O5: WO 2010 106181 A1
O7: WO 2007 014236 A2
O9: EP 1 652 868 A1
O10: US 1 801 053 A
O11: US 4 048 127 A
O13: US 3 006 879 A
O16: WO 2003 22899 A1

II. With the statement of grounds, the appellant submitted the following documents relevant to the present decision:

O20: H, Olbrich, The Molasses, published by Biotechnologie-Kempe GmbH, p. 6, 2006
O21: Ullmann's Encyclopedia of Industrial Chemistry, Fifth Edition, Chapter 22.2 Molasses.

III. With the reply of 10 October 2016, the respondent (patent proprietor) submitted auxiliary requests A and B.

IV. In its communication under Article 15(1) RPBA, the board was of the preliminary opinion that the main

request appeared to lack novelty, while auxiliary request A seemed to fulfil the requirements of the EPC.

V. By letter of 21 December 2018, the respondent submitted four auxiliary requests.

VI. By letter of 24 January 2019, the appellant withdrew its request for oral proceedings and announced that it would not attend the scheduled oral proceedings.

VII. Oral proceedings took place on 11 February 2019 in the absence of the appellant. Therein, the respondent filed a new sole request.

The independent claims of the request are as follows:

"*1. A curable composition for use in the binding of fiberglass comprising (i) an aldehyde or ketone and (ii) an amine salt of an inorganic acid obtainable by reacting the amine with the acid in water wherein the molar ratio of acid functionality to amine functionality is from 1:2 to 2:1 wherein (iii) the aldehyde is a reducing sugar and the molar ratio of salt to carbonyl is from 1:10 to 10:1 and, (iv) the amine is selected from the group consisting of ethylene diamine, 1,3-propanediamine, 1,4-butanediamine, 1,5-pentanediamine, 1,6-hexanediamine and mixtures thereof, (v) the composition comprises a thickener and/or rheology modifier.*"

"*16. A process for binding fiberglass comprising applying to fiberglass a curable composition comprising: (i) an aldehyde or ketone and (ii) an amine salt of an inorganic acid wherein (iii) the aldehyde is a reducing sugar, (iv) the amine is a di-functional primary or secondary amine, the amine is a diamine*

having at least one primary amine group, (v) the composition comprises a thickener and/or rheology modifier and (vi) the glass fibers are a fibrous substrate being a woven or non-woven material which comprises filaments, chopped fibers, staple fibers or mixtures thereof, and thereafter curing said composition while present on said fiberglass."

"*17. A formaldehyde-free fiberglass product formed by the process of claim 16.*"

Claims 2 to 15 relate to preferred embodiments of claim 1, while claim 18 is a preferred embodiment of claim 17.

VIII. The arguments of the appellant can be summarised as follows:

The molar ratio of acid functionality to amine functionality from 1:2 to 2:1 only related to the process for the preparation of the salt and not to the amine acid salt itself.

The description and claims did not teach the skilled person what was required to make the invention work over the whole scope claimed. In particular, claim 1 covered compositions that were not curable.

O20 and O21 showed that sugar cane molasses contained reducing sugar. O1 (examples on page 37) disclosed a composition comprising sugar cane molasses, phosphoric acid and phenylene diamine. O5 disclosed in claim 13 compositions comprising a sugar syrup which contained reducing sugar, an amine component, such as ethylene diamine (p 12), and up to 20 wt % curing accelerator. A preferred curing accelerator was hypophosphorous acid.

O11 disclosed in examples 6 and 7 compositions comprising dextrose, toluene diamine and ethylene diamine, respectively, and sulfuric acid.

O7 was a good starting point for inventive step. O3 disclosed similar binder compositions and preferred di- or polyamines to monoamines. O11 made use of diamines. O16 taught diamine salts as a crosslinker between the aldehyde molecules. The selection of diamines was an obvious alternative.

O9 was also a good starting point, since it disclosed a composition comprising dextrose, melamine and an inorganic acid catalyst and their application on fiberglass.

O13 was another good starting point for inventive step. This also applied to O1 and O11.

IX. The respondent refuted the arguments and indicated that O1 did not disclose diamines as present in claim 1, while O11 did not disclose a ratio of salt to carbonyl within the range claimed. In any case, the compositions of examples 6 and 7 of O11, respectively, were not suitable as a binder and did not directly and unambiguously disclose a salt of an amine. The arguments presented by the appellant did not apply any more to the current restricted request.

X. The appellant requests that the impugned decision be set aside and that the patent be revoked.

The respondent requests that the impugned decision be set aside and that the patent be maintained on the basis of the sole request submitted during the oral proceedings before the board.

Reasons for the Decision

1. Article 13(1) & (3) RPBA

The present request was submitted during the oral proceedings before the board. According to established jurisprudence (Case Law of the Boards of Appeal of the EPO, 8th edition 2016, IV.E.4.2.5, page 1133), a request filed after the grounds of appeal may be admitted and considered at the board's discretion if the amended request is clearly or obviously allowable.

In the present case, the request is a further restriction of a previously filed request and was submitted to overcome an objection under Article 123(2) EPC in view of the molar ratio of acid functionality to amine functionality and to avoid likely problems of double patenting with respect to European patent No. EP 2 464 771 B1. The request was considered clearly allowable (see below) and was therefore admitted into the proceedings.

2. Reformatio in peius

The opponent being the sole appellant, the patent proprietor is primarily restricted during the appeal proceedings to defending the patent in the form in which it was maintained by the opposition division in its interlocutory decision (G 04/93, Reasons 16) except for the circumstances defined in G 01/99 (Reasons 15).

In the case at hand, the amendment relating to the molar ratio of acid functionality to amine functionality concerns a clarification of an amendment added during opposition proceedings and objected to by

the appellant in its statement of grounds of appeal under Article 123(2) and (3) EPC (point 4). It is the board's view that the wording "the molar ratio of acid functionality to amine functionality is from 1:2 to 2:1" present in claim 1 of the then second auxiliary request found allowable by the opposition division was not to be understood as an indication of the acid to amine ratio in the final amine salt, but was rather to be interpreted as relating to the ratio of acid to amine in the mixture used for preparing the amine salt (see paragraph [0023] of the patent). This is what is now reflected more clearly in the wording of part (ii) of claim 1. As a consequence, this amendment does not change the scope of the claim in that respect compared to the claim found allowable by the opposition division and does not contravene the principle established in G 04/93.

3. Article 123(2) EPC

The amendments inserted into granted claims 1 and 19 (Article 100(c) EPC was not one of the grounds on which the opposition was based) are directly and unambiguously derivable from the following passages of the application as filed:

claim 1 (ii): page 5, lines 21 to 24
claim 1 (iii): claim 18 and page 6, lines 24 to 26.
claim 1 (iv): page 5, lines 31 and 32. The deletion of some of the compounds present in claim 14 as filed is a restriction of the meaning of diamine to what the skilled person normally would have understood by said term.
claim 1 (v): claim 2

claim 16 (iii): page 4, lines 7 to 11 (generic disclosure), respectively the passages cited for claim 1, in combination with claim 18
claim 16 (iv): page 4, lines 7 to 11 in combination with claim 13
claim 16 (v): page 4, lines 7 to 11 in combination with claim 2
Claim 16 (vi): page 8, lines 33 to 35.

The requirements of Article 123(2) EPC are fulfilled.

4. Article 123(3) EPC

Claims 1 and 16 have been restricted with respect to granted claims 1 and 19, respectively. In particular, the amendment in claim 1 (ii) relating to the molar ratio of acid functionality to amine functionality does not extend the protection conferred (see paragraph [0023]).

The requirements of Article 123(3) EPC are fulfilled.

5. Article 84 EPC

The wording relating to the molar ratio of acid functionality to amine functionality is now formulated such that it is clear that this ratio relates to the preparation of the amine salt and not to the ratio in the amine salt itself. The product-by-process formulation used in claim 1(ii) is best suited to correctly and clearly reflect this.

The requirements of Article 84 EPC are fulfilled.

6. Article 83 EPC

Claim 1 relates to a curable composition which implies that the composition has to be curable so that components that fulfil the criteria of claim 1, but are not curable, do not fall under the scope of the claim. The same applies to the curable composition applied to the fiberglass in process claim 16.

Claim 1 is restricted to a diamine selected from a limited number of well-defined diamines that is to be reacted with an inorganic acid to obtain the amine salt. The preferred acids are given in paragraph [0022]. The salt is cured with a reducing sugar or a ketone. The reducing sugar is further defined in paragraph [0026], while the ketone is exemplified in paragraph [0027]. The curing conditions are provided in paragraph [0037]. In addition, the preferred molar ratio of salt to carbonyl is included in claim 1.

Claim 16 does not contain the specification how the amine salt could be obtained, but this information is provided in paragraph [0023]. The diamine is also not defined, but the patent provides information thereto in paragraph [0024], while the ratio of salt to carbonyl is given in paragraph [0026].

The board concurs with the opposition division's opinion on Article 83 EPC, since the appellant, besides speculations, has not provided any evidence that the information provided in the patent does not allow provision of a curable composition. There is also no evidence that many of the components defined in claims 1 and 16, respectively, would not lead to a curable composition and that it was therefore an undue burden to find the appropriate components to obtain a curable

composition when taking into consideration the teaching of the patent.

The requirements of Article 83 EPC are fulfilled.

7. Article 54 EPC

The requirements of Article 54 EPC are met for the following reasons:

7.1 The board accepts that O20 and O21 show that cane molasses contains reducing sugar. The examples of O1 (pages 36 and 37) disclose a composition comprising phosphoric acid, phenylenediamine and sugar cane molasses. Phosphoric acid is present as a catalyst (page 3, third paragraph) and phenylenediamine to prevent the binder from degrading wood (page 7, first paragraph), but the first paragraph on page 5 explicitly states that the amine reacts with the acid residues. However, O1 does not disclose an amine selected from the group indicated in claim 1 and does not disclose the application of a curable composition to fiberglass as present in claim 16.

7.2 O5 relates to an aqueous composition comprising a sugar syrup containing a reducing sugar, a polycarboxylic acid component, an amine component, and a reaction product of a polycarboxylic acid component and an amine component (claim 1). A curing accelerator may also be added (claim 13). Ethylene diamine that is a diamine having at least one primary amine group is disclosed as one amine among many others (page 12, second to fifth paragraphs). Inorganic acids, such as phosphoric acid, are disclosed as a curing accelerator among many other components (page 16, first paragraph). Glass fibers are also disclosed, but they are one type of fibers in a

list of different fibers (page 17, first paragraph). In agreement with the opposition division, the board takes the view that, in order to arrive at the components indicated in claims 1 and 16, several selections from different lists would have to be made. Therefore, the subject-matter of claims 1 and 16 is not directly and unambiguously derivable from O5.

7.3 Examples 6 and 7 of O11 disclose the condensation of dextrose with toluene diamine and ethylene diamine, respectively, and phenol. Sulfuric acid is the catalyst (column 4, lines 35 to 54 and column 6, lines 37 to 57). In examples 6 and 7, 1 mole of dextrose is reacted with 0.5 mole of diamine. There is no indication in which form, under the given conditions, the diamine and the sulfuric acid would be present in the reaction mixture. Even if it was accepted that sulfuric acid and the diamine reacted to an amine salt, the molar ratio of salt to carbonyl would not be in the range of 1:10 to 10:1, since the composition contains 1 mole of dextrose (1 mole carbonyl) and only 1.4 g of 5N H_2SO_4, which would not allow the production of 0.1 moles - that would be needed to fulfil the ratio - of amine salt. O11 does not disclose fiberglass. Consequently, O11 is not prejudicial to the subject-matter of claims 1 and 16.

7.4 Analogous conclusions also apply to the claims directly or indirectly dependent on claims 1 and 16.

8. Article 56 EPC

8.1 Claim 1

8.1.1 The present invention relates to a binding composition for use with fiberglass.

8.1.2 It is established jurisprudence that the closest prior art is normally a prior-art document disclosing the same purpose or aiming at the same objective as the claimed invention and having the most features in common with the claimed subject-matter. In the present case, O7 is considered closest prior art, since it relates to formaldehyde-free binders suitable for fiberglass (page 2, paragraph 5; page 6, lines 1 and 2). It discloses Maillard reactants including an amine and a reducing sugar as binder (claims 1 and 5). Suitable amines are indicated in figure 1. Preferred binders for fiberglass are shown in Table 7 (page 59).

8.1.3 The alleged problem to be solved is to provide a binder that improves tensile strength (see paragraph [0029] of the patent in suit and the respondent's reply of 10 October 2016, page 12, paragraph 4).

8.1.4 As a solution to the problem, a composition according to claim 1 is proposed, characterised in that the curable composition comprises an amine salt of an inorganic acid, wherein the amine is selected from the group consisting of ethylene diamine, 1,3-propanediamine, 1,4-butanediamine, 1,5-pentanediamine, 1,6-hexanediamine and mixtures thereof, and the molar ratio of salt to carbonyl is from 1:10 to 10:1.

8.1.5 The data provided in the respondent's letter of reply to the grounds of appeal are based on a test procedure that is not described. It does not show a comparison with respect to the binders disclosed in O7. Thus, there is no evidence proving that the alleged problem is solved.

8.1.6 Therefore, in agreement with the opposition division, the problem to be solved is considered to be the provision of an alternative composition for binding fiberglass.

8.1.7 O7 does not teach amine salts of an inorganic acid in general.

O1 does not relate to fiberglass and does not teach amine salts of inorganic acids. Such salts would be formed as a side product in the reaction mixture. In any case, O1 does not disclose the diamines of claim 1.

O3 discloses that di- or polyamines may be used in the form of a salt of an inorganic acid (column 2, lines 59 to 62) for reacting with dextrose monohydrate (claim 1) to provide a binder in a shell moulding process, but it does not provide any pointer that these binders would be suitable for fiberglass. Further, there is no teaching that the binder of O3 would be equivalent to the binders of O7, especially since the intended use of the binders is different. In any case, O3 does not disclose any of the diamines present in claim 1.

Neither O10 nor O11 relates to binders, so the skilled person would not consider them when trying to solve the posed problem.

O16 discloses a binder that comprises a urea formaldehyde resin precursor cured in the presence of a catalyst which consists of at least one salt of an acid with a diamine (claim 1). However, O16 is silent about ketones or reducing sugars and it does not concern formaldehyde-free binders, so there is no reason that the skilled person starting from O7 would consider O16.

In its statement of grounds of appeal, the appellant raised, for the first time, objections under Article 56 EPC based on O9 and O13 as closest prior art. These are new alleged facts based on existing evidence. According to Article 114(2) EPC and Article 12(4) RPBA, the admission of new facts is at the board's discretion. There is no apparent reason why these additional objections were only raised at the appeal stage and why said documents should be more appropriate as closest prior art than O7, especially since O9 does not appear to disclose an amine salt of an inorganic acid and O13 does not relate to ketones and reducing sugar and a formaldehyde-free binder. Therefore, these new alleged facts are not admitted into the proceedings.

8.1.8 Consequently, the solution to the posed problem is not obvious and the subject-matter of claim 1 and of claims 2 to 15 depending directly or indirectly thereon involves an inventive step.

8.2 Claim 16

8.2.1 The invention relates to a process for binding fiberglass.

8.2.2 O7 is still the closest prior art for the reasons provided in point 8.1.2.

8.2.3 The problem to be solved is to find an alternative process for binding fiberglass.

8.2.4 The problem is solved by a process according to claim 16 characterised in that the composition comprises an amine salt of an inorganic acid, wherein the amine is a di-functional primary or secondary amine, the amine

being a diamine having at least one primary amine group.

8.2.5 The reasoning provided in point 8.1.7 still applies, mainly since none of O1, O3, O10 and O11 relate to fiberglass, while O16 does not concern formaldehyde-free binders.

8.2.6 Consequently, the solution to the posed problem is not obvious and the subject-matter of claim 16 and of claims 17 and 18 depending directly or indirectly thereon involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent with the claims according to the main request as filed during the oral proceedings and a description to be adapted thereto.

The Registrar: The Chairman:

C. Moser E. Bendl

Decision electronically authenticated