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D E C I S I O N
of 18 December 2002

Case Number: T 0599/99 - 3.3.5

Application Number: 96903724.1

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Language of the proceedings: EN

Title of invention:
Seamless capsules

Applicant:
WARNER-LAMBERT COMPANY

Opponent:
-

Headword:
Seamless capsules/WARNER-LAMBERT

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty: yes, after amendment"
"Inventive step: yes, after amendment"

Decisions cited:
-

Catchword:
-



Case Number: T 0599/99 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 18 December 2002

Appellant:
(Applicant)

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Representative:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted 20 January 1999
refusing European patent application
No. 96 903 724.1 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: B. P. Czech
J. H. Van Moer

Summary of Facts and Submissions

I. The appeal is from a decision of the examining division refusing the European patent application No. 96 903 724.1.

II. The examining division considered that the subject-matter of the amended independent apparatus claim 8 then on file lacked novelty over the disclosures of documents

D1: US-A-4 888 140, and

D2: US-A-4 422 985.

The said claim had the following wording (the amendments to corresponding claim 10 as filed are highlighted in **bold**):

"8. An apparatus for making a seamless capsule comprising a shell material encapsulating a center-filled core material comprising:

a concentrically aligned multiple nozzle system having at least an outer nozzle and an inner nozzle for simultaneously extruding a shell material **which is a carbohydrate in a melted state** through the outer nozzle and a core material through an inner nozzle, thereby forming a coaxial jet of the shell material surrounding the core material;

means for supplying the shell material to the outer nozzle and the core material to the inner nozzle;

a first duct located beneath the multiple nozzle system for receiving the coaxial jet;

means for delivering a heated carrier liquid to the first duct to form a flow of the heated carrier

liquid surrounding the coaxial jet, thereby allowing the shell material to encapsulate the core material to form capsules in the heated carrier liquid;

a second duct, at least part of which is located beneath the first duct, for receiving the flow of the heated carrier liquid carrying the capsules from the first duct;

means for delivering a cooled carrier liquid into the second duct to form a flow of the cooled carrier liquid surrounding the capsules, thereby allowing the capsules to solidify; **whereby the carbohydrate is in a glassy state.**"

III. Although it did not base the refusal of the application on these grounds, the examining division also held in the contested decision that the subject-matter of the independent method claim 1 and of the independent product claim 16 then on file lacked the required inventive step in view of the disclosures of D1 and D2.

These two claims had the following wordings (the amendments to the corresponding claims 1 and 18 as filed are highlighted in **bold**):

"1. A method for making a seamless capsule comprising a shell material encapsulating a center-filled core material comprising the steps of:

providing a concentrically aligned multiple nozzle system having at least an outer nozzle and an inner nozzle;

supplying a **carbohydrate in a melted state as** shell material to the outer nozzle and a core material to the inner nozzle;

simultaneously extruding the shell material through the outer nozzle and the core material through

the inner nozzle, thereby forming a coaxial jet of the shell material surrounding the core material;

introducing the coaxial jet into a flow **of air having a temperature within a range in which the shell material does not solidify or into a flow of heated carrier liquid**, thereby allowing the shell material to encapsulate the core material to form capsules in the heated carrier liquid; and

introducing the capsules into a flow of a cooled carrier liquid, thereby allowing the capsules to solidify;

and when the capsules solidify, the carbohydrate is in a glassy state."

"16. A seamless capsule comprising a shell material encapsulating a center-filled core material, wherein the shell material comprises a carbohydrate in a glassy state".

IV. In its statement of grounds of appeal, the appellant contested the findings of the examining division and commented on the relevance of D1 and D2.

V. In the annex to the summons to oral proceedings, the board *inter alia* cited a new document, which was itself cited in several of the references on file:

D4: US-A-3 389 194.

Documents D1, D3, D4 and

D10: CH-A-563 807 (cited in the search report)

were cited with respect to the novelty and/or inventiveness of the claimed subject-matter.

Having regard to the novelty of the claimed capsules, the board referred to the following documents, cited in the application in suit:

D5: US-A-4 251 195

D6: US-A-4 695 466

D7: EP-A-0 525 731

D8: US-A-5 300 305 and

D9: WO-A-96/11053.

VI. With its letter dated 15 November 2002, the appellant filed a new set of amended claims 1 to 20 as a basis for the further prosecution of the application and referred to the further document

D11: US-A-5 399 368.

It indicated passages of the application as filed in support of the amendments carried and commented on the relevance of documents D1 to D4 concerning the method and apparatus claims and on the relevance of D5 to D9 concerning the claims to the capsules.

VII. During the oral proceedings, which took place on 18 December 2002, the appellant repeatedly amended the claims previously on file and finally presented a new set of claims 1 to 19.

In new independent claim 1, the part reading "introducing the coaxial jet ... in the heated carrier liquid;" in the claim version underlying the decision

of the opposition division was replaced by

"introducing the coaxial jet into a flow of a heated carrier liquid, heated to a temperature that is close or higher than the temperature of the shell material thereby allowing the shell material to encapsulate the core material to form capsules in the heated carrier liquid

or

introducing the coaxial jet into air having a temperature maintained within a range in which the shell material does not solidify within the travelled distance".

In new independent apparatus claim 9, the part reading "a first duct ... in a glassy state." in claim 8 underlying the decision of the opposition division was replaced by the following wording (features added to or modified in comparison to said claim 8 are highlighted in **bold**):

"a first duct located beneath the multiple nozzle system for receiving the coaxial jet, **the upper part of which is surrounded by a heating cylinder in a concentric alignment.** (read: ",")

means for delivering a heated carrier liquid, **heated to a temperature that is close or higher than the temperature of the shell material,** to the first duct to form a flow of the heated carrier liquid surrounding the coaxial jet, thereby allowing the shell material to encapsulate the core material to form capsules in the heated carrier liquid **within said duct;**

a second duct - **containing a cooled carrier liquid -**, at least part of which is located beneath the first duct, for receiving the flow of the heated carrier

liquid carrying the capsules from the first duct means for delivering a cooled carrier liquid into the second duct to form a flow of the cooled carrier liquid surrounding the capsules, thereby allowing the capsules to solidify **and thereby turning the carbohydrate in a glassy state.**"

New claim 16 was amended to read as follows (amendments in comparison the claim 18 as filed are highlighted in **bold**):

"**16.** A seamless capsule comprising a shell material encapsulating a center-filled core material, wherein the shell material **is formed of** carbohydrate in glassy state, **obtainable by the method of any one of claims 1 to 8.**"

VIII. The appellant essentially argued as follows:

Although the concentric nozzles technique of seamless capsule preparation was known for more than twenty-five years, the industry had not considered the use of carbohydrate melts leading to glassy capsule shells. D11 related to a different technology leading to seamed capsules, which are not desired in certain applications, such as in the field of pharmaceuticals. The processing of carbohydrate melts to glassy shells in the claimed manner lead to seamless centre-filled capsules which were hard and had a glassy, transparent and more "modern" look desired by customers. In comparison to the preparation methods according to D5, no evaporation of water was necessary. Gelatin solutions as used in D1 were not comparable to carbohydrate melts since they relied on different solidification mechanisms. Both D3 and D4 taught a

rather slow cooling which would not be suitable for obtaining a glassy carbohydrate shell. A wax as used according to D4 was a material having quite different processing properties than a carbohydrate.

- IX. At the end of the oral proceedings, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims filed at the oral proceedings (sole request).

Reasons for the Decision

1. *Amendments*

The board is satisfied that the amendments carried out in present claims 1 to 19 are sufficiently based on the application as filed to meet the requirements of Article 123(2) EPC. Concerning the independent method claim 1, see in particular claims 1 to 9, page 7, lines 19 to 22, page 8, lines 21 to 24. Concerning the new dependent method claim 8, see page 9, line 35 to page 10, line 7. Concerning independent claim 16 directed to the capsules obtainable by the claimed methods, see also page 1, lines 7 to 11 and claims 18 to 22 of the application as filed. Independent apparatus claim 9 is based on a combination of claims 10 and 11 as filed. Dependent claims 2 to 7, 10 to 15 and 17 to 19 correspond to claims 2,3 and 6 to 9, 12 to 17 and 19 to 21 as filed, respectively, except for the adapted back-references.

2. *Novelty*

2.1 The capsules according to claims 16 to 19

2.1.1 The center-filled seamless capsule according to present claim 16 has a shell formed of glassy carbohydrate and is obtainable by cooling molten carbohydrate as referred to in claim 1. The board can accept that this wording implies that the glassy carbohydrate is by far the major, if not the sole, component of the capsule shell. The board also considers it plausible that such a capsule shell can be discerned, by virtue of its testable physical properties, from a shell material obtainable by drying an aqueous solution of the carbohydrate comprising substantial amounts of water.

2.1.2 D5 discloses the preparation of seamless center-filled capsules by extrusion of a coaxial jet of core and shell forming materials. The shell material is a composition that is set by cooling. See column 2, lines 12 to 16, Figure 1 and claim 1. D5 explicitly discloses shell forming compositions comprising gelatin, D-sorbit and water (see column 5, lines 16 to 17 and line 25, column 6, line 27), and optionally gum arabic (see column 3, line 6 and lines 42 to 43), compositions comprising gelatin, glycerine and water (see column 5, lines 31 to 32), and compositions comprising D-sorbit and water (see "preferred embodiment 1" in column 6, lines 12 to 13). This latter embodiment thus represents a disclosure of a seamless center-filled capsule wherein the shell material is formed by processing a mixture of a carbohydrate (D-sorbit) and water.

However, the method relied upon in the preparation of these specific capsules is not described in detail. In particular, the amount of water to be mixed with the D-sorbit, and the way in which the capsules are dried, are not indicated. Whenever it is mentioned, if at all,

the water content of the shell forming mixtures is at least 70%, see column 5, line 32 and column 6, line 28. Moreover, according to the only indications given in D5 concerning the relative amounts of the solid components, the gelatin is used in excess of the sorbit, see column 6, line 28. Hence, D5 does not provide a clear and unambiguous disclosure of a capsule shell comprising D-sorbit as major component, and with the D-sorbit being in a glassy state as obtainable by the cooling of a melt.

2.1.3 D11 discloses the preparation of center-filled capsules having a shell comprising a carbohydrate in a glassy state and obtained by extruding and cooling a melt comprising the carbohydrate, see claim 1, column 3, lines 31 to 51 and Figure 2. However, these capsules necessarily have parts that are to be seen as seams, since their preparation involves the mechanical cutting or pinching of the co-extruded shell and core material strand.

2.1.4 Most of the other documents on file, ie D1, D2, D3, D4, D10, CH-A-675 370 (cited in search report) and US-A-4 279 632 (cited in search report) do not address the use of a carbohydrate as a shell material component at all.

2.1.5 The disclosures of D6 (see tables in examples) and D7 (see tables in examples) are similar to the disclosure of D5 insofar as they both teach a method for the preparation of seamless capsules relying on the use of aqueous shell forming solutions (with water being the major component) of gelatin and sorbite/sorbitol (with gelatin being present in higher amounts than the sorbite/sorbitol). Hence, these documents do not

disclose a glassy carbohydrate phase as major component of the capsule shell.

2.1.6 D9, published after the filing date of the application in suit, generally mentions carbohydrates such as sorbitol and oligosaccharides as shell materials for seamless center-filled capsules, see page 6, line 33 to page 7, line 8. However, gelatin is said to be the preferred material. According to the examples, use is made of aqueous gelatin (33%) solutions as shell former. Capsules with shells having a carbohydrate in a glassy state as the major component, such as obtainable by melt precessing, are not disclosed.

2.1.7 D8 mentions center-filled capsules of various shapes and sizes with a shell material selected from a group including sugar candy, see column 1, lines 58 to column 2, line 3 and claim 1. D8 generally states that various techniques may be used to produce the capsules, see column 2, lines 44 to 46. However, the sole example illustrating the preparation of such capsules describes a co-extrusion process apparently making use of a solution comprising gelatin and sorbitol, similar to the processes disclosed in D5 to D7. In the board's view, considering that methods of the type disclosed eg in D11 are not excluded by D8, the latter document does not clearly and unambiguously disclose the preparation of seamless capsules having a glassy rather than crystalline sugar shell.

2.1.8 Other known encapsulation techniques lead to capsules having a matrix type shell wherein the core material is dispersed, see the further prior art mentioned on pages 2 and 3 of the present application as filed. Such capsules do not qualify as center-filled in the sense

of claim 16.

2.1.9 Hence, the subject-matter of claim 16, and consequently of claims 17 to 19 dependent thereon, is novel over the disclosures of the prior art on file.

2.2 The methods according to claims 1 to 8

It can be gathered from the above analysis of the prior art that none of the prior art documents discloses a method for the preparation of seamless center-filled capsules having a shell formed of a glassy carbohydrate obtainable by the cooling of a carbohydrate melt. Since the method of claims 1 to 8 leads to this novel type of capsule, their subject-matter is novel as well.

2.3 The apparatus according to claims 9 to 15

2.3.1 The board is convinced that, apart from D10, none of the documents on file discloses means that could be considered as a heating cylinder surrounding the upper part of a duct receiving a coaxial jet of the shell and core forming materials. This finding is also in agreement with the contested decision, where the novelty of the subject-matter of claim 9 then on file was not objected to, in contrast with the subject-matter of some other dependent apparatus claims then on file.

2.3.2 D10 discloses an apparatus for the preparation of seamless center-filled capsules by co-extrusion of shell and core materials into a carrier liquid flow. A duct is arranged beneath the nozzle system and receives the coaxial jet of extruded materials. Capsules form within this duct. See in particular Figure 2, column 6,

lines 29 to 38 and column 8, lines 42 to 47. However, the apparatus disclosed in D10 does not comprise means for delivering cooled carrier liquid to a further duct arranged below said before-mentioned duct.

2.3.3 D4 discloses a method for the preparation of seamless, center-filled capsules, comprising the co-extrusion of core and shell forming material through concentric nozzles, see Figure 1 and the corresponding description and claims 3 and 4. A duct (10c) for receiving the coaxial jet of the capsule forming materials is arranged horizontally and thus not beneath the nozzle, see Figures 1 and 2. Moreover, the apparatus disclosed in D4 does not comprise heating means surrounding this duct.

2.3.4 In the board's view, the disclosures of the other cited documents do not come closer to the apparatus of present claim 9.

2.3.5 Since none of the cited documents discloses an apparatus with all the features of present claim 9, the subject-matter of this claim, and consequently of claims 10 to 15, is also found to be novel over the cited prior art.

3. *Inventive step*

3.1 The capsules according to claim 16 and the preparation method according to claim 1

3.1.1 According to the application as filed, the prior art seamless center filled capsules having gelatin or gums as shell materials are disadvantageous in terms of their preparation and use. Their preparation from

aqueous solutions requires the removal of large amounts of water. When consumed, these shell materials dissolve slowly and leave a distasteful plastic-like residue in the mouth.

- 3.1.2 However, as acknowledged by the appellant during the oral proceedings, document D5, which can be considered to represent the closest prior art for the purpose of assessing inventive step, *inter alia* discloses as a preferred embodiment a center-filled seamless capsule comprising peppermint oil enclosed in a film composed of D-sorbit and water, see column 6, lines 11 to 15, claim 1 and Figure 1.
- 3.1.3 In view of D5, the technical problem to be solved by capsules according to present claim 16 can thus be seen in the provision of a further type of center-filled seamless capsules having carbohydrate based shells meeting several customer wishes in terms of properties such as appearance, taste, hardness and/or shell dissolution rate.
- 3.1.4 However, as already set out under point 2.1.2 above, the method relied upon in the preparation of these specific capsules is not described in detail in D5. The board holds that in view of the other indications comprised in D5, it can only be reasonably assumed that a solution comprising an excess of water relative to the amount of D-sorbit is to be used, and that the processing of such a solution requires the removal of a certain amount of water subsequently to capsule formation. Special precautions as necessary for obtaining a glassy rather than crystalline carbohydrate shell are, however, not mentioned. In any case, a method involving the processing of a shell former in a

molten state is neither addressed nor suggested. Therefore, D5 taken alone cannot suggest the preparation of capsules with the properties of the capsules according to present claim 16.

3.1.5 Starting from prior art particulate products described to comprise aroma compounds dispersed in a glassy matrix obtained by cooling a melt, document D11 suggests the co-extrusion and encapsulation of a core aroma product with a molten carbohydrate material that solidifies in a glassy form upon cooling. See column 2, lines 8 to 15 and claim 1, Figures 1 and 2 and column 7, line 14 to column 8, line 18. D11 requires means for subdividing the co-extruded stream into sealed capsules (see claim 1). The only specific means disclosed in D11 are cutting or pinching means, ie means relying on moving mechanical parts and inevitably leading to some kind of seam. D11 cannot, therefore, be considered to suggest the preparation of seamless capsules, let alone by a co-extrusion method relying on the viscosities and flow conditions of the co-extruded materials for capsule formation, as in the case of the solution based process disclosed in D5.

3.1.6 Document D4 is the only document disclosing center-filled seamless capsules prepared by a co-extrusion method, wherein the shell is formed by melting and extruding a suitable material and cooling it after the capsules have formed within a carrier liquid stream. However, the only suitable material explicitly mentioned is a wax, see column 5, lines 12 to 26. Considering the differences between waxes and carbohydrates in terms of their chemical structure and melt processing properties, the board accepts the view of the appellant that D4 could not possibly encourage

the skilled person to consider the use of a carbohydrate as a meltable shell material in the process disclosed. The board is also satisfied that, in view of the said differences between carbohydrates and waxes, a skilled person, confronted with the stated technical problem, would not, without hindsight considerations, combine the diverging teachings of D5 (use of aqueous solution of sorbit) and D4 (use of a melt of a wax), or of D4 (flow/viscosity induced seamless capsule formation) and D11 (mechanical formation of capsules with seams).

3.1.7 D3 suggests certain improvements to known methods for producing seamless and implicitly center-filled capsules, wherein the core and shell materials are fed through concentric nozzles. In these known methods, the materials may be blown from the nozzle into the ambient air or directly into a hardening liquid. Preferably, the hardening of the capsule shells is carried out by cooling solidification in a cooled hardening liquid. After separation from the hardening liquids, the capsules are dried. See column 1, lines 14 to 57, Figures 1 and 4 and the corresponding description parts, and claims 1, 4, 5, 7, 8 and 11. D3 is, however, silent about the nature of the shell material that may be used. Hence, in view of the above considerations with respect to D5, D11 and D4, the board holds that D3 cannot be held to suggest the preparation of seamless center-filled capsules having a glassy carbohydrate shell obtainable by melt solidification.

3.1.8 Since the board does not share the examining division's view that a hot gelatin aqueous solution and a carbohydrate melt are comparable shell-forming materials, the board takes the view that documents D1,

D2, D6 or D7 cannot, either taken alone or in combination with D5, suggest the preparation of capsules as presently claimed.

3.1.9 The board is also convinced that the other documents on file do not contain any more relevant information concerning inventive step.

3.2 The methods according to independent claim 1

The process steps foreseen by present method claim 1 lead to seamless, center-filled capsules having a glassy carbohydrate shell obtained by solidifying a carbohydrate melt. Such capsules were found to be inventive for the reasons given above. Consequently, the two methods according to claim 1 are based on an inventive step.

3.3 The apparatus according to independent claim 9

3.3.1 The novel apparatus of claim 9 is particularly suited for the preparation of the novel and inventive capsules of claim 16 according to the nozzle-in-liquid method encompassed by claim 1.

3.3.2 D10 is the only prior art document disclosing an apparatus for the preparation of center-filled seamless capsules which comprises heating means surrounding the upper part of the carrier liquid containing duct, into which the capsule materials are ejected (see point 2.3.2 above). The heating means are provided to avoid the solidification of the shell before the capsules are formed, see column 6, lines 29 to 38 and sub-claim 7. However, in the board's view, the apparatus disclosed in D10 does not lend itself to the

preparation of the capsules as presently claimed, since it does not comprise means for delivering a cooling liquid in a way enabling a relatively fast cooling of a melt, as required for obtaining a glassy carbohydrate shell. Since the only shell material actually mentioned in D10 is molten paraffine (see column 3, line 42), and since the use of carbohydrate melt as a material for forming seamless center-filled capsules was not obvious, the skilled person had no particular reason to modify the apparatus of D10 by providing additional means for feeding a cooling liquid to the carrier liquid duct.

3.3.3 The apparatuses disclosed in D1 and in D4 both comprise means for feeding a coaxial capsule material jet into a heated carrier liquid, and subsequently hardening the formed capsules within a cooled carrier liquid. However, according to these documents, the means for heating the carrier liquid flow are arranged separately from the jet-receiving duct, see D1, Figure 1, reference number 24, and D4, Figure 1, reference number 23. Apparently, these apparatuses perform satisfactorily with gelatin solutions (D1) and wax (D4). An arrangement of these heating means surrounding the jet-receiving duct is not suggested by these documents.

3.3.4 It is plausible that the arrangement of the required heating means in the upper part of the jet-receiving duct provides a good control of the temperature and viscosities prevailing at the location where the capsules actually form from the melt, especially at higher temperatures as required for processing some kinds of carbohydrate melts. However, since the processing of carbohydrate melts in the preparation of

seamless center-filled capsule formation was not known, the board takes the view that without hindsight considerations the skilled person had no reason to combine the teachings of D1 or D4 with the teaching of D10.

3.3.5 The board is also convinced that the further prior art on file does not contain any more relevant information concerning the apparatus of claim 9.

3.4 The subject-matter of independent claims 1, 9 and 16 is thus found to be inventive. Consequently, the same is true for the subject-matter of dependent claims 2 to 8, 10 to 15 and 17 to 19.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent with the following documents:
 - claims 1 to 19 filed at the oral proceedings
 - a description and figures to be adapted accordingly.

The Registrar:

The Chairman:

U. Bultmann

R. Spangenberg