



Case Number: T 0834/91 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 31 August 1993

Appellant: Union Carbide Corporation
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Decision under appeal: Decision of the Examining Division of the
European Patent Office dated 13 March 1991, posted
on 4 June 1991 refusing European patent
application No. 86 101 287.0 pursuant to
Article 97(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: R. Lunzer
G. Davies

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File No.: T 0834/91 - 3.3.3
Application No.: 86 101 287.0
Publication No.: 0 189 935
Classification: C08B 11/14
Title of invention: Hydrophobe substituted, water-soluble cationic polysaccharides

D E C I S I O N
of 31 August 1993

Applicant: Union Carbide Corporation

Proprietor of the patent: -

Opponent: -

Headword: -

EPC: Art. 56

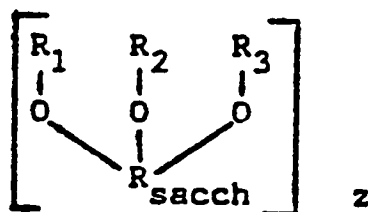
Keyword: "Inventive step (denied)" - "Closest state of the art" -
"Obvious extension of a specific class of compounds to a large group of compounds having similar properties"

Headnote
Catchwords

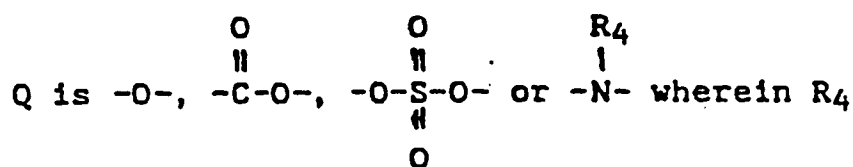
Summary of Facts and Submissions

I. European patent application No. 86 101 287.0 filed on 31 January 1986, claiming priority of 1 February 1985 from an earlier application in the United States and published under the publication No. 0 189 935, was refused by a decision of the Examining Division dated 13 March 1991 and issued in writing on 4 June 1991. This decision was based according to the main request on a set of 24 claims, of which Claim 1 filed on 4 May 1990 and amended on 13 March 1991 reads as follows:

"A water-soluble, quaternary nitrogen-containing polysaccharide represented by the overall structural formula:



wherein:

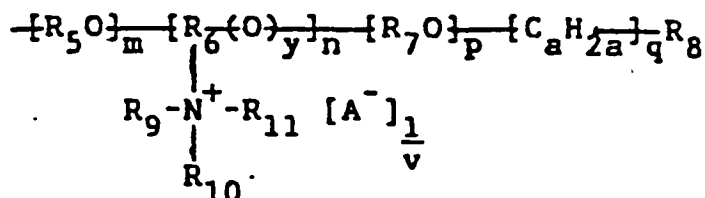


is $\begin{array}{c} O \\ || \\ -C-CH_3 \end{array}$ or a mixture of $\begin{array}{c} O \\ || \\ -C-CH_3 \end{array}$ and hydrogen;

R_{sacch} is the residue of cellulose, cellulose ether, chitosan, chitin, alginate, carrogeenan, natural gums or bio-derived polysaccharides, excluding starch;

z is from 50 to 20,000; and

each R_1 , R_2 and R_3 is individually represented by the substituent structural formula:



wherein:

A is an anion;

a is an integer of from 1 to 3;

m is an integer of from 0 to 6;

n is an integer of from 0 to 3, provided that the level of cationic substitution, CS, defined by the average moles of quaternary nitrogen atoms per mole polysaccharide repeat unit is greater than 0;

p is an integer of from 0 to 6;

q is 0 or 1;

each R_5 and R_7 is individually ethylene, a propylene or a hydroxypropylene;

R_6 is a di- or trivalent, branched or straight chain, saturated or unsaturated hydrocarbon having from 2 to 4 carbon atoms, provided there are at least 2 carbon atoms between the nitrogen atom and any oxygen atom;

R_8 is hydrogen, hydroxyl, R_h , carboxyl or alkali metal or amine carboxylate, provided that when q is 0 then R_8 is hydrogen or R_h ;

each R_9 , R_{10} and R_{11} is individually R_h , alkyl, aryl, aralkyl, alkaryl, cycloalkyl, alkoxyaryl or alkoxyalkyl, having at least two carbon atoms separating the oxygen atom in the alkoxyaryl or alkoxyalkyl group from the nitrogen atom;

R_h is a hydrophobic group comprising an alkyl group having at least 8 carbon atoms;

y is equal to the valence of A;

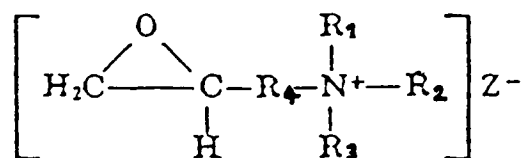
y is 0 or 1, provided that when y is 0 then p and q are 0 and R_8 is hydrogen;

with the proviso that the extent of hydrophobic group substitution, HS, defined by the average moles of said hydrophobic groups per mole of polysaccharide repeat unit, is greater than 0."

As to the other claims, they basically correspond to Claims 6 to 18 and 22 to 31 as originally filed.

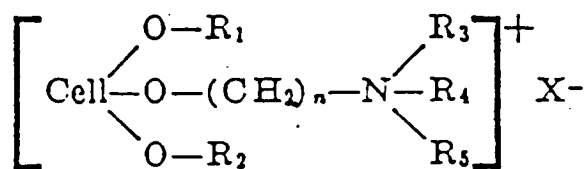
Claim 1 according to the auxiliary request filed on 13 February 1991 differs from the above main claim by the addition of the following disclaimers at the end:

"Xanthomonas gums which have been reacted with a compound of formula



wherein R₄ is a divalent alkylene radical of from 1 to 3 carbon atoms, Z⁻ is an anion, R₃ is an alkyl group containing up to 18 carbon atoms and R₁ and R₂ are methyl or ethyl; and

ammonium salts of an aminoalkyl ether of cellulose containing at least about 0.6 aminoalkyl groups per glucose unit and having the formula



wherein R₁ and R₂ are selected from hydrogen and aminoalkyl, R₃ and R₄ are selected from alkyl and aralkyl, R₅ is selected from decyl, lauryl, cetyl and stearyl, X is a halide ion and n is an integer of from 2 to 4; being excluded."

The other claims according to the auxiliary request correspond to those according to the main request.

II. The grounds for this decision were lack of novelty of the subject-matter of Claim 1 according to the main request and lack of inventive step of the subject-matter of Claim 1 according to the auxiliary request. More specifically, it was first stated that the teachings of US-A-2 768 162 (document (1)) and US-A-3 598 730 (document (2)) were novelty destroying in the case of the main request; in particular, the water solubility could not be regarded as a distinguishing feature, for this parameter was neither mentioned in the main claim, nor even properly defined in the description of the application. Although the two disclaimers in the auxiliary request could restore novelty, the resulting subject-matter did not involve an inventive step with regard to the teaching of LU-A-71 635 (document (3)), wherein starch-based compositions were described. It was considered obvious to replace the starch used in this citation by cellulose or other polysaccharides, because the skilled man could expect that all polysaccharides would be equally appropriate for the preparation of similar modified cationic polysaccharides.

III. On 9 August 1991 a Notice of Appeal was lodged against this decision together with payment of the prescribed fee.

(i) Together with the Statement of Grounds of Appeal filed on 10 October 1991 the Appellant submitted a comparative test report, wherein Example 3 of document (1) had been repeated. In contrast to the claimed polysaccharides, the prior art polysaccharides did not yield clear aqueous solutions at a concentration of one weight percent. This difference in property was supposed to demonstrate novelty of the subject-matter as defined in the main request.

(ii) During oral proceedings held on 31 August 1993 the Board pointed out several differences between Example 3 of document (1) and the procedure followed by the Appellant in the comparative test, in particular the solvent and the drying temperature, resulting in a much lower yield (9.6 parts in document (1) vs. 6.5 parts in the comparative test). It followed that the comparison was not conclusive. Thereafter the Board expressed the same negative view as the Examining Division concerning the issue of novelty of the main request, which led the Appellant to withdraw that request and to continue the appeal procedure on the sole basis of the auxiliary request.

(iii) The main issue raised by the Appellant was the suitability of document (3) as the starting point for the definition of the technical problem underlying the application in suit, since that citation dealt with germicidal cationic starches. Such teaching could not be relevant in the field of cosmetic preparations having improved viscosity, foaming and surface tension properties. More appropriate as a starting point for assessing inventive step was US-A-3 931 148 (document (4)); the teaching thereof clearly could not lead to the claimed subject-matter.

IV. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the auxiliary request filed on 13 February 1991.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.
2. The wording of the claims does not give rise to any objections under Article 123(2) EPC.

With regard to Claim 1 as originally filed the present main claim differs by (i) the limitation of R_{sacch} to specific residues, (ii) the deletion of the word "about" from several ranges, and (iii) the incorporation of several disclaimers. Amendment (i), i.e. the specific meanings of radical R_{sacch} , corresponds to the possible residues according to original Claim 5, from which starch has been explicitly disclaimed because of the teaching of document (3). Amendment (ii), i.e. the deletion of the word "about", cannot result in subject-matter extending beyond the content of the application as filed. As to the final disclaimers, they correspond to the teachings of document (2), particularly the passage from column 1, line 58 to column 2, line 22, and document (1), particularly Claim 7 in conjunction with the passage from column 2, lines 64 to 69 respectively.

The only amendments carried out in the other claims are the deletion of the word "about" from the ranges.

3. After examination of documents (1) to (3), the Board has come to the conclusion that the scope of Claim 1 has been appropriately delimited by means of disclaimers corresponding to the teaching of these citations and that the subject-matter of Claim 1 is, therefore, novel. Since the issue of novelty has not been raised in the decision under appeal in the case of the auxiliary

request, which is identical with the present request, it is not necessary to consider this matter in further detail.

4. The application in suit concerns hydrophobe substituted, water-soluble cationic polysaccharides characterised by a combination of quaternary ammonium group and hydrophobic substituent. Such polysaccharides provide enhanced viscosification, foaming as well as surface tension reduction properties, when in aqueous solution, and exhibit a balance of properties indicating desirable utility in personal care application, i.e. cosmetic applications, such as shampoos (page 1, lines 2 to 7; page 7, lines 2 to 8; page 34, lines 5 to 29).

Since the point has been raised by the Appellant in both its written and oral submissions, it first has to be examined whether document (3) can be regarded as the closest state of the art, as decided by the Examining Division, or whether document (4) qualifies as the closest prior art, as contended by the Appellant.

- 4.1 As underlined in the unpublished decision T 606/89 of 18 September 1990, to which the Appellant made reference, the closest prior art for the purpose of objectively assessing inventive step is generally that which corresponds to a similar use requiring the minimum of structural and functional modifications. Thus, if an invention relates to a composition having properties making it suitable for a particular use - in that case a detergent composition which was easy to stock - the Board found that to establish the closest prior art consideration had to be given to the particular properties rendering the composition suitable for the desired purpose. It decided that the closest prior art in that case was represented by detergent compositions addressing the same technical problem - namely improved

stockability - even though detergent compositions existed in the state of the art with a structure closer to that of the invention's composition (Reasons for the Decision, point 2).

- 4.2 Document (3) describes starches modified by quaternary ammonium groups containing a fatty hydrocarbon radical as well as the preparation and uses thereof (page 3, lines 10 to 24; page 6, line 15 to page 8, line 20). A specific molecular weight of the starch is not given, but it is indicated that degraded starches obtained by acidic hydrolysis having a viscosity ranging from that of dextrine to Stormer 80 would be suitable; further the polymer should give rise to gels in aqueous solutions of pH comprised between 10 and 12 at a temperature close to 50°C (page 2, line 28 to page 3, line 9). Therefrom the Examining Division concluded that, at least in the upper viscosity range, the number of repeat units of the starches used was above 50, thus within the range required in Claim 1 of the application in suit (Reasons for the Decision, point 2.3.1). The Board relies on that assumption as well, since it has not been disputed by the Appellant. It follows that the only structural modification required in the application in suit is the extension to a broad class of polysaccharides of a teaching specifically directed to starch.

As far as the properties of the cationic starches according to document (3) are concerned, they have been tested on 2% aqueous solutions (page 8, line 25 and page 9, line 8). There is thus no doubt that the prior art products meet the criterion of water solubility defined in the description of the application in suit. Further, the modified starches according to document (3) are said to have a germicidal activity and to be suitable for personal care and cosmetic applications (page 6, lines 7 to 26), such as hair shampoos (page 8,

lines 1 to 20). In particular, the words "Les compositions cosmétiques selon l'invention **sont** également des compositions pour cheveux, et notamment des shampoings ..." (emphasis added) make it clear beyond doubt that the modified starches described in document (3) are not merely suited for use as germicidal additives to shampoos, but that they are or constitute the active detergent ingredient of a shampoo. In the Board's view, this clearly means that the modified starches influence various parameters of their aqueous solutions usually related to detergency, in particular viscosity, foaming and surface tension. In other words, even if germicidal properties are apparently in the foreground of the teaching of document (3) and even if there is no explicit reference to these three properties in that citation, for the skilled man the sole mention of a suitability as hair shampoos represents an implicit disclosure of the parameters which are essential in that field.

- 4.3 Document (4) describes a three-step process for the preparation of hydroxyalkylamino glycosides which comprises (i) reacting glucose or a compound hydrolysable to glucose with glycerine monochlorhydrin in the presence of an acid catalyst, (ii) converting the resulting 2-hydroxy-3-chloropropyl glycoside with an alkali into a glycidyl glycoside, and (iii) reacting the latter with an alkyl amine into the desired glycoside (column 1, lines 6 to 33; column 2, lines 58 to 66). Depending upon the class of amine used, primary, secondary or tertiary (column 3, lines 43 to 58), the final glycoside contains a secondary amino group, a tertiary amino group or a quaternary ammonium group (Claim 1). In practice, compounds containing a quaternary ammonium group seem to play a minor role and none of the examples describes the preparation of a glycoside characterised by such a feature. Further, the

general formula of the glycosides shows that these compounds contain at most 21 glycosyl units, thus at least 29 units less than the smallest polysaccharide derivative covered by Claim 1 of the application in suit. With regard to that teaching, thus, the structural modifications required in the application in suit involve a non-obvious selection of a functional group as well as an increase of the number of saccharide units.

Regarding the properties, the glycosides according to document (4) are said to be surfactants exhibiting biodegradability, water and alkali solubility as well as foam stability (column 4, lines 5 to 16). The latter properties correspond explicitly to the parameters regarded as critical in the application in suit.

4.4 The comparison of documents (3) and (4) on the basis of the properties as well as the structural features of the products described therein shows, on the one hand, that document (3) implicitly and document (4) explicitly deal with products which, besides water solubility, exhibit a similar combination of properties derived directly from their suitability as detergents/surfactants and that, in that respect, both citations can be regarded as equally relevant; on the other hand, such comparison shows that the products disclosed in document (3) are structurally closer to the products claimed in the application in suit than the products known from document (4), since they require one modification only instead of two. This means that document (3) is to be considered as the closest state of the art, which confirms the finding of the Examining Division.

5. In view of point 4.2 above, the technical problem underlying the application in suit can thus be defined as the provision of further cationic polysaccharides usable for personal care products, like hair shampoos.

According to Claim 1 of the application in suit this problem is to be solved by cationic, hydrophobic substituted polysaccharides which derive from cellulose, cellulose ether, chitosan, chitin, alginate, carrogeenan, natural gums or bio-derived polysaccharides, starch being explicitly excluded.

The numerous examples in the application in suit provide evidence that the above-defined technical problem is effectively solved.

6. The essential features of the cationic products known from document (3) are, on the one hand, the combination of a quaternary ammonium group and a fatty hydrocarbon radical, which combination is responsible for the hydrophilic/hydrophobic balance of the product, and, on the other hand, the residue of starch, i.e. the residue of a specific polysaccharide. Since the above-defined technical problem is the provision of further products suitable for the same kind of application, the skilled man will self-evidently look for compounds having a similar balance of properties, thus for compounds exhibiting the same combination of functional groups, and further consider possible alternatives for the less active part of the molecule, i.e. the starch residue. As pointed out by the Board during oral proceedings, the skilled man could expect that compounds closely related to starch, i.e. other members of the polysaccharide family, would be suitable for that purpose. In particular, document (4), which regards cellulose and starch as equally suitable starting compounds for the preparation of glycosides (column 2, lines 27 to 31), provides an incentive to substitute cellulose for starch in the cationic products disclosed in document (3).

The selection of specific polysaccharides according to Claim 1 of the application in suit does not seem to confer any advantage to the corresponding cationic products over the known starch based derivatives. In fact, such a technical effect, which has not been claimed by the Appellant, was not to be expected, since starch was within the polysaccharides in Claim 1 as originally filed and is now excluded by means of a disclaimer.

For these various reasons, the subject-matter as defined in Claim 1 does not involve an inventive step.

7. Claim 1 not being allowable, the same applies to the other claims since a request can only be considered as a whole.

Order


For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:


E. Gorgmayer

The Chairman:


C. Gérardin