BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen
(D) [ ] No distribution

D E C I S I O N
of 21 December 2005

Case Number: T 0657/02 - 3.3.03

Application Number: 96911123.6

Publication Number: 0822943

IPC: C08B 37/00

Language of the proceedings: EN

Title of invention:
Inulin derivatives

Patentee:
Coöperatie Cosun U.A.

Opponent:
Tiense Suikerraffinaderij n.v.

Headword:
-

Relevant legal provisions:
EPC Art. 114(2), 83, 56

Keyword:
"Late-filed documents (not admitted)"
"Disclosure - sufficiency (yes)"
"Inventive step - non obvious combination of known features"

Decisions cited:
T 0301/87, T 0381/02

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0657/02 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 21 December 2005

Appellant: (Opponent)
Tiense Suikerraffinaderij n.v.
Tervurenlaan 182
B-1150 Brussel (BE)

Representative:
Hermans, Johny
Tiense Suikerraffinaderij N.V.
Patent Department
Aandorenstraat 1
B-3300 Tienen (BE)

Respondent: (Proprietor of the patent)
Coöperatie Cosun U.A.
Zuilenstraat 100
NL-4814 ND Breda (NL)

Representative:
van Westenbrugge, Andries
Nederlandsch Octrooibureau
P.O. Box 29720
NL-2502 LS The Hague (NL)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office dated 12 March 2002 and posted 23 April 2002 concerning maintenance of European patent No. 0822943 in amended form.

Composition of the Board:

Chairman: R. Young
Members: W. Sieber
H. Preglau

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 822 943, in respect of European patent application no. 96 911 123.6, based on International application PCT/NL96/00187, filed on 29 April 1996 and claiming an EP priority of 27 April 1995 (EP 95201091), was published on 14 July 1999 (Bulletin 1999/28). The granted patent contained 11 claims, whereby Claims 1 and 6 read as follows:

"1. Fructan derivative characterised in that, for each monosaccharide unit, it contains 0.1 to 2.5 groups having the formula $-CHR^1-CHR^2-R^3$, wherein R^1 and R^2 each represent hydrogen or methyl and R^3 represents $-CN$, $-C(=NX)-NR^4R^5$, $-CO-NR^4R^5$, $-CO-OR^4$ or $-CH_2-NR^5R^6$, wherein R^4 represents hydrogen or C_1-C_{22}-alkyl or C_1-C_{22}-alkenyl optionally substituted by hydroxy, R^5 represents hydrogen, C_1-C_{22}-alkyl, carboxy- or hydroxy-substituted C_1-C_{22}-alkyl, or optionally substituted C_1-C_{22}-acyl, R^6 represents hydrogen or C_1-C_{22}-acyl, and X represents hydrogen, hydroxyl or amino.

6. Process for producing a fructan derivative according to any one of claims 1-5, wherein fructan is reacted with a nitrile having formula $R^1HC=CR^2-CN$, with an amide having formula $R^1HC=CR^2-CO-NR^4R^5$, or with an ester having formula $R^1HC=CR^2-COOR^7$, wherein R^1, R^2, R^4 and R^5 are as defined in claim 1 and R^7 represents hydrogen or C_1-C_4-alkyl, and the addition product is optionally hydrolysed, reduced, alkylated and/or oxidised."

The remaining claims are not of importance for this decision and consequently they will not be considered in further detail.

II. A notice of opposition was filed on 14 April 2000 by Tiense Suikerraffinaderij N.V. requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of novelty and lack of inventive step).

(a) The opposition was supported *inter alia* by the following document:

D2: FR-A-2 707 649.

(b) After expiry of the time limit set by Article 99(1) EPC, numerous further documents were filed by the parties, *inter alia*:

D6a: *Thomas-Michael Bliesener*, "Synthese und Charakterisierung von Inulinderivaten" (Diplomarbeit, 1993)

D6b: *Thomas Bliesener*, "Synthese und Charakterisierung von Polyelektrolyten auf der Basis von Inulin" (Dissertation, 1998);

D8: *A. Hebeish et al*, "Characterization of the Reaction Products for Starch and Acrylonitrile, Starch/Stärke 40 (1988), 104-107;

D9: *J.H. MacGregor*, "The Reaction of Acrylonitrile with Macromolecular Hydroxy

Substances", J. Soc. Dyers and Colorists, 67 (1951), 66-73;

D10: Proceedings of the Fourth Seminar on Inulin (26 October 1993);

D11: *D. L. Verraest et al*, "Oxidation and carboxymethylation of sucrose and inulin", Zuckerind. 120 (1995) Nr. 9, 799-803; paper presented at the 2nd Symposium of Association of A.v.H., Reims, 26 January 1995;

A2a: *Dorine L. Verraest*, "Modification of Inulin for non-food Applications", Dissertation 1997, 101-102;

A2b: *Dorine L. Verraest*, "Modification of Inulin for non-food Applications", Dissertation 1997, 78-79;

A2c: *Dorine L. Verraest*, "Modification of Inulin for non-food Applications", Dissertation 1997, 139-141, 147-148 and 152;

A3a: *Dorine L. Verraest et al*, "Modification of inulin with amidoxime groups and coordination with copper(II) ions", Carbohydrate Polymers 37 (1998), 209-214; and

A3b: Table titled "Inulin amidoxim".

(c) An objection under Article 83 EPC was raised by the opponent for the first time during the oral proceedings before the opposition division.

III. During prosecution of the case before the opposition division, an amended set of claims was filed by the proprietor (main request) which corresponded to Claims 1 to 11 as granted except that in Claim 1 the fructan derivative (line 1) was further defined as "*having at least three monosaccharide units*".

Furthermore, 1st to 3rd auxiliary requests were filed which are, however, not of importance for this decision and consequently will not be considered in further detail.

IV. By an interlocutory decision which was announced orally on 12 March 2002 and issued in writing on 23 April 2002, the opposition division maintained the patent in amended form according to the proprietor's main request.

(a) The opposition division held that the amendment in Claim 1 of the main request "*having at least three monosaccharide units*" was supported by the passage bridging pages 1 and 2 of the application as originally filed so that the requirements of Article 123(2) EPC were met.

(b) The opposition division dealt with the late-filed objection under Article 83 EPC and found that the requirements of this article were met.

(c) As regards the documents filed after expiry of the time limit set by Article 99(1) EPC, the

opposition division admitted D6a, D8, D10 and D11 into the proceedings. The same apparently applied to A2a, A2b, A2c, A3a and A3b which were considered in point 5.5 of the decision.

(d) Novelty of the claimed subject-matter over the cited prior art was acknowledged. As regards D6a in particular, it had not been shown that this document had been made available to the public before the priority date of the opposed patent.

(e) As regards inventive step, D11 was considered to be the closest prior art which disclosed carboxy-methyl inulin (CMI). The problem to be solved had to be seen in the provision of fructan derivatives, such as inulin derivatives, that were substituted with three carbon side chains having functional groups on the side chains. The derivatives should have useful properties as surfactants, emulsifiers or as agents inhibiting the crystal growth of calcium salts, and have low viscosity. The solution to this problem, namely a product as claimed in Claim 1 of the main request, was not obvious from the cited prior art, in particular not from D2 and D10. In the opposition division's view, the point was not whether a skilled person could have arrived at the invention by modifying the prior art, but rather whether, in expectation of the advantages actually achieved, he would have done so because of promptings in the prior art. *Ex post facto* analysis had to be avoided when combining different documents from the prior art.

V. On 20 June 2002, the appellant (opponent) filed a notice of appeal against the above decision with simultaneous payment of the prescribed fee.

The appellant's arguments filed with the statement of grounds of appeal on 28 August 2002 and with the letter dated 7 July 2003 may be summarized as follows:

(a) Basically, the appellant was of the opinion that the opposition division had not considered at its full merit the prior art and arguments filed during the opposition procedure with respect to the non-patentability of the claimed subject-matter. The underestimation of the merits of the prior art accordingly led to the erroneous conclusion that the claimed subject-matter did involve an inventive step.

(b) The appellant considered typical prior art compounds, such as carboxymethyl and carboxyethyl derivatives of cellulose and starch, as the starting point for assessing inventive step of the claimed subject-matter. These compounds had drawbacks such as restricted solubility and relatively high viscosity. Thus, the problem had to be seen in the provision of new polysaccharide derivatives containing side chain functional groups which did not present or did present to a lesser extent the drawbacks of relatively high viscosity and restricted solubility of the prior art compounds. The substitution of starch or cellulose for inulin would be obvious for the person skilled in the art, because D10 and D11 disclosed useful properties of carboxymethyl

substituted inulin, and, furthermore, it was common general knowledge that starch and cellulose were less soluble than inulin and that this difference in solubility persisted to a more or lesser extent in the corresponding derivatives of these carbohydrates. The generic disclosure in D2 about the cyanoethylation or carboxyethylation of inulin made the skilled person consider overcoming the drawbacks of the prior art by substituting the polysaccharide of cellulose or starch for the polysaccharide backbone of inulin. Thus, the teaching of D10 or D11 in combination with the teaching of D2 rendered the claimed subject-matter obvious.

(c) Alternatively, the appellant considered CMI as disclosed in D10 or D11 as the starting point for the assessment of inventive step. In that case, the problem to be solved had to be seen in the provision of fructan derivatives that were substituted with three-carbon side-chains having functional groups on the side chain. The solution to this problems was obvious mainly in view of D10 or D11 in combination with D2 and/or D8 which disclosed the reaction of acrylonitrile and starch.

(d) Furthermore, the appellant questioned the reliability of the experiments taken from A2a in view of a discordance with A2b which concerned also experiments from the dissertation of which A2a was a part.

(e) Finally, the appellant requested that D6b and D9 be admitted into the proceedings for consideration.

VI. The arguments of the respondent (proprietor) presented in its counterstatement dated 10 March 2003 may be summarized as follows:

(a) The respondent considered D11 (or the teaching of D10 which was largely the same and not more pertinent than D11) as the appropriate starting point for the assessment of inventive step. However, neither the combination of D11 (or D10) and D8 nor a further combination with D2 made it obvious for the skilled person that certain inulin derivatives, other than those mentioned in D10 and D11, could be devised in the expectation of achieving interesting, let alone improved properties as could be seen from A2a.

(b) The appellant had merely shown that isolated elements of the present invention, eg cyano-ethylation and carboxyethylation, derivatisation of inulin and properties of carboxyalkyl derivatives could be found in the prior art. However, this did not allow the conclusion that a non-predetermined person of average skill would have made the combination of these isolated elements in the expectation of advantages to be achieved.

(c) As regards, the alleged discordance between the experiments disclosed in A2a and those disclosed in A2b, the respondent filed a declaration of Dorine L. Verraest, ie the author of the dissertation of which A2a and A2b were a part, dated 18 February 2003.

VII. On 21 December 2005, oral proceedings were held before the board.

(a) The appellant maintained its request to admit D6b and D9 into the proceedings for consideration.

(b) For the first time, the appellant raised an objection under Article 83 EPC against Claim 6 of the main request because Claim 6 did not define all the necessary steps to arrive at all variants claimed in Claim 1. In particular, it was not possible to obtain with the process steps listed in Claim 6 the amidoxime derivative referred to in Claim 1 (ie when R^3 represents $-C(=NX)-NR^4R^5$).

(c) As regards inventive step, the appellant pursued its two lines of argumentation already presented in the written procedure, ie starting from carboxymethyl and carboxyethyl derivatives of cellulose and starch as the closest prior and, alternatively, starting from D11.

(d) The respondent basically relied on its written submissions. As regards the data presented in A2a with respect to the calcium carbonate precipitation inhibition properties of carboxy-methyl and carboxyethyl inulin, the respondent pointed out that the induction period, t_{ind}, was the key parameter for measuring these properties. As regards the discordance between A2a and A2b, the respondent pointed out that the data in Table 5 of A2a were reliable for the purpose of

internal comparison and that the appellant had not shown that these data were wrong.

VIII. The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The respondent requested:

- that the appeal be dismissed (main request), or, in the alternative,

- that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary requests 1 to 3 as filed with letter dated 12 February 2002 before the opposition division.

Reasons for the Decision

1. The appeal complies with Articles 106 and 108 EPC and Rule 64 EPC and is therefore admissible.

2. *Late-filed documents D6b and D9*

2.1 The appellant requested that documents D6b and D9, filed after expiry of the time limit set by Article 99(1) EPC and not considered by the opposition division , be admitted into the appeal proceedings for consideration.

2.2 Since, however D6b (publication date 1998) is not prior art within the meaning of Article 54 EPC with respect

to the patent in suit (priority date 27 April 1995) and the appellant was not in a position to show why D9 was more relevant than the documents already in the proceedings, in particular more relevant than D8, the board decided not to admit D6b or D9 into the proceedings for consideration (Article 114(2) EPC).

3. *Amendments (main request)*

According to the decision under appeal, the amendment in Claim 1 of the main request ("*having at least three monosaccharide units*") meets the requirements of Article 123 EPC (point IV(a), above). The board sees no reason to challenge this finding. Nor was any objection in this respect raised by the appellant.

4. *Sufficiency of disclosure (main request)*

4.1 Claim 6 of the main request is directed to a process for producing a fructan derivative according to any one of Claims 1-5, wherein fructan is reacted with a nitrile, an amide or an ester, and the addition product is optionally hydrolysed, reduced, alkylated and/or oxidised (points I and III, above).

4.2 According to the appellant, Claim 6 does not define all the necessary steps to arrive at all variants claimed in Claim 1. In particular, it is not possible to obtain with the process steps listed in Claim 6 the amidoxime derivative referred to in Claim 1 (ie when R^3 represents $-C(=NX)-NR^4R^5$).

4.2.1 However, the process of Claim 6 is not limited to the process steps listed therein. The wording "… wherein

fructan is reacted with …" in Claim 6 merely introduces the essential step(s) in terms of the invention but does not exclude further reaction steps. In other words, the term "wherein" is not to be interpreted in the sense of "consisting of" but rather in the sense of "comprising" where it is not in contradiction to have further reaction steps.

4.2.2 Furthermore, paragraph [0019] in the patent specification teaches that the cyanoethyl fructan (ie the reaction product of fructan with a nitrile of the formula $R^1HC=CR^2-CN$) can be converted to an amidoxime by reaction with hydroxylamine. Thus, the patent specification clearly teaches how to obtain the amidoxime variant referred to in Claim 1.

4.2.3 Even if one interpreted the term "wherein" in more narrow way, ie that the process consists of the reaction steps listed in Claim 6 (as suggested by the appellant), the missing reference to the possible reaction with hydroxylamine would merely be an incompatibility between Claim 6 and Claim 1. Thus, the fact that Claim 6 is not quite in line with Claim 1 could at most give rise to an objection under Article 84 EPC (lack of clarity). However, Article 102(3) EPC does not allow objections to be based upon Article 84 EPC, if such objections do not arise out of the amendments made in the course of the opposition or opposition appeal proceedings, respectively (eg T 301/87 (OJ EPO 1990, 335, point 3.8 of the reasons) or T 381/02 of 26 August 2004 (not published in the OJ EPO, points 2.3.2 to 2.3.5 of the reasons)).

4.3 In view of the above, the appellant's objection under Article 83 EPC must fail.

5. *Novelty (main request)*

The appellant did not challenge the finding of the opposition division that the claimed subject-matter was novel with respect to the cited prior art. Nor does the board see any reason to raise an objection in this respect.

6. *Problem and solution*

6.1 Claim 1 of the main request is directed in general terms to fructan derivatives which contain three-carbon side-chains having functional groups on the side chain, eg carboxyethyl groups. The fructan derivatives have useful properties as surfactants, emulsifiers and as agents inhibiting the crystal growth of calcium salts, and have low viscosity (page 2, lines 10 to 12 of the patent specification).

6.2 D11 reviews methods for introducing carboxyl groups into sucrose and inulin, the latter being the preferred fructan in the patent in suit. These carbohydrate based polycarboxylates have a wide range of potential applications, eg as sequestering agents for Ca/Mg in detergent formulations, as dispersing agents or as metal ion carrier (last paragraph of point 1). In particular, D11 describes the carboxymethylation of inulin (point 4.1) and gives results of the crystallization inhibition properties of carboxymethyl inulin (CMI) whereby it is stated that CMI does not have a great impact on the viscosity of the solution

(last paragraph of point 4.3). Since CMI is structurally closely related to the claimed subject-matter (instead of the three-carbon side-chains CMI contains two-carbon side-chains), and D11 discloses technical effects, purpose and intended use most similar to the claimed subject-matter, D11 is considered to represent the closest prior art.

6.3 The respondent has shown by comparative tests disclosed in A2a (excerpts from the dissertation of one of the inventors of the patent in suit) that carboxyethyl inulin (CEI) according to Claim 1 has better calcium carbonate precipitation inhibition properties than the closest prior art compound, ie CMI. As can be seen from Table 5 of A2a, CEI has a much longer induction period, t_{ind}, than a CMI of comparable molecular weight. t_{ind} is, according to the respondent, the key parameter for measuring the precipitation inhibition ability of CMI and CEI, respectively.

6.3.1 Although the CEI in Table 5 of A2a has a degree of substitution (ds) of 0.65 and the CMI has a ds of 1.05, these tests represent a valuable comparison between CEI and CMI. As explained by the respondent, a higher ds is associated with a better performance in precipitation inhibition. In this context, the respondent referred to Table 2 in A2b (other parts of the dissertation of one of the inventors of the patent in suit) which confirms this relationship between ds and performance in precipitation inhibition. Thus, a CEI with a ds of 1.05 would show, under the same conditions, an even better performance in precipitation inhibition than the CEI of Table 5 of D2a (ds = 0.65).

6.3.2 The appellant questioned the reliability of the experiments taken from Table 5 in A2a in view of a discordance with experiments elsewhere in the same dissertation, ie Table 2 in A2b. Thus, Table 5 reports different data on t_{ind} and the apparent equilibrium concentration C_e than Table 2 for apparently one and the same CMI.

However, as explained by the author of the dissertation (declaration dated 18 February 2003), the data contained in Table 5 of the dissertation are reliable for the purpose of internal comparison, since these results follow from experiments that were carried out on the same day using the same reagents - apart from the particular inhibitor - under the same ambient conditions. On the other hand, results obtained in different tables are not automatically comparable, since they follow from experiments carried out on different days, and the qualities of the equipment and reagents and the ambient conditions were not necessarily exactly identical. Since, however, the outcome of the experiments depends on a variety of conditions (such as temperature, quality of water roughness of the glass surface and of the surface of the magnetic stirrer), the outcome of the experiments performed on different occasions may be different. The results described in Table 2 are obtained from an experiment done on another day than the experiments described in Table 5 and for the reasons given above need not be fully comparable with each other.

6.3.3 With the declaration on file and in the absence of any evidence from the appellant that the results in Table 5 are wrong, the board has no choice but to accept these

results as a valid comparison which establish the superiority of the claimed subject-matter over the closest prior art with respect to precipitation inhibition properties.

6.4 Therefore, the objective technical problem to be solved by the patent in suit has to be seen in the provision of fructan derivatives having improved calcium carbonate precipitation inhibition properties.

In view of the comparative tests in Table 5 of A2a, the board is satisfied that the above identified objective technical problem is solved by the features identified in Claim 1 of the main request.

7. *Inventive step (main request)*

7.1 It remains to be decided whether the proposed solution, ie the introduction of a three-carbon side chain into a fructan, is obvious from the available prior art.

7.2 In D11 itself there is no suggestion as to how the calcium carbonate precipitation inhibition property of CMI could be further improved, let a lone a hint to the introduction of a three-carbon side-chain.

7.3 However, also a combination of the closest prior art D11 (or D10) with other documents, in particular with D2 and/or D8, does not make the claimed subject-matter obvious for the following reasons:

7.3.1 D2 teaches the carboxyalkylation of polysaccharides. Although among various polysaccharides, inulin is mentioned (eg Claim 4), and although among carboxy-

alkylations, carboxyethylation and cyanoethylation are mentioned (eg Claim 3), the only real teaching of D2 is on carboxymethylation of starch, in particular starch derivatives of a certain chain length. There is neither a generic disclosure in D2 about the cyanoethylation or carboxyethylation of inulin, as suggested by the appellant, nor a teaching or suggestion of any useful property of any inulin derivative, let alone of a carboxyethylated or cyanoethylated inulin. The mere fact that D2 discloses the theoretical possibility of a carboxyethylation and cyanoethylation of inulin is not sufficient, as alleged by the appellant, that it was obvious to modify the CMI of the closest prior art in this way. Moreover, the skilled person, trying to solve the objective technical problem, would have no motivation to apply this theoretical teaching of D2 to the CMI of D11, because D2 provides no hint that carboxyethylation and cyanoethylation would improve the calcium carbonate precipitation inhibition properties of the compounds. Consequently, a combination of D11 with D2 would be based on hindsight.

7.3.2 As regards the other documents referred to by the appellant, namely D8 and D10, they cannot make the claimed invention obvious, either.

D8 describes the cyanoethylation of starch. As mentioned under "3 Results and Discussion", the objective of D8 was to optimise the reaction conditions and to identify the chemical structures of the reaction products. The objective of D8 was not to obtain any industrially useful product, nor does D8 give any results allowing concluding that cyanoethyl starch or a further derivative thereof could have interesting

properties. The respondent has never disputed that the cyanoethylation on polysaccharides was known. However, D8 does not provide any hint to the skilled person, trying to solve the objective technical problem, that the cyanoethylation would improve the calcium carbonate precipitation inhibition properties of the products. Thus, the skilled person had no reason to combine D8 with D2.

The teaching of D10 is largely the same and not more pertinent than that of D11. The objective appears to be the same, although no experimental results on the properties of the CMI are mentioned yet. It contains a statement of dicarboxy inulin being a better complexing agent that dicarboxy starch, but this is associated with the particular structure resulting from 2,3-oxidation, which is not relevant in the patent in suit.

7.3.3 Consequently, the claimed subject-matter is not obvious from the documents relied upon by the appellant.

7.4 In a second line of argumentation, the appellant considered known polysaccharide derivatives, such as carboxymethyl cellulose, carboxyethyl cellulose and carboxyethyl starch, which are mentioned in paragraph [0002] of the patent specification, as the closest prior art. Since D10 and D11 disclosed useful properties of carboxymethyl substituted inulin, and, furthermore, it would be common knowledge that cellulose and starch are less soluble than inulin and that this difference in solubility persisted in the corresponding derivatives, the appellant's conclusion was that the substitution of starch or cellulose for inulin to form certain derivatives would be obvious.

However, this line of argument is flawed from the very start because there is no common knowledge that certain physical properties such as solubility of certain polysaccharides persist into the respective derivatives. For example, it is known that starch, a poorly soluble and often viscous polysaccharide, on substitution with carboxymethyl groups becomes more soluble and less viscous in solution, whereas dextran, a readily soluble polysaccharide, increases in viscosity and thus becomes less soluble after substitution with carboxymethyl groups. Moreover, Example 1 of the patent in suit shows that derivatisation of inulin with cyanoethyl groups results in decreasing solubility (up to insolubility), and that thus the solubility of inulin does not persist in these derivatives. Hence, there is no incentive based on common knowledge to substitute cellulose and starch by inulin when developing useful derivatives.

7.5 In summary, the solution to the stated problem does not arise in an obvious manner from the state of the art. Consequently, the subject-matter of Claim 1 of the main request, and by the same token, the subject-matter of Claims 2-11 involves an inventive step.

8. Because the respondent succeeded on the main request, there was no need to consider its auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier R. Young