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Language of the proceedings: EN

Title of invention:
AQUEOUS BINDER COMPOSITION FOR MINERAL FIBRES

Patent Proprietor:
ROCKWOOL A/S

Opponent:
Knauf Insulation SPRL

Headword:
Binder Composition/ROCKWOOL

Relevant legal provisions:
EPC Art. 54(1), 54(2), 56

Keyword:
Novelty - main request (no)
Inventive step - auxiliary request (yes) - unexpected improvement shown

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 2127/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 7 July 2023

Appellant: (Patent Proprietor)	ROCKWOOL A/S Hovedgaden 584 2640 Hedehusene (DK)
Representative:	Meissner Bolte Partnerschaft mbB Patentanwälte Rechtsanwälte Postfach 86 06 24 81633 München (DE)
Respondent: (Opponent)	Knauf Insulation SPRL Rue de Maastricht, 95 4600 Visé (BE)
Representative:	ARC-IP ARC-IP sprl Rue Emile Francqui 4 1435 Mont-Saint-Guibert (BE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 28 September 2021 concerning maintenance of the European Patent No. 2408723 in amended form.**

Composition of the Board:

Chair	G. Glod
Members:	T. Burkhardt
	P. Guntz

Summary of Facts and Submissions

I. The appeal of the patent proprietor (appellant) is against the opposition division's decision to maintain European patent No. 2 408 723 B as amended on the basis of what was then auxiliary request 2A.

II. Of the documents discussed at the opposition stage, the following are relevant to the present decision:

O1 US 1,801,052 A
O5 WO 2009/019235 A1
O6 WO 2007/060236 A1
O7 DE 10 2005 056 794 A1
O9 WO 2008/091256 A1
O10 WO 2007/014236 A2

D2 WO 2004/007615 A1
D3 F W Schenck, "Glucose and glucose containing syrups", Ullmann's Encyclopedia of Industrial Chemistry, Wiley & Sons, 2006, 45-66

III. The opposition division came, *inter alia*, to the conclusion that
- the main request (patent as granted) did not meet the requirements of Article 54 EPC, i.e. it was not novel over Example 2 of document O1, and that
- auxiliary request 1A did not meet the requirements of Article 56 EPC, i.e. it did not involve an inventive step in view of document O5.

IV. Claim 1 of the main request reads as follows:

"1. An aqueous binder composition comprising:
(a) a sugar syrup containing a reducing sugar and having a dextrose equivalent DE of at least 50 and less than 85;
(b) a polycarboxylic acid component;
(c) an amine component, ammonia, or ammonium salts; and optionally,
(d) a reaction product of a polycarboxylic acid component (b) and an amine component (c)."

V. The sole claim of auxiliary request 1A reads as follows:

"1. A method of producing a bonded mineral fibre product which comprises:
fiberizing a mineral melt; carrying the mineral fibres formed by means of a gas stream into a forming chamber; applying a thermosetting binder on to the mineral fibres; depositing the coated fibres as a mineral fibre web on a receiver means; and transferring the mineral fibre web to a curing oven for curing of the binder and forming a bonded mineral fibre product, wherein the binder is an aqueous binder composition comprising:
(a) a sugar syrup containing a reducing sugar and having a dextrose equivalent DE of at least 50 and less than 85;
(b) a polycarboxylic acid component;
(c) an amine component, ammonia, or ammonium salts; and optionally,
(d) a reaction product of a polycarboxylic acid component (b) and an amine component (c)."

VI. With its reply to the statement setting out the grounds of appeal, the opponent (respondent) submitted, *inter alia*, the following document:

D4 Wikipedia entry entitled "Dextrose equivalent", 10 March 2022

VII. The appellant's arguments at the appeal stage, where relevant to the present decision, can be summarised as follows:

Document D4 should have been filed earlier and was therefore to be disregarded. Moreover, the definition of dextrins may have changed with time.

The main request met the requirements of Article 54 EPC since:
- Example 2 of O1 did not disclose a dextrose equivalent, and
- the "Glucose 70%" and "Dextrin 30%" mixture was not necessarily a sugar syrup produced by the hydrolysis of starch and having a molecular weight distribution, let alone a sugar syrup with a dextrose equivalent in the claimed range.

Auxiliary request 1 met the requirements of Article 56 EPC in view of O5 as the closest prior art. The inventive-step objection starting from D2 was to be disregarded. At any rate, the subject matter of claim 1 also involved an inventive step over D2.

VIII. The respondent's arguments at the appeal stage, where relevant to the present decision, can be summarised as follows:

Example 2 of O1 anticipated the subject-matter of claim 1 of the main request.

The subject-matter of claim 1 of auxiliary request 1A lacked an inventive step in view of both O5, in particular Examples I, J and K thereof, and D2:
- There was no effect over the entire scope of claim 1, as shown in Figure 1 of the patent in suit. Water uptake was determined by the composition, not by the dextrose equivalent. The problem to be solved was therefore merely the provision of an alternative.
- There were serious doubts as to the experimental results of the patent in suit since sometimes "days" were used as the unit of time and sometimes "weeks" were used.
- In accordance with the teaching of O5, the skilled person would use unpure dextrose with a low DE.
- Mylose 120 was representative of Experiment 5 of D2.
- Combining O5 with each of D3, O6, O7, O9 and O10 and combining D2 with each of O6 and O9 resulted in the subject-matter of claim 1.

IX. The appellant requested that the decision be set aside and the opposition be rejected (patent be maintained as granted). As an auxiliary measure, they requested that the patent be maintained in amended form on the basis of auxiliary requests 1A or 1 re-submitted with the statement setting out the grounds of appeal.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Consideration of documents

1.1 The appellant argued that the respondent should have submitted **D4**, the Wikipedia article, earlier than with its grounds of appeal. The lack of an explicit disclosure of a dextrose equivalent (DE) in O1 had been an issue from the beginning of the opposition procedure (see, for example, the first paragraph on page 6 of the reply to the notice of opposition). Therefore, D4 was to be disregarded.

However, **D4** was filed to corroborate the respondent's argument that "Dextrin" as mentioned in Example 2 of O1 has a dextrose equivalent such that the resulting DE of the mixture "Glucose 70%" (DE of 100) and "Dextrin 30%" mixture falls within the range of claim 1 of the main request.

The decision under appeal refers to the DE value of maltodextrins in **D3** to support the finding that the subject-matter of claim 1 of the patent in suit is not novel. In its grounds of appeal, the appellant then argued in response to this and for the first time in the proceedings that D3 only mentioned maltodextrins and that these were not necessarily representative of dextrins. In turn, the DE of the dextrin in Example 2 of O1 was not necessarily such that the 70% glucose/ 30% dextrin mixture had a DE in the claimed range.

The submission of D4 with the reply to the grounds of appeal constituted a timely response to this argument

and therefore D4 is admitted into the proceedings (Article 12(4) RPBA 2020).

Main request

The main request corresponds to the patent as granted.

2. Novelty

The board concurs with the decision under appeal that document **O1** anticipates the subject-matter of claim 1 (Article 54(1) and (2) EPC) for the reasons set out below.

2.1 Example 2 of O1 discloses a mixture of "Glucose 70%"/"Dextrin 30%" (forming a sugar syrup), phthalic acid (a polycarboxylic acid), aniline (an amine) and water.

The only point of debate was feature (a) of claim 1.

"Dextrin" (with regard to the spelling thereof, see also page 1, line 12, of O1: "dextrines") refers to a family of oligosaccharides. According to **D4**, which constitutes indirect evidence (Case Law of the Boards of Appeal, 10th edn, 2022, III.G.3.3.9), "Dextrins" have a DE between 1 and 13 and "Dextrose (glucose)" has a DE of 100. This *inherently* results in a DE of between 50 and 85 for the "Glucose 70%" and "Dextrin 30%" mixture in Example 2 of O1; linear interpolation results in a DE right in the middle of the claimed range. The appellant disputed the respondent's calculations (e.g. in the middle of page 3 of the letter dated 14 April 2020, according to which a dextrin DE of 10 results in a mixture DE of 73) but

failed to submit any counter-evidence which would contradict the respondent's calculations.

Under these circumstances, it is of no relevance whether the dextrin DE was already common general knowledge at the time of filing of O1 in 1923.

2.2 The appellant also questioned the assertion that Example 2 of O1 discloses a "sugar syrup". In its view, a sugar syrup had to be produced by hydrolysis from starch and had to have a continuous molecular weight distribution as allegedly required by paragraphs [0015] and [0018] of the patent in suit, as well as by page 51 and Table 5 of **D3**.

However, this is not convincing. According to the Oxford English Dictionary, a "syrup" is "[a] thick sweet liquid". The "Glucose 70%"/"Dextrin 30%" mixture in Example 2 of O1 was "refluxed for half an hour" (page 1, line 88) and thus has to be a liquid.

Paragraph [0015] of the patent in suit does not indicate that sugar syrups have to be produced from starch by hydrolysis. It is merely indicated that the hydrolysis of starch results in carbohydrate mixtures; the term carbohydrate mixtures being followed by the expression "(sugar syrups)". Similarly, paragraph [0018] of the patent in suit merely indicates that "the more high-molecular components of the starch hydrolysate" are a kind of sugar syrup, since this expression is also followed by "(sugar syrup)". Similarly, the fact that the carbohydrate mixtures of paragraph [0015] of the patent in suit are a kind of sugar syrup and have a certain "molecular weight distribution" does not mean that all sugar syrups have a molecular weight distribution.

Table 5 of **D3** mentions the "[d]egree of hydrolysis" of different glucose-containing syrups. However, neither Table 5 nor chapter 4 on page 51 indicates that a sugar syrup is necessarily produced by hydrolysis from starch.

2.3 In the appellant's view, the content of Wikipedia article **D4** could have changed with time and was not reliable.

However, the appellant has failed to submit any evidence in this regard and the board cannot see any reason why the definition of dextrins would have changed since the filing date of O1.

Thus, all of the elements on file indicate that dextrin has a DE of at most 20 (Table 5 of D3). For the DE of the "Glucose 70%"/"Dextrin 30%" mixture in Example 2 of O1 to be outside the claimed range, the DE of dextrin would have to be significantly higher. However, there is absolutely no evidence for this.

2.4 Consequently, the subject-matter of claim 1 of the main request is anticipated by Example 2 of O1 (Article 54(1) and (2) EPC).

The main request is not allowable.

Auxiliary request 1A

Auxiliary request 1A is identical to that submitted during the oral proceedings in opposition.

3. Inventive step

In the respondent's view, the subject-matter of claim 1 of auxiliary request 1A lacked an inventive step starting from document O5 or D2 as the closest prior art.

However, the board holds that auxiliary request 1A does meet the requirements of Article 56 EPC for the reasons set out below.

3.1 The invention relates to a method of producing a bonded mineral fibre product.

3.2 The parties do not dispute that **O5**, and more specifically Examples I, J and K thereof, is the closest prior art.

It has not been contested that dextrose monohydrate ("DMH" in the table on page 17) has a DE of 100, which is above the claimed range.

However, it has also not been contested that these examples disclose the remaining features of claim 1.

Since O5 also relates to binder compositions, it is an appropriate starting point for assessing inventive step.

3.3 According to the patent in suit, the problem to be solved is to provide a method with, *inter alia*, improved humidity resistance (paragraph [0008]).

3.4 It is proposed that this problem be solved by the method of claim 1, which is characterised by the DE of the sugar syrup being at least 50 and less than 85.

3.5 For the reasons set out below, this problem has been successfully solved.

- When compared with the elevated dextrose equivalents represented in Examples I, J and K of O5, Table 2 of the patent shows a reduced water uptake for the examples with the inventive sugar syrups "Glucoplus 361" (DE of 62 according to Table 1) and "Glucosweet 660" (DE of 73-79), and this for durations of 3, 10 and 14 days. While there is sometimes an overlap in water uptake when standard deviations are accounted for, the overall tendency is clear in that an improved humidity resistance is achieved.

- The respondent argues that the curves in Figure 1 did not show a reduced water uptake over the entire claimed range of DE.

However, Figure 1 merely illustrates the experimental results of Table 2. The interpolation curves between the experimental results are of no relevance.

- In the respondent's opinion, there was no link between water uptake and DE; paragraph [0066] of the patent in suit indicated that the "ratio of reactive groups" determined humidity resistance, and paragraph [0030] showed that different compositions could result in identical DE values.

However, Table 2 confirms the link between water uptake and DE, and the respondent has provided no counter-evidence in this regard.

- The respondent expressed doubts as to the results, since Figure 1 refers to "days" of test duration, while Table 2 refers to "weeks".

Paragraph [0094] and Figure 1 suggest that "days" is the correct unit of time. Initially, the respondent saw this the same way (see the paragraph bridging pages 7 and 8 of the grounds of appeal). Even if "weeks" was the correct time unit, this would simply mean that the inventive composition had a reduced water uptake for an even longer time. The conclusion would be identical.

- Importantly, the respondent has provided no evidence showing that a sugar syrup according to claim 1 does not result in a reduced water uptake.

There is thus no reason to doubt that the composition of claim 1 yields an improved humidity resistance.

3.6 As explained below, it is not obvious to solve the problem posed in the claimed manner.

The skilled person starting from Example I or J finds no incentive in O5 itself to use unpure dextrose resulting in the claimed DE of the sugar syrup in order to reduce water uptake.

Even if they contemplated the use of unpure dextrose in accordance with the teaching on page 4, lines 12 to 22, they would at best use dextrose with the more preferred DE of at least 95% (page 4, lines 19 to 22). This passage of O5 actually teaches away from the solution since even the least preferred impure dextrose still has a DE of *at least* 85, which is still outside the claimed range.

3.7 The respondent also alleges that a combination of O5 with each of **D3, O6, O7, O9** and **O10** rendered obvious the use of a sugar syrup having a DE in the claimed range.

However, notwithstanding the question of whether these attacks were sufficiently substantiated at the initial appeal stage, the respondent has failed to indicate an incentive in these documents to use sugar syrups with a DE in the claimed range in order to improve humidity resistance.

Hence, the subject-matter of claim 1 of auxiliary request 1A involves an inventive step over O5 even when taken in combination with each of D3, O6, O7, O9 and O10 (Article 56 EPC).

3.8 Following the board's communication under Article 15(1) RPBA 2020, the respondent argued that the subject-matter of claim 1 did not involve an inventive step over Example 5 of **D2** either. The subject-matter of claim 1 did not achieve a reduced water uptake over the entire scope of claim 1, since at day 3 and day 10, "Glucosweet 660" did not perform any better than "Mylose 120" (Table 2 of the patent in suit). However, Mylose 120 with a DE of 25 to 32 (Table 1) was representative of Example 5 of D2, which had a DE of 30.

Even if D2 was alternatively considered to be the closest prior art (notwithstanding the question of whether or not this objection is to be considered), an inventive step can be acknowledged.

While there is no significant difference between "Mylose 120" and the inventive "Glucosweet 660" for

durations of up to 10 days, there is a clear improvement in the case of a duration of 14 days: while Mylose 120 has a water uptake of 60.7%, the inventive Glucosweet 660 has a water uptake of only 32.2% (Table 2 of the patent in suit). An effect is therefore achieved at least for long durations, and this has not been called into question by way of counter-evidence.

In the absence of any incentive to reduce water uptake by using a sugar syrup having the claimed DE, whether in D2, O6 or O9, an inventive step over D2 is also acknowledged.

Consequently, auxiliary request 1A is allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of auxiliary request 1A and a description to be adapted where necessary.

The Registrar: The Chair:

C. Vodz G. Glod

Decision electronically authenticated