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**Datasheet for the decision
of 25 November 2011**

Case Number: T 0192/09 - 3.3.03

Application Number: 03763836.8

Publication Number: 1521807

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C08K 7/14, C08K 7/18, C08K 7/28

Language of the proceedings: EN

Title of invention:
Formaldehyde-free aqueous binder composition for mineral
fibers

Patentee:
Rockwool International A/S

Opponent:
Saint-Gobain Isover G+H AG

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 54, 56

Keyword:
"Amendments - added subject-matter (no)"
"Novelty (yes)"
"Inventive step (no)"

Decisions cited:
T 0002/81, T 0342/98, T 0120/00, T 0157/03, T 0760/05

Catchword:
-



Case Number: T 0192/09 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 25 November 2011

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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 14 October 2008
and posted 20 November 2008 revoking European
patent No. 1521807 pursuant to Article
101(3)(b) EPC.

Composition of the Board:

Chairman: B. ter Laan
Members: M. C. Gordon
C.-P. Brandt

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division announced on 14 October 2008 and posted 20 November 2008 revoking European patent number EP-B1-1 521 807 (granted on European patent application number 03 763 836.8).

II. The patent was granted with a set of 16 claims, claims 1-3 reading as follows:

- "1. A formaldehyde-free aqueous binder composition comprising:
a binder component (A) obtainable by reacting at least one alkanolamine with at least one carboxylic anhydride and, optionally, treating the reaction product with a base; and
a binder component (B) which comprises at least one carbohydrate.
2. The formaldehyde-free aqueous binder composition of claim 1 wherein binder component (A) comprises the reaction product of at least one alkanolamine with at least one carboxylic anhydride in an equivalent ratio of amine and hydroxy groups (NH+OH) to carboxy groups (COOH) of at least 0.4, preferably at least 0.6.
3. The formaldehyde-free aqueous binder composition of claim 1 or 2 wherein the equivalent ratio of amine and hydroxy groups (NH+OH) to carboxy groups (COOH) in the final binder composition is 2.0 or less, preferably 1.7 or less".

III. A notice of opposition against the patent was filed on 6 December 2006 in which revocation of the patent on the grounds of Art. 100(a) EPC (lack of novelty, lack of inventive step) was requested. The following documents, *inter alia* were cited in support of the opposition:

D1: EP-A-1 170 265

D5: WO-A-99/36368

D6: WO-A-01/05725

D8: WO-A-02/06178

During the course of the opposition procedure, by letter of 11 August 2008, the opponent cited D9: DE-A1-31 29 721.

With a letter dated 12 August 2008 the patent proprietor submitted an experimental report.

IV. The decision of the opposition division was based on a set of 16 claims filed on 12 October 2007 as the main request and a set of 16 claims filed during the oral proceedings before the opposition division as the sole auxiliary request.

Claim 1 of the main request read as follows:

"1. A formaldehyde-free aqueous binder composition comprising:
a binder component (A) obtainable by reacting at least one alkanolamine with at least one carboxylic anhydride and, optionally, treating the reaction product with a base; and
a binder component (B) which comprises at least

one carbohydrate;
wherein binder component (A) comprises the reaction product of at least one alkanolamine with at least one carboxylic anhydride in an equivalent ratio of amine and hydroxy groups (NH+OH) to carboxy groups (COOH) of at least 0.4; and wherein the equivalent ratio of amine and hydroxy groups (NH+OH) to carboxy groups (COOH) in the final binder composition, including binder components (A) and (B), is 2.0 or less."

Claim 1 of the first auxiliary request differed from claim 1 of the main request in that the final section of the claim read:

"... wherein the equivalent ratio of amine and hydroxy groups (NH+OH) to carboxy groups (COOH) in the final binder composition, including binder components (A) and (B), is within the range of 1.3 to 2.0."

V. According to the decision:

- (a) D9 and the experimental report of the patent proprietor were admitted to the proceedings.

Main request

- (b) Art. 123(2) and 123(3) EPC
The amendments were based on the features of claims 1, 2 and 3 as filed and did not extend the protection conferred.

(c) Art. 84 EPC

It was clear that the ratio $(\text{NH}+\text{OH})/(\text{COOH})$ related to reactant ratios.

(d) Art. 54 EPC

None of the cited documents disclosed a combination of a binder (A) together with a carbohydrate in the proportions as specified in claim 1. Consequently the subject matter claimed was novel.

(e) Art. 56 EPC

The closest prior art was represented by D6, example 1, in combination with claim 10. The subject-matter claimed was distinguished from this disclosure by the specified $(\text{NH}+\text{OH})/(\text{COOH})$ ratio. The problem to be solved with respect to D6 was to provide further binder compositions for mineral fibres with good properties.

The solution was to add a carbohydrate in the form of a saccharide in the claimed amounts. That solution would be a matter of routine experimentation for the skilled person, starting from example 1 of D6, as there was no unexpected technical effect associated with the presence of the carbohydrate in the binder composition. Consequently an inventive step was denied.

Auxiliary request

(f) Art. 123(2) and 123(3) EPC

The amendment of the ratio $(\text{NH}+\text{OH})/(\text{COOH})$ in the final binder to 1.3 to 2.0 was based on the

description and was in accordance with the pertinent case law, e.g. decision T 2/81 (OJ EPO 1982, 394).

(g) Art. 54 EPC

The subject matter of the auxiliary request was novel for the same reasons as the main request.

(h) Art. 56 EPC

The subject matter of claim 1 of the auxiliary request was not founded on an inventive step for the same reasons as indicated for the main request.

(i) Consequently the patent was revoked.

VI. On 19 January 2009 the patent proprietor lodged an appeal against the decision, the prescribed fee being paid on the same date.

VII. With the statement of grounds of appeal submitted on 30 March 2009 with a letter dated 27 March 2009, the appellant submitted three sets of claims forming a main and first and second auxiliary requests whereby the main and first auxiliary requests corresponded to the requests considered by the opposition division.

The second auxiliary request consisted of 15 claims and differed from the first auxiliary request in that in claim 1 the carbohydrate (B) was specified as being selected from glucose syrup and fructose syrup. Thus the corresponding part of claim 1 of the second auxiliary request read as follows:

"... a binder component (B) which comprises at least one carbohydrate selected from glucose syrup and fructose syrup".

- VIII. The opponent - now the respondent - replied with a letter dated 4 August 2009. Objections pursuant to Art. 84, 83, 54 and 56 EPC were raised.
- IX. On 24 June 2011 the Board issued a summons to attend oral proceedings, accompanied by a communication.
- X. By letter dated 19 October 2011 the appellant submitted a further experimental report.
- XI. By letter of 20 October 2011 the respondent made further submissions.
- XII. Oral proceedings were held before the Board on 25 November 2011.
- XIII. The arguments of the appellant can be summarised as follows:
- (a) The experimental report of October 2011 had been submitted within the time limit indicated by the Board in its communication and was filed in order to address the points raised by the Board against the existing examples. Therefore it should be admitted to the proceedings. The respondents had not requested postponement of the oral proceedings or indicated in any other way that they needed more time to deal with the report.

(b) Interpretation of the claims

The (NH+OH)/(COOH) ratio specified in the claims related to the starting materials, which was conventional in the present field. According to the claims, the properties of the compositions were determined by both the ratio in component A and the ratio in the final composition (components A+B). Any other additives with the specified functional groups would have to be taken into account in calculating the ratio. The claims should be read with the will to understand the invention.

The interpretation relating to the content of functional groups in the starting materials was clear in the light of paragraphs [0020] and [0021] of the description. Nothing else would make technical sense since the number of functional groups would change upon curing and the precise number of residual functional groups depended critically on the curing conditions.

The examples of the patent also supported that interpretation of the claims. The carbohydrate used in the examples of the patent and in examples 1-3 submitted with the letter of 20 October 2011 - alternatively named either "Cerastar® 01411" or "C*Sweet 01411" - was identified by its dextrose equivalent. This provided an indication of the OH group content. In the case of a simple carbohydrate there would be no problem calculating the ratio in the final product since the chemical constitution of such a material was precisely known. When asked by the Board, the appellant was

however unable to demonstrate how the ratio of functional groups in the final compositions could be calculated on the basis of the dextrose equivalent.

(c) Main request - Art. 54 EPC

None of the documents cited by the respondent - D1/D8, D5 or D6 - provided a disclosure of the amount of the carbohydrate employed in the general parts of these documents. Nor were there any examples which showed corresponding compositions. Therefore, the claimed subject-matter had not been clearly and unambiguously disclosed in any of those documents.

(d) Main request - Art. 56 EPC

D6 was the closest document. It concerned primarily component A of the binder. The examples of D6 showed that the performance of the binder decreased upon exposure to humidity. The present inventors had found that addition of a carbohydrate in specific quantities to the binder resulted in improved aging properties. This was in particular shown by the October 2011 results which did not show any decrease in properties on aging. That a viable binder could be obtained if the functional group ratios were maintained within the range as specified for component A and components (A+B) was also shown by the experimental report of 12 August 2008 and explained in paragraphs [0021] and [0022] of the patent in suit, according to which certain equivalent ratios of functional groups were required in the resin component A and in the final binder (A+B) in order to obtain a

binder with the required properties (curing behaviour, durability, humidity resistance). D1/D8 and D6 provided only a superficial disclosure of binder additives, *inter alia* carbohydrate. There were no examples illustrating this. In particular there was no clear teaching in D6 to use carbohydrate. The common understanding in the prior art had been that addition of carbohydrates to binders worsened their properties so that the addition of carbohydrates to binders would not be considered by the skilled person. Since none of the cited documents foreshadowed the necessity to maintain the content of carbohydrate in a specific range in order to obtain the desired effect, the claimed subject-matter was inventive.

- (e) Regarding the first and second auxiliary requests, apart from an indication of the support for the amendments, the appellant relied on its submissions in respect of the main request.

XIV. The arguments of the respondent can be summarised as follows:

- (a) The experimental report of 19 October 2011 was late filed and should not be admitted to the proceedings. During the opposition proceedings it had already been discussed that additional evidence was required with respect to D6. Consequently there had been sufficient time for the appellant to furnish such evidence at an earlier point.

The results of the appellant's experimental report of 19 October 2011 demonstrated that it was not a trivial matter to carry out the required experiments and there had been inadequate time for the respondent to check the results or repeat the experiments. The respondent had not considered requesting postponement of the oral proceedings to that end since it was in the interest of the respondent to get a decision as swiftly as possible and since the case law in respect of late filed data was abundantly clear, holding that when experimental reports were relied upon, the other party had to have the opportunity to provide an experimental response. Pertinent case law was for example T 342/98 (20 November 2001, not published in the OJ EPO), T 120/00 (18 February 2003, not published in the OJ EPO), T 157/03 (4 January 2005, not published in the OJ EPO), and T 760/05 (3 June 2008, not published in the OJ EPO), all of which held that the submission of data at the end of the time permitted conflicted with the legal principle that the other party must have adequate time to deal with this. The respondent would consider admission of this report to the proceedings a violation of its right to be heard and would consider this as a reason to file a petition for review pursuant to Art. 112a EPC.

(b) Interpretation of the claims

It was not clear whether the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio specified in the claims applied to the starting materials or to the final product. Both interpretations were consistent with the wording of claim 1 of all requests. In paragraphs [0020]

and [0021] of the patent reference was made to the properties in the final product, not the reactants. However if the ratio was intended to relate to the final product then it was not apparent from the patent how this could be determined, and whether other permissible additives, e.g. as discussed in paragraphs [0032]-[0034], which would have a significant influence on the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio, were to be taken into account.

For the final component A the content of equivalents could be calculated as this was based on well-defined starting materials. However a serious problem arose with the final composition. which suggested that the product, not the starting materials was meant.

The examples did not assist in resolving this problem since they could not be repeated and hence failed to teach how the reported ratio could reliably be obtained. The glucose syrup employed in the examples was for the greater part undefined making it impossible to determine the content of OH groups and hence the ratio of these in the final composition. The specification of the "dextrose equivalent" did not overcome this defect since this was a measure of the reducing power of the sugar, i.e. the content of CHO groups, but did not provide any information about the content of OH groups. In this respect reference was made to an extract from Wikipedia regarding the meaning of "dextrose equivalent". There was furthermore no indication in the patent in suit how to determine the content of OH groups based on the reported

dextrose equivalent and no other information which would reveal to the skilled person how to calculate the ratio of functional groups in the final composition.

It was consequently not clear how to interpret the claim. As this feature could not be unambiguously understood, it could not be taken into account for establishing a distinction over the prior art and hence could play no role in considerations of novelty and inventive step.

(c) Main request - Art. 54 EPC

All of D1/D8, D5 and D6 disclosed the reaction product A of the operative claims with the required ratio of functional groups. All these documents also disclosed carbohydrate as an additive. Although the amount used was not specified it was to be expected that only small quantities would be employed.

If the claims were interpreted such that the specified content of functional groups was that of the starting materials, on the basis of D8, and assuming addition of 25% carbohydrate, it could be calculated that in the final product the ratio of functional groups would be 1.46. Similar results were obtained for the other documents. Thus assuming that such amounts of carbohydrate would also be employed in D1/D8, D5 and D6 it was inevitable that the resulting composition would fall within the ambit of claim 1.

Based on the alternative interpretation, i.e. that the functional group content related to that actually present in the final product it was much more difficult - even impossible - to calculate the relevant content of functional groups making it impossible to ascertain whether this feature provided a distinction over the prior art.

(d) Main request - Art. 56 EPC

D6 was the closest document. The examples of the patent in suit and those submitted during the opposition proceedings provided insufficient evidence to demonstrate an effect linked to the specified amount of carbohydrate, even if this feature could be unambiguously understood, which was not the case. The objective technical problem to be solved with respect to the closest prior art D6 therefore had to be formulated as being to provide a further binder. It was known, e.g. from D6 and D9 to use carbohydrates as fillers or extenders in binders. Consequently this alone could not support inventive step. Therefore an inventive step had to be denied. This conclusion applied also to the teachings of D1/D8 and D5.

(e) First auxiliary request

The respondent relied in essence on its submissions with respect to the main request.

(f) Second auxiliary request

Claim 1 of this request did not meet the requirements of Art. 123(2) EPC since two embodiments out of a large number of possible carbohydrates had been selected. Regarding novelty

and inventive step, the further specification of particular species as the carbohydrates did not lead to any different conclusion than that given with respect to the main request.

- XV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the main, or the first or second auxiliary request all as filed together with the statement of grounds of appeal.

The respondent (opponent) requested that the appeal be dismissed.

The respondent further requested not to admit the Experimental Report filed with the letter of the patent proprietor/appellant dated 19 October 2011 into the proceedings.

After the Board had announced its decision to admit the Experimental Report into the proceedings the opponent/respondent raised the objection that this would be a violation of his right to be heard. This objection was dismissed by the Board.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*
 - 2.1 The experimental report of 19 October 2011 was filed in reaction to the communication of the Board of 24 June

2011 in which the Board had identified deficiencies in the data thusfar submitted in the procedure, and was submitted one day before the end of the period set by the Board for making further submissions. Those deficiencies had also been pointed out in a general way in the appealed decision, to which the appellant had given arguments in its statement of grounds of appeal. There is no indication that the appellant had realised before the communication of the Board, in which the deficiencies had been pointed out in more detail, that additional evidence might be necessary and had wilfully refrained from submitting it. Consequently, the late filing of the additional experimental report cannot be seen as an abuse of procedure.

- 2.2 The new results had been submitted one month before the oral proceedings, in accordance with the instructions of the Board. This provided the respondent with adequate time to examine the data, decide if counter-experiments were necessary and assess whether it was feasible to provide these within the available time. If the respondent had concluded this was not possible, then it was within its rights to file a reasoned request for postponement of the oral proceedings. This was however not done. Rather, the respondent chose to wait until the oral proceedings to mount a challenge to the submission of this evidence since, as it explained, it was interested in a swift conclusion to these proceedings, thus accepting the possibility that the late filed submission would be admitted and might play a role in deciding the case. Therefore, the Board considers that admission of the late filed data does not contravene Article 113(1) EPC.

2.3 The decisions cited by the respondent to justify its request not to admit the additional experimental data do not support its position. Among the reasons given in Decisions T 342/98, T 120/00, T 157/03 for not admitting late filed experiments was the complex, time consuming, cumbersome nature of the required experiments. This argument has however not been put forward by the respondent. In decision T 760/05 the late filed experiments were not admitted as they were held not to be relevant. Also this argument has not been brought forward in the present case.

2.4 In view of the above, the Board sees no reason not to admit the experimental report submitted with the letter of 19 October 2011 to the procedure.

3. *Main request*

3.1 Interpretation of the claims

Claim 1 of the main request contains two (NH+OH)/(COOH) ratios: one referring to component A, the second referring to "the final binder composition, including binder components (A) and (B)".

3.1.1 Component A is defined in the first part of claim 1 of the main request as being obtainable by reacting at least one alkanolamine and at least one carboxylic anhydride and in the second part as comprising the reaction product of the aforementioned compounds in an equivalent ratio of (NH+OH) groups to (COOH) groups of at least 0.4. From this wording it is ambiguous whether what is meant is the proportion of functional groups

based on the starting materials or that present in the final product.

- 3.1.2 According to paragraph [0020] of the patent in suit, "In the preparation" of component A the proportion of alkanolamine and carboxylic anhydride is selected such that the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio is at least 0.4. This wording suggests that the ratio refers to the starting materials.
- 3.1.3 According to paragraph [0021] the properties of the final binder composition, including binder components (A) and (B), such as curing behaviour, durability and humidity resistance are determined by the total ratio of reactive groups **present** (emphasis of the Board). This text appears to refer to the final binder.
- 3.1.4 Thus on the one hand the description and claims appear to be referring to the ratio of functional groups in the starting materials, at least as far as the first component is concerned. However in another respect, the content of functional groups present in the final binder, i.e. the reaction product of these starting materials, is referred to.
- 3.1.5 The ambiguity in the claims is exacerbated by the use of the wording "comprising" indicating that other materials, also such containing OH, NH or COOH functional groups may be present. Among the "other components" permitted are, according to paragraph [0033] of the patent, β -hydroxyalkylamides, i.e. a compound containing hydroxy groups, citric and adipic acids, i.e. components containing carboxyl groups. The presence of

any such compound would clearly affect the (NH+OH)/(COOH) ratio.

- 3.1.6 The examples do not assist in clarifying the matter. Examples 1-4, disclosing the preparation of the binder component A, report the quantities of starting materials employed and also give the ratio of functional groups in the product "obtained". However, the latter is identical to the ratio of functional groups as calculated on the basis of the amounts of starting materials employed. Since a reaction would imply that the functional groups in the starting materials have been consumed - otherwise there would be no reaction - it appears that the information in the examples does not in fact relate to the final product but to the starting materials.
- 3.1.7 To prepare the final binder in the examples a commercial carbohydrate component is added, identified as "Cerestar ® 01411". According to paragraph [0030] of the patent in suit this is a composition of 3% dextrose, 12% maltose, 16% maltotriose and 69% "higher sugars". It is also reported in paragraph [0051] that this material has a dextrose equivalent of 30. This information is insufficient to disclose the content of functional groups, especially OH groups in the carbohydrate since 69% of the composition of that carbohydrate component is unknown. Furthermore it is not even indicated on what the percentages are based (mole, mass, volume?). The reported dextrose equivalent has not been demonstrated to provide, either directly or indirectly, the missing information. On the contrary, the dextrose equivalent is a measure of the reducing power of the sugar, i.e. relates to the content of CHO

groups but not to OH groups. This information was provided by the respondent, referring to a Wikipedia extract, and was not contradicted by the appellant.

3.1.8 It is a technically sensible interpretation that the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio relates to the final product according to the wording of the claims. The interpretation that the ratio refers to the starting materials would not only go against the wording of the claims, but is also not supported by any information that could be obtained from the description and examples, in particular as regards the presence of other components. Furthermore, the Board doubts that it would be "technically sensible" to define a two component system by features which would no longer be present therein, such as the proportions of starting materials of one of the components thereof.

3.1.9 The consequence of all this is that, although it is clear that the ratios specified in the claim impose a restriction on the subject matter thereof, in particular on the quantities of the compounds used in the binder, the precise limits and nature of this restriction are unclear. As a result the only possible interpretation of the claims that is consistent with the wording thereof is that there is some kind of restriction on the proportions of compounds present, but not what this restriction actually is.

3.2 Art. 123(2) EPC

The subject matter of claim 1 of the main request is a combination of the features of originally filed claims 1, 2 and 3. The wording "including binder components (A)

and (B) in the final phrase of the claim is disclosed at page 5 lines 1-2 of the application as filed. The requirements of Art. 123(2) EPC are met.

3.3 Novelty

3.3.1 D5 relates to a binder for mineral fibres which has a carboxylic acid group and/or a β -hydroxyalkyl amide group (claim 1). According to claim 18 the binder comprises a carbonyl compound, preferably an anhydride, and an alkanolamine. Those compounds are mixed under reactive conditions (claim 19). According to page 7 lines 6-10 the carboxylic acid group containing compound can be obtained by reaction of, for example, poly-saccharides with cyclic anhydrides. Thus D5 relates to the preparation of component A of the binder of the patent in suit. Although carbohydrates are mentioned, this is in the context of providing the anhydride component, employed in forming component A, but not as something which is added to the formed component A. Consequently D5 does not disclose the subject matter of claim 1 of the main request.

3.3.2 D6 relates to a resin for mineral wool binders which is the reaction product of an amine with a first and second anhydride (claim 1). According to claim 10 carbohydrates, for example starch or polysaccharides including glucose syrup and sucrose, may be incorporated. In example 1 binders are disclosed which are the reaction product of anhydrides and diethanolamine whereby the ratio of (NH+OH) to (COOH) groups is within the range specified in operative claim 1. There is however no information relating to the amount of polysaccharides to employ and

consequently no restriction on the proportion of functional groups in the final binder composition.

To assume that the skilled person when working according to the teaching of D6 would as a matter of course employ an amount of polysaccharide that would yield a binder within the scope of operative claim 1, is not based on the actual disclosure of D6 but rather on considerations of probability, i.e. what it is likely that the skilled person would do when carrying out the teaching of D6. The assessment of novelty however relies on a consideration of the specific disclosure of a cited document from which the claimed subject-matter must be directly and clearly derivable for it not to be novel (Case Law of the Boards of Appeal of the European Patent Office, 6th Edition, 2010, section I.C.2.). Accordingly D6 does not contain any information with respect to the constitution of the final binder containing a carbohydrate and consequently does not anticipate the subject matter of operative claim 1, regardless of how this is interpreted.

- 3.3.3 D8 (and D1 which is claimed by D8 as its priority document) discloses a process for providing a binder for mineral fibres based on the reaction product of an anhydride and an - optionally - hydroxy amine (claims 1 and 12). According to claim 16 additives such as mono-, di- and polysaccharides may be employed. However, as in the case of D6 there is no indication of any amount of such additives and consequently no restriction of any kind on the proportion of functional groups in the final binder composition. Consequently the disclosure of D8 also does not anticipate the subject matter of claim 1 of the main request.

3.3.4 In view of the above and since none of the other documents on file comes closer than those specified above, the subject matter of the main request is novel.

3.4 Inventive step

3.4.1 Closest prior art

By common consent the closest prior art is represented by D6, in example 1 of which binders for mineral wool products are described which binders are the reaction products of two anhydrides with a hydroxy amine (example 1: diethanolamine) and which can optionally contain further additives such as carbohydrates in unspecified amounts (see point 3.3.2 above).

3.4.2 Problem solved

According to paragraph [0007] of the patent in suit an object of the patent in suit was to provide a formaldehyde-free aqueous binder composition suitable for binding mineral fibres which exhibited excellent binding characteristics, in particular suitable curing speed and strength, good water solubility and dilutability and could be economically produced.

The examples in the patent and those filed subsequently are stated to demonstrate the effect of the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio on the binder properties. However as explained in section 2 above the meaning of this ratio is unclear. As a consequence it is not possible to demonstrate any influence of the proportion of functional groups - in other words the quantities of compounds - on the properties of the binder. As a result the only technical problem which can be

formulated as being solved by the claimed subject matter is to provide further binders based on those known from D6. From the examples in the patent in suit and the additional experiments it can be seen that that problem has been effectively solved by the claimed compositions.

3.4.3 Obviousness

D6 discloses the possible presence of carbohydrates in the binders (claim 10), even if no particular reasons for doing so, or amounts to employ, are given. Since no effect has been demonstrated for the proportion of functional groups in operative claim 1, it has to be concluded that the claimed subject matter, amounting to imposing an arbitrary restriction with respect to the teachings of D6, represents an obvious solution to the problem of providing further compositions based on the teachings of D6.

The conclusion is that the subject matter of the main request is obvious and does not meet the requirements of Art. 56 EPC.

3.5 For those reasons, the main request is refused.

4. *First auxiliary request*

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the permissible range for the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio in the final part of the claim is restricted to 1.3-2.0.

4.1 Art. 123(2) EPC

The specified lower limit is disclosed at page 5 line 6 of the application as filed as the lower limit of a range of from 1.3-1.5. The upper limit is disclosed in original claim 3. There is no indication in the application that the various limits of the subranges disclosed in the description of the application as filed are in some way interdependent, related to or influenced by any other properties of the binder. Thus it is not contrary to the requirements of Art. 123(2) EPC to combine a lower limit within the broadest range disclosed in connection with a specific upper limit, with a generally disclosed upper limit. Consequently the requirements of Art. 123(2) EPC are satisfied.

4.2 Novelty

As noted for the main request, there is no disclosure in the prior art of any particular proportions of binder components. Consequently novelty is acknowledged.

4.3 Inventive step

The findings indicated for the main request are unchanged by the restriction of the range for the $(\text{NH}+\text{OH})/(\text{COOH})$ ratio and hence apply also to the first auxiliary request, the subject-matter of which is therefore found to be obvious.

4.4 The first auxiliary request is refused.

5. *Second auxiliary request*

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that glucose syrup and fructose syrup are specified as the carbohydrate component.

5.1 Art. 123(2) EPC

According to claim 13 of the appellation as filed, the carbohydrate can be selected from a number of groups, each with specific exemplary members disclosed. One of these groups is oligosaccharides, and the two members of this group specified in the claim are glucose syrup and fructose syrup. Accordingly this amendment of claim 1 amounts to a restriction to a specific embodiment - having two members - of claim 13 as originally filed. The requirements of Art 123(2) EPC are therefore satisfied.

5.2 Novelty

Both D6 (claim 10) and D8 (claim 16) disclose explicitly glucose syrup as a permissible carbohydrate. However, neither of these discloses a binder containing a carbohydrate with any kind of restriction on the proportions of components present. Accordingly, analogously to the findings for the main request, novelty can be recognised.

5.3 Inventive step

The specification of particular carbohydrates does not serve to overcome the deficiencies noted above with respect to the main request, since one of these carbohydrates - glucose syrup - is explicitly suggested in D6, which remains the closest prior art document, and no evidence for any technical effect associated with the specified carbohydrate, regardless of the proportions employed, has been provided. Accordingly, as for the previous requests considered, the subject-matter of claim 1 of the second auxiliary request is obvious in the light of D6 so that it does not meet the requirements of Art. 56 EPC.

5.4 The second auxiliary request is refused.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

E. Görgmaier

B. ter Laan