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Datasheet for the decision of 4 February 2008

Case Number: T 0045/05 - 3.3.03

Application Number: 99903186.7

Publication Number: 1049720

IPC: C08B 30/18

Language of the proceedings: EN

Title of invention:
Reduced malto-oligosaccharides

Applicant:
GRAIN PROCESSING CORPORATION

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84, 123(2)
EPC R. 137(3)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Extension of subject-matter - Requests A, A1-A9, C6 (yes)"
"Clarity - Requests B, B1-B9 (no)"
"Inventive step - Requests C, C3-C5, C7-C9 (no)"
"Late filed request C10 - not admitted"

Decisions cited:
T 0383/88

Catchword:
-

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Case Number: T 0045/05 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 4 February 2008

Appellant: GRAIN PROCESSING CORPORATION
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 19 July 2004 and posted 9 August 2004 refusing European application No. 99903186.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: R. Young
Members: C. Idez
E. Dufrasne

Summary of Facts and Submissions

I. European patent application No. 99 903 186.7, filed as PCT/US99/01098 on 19 January 1999 in the name of Grain Processing Corporation, published under No. WO-A-99/36442 (EP publication No. 1 049 720) on 22 July 1999 and claiming the priority of the US patent application No. 60/071905 filed on 20 January 1998 was refused by a decision of the Examining Division announced orally on 19 July 2004 and issued in writing on 9 August 2004.

II. The decision of the Examining Division was based on Claims 1 to 13 filed with letter dated 8 April 2004.

The Examining Division rejected the application on the grounds that the subject-matter of Claim 1 did not meet the requirements of Article 56 EPC in view of document D6 (Chemical Abstracts, Vol. 72, 12 March 1984, Accession No. 72:90 823 referring to JP-B-44-018 898; and partial English translation thereof).

III. Notice of Appeal was filed on 7 October 2004 by the Appellant (Applicant) with simultaneous payment of the prescribed fee. With the Statement of Grounds of Appeal filed on 17 December 2004, the Appellant submitted a set of 13 claims as new main request and contested the findings of the Examining Division concerning inventive step. With a further letter dated 6 October 2005, the Appellant submitted a set of 13 Claims representing its first auxiliary request.

IV. A communication was issued on 22 February 2007 by the Board, in which the Board gave its preliminary view concerning issues under Articles 123(2) 84, 54 and 56

EPC. In this communication the Board referred in particular to the further document:

D8: GB-A-1 169 538.

V. With its letter dated 3 September 2007, the Appellant submitted a new main request and new auxiliary requests 1 to 5.

VI. In a communication dated 8 November 2007, the salient issues to be discussed at the oral proceedings scheduled to take place on 12 February 2008 were identified by the Board as being *inter alia* the allowability under Article 123(2) EPC of Claims 3 to 7 of all requests in view of the DP profile indicated in these claims, and of Claims 1 and 10 of the fifth auxiliary request in view of the reference to the feature according to which 60 percent of the malto-oligosaccharide species had a DP value greater than 8, the question of clarity of the feature that "in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide having a given DP value does not differ by more than 7% based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction", and the question of novelty and inventive step in particular in view of documents D6 and D8.

VII. With its letter dated 14 December 2007, the Appellant requested that the date of the oral proceedings scheduled to take place on 12 February 2008 be changed.

VIII. By a communication issued on 28 December 2007, the Board informed the Appellant that the date of the oral proceedings would be changed to 4 February 2008.

IX. A whole English translation of the Japanese patent document JP-B-44-18898 (D6) was sent to the Appellant by the Board on 4 January 2008.

X. With its letter dated 4 January 2008, the Appellant submitted *inter alia* the following documents:

Exhibit E: Laboratory Notebook 1997 of Dr. Barresi; and
Declaration of Mr. L. Antrim dated 3 January 2008.

It also filed 30 new sets of claims. These sets of claims were presented as belonging to three groups of requests i.e. A, B, and C, each of these groups of requests comprising a main request labelled as A, B, or C respectively and 9 auxiliary requests labelled as A1 to A9, B1 to B9, and C1 to C9.

Concerning Group of Request A, independent Claim 5 of Requests A, A2, A3, A5 and A9 read as follows:

"A method for reducing the dextrose equivalent (DE) of a maltodextrin by at least 85%, the method comprising the steps of:
providing a maltodextrin comprising a mixture of a plurality of malto-oligosaccharide species, said mixture having a DE greater than 2, and having the following DP profile:

DP	DP Profile (% dry solids basis)
DP>8	46.6 ± 4%
DP 8	3.9 ± 2%
DP 7	9.5 ± 2%
DP 6	11.4 ± 2%
DP 5	5.9 ± 2%
DP 4	6.4 ± 2%
DP 3	8.3 ± 2%
DP 2	6.2 ± 2%
DP 1	1.8 ± 1.5%

catalytically hydrogenating said malto-oligosaccharide mixture in a reaction mixture under the following reaction conditions:
Pressure 400 psi (27.5 bar) to 700 psi (48.2 bar)
Temperature 100°C to 130°C
and recovering a reduced malto-oligosaccharide mixture from said reaction mixture, the DP profile of said malto-oligosaccharide mixture being substantially preserved (i.e. in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide species having a given DP value does not differ by more than 7%, based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction)."

Independent Claims 6, 7, 8, and 9 of Requests A, A2,

A3, A5 and A9 differed from Claim 5 only in that the maltodextrin had the following DP profile:

Claim 6:

DP	DP profile (% dry solids basis)
DP>8	54.7 ± 4%
DP 8	4.8 ± 1.5%
DP 7	9.1 ± 1.5%
DP 6	8.4 ± 1.5%
DP 5	4.7 ± 1.5%
DP 4	5.5 ± 1.5%
DP 3	6.7 ± 1.5%
DP 2	4.8 ± 1%
DP1	1.3 ± 1%

e

Claim 7:

DP	DP profile (% dry solids basis)
DP>8	67.8 ± 4%
DP 8	4.5 ± 1.5%
DP 7	7.0 ± 1.5%
DP 6	6.1 ± 1.5%
DP 5	3.3 ± 1.5%
DP 4	3.7 ± 1.5%
DP 3	4.2 ± 1.5%
DP 2	2.5 ± 1%
DP 1	0.7 ± 1%

Claim 8:

DP	DP profile (% dry solids basis)
DP>8	90.6 ± 4%
DP 8	1.5 ± 1%
DP 7	1.5 ± 1%
DP 6	1.4 ± 1%
DP 5	1.3 ± 1%
DP 4	1.1 ± 1%
DP 3	1.0 ± 1%
DP 2	0.8 ± 1%
DP 1	0.8 ± 1%

and Claim 9:

DP	DP profile (% dry solids basis)
DP>8	88.5 ± 4%
DP 8	2.0 ± 1%
DP 7	2.4 ± 1%
DP 6	1.8 ± 1%
DP 5	1.3 ± 1%
DP 4	1.4 ± 1%
DP 3	1.4 ± 1%
DP 2	0.9 ± 1%
DP 1	0.3 ± 1%

Independent Claims 5 to 9 of Request A1 differed from Claims 5 to 9 of Request A only in that it had been specified that each of the malto-oligosaccharide species had a non-zero DE resulting from the presence of a reducing group on said malto-oligosaccharide species.
Independent Claims 4 to 8 of Request A4 corresponded to Claims 5 to 9 of Request A.
Independent Claims 5 to 7 of the sets Requests A6, A7 and A8 corresponded to Claims 7 to 9 of Request A.

Independent Claims 5 to 9 of Requests B, B1, B2, B3, B5 and B9 differed from independent Claims 5 to 9 of Requests A, A1, A2, A3, A5 and A9, respectively, in that the expression "having the following approximate DP profile" had been introduced in place of the expression "having the following DP profile", and in

that the uncertainty ranges in the DP profile had been deleted.

Independent Claims 4 to 8 of Request B4, and independentClaims 5 to 7 of the Requests B6, B7 and B8, differed from independent Claims 4 to 8 of Request A4 and from independent Claims 5 to 7 of the sets A6, A7 and A8, respectively, in that expression "having the following approximate DP profile" had been introduced in place of the expression "having the following DP profile", and in that the uncertainty ranges in the DP profile had been deleted.

The Appellant also presented arguments concerning Article 123(2) EPC, 84, 54 and 56 in response to the objections raised by the Board in its communication dated 8 November 2007 which may be summarized as follows:

(i) Concerning Article 123(2) EPC:

(i.1) The specification specified the MALTRIN® brand of maltodextrin and the DP profile thereof (cf. page 9). This did not however mean that the specification was limited to this brand.

(i.2) Reference was made to the declaration of Dr. Antrim at paragraph no. 6. According to the Appellant, when reading original Claims 70, 74, 78, 82 and 86, the skilled person would have immediately understood that the term "approximate" used in these claims in respect of the DP profile to mean as stated on original page 9 and the preceding paragraph.

(i.3) Thus, replacing the term "approximate" by the uncertainty ranges in Claims 5 to 9 of Request A did not contravene Article 123(2) EPC.

(i.4) While it was indeed true that the specification discussed the "60%" requirement near the place where the specification discussed the "80%" feature (cf, page 7, starting from line 14), this did not, however, signify that these features were co-dependent.

(ii) Concerning clarity:

(ii.1) There was nothing unclear about the term "does not differ by more than 7% based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction".

(ii.2) This terminology signified that the percentage content in respect of at least a majority of DP values of the malto-oligosaccharide species in the maltodextrin was constant to within 7% of the original weight value.

(ii.3) For example, if the maltodextrin consisted of DP6, DP7, DP8, DP9 and DP1O materials, then at least three of these five materials had to be constant to within 7% of their original weight value.

(iii) Concerning novelty and inventive step:

(iii.1) D8 appeared to be of mere marginal relevance to the application in suit, since it taught the average

number of saccharide units in the hydrolysis product should bepreferably 4. This product would have a dextrose equivalent value of 25, and would not be a maltodextrin.

(iii.2) With respect to inventive step, D8 could not beapplied. D8 stated that there was no reduction in the number of monosaccharide units per molecule but this was not measured.

(iii.3) In any case it would be unfair to extrapolate these teachings to the higher molecular weight maltodextrins.

(iii.4) As shown by the declaration of Mr. Antrim hydrogenation of a maltodextrin might cause higher molecular weight materials to degrade and to cause an increase in the portion of DP 1 and DP 2 saccharides.

(iii.5) D8 did not recognize this phenomenon, much less did D8 teach how to overcome it.

(iii.6) D6 concerned itself with avoiding "decomposition" of the carbohydrate, but this decomposition was not the same as degradation of DP profile.

(iii.7) D6 did not contain any teachings as to the desirability of maintaining DP profile.

(iii.8) Indeed, D6 taught that the DP profile was in fact modified by the hydrogenation process disclosed therein (cf. Fig. 2 and Table 3 thereof).

(iii.9) As shown by Fig. 2 and Table 3 the DP profile changed dramatically upon hydrogenation.

(iii.10) D6 taught away from the present invention. D6 did not disclose that DP profile should be preserved, did not inherently disclose preservation of DP profile, and taught conditions that led to the degradation of DP profile.

XI. Oral proceedings were held before the Board on 4 February 2008.

(i) At the oral proceedings the discussion firstly focussed (a) on the question of allowability of Requests A, A1 to A9 under Article 123(2) EPC, and (b) on the question of clarity of Requests B, B1 to B9 under Article 84 EPC.

Concerning point (a) the Appellant essentially submitted that the DP profiles indicated in Requests A, A1 to A9 were supported by page 9 and the passage from lines 5 to 8 on page 8 of the application as filed. Furthermore, according to the Appellant, the skilled person would have recognized that the uncertainty rangesindicated on page 9 for the specific maltodextrins could be generalized to any maltodextrins having the DP profile exemplified on page 9.
Concerning point (b) the Appellant argued that the term "approximate" present in Requests B, B1 to B9 in the definition of the DP profile of the maltodextrin should be interpreted in the light of the description (cf. page 9 and page 17) and that its meaning was clear in the context of the application in suit.

(ii) The Board having informed the Applicant that the Requests A, A1 to A9 and B, B1 to B9 were not allowable, the discussion moved to Requests C, C1 to C9 as submitted with the letter dated 4 January 2008.

(ii.1) Following preliminary observations from the Board under Article 84 EPC concerning the expression "substantially reduce the DE" in Claim 7 of the sets C, C1 to C3, C5, C7 to C9, in Claim 6 of set C4 and in Claim 5 of set C6, the Appellant submitted new requests C, C1 to C9.

Claim 1 of set C read as follows:

"A method for reducing a maltodextrin to a dextrose equivalent (DE) of less than 1, said maltodextrin comprising a mixture of a plurality of malto-oligosaccharide species differing at least in degree of polymerisation (DP) value thus defining a DP profile for said mixture, said method comprising the steps of: providing said malto-oligosaccharide mixture, and catalytically hydrogenating said mixture under hydrogenation conditions suitable to substantially preserve the DP profile of said mixture (i.e. in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide species having a given DP value does not differ by more than 7%, based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction).".

(ii.2) The Appellant reiterated its interpretation of the feature according to which "in the reduced product, the oligosaccharide percentage of at least a majority

of the polysaccharide species having a given DP value does not differ by more than 7%, based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction". In that respect, the Board indicated that this interpretation would imply that the so called "majority of species" could however indeed represent a minority of the oligosaccharides present in the maltodextrin. Reference was made in particular by the Board to the product Maltrin® M050 on page 9, in which the amount of species having a DP greater than 8 represented more than 90% by weight but could be considered as not being part of the "majority" (in terms of number) of species whose DP should not vary by more than 7%.

(ii.3) Concerning novelty of the subject-matter of Claim 1, the Appellant submitted that, in Example 2 of D6, the DE of the reduced maltodextrin was not disclosed, and that the change in the amount of components of degree of polymerization 1 indicated that the DP profile of the starting maltodextrin had been considerably modified. According to the Appellant, the fact that the process disclosed in D8 intended to achieve a DE of 0 inevitably implied that a degradation of the DP profile would take place. Thus, according to the Appellant novelty was given over D6 and D8.

(ii.4) Concerning inventive step, the Appellant essentially reiterated the arguments presented in the written phase of the appeal, according to which D6 was not concerned with the preservation of the DP profile of the starting maltodextrin. Furthermore, the results obtained in Example 2, which, according to the

Appellant, showed a degradation of the DP profile, would have taught the skilled person away from the solution proposed in the application in suit, i.e. a combination of process conditions such that the DP profile set out in Claim 1 did not vary by more than 7%.

(ii.5) The Board having, after deliberation, informed the Appellant that Request C was not allowable, the Appellant indicated that it wished that the examination of the appeal be carried out on the basis of Requests C6 to C8, C1 to C5, and C9 in that order. Requests C1 to C2 were however later withdrawn by the Appellant.

(ii.6) Claim 1 of Request C6 differed from Claim 1 of Request C in that it had been specified that at least 60 percent of the malto-oligosaccharide species in the mixture had a DP value greater than 8. The Board having expressed the view that Claim 1 of Request C6 did not meet the requirements of Article 123(2) EPC, the discussion moved to the assessment of inventive step of the subject-matter of Claim 1 of Requests C7 and C8.

(ii.7) Claim 1 of Request C7 differed from Claim 1 of Request C in that it had been specified that at least 80 percent of the malto-oligosaccharide species in the mixture had a DP value greater than 5. Claim 1 of Request C8 differed from Claim 1 of Request C7, in that it had been additionally specified that at least 60 percent of the malto-oligosaccharide species in the mixture had a DP value greater than 8.

(ii.8) According to the Appellant the starting maltodextrins according to Claim 1 of either Request C7

or Request C8 had a high content of high molecular weight oligosaccharides. This high molecular weight fraction was known to be more susceptible to degradation, as shown by the declaration of Mr. Antrim and the reference made therein to the tests of Exhibit E. According to the Appellant, there was no indication in D6 that high molecular weight maltodextrins could be hydrogenated while maintaining the DP profile defined in Claim 1 of Requests C7 and C8.

(ii.9) Claim 1 of Request C3 differed from Claim 1 of Request C in that it had been specified that the conditions included a temperature of from 50°C to 150°C. Claim 1 of Request C4 differed from Claim 1 of Request C3 in that it had been additionally specified that the conditions further included a pressure of up to 1500 psi (103.4 bar) and a metal catalyst. The Appellant, while admitting that the process conditions disclosed in D6 overlapped with those mentioned in Claim 1 of Request C3 and C4, submitted that there was however no hint in D6 to use a combination of such process parameters in order to maintain the DP profile of the starting maltodextrin.

(ii.10) Concerning inventive step of the subject-matter of Claim 1 of the Request C5 which differed from Claim 1 of Request C in that it had been specified that at least one of the malto-oligosaccharides in the mixture had a DP value of at least 10, the Appellant relied essentially on the line of argument presented for Claim 1 of Requests C7 and C8.

(ii.11) Claim 1 of Request C9 differed from Claim 1 of Request C in that it had been specified the hydrogenation time ranged from 2 to 4 hours. According to the Appellant, D6 however taught to carry out the hydrogenation in much shorter time and would lead away from the claimed subject-matter.

(ii.12) Following the discussion of the issue of inventive step of the subject-matter of Claim 1 of Requests C7 to C8, C3 to C5 and C9, the Appellant indicated that it intended to submit a further request referred to as C10, Claim 1 of which differed from Claim 1 of Request C in that it had been specified that the conditions included a pressure from 400 psi (27.5 bar) to 700 psi (48.2 bar). According to the Appellant, this provided a further distinction from the teaching of D6, which disclosed a pressure of 50 to 130 kg/cm^2 and exemplified (cf. Example 2) a pressure of 115 kg/cm^2.

XII. The Appellant requested that the decision be set aside and that a patent be granted on the basis of one of the requests A, A1 to A9, B, B1 to B9, all filed with letter dated 4 January 2008 or one of the requests C, C6, C7, C8, C3, C4, C5, C9 and C10 in that order, all filed during the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

Request A

2. *Article 123(2)EPC*

2.1 Independent Claim 5 of Request A differs from Claim 70 of the application as originally filed, in particular, in that the expression "approximate DP profile" has been replaced by the indication of the uncertainty range associated with the amount of species of specific DP in the mixture of malto-oligosaccharides.

2.2 While it is true that the DP profile indicated in Claim 5 (cf. Section X above) is as such disclosed on page 9 (cf. column in the Table referring to the product Maltrin® M180), the Board, however, notes that the product Maltrin® M180 has, according to the application as originally filed a DE of 18 (cf. page 27). In other words, the uncertainty ranges mentioned in Claim 5 in respect to the DP profile of the malto-oligosaccharide mixture is only disclosed in the application as originally filed in connection with the specific product Maltrin® M180 which has a specific DE of 18.

2.3 The Board further notes that Claim 5 is however directed to mixtures of malto-oligosaccharides having a DE greater than 2.

2.4 In the Board's view the uncertainty ranges given for the product Maltrin® M180 on page 9 might either reflect the variations inherent to its manufacturing process, or tolerances in the analytical determination of the amount of species having a specific DP value, or combinations of both. Taking further into account that

the DE of a mixture of malto-oligosaccharides is inevitably linked to its DP profile, there are thus doubts as to whether the uncertainty ranges associated with a DP profile of product Maltrin® M180 can be generalized to mixtures having a DE of more than 2 i.e. having inevitably a different DP profile than Maltrin® M180, and which might further be prepared by a different process.

2.5 Since, as indicated in the decision T 383/88 of 1 December 1992 (not published in OJ EPO; Reasons point 2.2.2), the slightest doubt as to the derivability of an amendment from the unamended document would rule out the amendment, the Board can only come to the conclusion that the amendment carried out in Claim 5 of the request A infringes Article 123(2) EPC.

2.6 This conclusion cannot be altered by the reference made by the Appellant to the passage on page 8, lines 5 to 8 of the application as filed, because this passage merely refers to specific maltodextrin products (i.e. Maltrin®) having hence specific DE, whose specific DP profile is disclosed in the Table of page 9.

2.7 For the same reasons as for Claim 5 the similar amendment carried out in Claims 6, 7, 8 and 9 in respect of original Claims 74, 78, 82 and 86 must be considered as infringing Article 123(2) EPC.

2.8 It thus follows from the above that Request A must be refused.

Requests A1, A2, A3, A4, A5, A6, A7, A8, and A9.

3. *Article 123(2) EPC*

3.1 As indicated above in Section X, Claim 5 to 9 of Sets A2, A3, A5 and A9, and independent Claims 4 to 8 of set A4 correspond to Claims 5 to 9 of Set A. Furthermore, independent Claims 5 to 9 of set A1 differ from Claims 5 to 9 of Set A only in that it has been specified that each of the malto-oligosaccharide species has a non-zero DE resulting from the presence of a reducing group on said malto-oligosaccharide species.

3.2 Thus, for the same reasons as indicated above for Claims 5 to 9 of Request A, all these claims do not meet the requirements of Article 123(2) EPC.

3.3 Claims 5 to 7 of the sets A6, A7 and A8 correspond to Claims 7 to 9 of Set A. They hence do not meet the requirements of Article 123(2) EPC either.

3.4 Consequently, Requests A1, A2, A3, A4, A5, A6, A7, A8 and A9 must be refused.

Request B

4. *Article 84 EPC*

4.1 Claim 5 of Request B differs from Claim 5 of Request A in that the expression "having the following approximate DP profile" has been introduced instead of the expression "having the following DP profile", and that the uncertainty ranges associated with the

respective amounts of species of specific DP in the mixture of malto-oligosaccharides have been deleted.

4.2 According to Article 84 EPC, the claims shall define the matter for which protection is sought (first sentence) and for this purpose they shall, inter alia, be clear and supported by the description (second sentence). This implies that the claims must be clear in themselves when being read with the normal skills, but not including any knowledge derived from the description of the patent application. In Article 84 EPC, the description is only mentioned in the context of the additional requirement that the claims must be supported by it.

4.3 Thus, in order to allow the matter for which protection is sought to be defined, it must be clear from the claim itself when being read by the person skilled in the art what is meant by the expression "approximate DP profile" in Claim 5.

4.4 In this connection, the Board can, however, only state that the term "approximate" is as such a very vague concept without any generally recognized technical meaning. It is not even clear whether the term "approximate" is intended to cover the necessary variations of DP profile linked to a DE range of not less than 2 indicated in Claim 5, or the normal tolerances associated with the analytical determination of the DP profile. This lack of clarity results in uncertainty as to the definition of the DP profile of the malto-oligosaccharides, and therefore implies that the "approximate" DP profile cannot limit the subject-

matter of Claim 5 in any clear way. In other words, Claim 5 is not clear as required by Article 84 EPC.

4.5 This conclusion cannot be altered by the arguments of the Appellant, that the term "approximate" should be interpreted in the light of the description (page 8, lines 5 to 8, and page 17, Table).

4.5.1 This is primarily because, as indicated above in paragraph 4.2, the claims must be clear in themselves.

4.5.2 This is further because, even if it would be considered that the description illustrates the term "approximate" for specific maltodextrins i.e. Maltrin® M180, M150, M100, M050, and M040, it is any case evident that the uncertainty varies with the respective DP and the respective products, so that it would not be possible to derive a generally applicable meaning of the term "approximate".

4.5.3 This is finally because the uncertainty ranges disclosed on page 9 are associated with specific maltodextrins having a specific DE and prepared by specific processes, which cannot be used in order to derive a meaning of the term "approximate" generally applicable on the whole range of DE claimed, i.e. greater than 2.

4.5.4 For the same reasons as for Claim 5, Claims 6 to 9 of request B do not meet the requirements of Article 84 EPC.

4.5.5 It thus follows from the above that Request B must be refused.

Requests B1, B2, B3, B4, B5, B6, B7, B8, and B9.

5. *Article 84 EPC*

5.1 Claims 5 to 9 of Requests B2, B3, B5 and B9, and independent Claims 4 to 8 of set B4 correspond to Claims 5 to 9 of Request B.
Furthermore, independent Claims 5 to 9 of Request B1 differ from Claims 5 to 9 of Request B only in that it has been specified that each of the malto-oligosaccharide species has a non-zero DE resulting from the presence of a reducing group on said malto-oligosaccharide species.

5.2 Thus, for the same reasons as indicated above for Claims 5 to 9 of Request B, all these claims do not meet the requirements of Article 84 EPC.

5.3 Claims 5 to 7 of the Requests B6, B7 and B8 correspond to Claims 7 to 9 of Request B. They hence do not meet the requirements of Article 84 EPC.

5.4 Consequently, Requests B1, B2, B3, B4, B5, B6, B7, B8 and B9 must be refused.

Request C

6. *Wording of the Claims*

6.1 The Board is satisfied that the requirements of Article 123(2) EPC are met by Claims 1 to 7 of Request C.

6.2 The Board can accept that the feature in Claim 1 "that in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide having a given DP value does not differ by more than 7% based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction", can only mean, as submitted by the Appellant, that the percentage content in respect of at least a majority of DP values of the malto-oligosaccharide species in the maltodextrin was constant to within 7% of the original weight value.

6.3 Consequently, the requirements of Article 84 EPC are regarded as met.

7. *Novelty*

7.1 Novelty of the subject-matter of Claim 1 was questioned by the Board only in view of documents D8 and D6.

7.2 In that respect, the Board notes that Claim 1 explicitly requires that the process should be carried in such a way that

(i) the reduced maltodextrin should have a DE of less than 1, and
(ii) that in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide having a given DP value does not differ by more than 7% based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction.

7.3 Although the hydrogenation process disclosed in Example 1 of D8 would lead to a reduced maltodextrin having a DE of zero, i.e. less than 1, it cannot be directly and unambiguously ascertained by the Board that the reduced product obtained also fulfils the requirements in terms of maintenance of DP profile set out in Claim 1.

7.4 Concerning document D6 (cf. English translation provided by the Board referred below as D6'), while Examples 1 and 2 refer to the hydrogenation of mixtures of malto-oligosaccharides having a DE of respectively 10 and 18, there is no detailed indication in these examples either concerning the DE of the reduced product or the complete DP profile of the reduced product.

7.5 Although it is clear from the general teaching of D6 that its aim is to provide a process for obtaining essentially non-reducing products (cf. D6', page 4, second paragraph) while avoiding depolymerisation (cf. page 6, first paragraph; page 12, last paragraph), it cannot be deduced that the reduced products obtained in Examples 1 and 2 of D6 would inevitably exhibit a DE of less than 1 and a DP profile meeting the requirements set out in Claim 1.

7.6 Consequently, the subject-matter of Claim 1, and by the same token that of dependent Claims 2 to 7 must be regarded as novel over D8 and D6 (Article 54 EPC).

8. *Closest state of the art, the technical problem.*

8.1 The application in suit relates to a process for reducing maltodextrin products by hydrogenation.

8.2 Such process is known from document D6, which the Board in agreement with the Examining Division considers as representing the closest state of the art.

8.3 D6 refers to a process for the production of non-reducing starch comprising the steps of:

(i) adding a buffer to an aqueous solution of a reducing intermediary starch hydrolyzate, in which the constitutional saccharides are glucose as well as other reducing oligosaccharides such as maltose, isomaltose,gentiobiose, maltotriose, isomaltotriose, panose, maltotetraose, maltopentaose, maltohexaose, as well as dextrin with a higher number of monosaccharide molecules,
(ii) adjusting the pH of the reaction solution to pH 7—9; and
(iii) carrying out an hydrogenation reaction in presence of a reduction catalyst such as a nickel catalyst, wherein the temperature is about 50-150°C and the reaction hydrogen pressure is about 50-130kg/cm^2 while performing an effective stirring, so that the hydrogenation is carried out without any marked decomposition or isomerisation of the saccharides to produce a non-reducing starch intermediate hydrolyzate (cf D6', page 2, lines 2 to 26).

8.4 In view also of the passages of D6' referred to above in paragraph 7.5, it is clear that D6 aims to provide a

process for the reduction of products such as maltodextrins while avoiding depolymerisation, in other words while preserving the DP profile of the starting oligosaccharide mixture.

8.5 As can be deduced from the application in suit, its aim is to provide reduced maltodextrin mixture having a low DE (less than 1) while substantially preserving the DP profile of said mixture.

8.6 The substantial preservation of the DP profile referred to in the application in suit is expressed in Claim 1 by the feature that "in the reduced product, the oligosaccharide percentage of at least a majority of the polysaccharide having a given DP value does not differ by more than 7% based on 100% of the polysaccharide species and relative to the corresponding species of like DP value in the starting material prior to reduction".

8.7 As indicated above in paragraph 6.2, the meaning of the feature is that the percentage content in respect of at least a majority of DP values of the malto-oligosaccharide species in the maltodextrin is constant to within 7% of the original weight value.

8.8 In this connection, the Board, however, observes in view of the Table on page 9 concerning the DP profile of maltodextrins Maltrin®, that a majority of DP values (in number) of the malto-oligosaccharide species can indeed correspond to a very small minority (in weight) of the oligosaccharides present in the maltodextrin mixture (cf. in particular Maltrin® M050 in which a

majority of DP values (e.g. DP 1 to DP 5 may only represent 5% by weight of the oligosaccharides).

8.9 This has for its consequence that the "substantial preservation of the DP profile" aimed by the application in suit may indeed concern a very small percentage in weight of the oligosaccharides of the mixture and would amount to a very modest preservation of the DP profile of the starting oligosaccharide mixture. In other words although Claim 1 referred to a substantial preservation of the DP profile, the claimed process would indeed allow a substantial degradation of the DP profile of a majority (in terms of weight) of the oligosaccharide components of the maltodextrin.

8.10 Consequently, starting from D6, the technical problem might be seen in the provision of an alternative process allowing the production of substantially non-reducing oligosaccharide mixture while preserving to some extent the DP profile of the starting oligosaccharide mixture.

8.11 The solution proposed by the application in suit is to carry out the hydrogenation under conditions suitable for preserving the DP profile of the starting oligosaccharide mixture as specified in Claim 1.

8.12 In view of the Examples 2, 3 and 6, the Board is satisfied that the claimed measures provide an effective solution to the technical problem.

9. *Inventive step*

9.1 It remains to be decided whether the proposed solution was obvious to the person skilled in the art in view of the cited prior art.

9.2 In that respect, the Board observes that the process conditions indicated in D6 in terms of temperature (50 to 150°C), of pressure (between 50 and 130 kg/cm^2), of pH between 7 and 9, of catalyst (metal catalyst such as nickel) overlap with those envisaged in the application in suit (cf. Claims 3, 4, 5, 6, and 7).

9.3 As indicated in D6 the hydrogenation should be conducted under mild conditions in order to suppress as far as possible decomposition and isomerisation reaction (cf D6', page 5, last paragraph).

9.4 Thus, starting from D6, it would have been within the scope of the customary practice of the skilled person to arrive at process conditions (e.g. temperature, pressure, pH, catalyst) avoiding depolymerisation reaction in such an extent to achieve the relatively modest goal of DP preservation as expressed in Claim 1.

9.5 This conclusion could not be altered by the argument of the Appellant that the results achieved in Example 2 of D6 would have led the skilled person away from the proposed solution.

9.5.1 While it might be true that in Example 2, the amount of components with a DP of 1 has increased from 4.4% (glucose in the starting maltodextrin) to 9.0% (sorbitol) in the reduced product (cf. Table 3 and

Fig.2 of D6'), so that some degradation might have occurred during the hydrogenation reaction, it cannot however, be inferred from this example that the DP of the remaining part of the oligosaccharide mixture (i.e. the overwhelming majority thereof (i.e. 95.6%) has not been substantially preserved. In other words, the disclosure of Example 2 does not invalidate the general teaching of D6 that oligosaccharides mixtures could be reduced to a very low DE (substantially non reducing) without any marked depolymerisation.

9.5.2 In any case, even if the skilled person would have realized that a marked depolymerisation had taken place in Example 2 of D6, it is to be noted that Example 2 has been carried out at a rather high pressure (115 kg/cm^2) and at a rather high temperature (130°C) within the ranges disclosed in D6.

9.5.3 Thus, it would have been also within the normal practice of the skilled person to use milder conditions in order to reduce the level of depolymerisation in order to come within the level defined in Claim 1, taking further into account that the process according to Claim 1 allows that the overwhelming majority (in terms of weight) of the oligosaccharide might suffer of marked depolymerisation.

9.6 Thus, it follows from the above that the subject-matter of Claim 1 must be regarded as obvious, and that, hence, Claim 1 does not meet the requirements of Article 56 EPC.

10. Consequently, Request C must be refused.

Request C6

11. *Article 123(2) EPC*

11.1 Claim 1 of Request C6 differs from Claim 1 of request C in that the following feature has been incorporated therein:

"wherein at least 60 percent of the malto-oligosaccharide species have a DP value greater than 8".

11.2 While it is mentioned in lines 17 to 18 on page 7 of the application as filed that at least 60 percent of the malto-oligosaccharide species have a DP value greater than 8", it is however evident in view of the preceding lines 14 to 17 on page 7 that this statement is made in the context that at least 80 percent of the malto-oligosaccharide species have a DP value greater than 5. The fact that these two features are interconnected is further shown by original Claims 12 and 13 and the dependency of original Claim 13 on original Claim 12.

11.3 In other words the requirement that the "at least 60 percent of the malto-oligosaccharide species have a DP value greater than 8" is subordinate to the requirement that at least 80 percent of the malto-oligosaccharide species have a DP value greater than 5.

11.4 Thus, dissociating the former feature from its governing feature inevitably extends the content of the application beyond its content as originally filed.

Consequently, Claim 1 of Request C6 contravenes Article 123(2) EPC.

11.5 It follows from the above that Request C6 must be refused.

Requests C7, C8, and C5

12. *Wording of the claims*

12.1 Claim 1 of Request C7 differs from Claim 1 of Request C only in that it has been specified that at least 80 percent of the malto-oligosaccharide species in the mixture have a DP value greater than 5. Claim 1 of Request C8 differs from Claim 1 of Request C7 by the additional requirement that at least 60 percent of the malto-oligosaccharide species in the mixture have a DP value greater than 8.
Claim 1 of Request C5 differs from Claim 1 of Request C in that it has been specified that at least one of the malto-oligosaccharides in the mixture has a DP value of at least 10.

12.2 The Board is satisfied that the requirements of Article 123(2) EPC are satisfied by these claims.

13. *Inventive step*

13.1 While the amendments carried out in the respective Claim 1 of Requests C7, C8, and C5 would appear to restrict the starting mixture of malto-oligosaccharides to mixtures containing either a predominant amount of long-chain saccharide species (Requests C7 and C8) or some long-chain saccharide species (Request C5), the

Board notes that the teaching of document D6 also encompasses the reducing of mixtures containing such long-chain saccharides species (cf. D6', page 6, lines 1 to 14; page 9, point (4)(a)) e.g. mixtures having a DE of up to 12 (cf. D6' page 3, lines 9 to 12); i.e. having a high content in high molecular weight saccharides (cf. also application in suit, page 9, product Maltrin® M100 having a DE of 11.8 (page 17, line 4) and a content of species with a DP greater than 5 of 85.4 and a content of species with a DP greater than 8 of 67.85).

13.2 Consequently, even if it would be considered, as submitted by the Appellant (cf. Sections XI (ii.8) and (ii.10) above), that starting mixtures with a high content of high molecular weight saccharides would be more susceptible to degradation, it would still have been within the scope of the customary practice of the skilled person to arrive at process conditions (e.g. temperature, pressure, pH, catalyst) avoiding depolymerisation reaction in such an extent to achieve the relatively modest goal of DP preservation as expressed in Claim 1 of the requests C7, C8, and C5. This would even more be the case because the majority (in number) of species whose DP might not vary of more than 7% would represent an even smaller minority (in weight) of the oligosaccharides present in the starting maltodextrin.

13.3 It thus follows that the subject-matter of Claim 1 of Requests C7, C8 and C5 does not involve an inventive step. Requests C7, C8 and C5 must hence be refused.

Requests C3 and C4

14. *Wording of the claims*

14.1 Claim 1 of Request C3 differs from Claim 1 of Request C in that it has been specified that the conditions include a temperature of 50°C to 150°C.
Claim 1 of Request C4 differs from Claim 1 of Request C3 by the additional indications that the conditions include a pressure of up to 1500 psi (103.4 bar) and a metal catalyst.

14.2 The Board is satisfied that the requirements of Article 123(2) EPC are met by these claims.

15. *Inventive step*

15.1 Since the process conditions incorporated in Claim 1 of Request C3 (temperature range) and of Request C4 (temperature range, pressure range; metal catalyst) clearly overlap with those disclosed in D6 (cf. point 9.4 above), it is evident that the lack of inventive step of the subject-matter of Claim 1 of Request C over document D6 cannot be overcome by the incorporation of these process features.

15.2 Consequently, Request C3 and C4 must be refused.

Request C9

16. *Wording of Claim 1*

16.1 Claim 1 of Request C9 differs from Claim 1 of Request C in that it has been indicated that the hydrogenation reaction time ranges from 2 to 4 hours.

16.2 The Board is satisfied that the requirements of Article 123(2) EPC are met by Claim 1.

17. *Inventive step*

17.1 Although D6 might apparently suggest to use a reaction time of not more than one hour (cf. D6' page 5, last paragraph), the Board notes, however, that D6 indicates that reaction times between 5 and 25 hours at high pressure (20-200 kg/cm^2) and high temperature (100-300°C) might lead to degradative hydrogenation (D6', page 5, second paragraph) and that the reaction time, the temperature and the pressure have to be adjusted to the DE level of the reactant (D6', sentence bridging pages 13 and 14).

17.2 Furthermore no specific effect can be discerned by the Board in the application as filed to be linked to the use of a reaction time between 2 and 4 hours.

17.3 Since this reaction time is also shorter than the reaction times presented in D6 as possibly causing degradation (i.e. 5 to 25 hours), the change of a reaction time from at most one hour to a reaction time of 2 to 4 hours according to Claim 1 represents at best an arbitrary modification of the process of D6, and may even be technically disadvantageous (longer reaction time).

17.4 Consequently, the lack of inventive step of the subject-matter of Claim 1 of Request C over document D6 cannot be remedied by the incorporation of the feature that the reaction time is between 2 to 4 hours.

17.5 It thus follows from the above that Request C9 must be refused.

18. *Request C10*

18.1 Request C10 has been submitted at the end of the oral proceedings before the Board.

18.2 Claim 1 of this request differs from Claim 1 of Request C in that it has been indicated that the conditions include a pressure of from 400 psi (27.5 bar) to 700 psi (48.2 bar).

18.3 In this connection, the Board notes that the Appellant has already submitted at the beginning of the oral proceedings a request (C4) in which the conditions including a specific range of pressure i.e. up to 1500 psi (103.4 bar) in association with a specific range of temperature (50°C to 150°C) and the use of a metal catalyst.

18.4 It is hence evident that no convergence can be discerned by the Board in the submission of a request which on the one hand restricts the pressure range but which, on the other hand, deletes the features concerning the process temperature and the use of a metal catalyst.

18.5 Furthermore this amendment could not *prima facie* be considered as appropriate to set aside the Board's concern relating to the lack of inventive step of Request C, since according to the application in suit (page 21, lines 1 to 2) the best results are obtained

when the hydrogenation pressure was between 1000 and 1300 psi.

18.6 Taking further into account

(a) that the Appellant was well aware from the beginning of the appeal proceedings of the concern of the Board relating to the assessment of inventive step in view of document D6, and that the Appellant has already submitted no less than 45 sets of claims in the course of the appeal proceedings so that it had hence had ample opportunities to amend the claims in order to overcome the objection of lack of inventive step, and

(b) that this amendment submitted for the first time in the course of the appeal proceedings might also introduce new aspects for the assessment of inventive step and might, hence, have rendered necessary further investigations from the Board in that respect,

the Board decides not to admit the request C10 into the proceedings (Rule 137(3) EPC).

19. Since none of the requests of the Appellant can be granted, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier R. Young