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Datasheet for the decision of 14 September 2012

Case Number: T 0126/11 - 3.3.09

Application Number: 02779228.2

Publication Number: 1542542

IPC: A23G 4/00

Language of the proceedings: EN

Title of invention:
Biodegradable chewing gum comprising at least one high molecular weight biodegradable polymer

Patent Proprietor:
Gumlink A/S

Opponent:
WM. Wrigley Jr. Company

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty - yes"
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

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Case Number: T 0126/11 **-** 3.3.09

D E C I S I O N
of the Technical Board of Appeal 3.3.09
of 14 September 2012

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 17 November 2010 concerning maintenance of European patent No. 1542542 in amended form.

Composition of the Board:

Chairman: W. Sieber
Members: J. Jardón Álvarez
R. Menapace

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 1 542 542 in respect of European patent application No. 02779228.2, in the name of Gumlink A/S, filed on 24 September 2002 as international application PCT/DK2002/000625, was published on 13 August 2008 (Bulletin 2008/33). The granted patent contained 48 claims, claim 1 reading as follows:

"1. Chewing gum comprising at least one biodegradable polymer, wherein the molecular weight of said biodegradable polymer is at least 105000 g/mol (Mn), and wherein the chewing gum is substantially free of non-biodegradable polymers."

Claims 2 to 48 were dependent claims.

II. A notice of opposition was filed by Wm. Wrigley Jr. Co. on 13 May 2009 requesting revocation of the patent in its entirety, reference being made to Article 100(a) (lack of novelty and lack of inventive step) EPC.

The documents cited in support of the opposition included the following document:

D1: WO 00/19837 A1;

III. By its interlocutory decision announced orally on 13 October 2010 and issued in writing on 17 November 2010, the opposition division decided that the claims of the proprietor's main request filed during the oral proceedings met the requirements of the EPC. Claim 1 read as follows:

"1. Chewing gum comprising at least one biodegradable polymer, wherein the molecular weight of said biodegradable polymer is within the range of 105,000 g/mol (Mn) to 350,000 g/mol (Mn), and wherein the chewing gum is substantially free of non-biodegradable polymers, and wherein the chewing gum comprises at least one softener."

The opposition division held that the subject-matter of amended claim 1 represented a novel selection over the disclosure of D1 and was therefore novel. Starting from the disclosure of D1 as closest prior art, the opposition division saw the technical problem addressed by the invention in the provision of further chewing gum compositions containing a biodegradable polymer and having improved chewing gum properties (texture). The claimed combination of biodegradable polymers having a molecular weight, Mn, within a specific range and the use of a softener lead to an improvement of the texture of the chewing gum as shown by the examples and comparative examples in the specification. The opposition division regarded this effect as unexpected in view of D1 and acknowledged an inventive step.

IV. On 17 January 2011 the opponent (in the following: the appellant) filed an appeal against the decision of the opposition division and on the same day paid the prescribed fee. On 28 March 2011 the appellant filed the statement setting out the grounds of appeal and requested that the decision under appeal be set aside and the patent be revoked in its entirety on the grounds of lack of novelty and lack of inventive step.

The appellant also filed the following fresh documents and evidence in support of its arguments:

D9: S.J. Batterman-Azcona, "Microstructural and chemical changes in corn protein bodies and α-zeins during processing and their effect on texture", thesis submitted to the Faculty of Purdue University, August 1998; pages 4-6, 106, 107 and 109;

D10: US 5,482,722 A;

D11: US 6,441,126 B1;

D12: WO 01/47368 A1;

D13: E. Chiellini *et al.*, "Biodegradation of poly(vinyl alcohol) based materials", Prog. Polym. Sci. 28 (2003), pages 963-1014; and

D14: Declaration by Dr. Jinping Liu dated 25 March 2011.

V. With its reply dated 7 October 2011 the patent proprietor (in the following: the respondent) disputed all the arguments submitted by the appellant and requested that the appeal be dismissed and the patent maintained on the basis of the claims maintained by the opposition division (main request) or, alternatively on the basis of the first or second auxiliary requests annexed to the minutes of the oral proceedings before the opposition division. A copy of these requests was also filed on 7 October 2011.

VI. On 19 June 2012 the board dispatched a summons to attend oral proceedings, which were held before the board on 14 September 2012.

VII. The arguments presented by the appellant in its written submissions and during the oral proceedings may be summarised as follows:

– The claimed subject-matter lacked novelty in view of the disclosures of documents D1 and D12. Document D1 explicitly disclosed all the features of claim 1 except the number average molecular weight. D1 mentioned a molecular weight of from approximately 2,000 to 2,000,000 and preferably from 10,000 to 500,000 g/mol for the biodegradable polymer, namely poly (D,L-lactic acid), although without specifying which type of molecular weight was meant. However, irrespective of the way in which the molecular weight was measured, the values in the ranges of the molecular weight in D1 would nevertheless always either fall within the scope of the range of claim 1 or substantially overlap with it. The selected range according to claim 1 was neither narrow nor could the data provided in the patent specification support the position that any biodegradable polymer within the claimed range would provide the advantages as stated in the patent. Moreover, the skilled person would seriously contemplate applying the teaching of D1 in the range of overlap. Concerning D12, this document also disclosed all the features of claim 1 except the number average molecular weight. However this parameter could be calculated from the values given in D12 for the weight average

molecular weight and the polydispersity index. The chewing gums of D12 also achieved the technical effect of the patent.

– Concerning inventive step, the appellant saw the teaching of D1 or D12 as the closest prior art. These documents showed that it was possible before the filing date of the patent to prepare chewing gums using biodegradable polymers having a molecular weight outside the claimed range and having good mouth feel and texture.

The appellant held that it was not credible that chewing gum compositions having improved properties could be achieved for any biodegradable polymer together with any softener. There were many types of biodegradable polymers with very different structures and it could not be expected that they would share common physical properties such that the polymers of the same molecular weight would have similar chewing structures as confirmed by the declaration of Dr. Liu (D14). The skilled person would arrive at the claimed subject-matter since the selection of a claimed range within the teaching of D1 or D12 represented merely an arbitrary selection that did not afford any technical effect across the broad range of biodegradable polymers claimed.

VIII. The arguments presented by the respondent, insofar as they are relevant for this decision, may be summarised as follows:

– Neither D1 nor D12 anticipated the claimed subject-matter. D1 did not mention which type of molecular weight was meant and it was therefore impossible to perform a direct comparison between the molecular weight of the document and the number average molecular weight required in claim 1. Concerning D12, the respondent argued that the combination of weight average molecular weight and polydispersity index made by the appellant was not part of the unambiguous disclosure of D12 which explicitly described a number average molecular weight outside the claimed range. In any case novelty should be acknowledged because in order to arrive at an embodiment covered by claim 1 it was necessary for the skilled person to make a multiple selection from the teaching of D12.

– The aim of the patent in suit was to obtain a biodegradable chewing gum having good chewing properties at the beginning of chewing and also a long shelf life. This object was achieved by the claimed chewing gums and was based on the unexpected finding that the increase of the molecular weight of at least one of the biodegradable polymers in the chewing gum together with the addition of softeners gave a chewing gum with improved chewing properties. This effect was demonstrated in the examples and comparative examples in the specification. There was no teaching, hint or suggestion in the cited prior art which would lead the skilled person to increase the molecular weight of one of the

chewing gum components and therefore the claimed subject-matter involved an inventive step.

IX. The appellant requested that the decision under appeal be set aside and the European patent No. 1 542 542 be revoked.

The respondent requested that the appeal be dismissed or that the patent be maintained on the basis of the claims of the first or second auxiliary requests as filed with letter dated 7 October 2011.

Reasons for the Decision

1. The appeal is admissible.

MAIN REQUEST

2. *Novelty*

2.1 Claim 1 of the main request is directed to a chewing gum presenting the following features:

(a) comprising at least one biodegradable polymer,

(a1) with a molecular weight within the range of 105,000 g/mol (Mn) to 350,000 g/mol (Mn);

(b) wherein the chewing gum is substantially free of non-biodegradable polymers, and

(c) wherein the chewing gum comprises at least one softener.

2.2 Novelty of this claim has been contested by the appellant in view of the disclosures of documents D1 and D12.

2.3 Document D1

2.3.1 Document D1 discloses biodegradable chewing gums which undisputedly have features (a), (b) and (c) of claim 1 (page 2, lines 15-17 for feature (a); page 7, lines 15 to 16 for feature (b) and page 11, lines 25-26 for feature (c); see also example 22).

2.3.2 Concerning feature (a1), i.e. the number molecular weight of the biodegradable polymer, the general disclosure of document D1 merely indicates on page 2, lines 27-30 that "In an embodiment, the poly(D,L-lactic acid) has a molecular weight of from approximately 2000 to about 2,000,000 g/mol" and that "In an embodiment, the poly(D,L-lactic acid) has a molecular weight of from approximately 10,000 to about 500,000 g/mol". However, D1 does not specify which type of molecular weight is meant.

In examples 1 to 11 poly(D,L-lactic acid) with a viscosity molecular weight of 42,200 g/mol is used. In the remaining examples the molecular weight of the polymer used is not given.

2.3.3 It is also undisputed that the poly(D,L-lactic acid) used in the examples has a number molecular weight below the claimed range because the number average molecular weight is always lower than the viscosity average molecular weight.

2.3.4 It remains to be decided whether the general disclosure of the molecular weight in D1 clearly and unambiguously discloses an embodiment within the scope of claim 1,

that is to say, a chewing gum comprising one biodegradable polymer with a number molecular weight within the range of 105,000 g/mol to 350,000 g/mol.

2.3.5 As indicated by the appellant in its statement of grounds of appeal, there are several ways of calculating/measuring the average molecular weight of a polymer, the one used depending mainly on the property of the polymer to be studied. The average molecular weight can be defined as a number average molecular weight (M_n), a weight average molecular weight (M_w), a viscosity average molecular weight (M_v) or a sedimentation average molar weight (M_z). The relationship between these values being:

$$M_n < M_v < M_w < M_z.$$

2.3.6 D1 does not specify in its general disclosure what type of molecular weight is being cited when it describes the molecular weight as being as high as 2,000,000. This makes a direct comparison with the subject-matter of claim 1 impossible. Consequently, the disclosure of D1 cannot deprive the subject-matter of claim 1 of novelty because feature (a1) of claim 1 is not clearly and unambiguously derivable from the disclosure of this document.

2.3.7 The appellant holds that irrespective of the way in which the molecular weight is measured, the values in the ranges of the molecular weight in D1 would nevertheless always either fall within the scope of the range of claim 1 or substantially overlap with it and consequently the skilled person would seriously

contemplate applying the prior art teaching within the area of overlap.

2.3.8 The board finds this argument not convincing. It is correct that the molecular weight range covered by D1 is so broad that it would embrace the molecular weight range now claimed. However, there is no information in D1 that an embodiment specified therein would actually fall or overlap with the subject-matter of claim 1. It has already been indicated above that the examples of D1 use a biodegradable polymer with a number average molecular weight well below the range covered by claim 1. Concerning the general values disclosed in D1, the lack of information as regards the type of molecular weight being cited makes a comparison with the subject-matter of claim 1 impossible. As D1 does not disclose a range of values for the number average molecular weight it is also not possible to apply the principles developed by the boards of appeal on novelty for selection inventions. In other words, in the absence of a properly defined range in the prior art it cannot be assessed whether the range covered by the claims would be narrow and sufficiently far removed from the known range.

2.4 Document D12

2.4.1 D12 discloses degradable copolymers (page 2, third paragraph, feature (a)) for use in chewing gum bases, the gum bases typically comprising from 1 to 99 wt% of the degradable copolymers (page 17, last paragraph, feature (b)). Thus, D12 embraces, according to the appellant, chewing gum compositions substantially free of non-biodegradable polymers. Furthermore, the chewing

gum formulations include softeners (page 7, line 2, feature(c)).

2.4.2 Concerning the molecular weight, D12 discloses on page 19, third paragraph that "Typically, the copolymers of the present invention have a weight average molecular weight (Mw) of from about 500 to 300,000 grams/gram mole, and preferably from about 10,000 to 225,000 grams/gram mole. Typically, the number average molecular weight (Mn) ranges from about 500 to 100,000 grams/gram mole, preferably from 10,000 to 90,000 grams/gram mole. The Polydispersity Index (M_w/M_n) typically ranges from about 1.3 to 10." Thus, the range for the average number molecular weight cited in this passage is outside the scope of the range required by present claim 1.

2.4.3 Two copolymers prepared in D12 have a number average molecular weight within the range of claim 1, namely example 1 with a Mn of 139,630 and example 14 with a Mn of 111,040. However, none of these copolymers is actually used in the preparation of chewing gum, let alone a chewing gum essentially free of non-biodegradable polymers.

2.4.4 The only chewing gum exemplified in D12 uses a gum base including 20% of a biodegradable copolymer having a number average molecular weight of 101,830 grams/gram mole together with other non-biodegradable copolymers (examples 48: gum base composition and example 49: chewing gum formulation including the gum base of example 48). Thus, the disclosure of examples 48 and 49 of D12 fails to disclose features a1) and b) of claim 1.

2.4.5 The appellant, however, maintained that D12 was novelty destroying because it was possible to calculate the number average molecular weight from the values given on page 19 of D12 for the weight average molecular weight (Mw) and the polydispersity index (Mw/Mn). Taking the range for the weight average molecular weight of from about 500 to about 300,000 g/mol the appellant calculated a number average molecular weight range of from 385 to 230,769 (for a polydispersity index of 1.3) and a range of from 50 to 3,000 (for a polydispersity index of 10).

2.4.6 It is however noted that in order to arrive at an embodiment falling within the subject-matter of claim 1, a multiple selection within the teaching of D12 has to be made. In particular, it is necessary to make at least the following selections:

- firstly, select a biodegradable copolymer having a weight average molecular weight of 300,000 grams/gram mole,
- select a polydispersity index of 1.3, and
- finally select a chewing gum formulation free of non-biodegradable polymers.

According to EPO practice, in case of a "multiple selection", one would have to show that the "combined selection" emerges from the prior art. In the present case, however a person skilled in the art would have had no reason, when applying the teaching of D12 to concentrate on the combination of features set out in claim 1. Such a combined selection is neither explicitly disclosed in, nor clearly and unambiguously derivable from D12. On the contrary, the skilled person would learn from the disclosure of the third paragraph

of page 19 of D12 that the preferred copolymers should have a number average molecular weight outside the range covered by claim 1 and had no reason to combine the values of polydispersity index and weight average molecular weight to calculate other values for the number average molecular weight. Moreover the skilled person would also learn from the working examples in D12 that chewing gums comprising non-biodegradable polymer are preferred.

2.5 For these reasons, the board concludes that the subject-matter of claim 1 of the main request is novel.

3. *Inventive step*

3.1 The patent in suit relates to biodegradable chewing gum comprising at least one biodegradable polymer having a number average molecular weight of between 105,000 g/mol and 350,000 g/mol.

According to the patent specification the use of biodegradable polymers in chewing gums results in an overall chewing gum having different characteristics than conventional chewing gum as these biodegradable polymers are vulnerable to chewing gum additives. In particular, softeners tend to dissolve the chewing gums even when applied in small amounts, degrading the chewing gum with time (see paragraph [0007]).

3.2 Closest prior art

Documents D1 and/or D12 were agreed by the parties as representing the closest prior art. As explained in detail above in relation to novelty, these two

documents disclose biodegradable polymers useful for chewing gum bases. The biodegradable polymers exemplified in D1 and D12 both have a number average molecular weight below the lower limit of the range of claim 1. Moreover neither D1 nor D12 emphasize the importance of the molecular weight of the polymers.

3.3 The technical problem and its solution

3.3.1 The technical problem underlying the present invention in the light of the closest prior art can be seen as the provision of chewing gums having acceptable chewing gum properties, in particular improved texture, and also a long shelf life.

3.3.2 As a solution to this problem, the patent proposes the claimed chewing gum wherein the number average molecular weight of at least one biodegradable polymer is within the range of 105,000 to 350,000 g/mol.

3.3.3 The board is satisfied that this problem has been credibly solved by the claimed chewing gums. On the one hand, the examples in the specification show that chewing gum formulations 1005, 1006 and 1007 including a biodegradable polymer with a number average molecular weight as required by claim 1 exhibit a pleasant and acceptable texture (paragraphs [0101]-[0102]). On the other hand, formulations 1003 and 1004 including a biodegradable polymer with a number average molecular weight below the lower limit claimed - and therefore close to those disclosed in D1 and D12 - are very soft and almost dissolved while chewing (paragraph [0099]).

Although an increase in the molecular weight of a polymer component normally increases the rheological stiffness of the chewing gum (i.e. negatively influences the chewing properties), this effect is in fact compensated by the hydrophilic nature of the biodegradable polymers. These polymers tend to take up water more quickly, e.g. from saliva, so that good chewing properties are maintained despite the high molecular weight. A higher resistance to degrading (and therefore a longer shelf life) is said to be obtained due to the fact that the increasing of the size of the molecular chains (higher Mn) results in increased entanglement between the polymer chains of neighbouring polymers (see paragraphs [0011]-[0012]).

3.3.4 The appellant did not dispute that for the exemplified polymers, improved texture could be achieved but, based on Dr. Liu's declaration, maintained that it was not credible that the stated technical effect could be achieved for any biodegradable polymer together with any softener. The results in the patent might well support a selection for the particular specified polymers and softening systems but not all biodegradable polymers would respond in a similar manner.

The board finds these arguments not convincing. As pointed out by the respondent during the oral proceedings, biodegradable polymers have in common that they degrade with time in the presence of softeners and that this degradation is decreased by the use of polymers having the claimed number average molecular weight. Thus, in the absence of experimental evidence to the contrary, the board accepts the argument of the

respondent that this inventive concept is generally applicable for biodegradable polymers.

3.4 Obviousness

3.4.1 It remains to be decided whether, in view of the available prior art documents, it would have been obvious for the skilled person to solve the technical problem identified above by the means claimed, namely by the use of a biodegradable polymer having a number average molecular weight as claimed in claim 1.

3.4.2 There is no hint to the claimed range of molecular weight in the cited documents. In fact, the importance of the number average molecular weight for improving the texture of chewing gum and its shelf life was not recognized in the available prior art. None of the documents cited by the appellant gives a hint to the person skilled in the art to use a biodegradable polymer with a number average molecular weight as claimed. The person skilled in the art would not have expected that it would be helpful to include such polymers in chewing gums in order to obtain good chewing properties and shelf life.

3.4.3 The appellant did not point to any document hinting to the claimed molecular weight range, but denied an inventive step for the claimed subject-matter because chewing gums on the basis of biodegradable polymers with a very broad range of molecular weights were known from the prior art.

However, this argument cannot question the validity of the present invention either. The fact that it might be

possible to formulate biodegradable chewing gums with other biodegradable polymers does not go against the finding of the present invention that the specific claimed number average molecular weight range produces chewing gums with improved properties.

3.5 For these reasons the subject-matter of claim 1, and by the same token the subject-matter of dependent claims 2 to 43, involves an inventive step.

4. As the main request is allowed, there is no need for the board to deal with the auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar The Chairman

M. Canueto Carbajo W. Sieber