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**D E C I S I O N**  
of 15 June 1999

**Case Number:** T 0475/96 - 3.3.3

**Application Number:** 88301770.9

**Publication Number:** 0281360

**IPC:** C08B 37/14

**Language of the proceedings:** EN

**Title of invention:**  
Hydrophobically modified non-ionic polygalactomannan ethers

**Patentee:**  
Stein, Hall & Co., Inc.

**Opponent:**  
Lamberti SpA  
Aqualon Company

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 114(1), 114(2)

**Keyword:**  
"Admission of late filed documents - beyond factual framework  
(no) - general knowledge within framework - enhanced relevance  
(yes)"  
"Inventive step (yes)"  
"Neighbouring fields (no)"

**Decisions cited:**  
T 0005/81, T 0229/85, T 0455/91, T 0939/92, T 1002/92;  
T 0039/93, T 0422/93, T 0644/97

**Catchword:**  
-



Case Number: T 0475/96 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 15 June 1999

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**Decision under appeal:**

Decision of the Opposition Division of the  
European Patent Office dated 6 March 1996, issued  
in writing on 28 March 1996 rejecting the  
opposition filed against European patent  
No. 0 281 360 pursuant to Article 102(2) EPC.

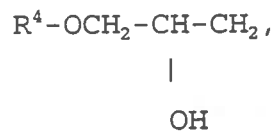
**Composition of the Board:**

**Chairman:** C. Gérardin  
**Members:** R. Young  
A. Lindqvist

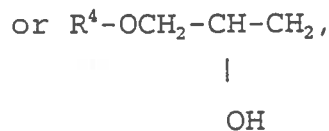
### Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 281 360, with eleven claims, in respect of European patent application No. 88 301 770.9, filed on 1 March 1988 and claiming a US priority of 2 March 1987 (US 20876) was announced on 1 September 1993 (Bulletin 93/35). Claim 1 reads as follows:

"As a composition of matter, a poly(alkyl ether) of a polygalactomannan having at least two different alkyl ether substituents wherein one alkyl ether substituent is HOR<sup>1</sup>, wherein R<sup>1</sup> is an alkylene group containing two to four carbon atoms and wherein the OH group is on the carbon atom beta to the ether group, wherein the other alkyl substituent is selected from the group consisting of R<sup>2</sup>, HOR<sup>3</sup> and



wherein R<sup>2</sup> is an alkyl group containing eight to twenty eight carbon atoms, wherein R<sup>3</sup> is an alkylene group which contains 8 to 28 carbon atoms having the OH group on the carbon atom beta to the ether group and wherein R<sup>4</sup> is an alkyl group containing 5 to 25 carbon atoms wherein the substituent HOR<sup>1</sup> is present in a molecular substitution (M.S.) of 0.3 to 1.5 and wherein the substituent, R<sup>2</sup>, HOR<sup>3</sup>



is present in a M.S. of 0.001 to 0.2."

Claims 2 to 10 are dependent claims directed to elaborations of the composition according to Claim 1.

Claim 11, an independent claim, is worded as follows:

"As a composition of matter, a hydroxypropyl, hydroxydecyl ether of guar gum, wherein the hydroxypropyl group is present in a M.S. of 0.5 to 1.5 and the hydroxydecyl group is present in a M.S. of 0.001 to 0.2."

II. Two Notices of Opposition were filed, both on 1 June 1994, on the grounds of Article 100(a) EPC (lack of inventive step). The oppositions were supported *inter alia* by the following documents:

D1: US-A-4 169 945; and

D3: US-A-4 228 277,

as well as the later filed, but admitted:

A1: "Industrial Gums, Polysaccharides and their Derivatives", 2nd Edition, Academic Press 1973, pages 16 and 310.

III. By a decision which was announced at the end of oral proceedings held on 6 March 1996 and issued in writing on 28 March 1996, the Opposition Division rejected the oppositions.

The decision contained the following reasoning:

- (i) The claimed subject-matter differed from the teaching of D3 only in that the modified polysaccharide was a polygalactomannan instead of cellulose. Whilst OI had considered that it

was obvious to replace, in D3, the cellulose by galactomannan, to solve the problem of providing further thickeners for aqueous systems, in particular in the presence of ionic or non-ionic surfactants, there were structural differences between the polysaccharides in question which could make them admittedly similar but not equivalent. In particular, galactomannan was water soluble whereas cellulose was characterised by its water insolubility, a perception which was not altered by the allegation that the water solubility of galactomannan gums was incomplete. Consequently, even if the skilled person were to have applied the teaching of D3 to a galactomannan, the chosen substrate would have been galactomannan itself and not a short chain hydroxyalkyl derivative thereof, so that the result would not have been the doubly substituted derivative according to Claim 1, but rather the solely long-chain alkyl modified galactomannan according to D1, or comparison Example 8 of the patent in suit.

- (ii) As regards the argument of OII, which started from A1, the only technical problem which was recognisable from this disclosure was that of preparing further polygalactomannan derivatives with good properties or to try, in general, to replace expensive unmodified gums with modified variants which were less expensive. Even if the skilled person would have had reason to combine A1 and D3, this would not have led to the claimed subject-matter, but rather to the product of D1 or comparison Example 8 of the patent in suit.

(iii) Consequently, the grounds of opposition did not prejudice the maintenance of the patent as granted.

IV. Notices of Appeal against the above decision were filed, on 24 May and 30 May 1996, by Opponent OI and Opponent OII, respectively, the respective prescribed fee being paid on the same respective day.

In the Statements of Grounds of Appeal, filed, respectively, by Appellant II (Opponent OII) on 26 July 1996 and by Appellant I (Opponent OI) on 29 July 1996, as well as in further submissions filed by Appellant I on 11 June 1997 and 11 May 1999, the Appellants argued, in essence, that cellulose and polygalactomannans were analogous, so that the exchange, in D3, of cellulose for polygalactomannan was obvious. The Statement of Grounds of Appeal of Appellant II was accompanied by a single new document, also cited for the first time:

D8: Ullmanns Encyklopädie der technischen Chemie (1980), 4th Edition, Vol. 19, pages 258 to 263; and

that of Appellant I by twelve new documents (X1 to X12), in particular:

X7: EP-A-0 152 095.

V. The Respondent (Patentee) disagreed, in submissions filed on 14 March 1997 and 13 April 1999, with the arguments of the Appellants, since whilst there might be structural similarities between polygalactomannan on the one hand and cellulose on the other, there was no

indication in the cited state of the art that the respective properties of the resultant polygalactomannan derivative and cellulose derivative would be such as to render these derivatives equivalent for all purposes.

VI. Oral proceedings were held on 15 June 1999. During the oral proceedings, Appellant I argued in favour of the introduction, into the proceedings, of documents X1 to X12 and in particular X7, and Appellant II for the introduction of D8 (section IV., above). The Respondent argued that these documents were irrelevant and should not be introduced. For the rest, the parties developed the arguments already put forward in the written submissions.

VII. The Appellants requested that the decision under appeal be set aside, and the patent in suit revoked in its entirety.

The Respondent requested, as main request, that the appeals be dismissed and the patent in suit maintained in the form as granted, or, failing this, that the patent be maintained in amended form on the basis of the first, second or third auxiliary request, filed during the proceedings before the Opposition Division, on 31 January 1996.

## Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of late filed documents*

The large number of documents cited for the first time in the Statement of Grounds of Appeal by Appellant I (X1 to X12) as well as the single document cited by Appellant II (D8) are considered to be late filed, to the extent that they were not cited during the nine month opposition period, or even referred to at any time during the proceedings before the Opposition Division.

- 2.1 As regards the matter contained in documents X1 to X12, it goes beyond the factual framework of the proceedings so far. According to the principles laid down in the decision T 1002/92 (OJ EPO 1995, 605), such matter should only very exceptionally be introduced into the proceedings in the appropriate exercise of the Board's discretion if it is *prima facie* highly relevant in the sense that it can reasonably be expected to change the eventual result and is thus highly likely to prejudice the maintenance of the European patent (Reasons for the decision, point 3.4(3), fifth sub-paragraph).

To the extent that the relevant content of the documents may be summarised as being such as to show that short-chain substituted polygalactomannans and similarly substituted cellulose materials were both known, at the relevant priority date, for the same end use as thickeners, this had already been explicitly acknowledged by the Respondent (submission of 14 March 1997, page 20, lines 4 to 7) and was thus not in dispute.



The argument of Appellant I, at the oral proceedings, according to which the statement in X7: "The cellulose ethers which may be used among others are the hydroxyl containing cellulose ethers such as hydroxyalkyl cellulose **corresponding to** the hydroxy alkyl ethers of galactomannans above such as hydroxyethyl and hydroxypropyl cellulose and the alkylhydroxyalkyl celluloses such as methylhydroxypropyl cellulose" (page 11, lines 7 to 13; emphasis by the Board) was particularly relevant in view of the phrase "corresponding to", is not convincing to the Board, since the passage relied upon can only be read in the general content of the document itself. This content has not, however, been shown to be more relevant than that of the documents already in the proceedings. Consequently, it is not such as to meet the criterion set out in T 1002/92, and its disclosure, as well as that of the remaining documents "X" referred to for the first time in appeal was excluded from the proceedings under Article 114(2) EPC.

- 2.2 As regards D8, this is a reference from Ullmanns Encyclopedia which sets out what may be regarded as the general knowledge of the skilled person relating to the structure and properties of polygalactomannans. Its content does not, therefore, in principle go beyond the framework of the proceedings so far. Furthermore, the argument of Appellant II at the oral proceedings, that a source reference (reference [2]) in D8 had been found corresponding to the previously cited document A1, so that the combined contents of D8 and A1 should be regarded as a single disclosure, was convincing to the Board to the extent that it supplemented, and thus could result in an enhancement of, the relevance

of A1, previously relied upon by Appellant I as "closest state of the art". Consequently, the disclosure of D8 was introduced, exceptionally, into the proceedings under Article 114(1) EPC.

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

The patent in suit relates, in general terms, to polysaccharides which have been doubly substituted, namely with a short chain hydroxyalkyl group (2-4 carbon atoms) and a long chain alkyl or hydroxyalkyl group (8-28 carbon atoms), for use as a thickener in aqueous systems, in which the thickening effect is further enhanced in the presence of small amounts of certain surfactants (page 2, line 5; Claim 1). Such a polysaccharide is, however, known from D3, which was considered, in the decision under appeal, and also by Appellant I in the appeal, to represent the closest state of the art.

- 3.1 According to D3, there is provided a modified water-soluble cellulose ether, having a sufficient degree of nonionic substitution selected from methyl, hydroxyethyl and hydroxypropyl to cause it to be water-soluble and further substituted with a long chain alkyl radical having 10 to 24 carbon atoms in an amount between about 0.2 weight percent and the amount which renders the cellulose ether less than 1% by weight soluble in water (Claim 1). The ether is capable, at relatively low molecular weight, of producing highly viscous aqueous solutions in practical concentrations, thus avoiding the need for higher molecular weight cellulose ethers requiring the use of more expensive cellulose furnishes such as cotton linters (col. 1, lines 5 and 6; 19 to 24 and 38 to 41). The preferred cellulose ether substrate is

thus hydroxyethylcellulose (HEC) of about 50 000 to 400 000 molecular weight (column 2, lines 14 to 16). According to Examples 1 to 6, a hydroxyethyl cellulose of 2.5 molecular substitution (M.S. hereinafter) is modified with, respectively, a C<sub>10</sub> chain (Example 1), a C<sub>12</sub> chain (Examples 2 to 4), or a C<sub>14</sub> chain (Examples 5, 6), the average number of modifiers per chain varying from 6.1 to 22.5 and the resulting viscosity of a 2% solution being from 12.6 to 815 cps (column 3, line 14 to column 4, line 10). Such products are additionally able to interact with nonionic surfactants so that their viscosifying power is further and dramatically increased (column 8, lines 6 to 9).

3.2 Compared with this state of the art, the technical problem is to be seen in the search for further thickeners for aqueous systems, in particular, in the presence of typical surfactants.

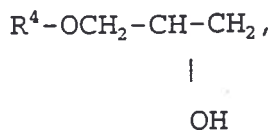
3.3 The solution proposed according to Claim 1 of the patent in suit is to replace, as substrate for modification, the hydroxyethyl or hydroxypropyl cellulose according to D3, with a hydroxyalkyl (2 to 4C) polygalactomannan and to apply the "long chain alkyl" substitution to a M.S. of 0.001 to 0.2.

3.4 It can be seen from the examples of the patent in suit, the accuracy of which has not been challenged, for instance from Examples 3 and 6, that a doubly substituted product, i.e. of modification 90 parts of a 1.2 M.S. hydroxypropyl guar with 18 or 36 parts of a 1,2-epoxyhexadecane (Example 3 or 6) provides a 0.5 percent aqueous solution having a viscosity 360 or 1520 cps respectively, which is higher than that of a

corresponding hydroxypropyl guar as control (200 cps), the higher viscosities being further dramatically enhanced in the presence of a small amount of ammonium lauryl sulphate surfactant, to 4 900 cps in the case of Example 3 (Table 1, page 6).

This is in contrast to the solutions of the reaction product of 90 parts of unmodified guar (i.e. without short chain hydroxyalkyl substitution) with 18 parts of 1,2-epoxyhexadecane, a 0.5 percent solution of which has a viscosity (380 cps), which is reduced to 340 cps by successive additions of ammonium lauryl sulphate. These values, which are lower than that of pure guar itself (510 cps), show that viscosity is hardly affected by the addition of surfactant (Comparative Example 8; page 6, lines 29 to 39).

3.4.1 The argument of Appellant I, submitted for the first time at the oral proceedings, that there was reason to doubt that such results were obtainable over the whole of the area claimed in Claim 1 of the patent in suit, in particular when certain embodiments of the long chain modifying radical were chosen, for instance the radical



was not supported by so much as a shred of evidence. It therefore amounts to no more than a simple assertion.

3.4.2 The onus was, however, on the Appellants at this stage to prove their case against the workability of the solution to the stated problem as proposed according to Claim 1 of the patent in suit. This they have failed to do.

3.4.3 Consequently, it is credible to the Board that the claimed measures provide an effective solution of the stated problem.

4. *Novelty*

Lack of novelty of the subject-matter claimed in the patent in suit was not a ground of opposition, and furthermore has not been asserted at any point in the proceedings. Consequently, the claimed subject-matter is held to be novel.

5. *Inventive step*

It is necessary to address the question of whether the skilled person, starting from D3, and searching for further thickeners capable of exhibiting an enhanced thickening effect in the presence of small amounts of typical surfactants, would have been led to move away from the solubilised cellulose ether substrates exemplified in D3 and instead to perform the long chain alkyl or hydroxyalkyl substitution on an already short-chain hydroxyalkyl substituted polygalactomannan.

5.1 There is no suggestion to do this in D3 itself, since the teaching of the latter does not apply to polysaccharides in general, but is limited to specific cellulose ether substrates. Indeed, it is clear from the opening description of D3 that its object was to reproduce, in a lower molecular weight cellulose ether, the thickening efficiency normally realized only with a high molecular weight cellulose ether (section 3.1, second sentence, above). This limitation of the area of concern to cellulose ethers is reflected by a corresponding restriction in Claim 1 of D3, and thus amounts to an essential

feature of the disclosure. It is not normally a routine procedure to modify an essential feature of a disclosure. Consequently, the disclosure of D3 contains no hint to the solution of the technical problem.

5.2 According to D1, there is provided a process for producing hydrocolloid gums having improved properties which make these products more attractive in a wide field of application (column 1, lines 64 to 68). Polygalactomannan gums swell readily in cold water and can be dissolved in hot water to yield solutions having high viscosity even at a concentration of 1-1.5 percent (1 000 to 4 000 cps at 1% concentration at 25°C in the case of commercial guar gum and locust bean gum). It would, however, be advantageous for a number of commercial applications to have a gum that provides a solution viscosity lower than that imparted by the same gum in the form in which it is ordinarily sold commercially, for instance in a gel or jelly type product, or in paper making or in the sizing or printing of textiles. Furthermore, it is desirable, in the case of a gum functioning as a gelling agent in oil well drilling, that it exhibit a degree of solution stability and heat stability under operating conditions, as well as sufficient stability under variable conditions of pH and temperature in the presence of polyvalent metal ions (column 1, lines 26 to 63).

Alkyl ethers of polygalactomannan gum, for the above applications, are obtained by contacting the gum with an alkyl halide in the presence of a metal hydroxide catalyst and a quaternary ammonium halide phase transfer agent (Claim 1). The "alkyl halide", which term includes alkenyl and aralkyl halides, is preferably an alkyl chloride or alkyl bromide containing about one to twenty carbon atoms, such as

methyl, pentyl, decyl and eicosyl chlorides or bromides (column 2, lines 33 to 39). According to the examples, the reactant is allyl chloride or methyl bromide, the performance of guar gum methyl ether as an oil well fracturing solution being exemplified.

5.2.1 Thus, whilst the incorporation of alkyl or hydroxyalkyl groups into polygalactomannans is taught for a variety of purposes in D1, the enhancement of viscosity of aqueous systems, whether or not in the presence of surfactant, is not one of them. On the contrary, it is evident from the introductory disclosure of D1 as well as the examples thereof, that the main purpose is rather to provide a generally **lower** level of viscosity. This is corroborated by the information given in the Control Example and Comparative Example 8 of the patent in suit, the accuracy of which has not been challenged, according to which the viscosity of a 0.5 per cent aqueous solution of a hydroxypropylguar is lower than that of an unreacted guar flour, e.g. 510 cps (Comparative Example 8, page 6 at line 39; and Table 1, first row of results, "Control"). Hence, there is no indication in D1 that the alkyl or hydroxyalkyl substituted products have any suitability for solving the stated problem.

5.2.2 Quite apart from this, the only exemplified such groups are short-chain groups, and there is no disclosure or suggestion, in D1, of a double substitution with both and short-chain and long-chain alkyl or hydroxyalkyl groups.

5.2.3 Consequently, D1 neither has any apparent relevance to the technical problem addressed, nor does it contain any hint to the measures necessary for its solution.

5.3 According to D8, which is an encyclopaedia reference to polygalactomannans, their production, properties, derivatives and uses, it is stated that, whereas guar gum is soluble in cold water, locust bean gum must be boiled to bring it completely into solution (page 259, section 12.2, "Eigenschaften"). Furthermore, in polygalactomannan gums, as in cellulose, there are one primary and two secondary hydroxyl groups per hexose unit. Consequently, the same derivative-forming and substitution reactions can in principle be carried out as in cellulose chemistry\*. The only derivatives having achieved technical significance are, however, the hydroxyalkyl-, carboxymethyl- and cationic derivatives as well as partially depolymerised products (page 260, section 12.4, "Derivate").

\* Reference is made, at this juncture, to two further documents, one of which corresponds to A1.

According to A1, it is stated, "Chemical modification of polysaccharides is useful for altering chemical and physical properties to give the polysaccharide new applications. Sometimes the modification of a low-cost polysaccharide introduces qualities that make it a suitable replacement for a more expensive gum." (page 16, "Modified gums", first paragraph). Furthermore, "Placement of neutral groups on linear polysaccharides leads to increased solution viscosity and stability. In effect, addition of methyl, ethyl, hydroxyethyl, and similar groups tends in a broad sense to give linear polysaccharides the behaviour patterns of guar or locust bean gums." (page 16, section 1. "Introduction of Neutral Groups", first paragraph). Also, "In the last few years hydroxyalkylguar has been assuming commercial importance. Hydroxyethyl- and hydroxypropyl-guar materials varying in viscosity and in molar



substitution have become available. Derivatization through the use of alkylene oxides has modified the properties of guar for certain useful areas." (page 310, section 8. "Derivatives", second paragraph). Finally, "One of the novel improvements attainable through hydroxyalkylation of guar is solubility in water-miscible solvents such as glycols and alcohol. Solvent miscibility enables hydroxyalkylguar derivatives to be used as thickeners for certain slurry explosives." (same page, fifth paragraph).

5.3.1 The conclusions which may be drawn, in the Board's view, by the skilled person reading the disclosure of D8 in the light of A1, as proposed by Appellant II, may be summarised as being: (i) in relation to polysaccharides in general, that chemical modification may lead to new, economically favourable uses; (ii) in relation to cellulose and polygalactomannan in particular, that the same reactions may be performed on each; (iii) in relation specifically to the hydroxyethyl and hydroxypropyl derivatives of polygalactomannan, that these have a faster hydration and residue-free solubility, solvent solubility being mentioned, compared with the untreated gum, whereas (iv) in relation to linear polysaccharides, such substitution tends to confer guar gum or locust bean gum behaviour patterns.

5.3.2 Of these conclusions, (i) and (iii) do not go beyond what is already derivable from D1, and (iv), which evidently relates to cellulose-type polysaccharides, since these are linear, in contrast to polygalactomannans which are not, is already derivable from D3. The remaining conclusion (ii), that the reactions that can be carried out on cellulose can also be carried out on polygalactomannan, is not concerned with the

properties of the products resulting from such substitution, and therefore gives no information useful in solving the technical problem. In particular, it cannot be taken as suggesting that the respective effects of corresponding substitutions will be the same.

- 5.3.3 In summary, the disclosures of D8/A1 do not add anything of assistance to the skilled person for the solution of the technical problem, beyond that already provided by the disclosures of D1 and D3.
- 5.4 The argument of Appellant I, that polysaccharides of the polygalactomannan and cellulose types would in any case be regarded by the skilled person as "neighbouring fields", so that he would have been led to break out of the framework of the disclosure of D3 (section 5.2, above) and apply its teaching to polygalactomannans, is not convincing to the Board for the following reasons:
- 5.4.1 There is no such incentive in D3, for the reasons already given (section 5.1, above).
- 5.4.2 The remaining state of the art, whilst indicating what needs to be done to cellulose to confer guar gum or locust bean gum behaviour patterns ("conclusion (iv)", section 5.3.1, above), does not give any information as to what treatment might be necessary, conversely, to confer cellulose-type properties on guar gum, etc. In other words, there is no indication of a reciprocal relationship of chemical properties going from cellulose to polygalactomannan species and vice versa, let alone that the two are equivalent in all respects.

5.4.3 The fact that short chain hydroxyalkyl cellulose ethers and guar gums have certain end uses in common is, in the Board's view, merely an illustration of this finding, since it is the result of an attempt to reproduce, in cellulose materials, the thickening effects associated with the gums themselves, rather than to confer cellulose-type properties on the gums. It does not, therefore, suggest a "two-way street" of transferable technology.

5.4.4 According to the case law relied upon in this connection, at the oral proceedings, by Appellant II:

(i) T 455/91, "Expression in yeast", OJ EPO 1995, 684;

(ii) T 500/91 of 21 October 1992, "Alpha-Interferon II/BIOGEN", not published in OJ EPO;

(iii) T 441/93 of 27 March 1996, "Cloning in Kluyveromyces/GIST BROCADES", not published in OJ EPO; and

(iv) T 387/94 of 3 July 1997, "Chimeric genes in plant cells/MONSANTO", not published in OJ EPO,

the issue of inventive step turned upon the degree of "expectation of success", of transfer of technology from one field to another (decision (i), Reasons 5.1.3.8, final paragraph; decision (ii) Reasons, 2.3.3, penultimate and pre-penultimate paragraphs; decision (iii) Reasons, 27; and decision (iv) Reasons, 9). The expectation of success depended in turn on the degree of predictability of the results of such transfer.

- 5.4.5 The present case has, in common with the decisions cited by Appellant II (all of which relate to the field of gene technology), that all the species involved (polysaccharides) are polymeric natural products or derivatives of such products. Consequently, it would be generally known that a small change in structure could cause a dramatic functional change. Furthermore, cellulose differs in a fundamental structural respect from polygalactomannan, in that it is a linear polysaccharide whereas polygalactomannan is a branched polysaccharide. Consequently, the effects of applying parallel measures to a cellulose derivative on the one hand, and polygalactomannan on the other, would in practice be to a large extent unpredictable.
- 5.4.6 In such a situation, the "person skilled in the art", who is of rather limited abilities (T 5/81, OJ EPO 1982, 249; T 39/93, OJ EPO 1997, 134), would, according to decision (i) cited by Appellant II, adopt a conservative attitude (Reasons 5.1.3.4, final paragraph). Consequently, the skilled person would be disinclined to regard the field of polygalactomannans as a "neighbouring field" worthy of investigation.
- 5.4.7 In summary, there is no basis in the state of the art for regarding polygalactomannans as a relevant "neighbouring field", appropriate for the application of the teaching of D3, with a view to solving the stated problem.
- 5.5 Even if the skilled person were, in spite of the above considerations, nevertheless for some other reason to attempt to apply the teaching of D3 to polygalactomannan gums, the chosen substrate would logically have been an unsubstituted polygalactomannan, for the reasons already given in the decision under appeal, with which the Board

entirely concurs (Reasons for the decision, especially point 3.3; cf. Section III., above). This is because the short-chain alkyl or hydroxyalkyl substituent would be regarded as superfluous, and, as pointed out by Appellant I at the oral proceedings, the person skilled in the art does not act out of idle curiosity (T 939/92, OJ EPO 1996, 309). The resulting, solely "long chain" substituted polygalactomannan does not, however, behave in the manner predicted, since it is evident, from Comparative Example 8 of the patent in suit, the accuracy of which has not been challenged, that a polygalactomannan substituted in this way is **less** viscous than the untreated polygalactomannan gum, and that this viscosity is unchanged in the presence of small quantities of surfactant (section 3.4, above). Consequently, the result establishes, if anything, a lack of transferability of the "cellulose" technology to polygalactomannans.

The further pursuit of such a line of investigation, in the face of such evident lack of success and in view of the surrounding lack of predictability of the results would, in the Board's view, require the skilled person to perform scientific research rather than routine work. According to decision (iii), cited by Appellant II, however, "If the Board concludes that a person skilled in the art would expect to have to perform scientific research rather than routine work in order to transfer a technology set up in one field of research to a neighbouring field, then inventive step may be acknowledged" (see Headnote).

5.6 In summary, there is no obvious route leading from D3 to the claimed subject-matter, even on the basis of regarding polygalactomannans and cellulose as "neighbouring fields".

- 5.7 The further argument, by Appellant I, that the concept of such a "neighbouring field" should extend to short-chain, e.g. hydroxyethyl or hydroxypropyl substituted polygalactomannan species, was made on the basis that there were many instances, in the prior art, of the identical use, as a thickener, of both short chain substituted hydroxyalkyl celluloses and similarly substituted polygalactomannans.
- 5.7.1 This argument is, however, also not convincing to the Board, for reasons analogous to those given in relation to cellulose itself (cf. sections 5.4.1 to 5.4.7, above).
- 5.7.2 Quite apart from this, it is clear from the disclosure of D1 that the main effect, from the point of view of thickening properties, of a short-chain alkyl or hydroxyalkyl substitution of polygalactomannan, is not to enhance the thickening effect, but on the contrary to **reduce** its viscosity (section 5.2.1, above). This loss of viscosity and consequent undesirable deterioration of the thickening effect would logically be expected to extend to further substituted derivatives of polygalactomannans, and also to the presence of surfactant. Consequently, the skilled person would be even less likely to consider the field of short-chain substituted polygalactomannans as a relevant "neighbouring field" to cellulose ethers, than he would the unreacted polygalactomannans themselves.
- 5.8 In summary, the solution of the technical problem does not arise in an obvious way, starting from D3. On the contrary, that an increase in viscosity, in particular in the presence of surfactant, is obtained

by substituting a polygalactomannan with two different substituents (long and short chain), either one of which, on its own, brings with it a reduction of the viscosity of the starting material, must be regarded as a surprising effect.

5.9 Nor would the result be different starting from A1 or its combination with D8 as "closest state of the art", as canvassed by Appellant II, for the following reasons:

5.9.1 The disclosure of A1, whether taken in conjunction or not with that of D8, by its very nature does no more than summarise general information relating to the preparation, properties, derivatives and uses of polygalactomannans and their short chain alkyl and hydroxyalkyl derivatives (section 5.3, etc., above). Such a disclosure does not, in principle, address a specific technical problem, except, possibly, that of modifying low-cost polysaccharides to make them suitable alternatives to more expensive (unmodified) gums (A1, page 16, second sentence of second paragraph). In particular, the Board is in full agreement with the finding, in the decision under appeal, that the technical problem underlying the patent in suit as stated (section 3.2, above) is not recognisable from the disclosure of A1.

5.9.2 This conclusion applies *a fortiori* to the terms of the technical problem as formulated by Appellant II at the oral proceedings, namely "to provide modified polygalactomannans which have improved viscosity **together with a surfactant**" (emphasis by the Board).

- 5.9.2.1 It is, in this connection, an axiom of the problem and solution approach to the assessment of inventive step, that the relevant technical problem be apparent (i.e. implicitly or explicitly derivable) from the closest state of the art, and therefore recognisable to the skilled person even without knowing the invention (T 422/93, OJ EPO 1997, 025). Furthermore, it is a requirement that the technical problem not be formulated in terms which contain a pointer to the solution (T 229/85, OJ EPO 1987, 237).
- 5.9.2.2 The latter requirement is not fulfilled in the statement of problem canvassed by Appellant II, because there is no suggestion, in A1 or A1 and D8 together, of enhanced viscosity in the presence of surfactant.
- 5.9.2.3 The argument of Appellant II, that it was inherent in the problem and solution approach to "take into account the differences between the closest state of the art and the claimed subject-matter", and the improved viscosity behaviour in the presence of surfactant was such a difference, is beside the point, since "taking into account" does not imply, or justify, writing the precise effect into the statement of problem, when that effect is not derivable from the closest state of the art.
- 5.9.2.4 On the contrary, in such a case, the provision of the "not derivable" effect becomes part of the solution, not the problem. The statement of problem favoured by Appellant II thus contravenes the requirement not to formulate the problem in terms containing a pointer to the solution.



- 5.9.2.5 Indeed, in the present case, a relevant statement of a problem which was derivable from A1/D8 would need, in the Board's view, to be formulated along the lines of "Providing a modified polygalactomannan having a different spectrum of properties.". Clearly, such a statement of problem, which reflects the extent of lack of relevance of a disclosure such as that of A1 to the claimed subject-matter, means that any attempt by the skilled person to establish a logical chain leading to the claimed subject-matter gets stuck at the start, for lack of an evident direction or goal (T 644/97 of 22 April 1999, not published in OJ EPO).
- 5.9.2.6 Put another way, A1/D8 is not the closest state of the art, and the claimed subject-matter is not obvious having regard to such art.
- 5.9.2.7 Nor would the skilled person be led to combine, with A1/D8, a disclosure having more relevance to the subject-matter of the patent in suit, since, given the nature of the technical problem, such relevance would not be apparent.
- 5.9.2.8 Whilst the statement of problem derived from A1 in the decision under appeal, in terms of being "to prepare further galactomannan derivatives with good properties or to try, in general, to replace expensive unmodified gums by other modified, less expensive gums" is, in the Board's view, entirely correct in the sense of being fully derivable from the state of the art, it also does not lead in an obvious way to the relevant solution, for the reasons given in that decision (Reasons for the decision, points 4.2.1 to 4.2.3).

5.10 In summary, the subject-matter claimed in Claim 1 of the patent in suit does not arise in an obvious way in the light of the state of the art, whether starting from D3, as canvassed by Appellant I, or starting from A1/D8, as favoured by Appellant II. In other words, it involves an inventive step in the sense of Article 56 EPC. It follows from the above, that the subject-matter of dependent Claims 2 to 10 of the patent in suit equally involves an inventive step. It also follows that the subject-matter of Claim 11, which, although an independent claim, lies fully within the scope of Claim 1, is by the same token also based on an inventive step. Consequently, the main request must be allowed.

6. In view of the above, it is not necessary for the Board further to consider the auxiliary requests of the Respondent.

### Order


**For these reasons it is decided that:**

The appeals are dismissed.

The Registrar:

  
E. Görgmaier

The Chairman:

  
C. Gérardin