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Datasheet for the decision of 20 December 2024

Case Number: T 0425/23 - 3.3.09

Application Number: 14737766.7

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Language of the proceedings: EN

Title of invention:
METHODS AND COMPOSITIONS FOR AFFECTING THE FLAVOR AND AROMA PROFILE OF CONSUMABLES

Patent Proprietor:
Impossible Foods Inc.

Opponent:
Reiser & Partner Patentanwälte mbB

Headword:
Meat substitute/IMPOSSIBLE FOODS

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123(2), 123(3)
RPBA 2020 Art. 12(4), 13(1)

Keyword:
Auxiliary request AR1A: admission - (yes); added subject-matter and extension of the scope of protection - (no), sufficiency, novelty, inventive step - (yes)

Decisions cited:
T 0038/11

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0425/23 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 20 December 2024

Appellant: (Patent Proprietor)	Impossible Foods Inc. 525 Chesapeake Drive Redwood City, CA 94063 (US)
Representative:	Wichmann, Hendrik Wuesthoff & Wuesthoff Patentanwälte und Rechtsanwalt PartG mbB Schweigerstraße 2 81541 München (DE)
Respondent: (Opponent)	Reiser & Partner Patentanwälte mbB Weinheimer Straße 102 69469 Weinheim (DE)
Representative:	Reiser & Partner Patentanwälte mbB Weinheimer Straße 102 69469 Weinheim (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 19 December 2022 revoking European patent No. 2943072 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	A. Haderlein
Members:	A. Veronese
	R. Romandini

Summary of Facts and Submissions

I. The appeal was filed by the patent proprietor (appellant) against opposition division's decision revoking the European patent.

II. With its notice of opposition, the opponent had requested revocation of the patent in its entirety on the grounds under Article 100(a) (lack of novelty and lack of inventive step), 100(b) and 100(c) EPC.

III. The documents submitted during the opposition proceedings included:

D3: G. Macleod et al., Critical Reviews in Food Science & Nutrition 14(4), 1981, 309-437

D4: B.K. Dwivedi et al., Critical Reviews in Food Science & Nutrition 5(4), 1975, 487-535

D13: WO 2013/010042 A1

D17: C.R. Calkins et al., Meat Science 77, 2007, 63-80

D18: S. Brewer, The Chemistry of Beef Flavor, Executive Summary, 2006

D29: GB 1,099,711

D39: GB 1,525,541

D89: U.S. Department of Agriculture, Report on the nutrient composition of peas, 2019

D90: G. Jahreis et al., Ernährungs Umschau 63(2), 2016, 36-42

D91: P. Macnicol, Plant Physiology 72, 1983, 492-7

D92: J. De Berrios et al., Food Research International 43, 2010, 531-6

D98: WO 2012/075088 A 1

D99: W.L. Butler et al., Nature 4978, 1965, 1319-21

D100: WO 2009/007424 A1

D101: M. Dharmadhikari, "Yeast autolysis", 2020, 1-5, source: https://www.extension.iastate.edu/wine/yeast-autolysis,

D102: P.B. Swiderski et al., Journal of Food Processing Technology 6(12), 2015, 1-5

D105: J. Zhao et al., J. Ind. Microbial. Biotechnol. 32, 2005, 415-23

D104: C. Fridman et al., Archives of Biochemistry and Biophysics 126, 1968, 299-304

D106: M.J.H. Van Haandel, J. Agric. Food Chem. 48(5), 2000, 1949

D116: B.B. Buchanan et al., "Biochemistry & Molecular Biology of Plants", Wiley Blackwell, 2015

D117: J.W. Riggs et al., Journal of Biological Chemistry 291(43), 2016, 22572-82

D118: D. de Souza Gomes, Ciencia Rural, Santa Maria 52(7), 2022, 1-14

D119: T. Hernawanm, Chemical and cytological changes during the autolysis of yeast, thesis submitted at the University of New South Wales, Australia, 1992

D120: B. Podpora et al., Czech J. Food Sci. 34, 2016, 554-63

IV. In its decision, the opposition division found, *inter alia*, that:

- the invention claimed in the main request and in auxiliary requests AR0A, AR1, AR1A, AR2, AR2A, AR7 and AR7A was not sufficiently disclosed; the patent application showed that compositions comprising some of the claimed ingredients did not have the

taste of meat; to provide compositions having that taste, the skilled person had to rely on trial and error; this involved an undue burden

- auxiliary requests AR1B to AR8C contained added subject-matter

- the claims of auxiliary request AR3 did not contain added subject-matter; the invention claimed in this request was sufficiently disclosed, and the claimed subject-matter was novel over D13 and D98

- the subject-matter of auxiliary request AR3 and auxiliary requests AR3A, AR4, AR4A, AR5, AR5A, AR6, AR6A, AR8 and AR8A did not involve an inventive step over D13, alone or in combination with D3

V. With its statement setting out the grounds of appeal, the appellant filed a main request and auxiliary requests AR0A, AR1 to AR5 and AR4A. With its letter dated 18 January 2024, it filed AR1A, AR2A, AR3A and AR5A. With a letter dated 22 August 2024, the appellant withdrew the main request and auxiliary request AR0A.

VI. With a letter dated 2 October 2024, after receiving the provisional opinion set out in the communication issued by the board under Article 15(1) RPBA, the opponent (respondent) stated that it would no longer participate in the appeal proceedings. It also withdrew its request for oral proceedings.

VII. With its letter dated 10 December 2024, the appellant stated that auxiliary request AR1A was its main request. Furthermore, it filed an amended description.

VIII. Claim 1 of auxiliary requests AR1A reads:

"*1. A method of making a meat substitute, the meat substitute comprising:*

a) an isolated heme-containing protein; and
b) at least the flavor precursor molecules
i) cysteine, glucose and thiamine, or
ii) cysteine, ribose and thiamine;

wherein the meat substitute is further characterized in that a taste and smell of meat is given to the meat substitute during the cooking process; and

wherein the method comprises a step of combining the isolated heme-containing protein and the flavor precursor molecules, wherein the flavor precursor molecules are added in purified form or are derived from ingredients in the uncooked meat substitute that are enriched with one or more of the particular flavor precursor molecules."

IX. The relevant arguments submitted by the parties during the proceedings are reflected in the reasons for the decision below.

The requests

X. The appellant requested, as the main request, that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary request AR1A, filed with the letter dated 18 January 2024.

XI. The respondent requested that the appeal be dismissed.

Reasons for the Decision

Auxiliary request AR1A (main request)

1. *Admission*

1.1 Auxiliary request AR1A was filed for the first time in appeal with the letter dated 18 January 2024.

1.2 The respondent requested that AR1A not be admitted into the appeal proceedings.

1.3 AR1A derives from auxiliary request AR8 of the decision under appeal. Claim 1 of auxiliary request AR1A differs from the claim 1 of that previous AR8 in that:

- the reference to "at least two flavor precursor molecules" was deleted

- reference is made to "enriched with one or more of the particular flavor precursor molecules" instead of "enriched with the particular flavor precursors"

- it is specified that "the meat product is further characterized in that"

1.4 The respondent argued that claim 1 of auxiliary request AR1A differed significantly from claim 1 of the aforementioned auxiliary request AR8. Thus, auxiliary request AR1A should have been filed during the opposition proceedings and should not be admitted in appeal.

1.5 The board disagrees for the following reasons.

1.6 During the opposition proceedings, the proprietor had and took the opportunity to file a considerable number of auxiliary requests.

1.7 However, it is readily apparent from the file history that the case at hand is complex. The proprietor had to address numerous and increasingly expanded attacks raised by the opponent and third parties during the opposition proceedings. More than 100 documents were filed, most of them after the filing of the notice of opposition. Thus, there were reasons to file new requests at different stages.

1.8 Furthermore, neither the two preliminary opinions nor the decision of the opposition division dealt specifically with the wording of claim 1 of auxiliary request AR8. The division considered that the subject-matter claimed in this request did not involve an inventive step for the reasons previously discussed when dealing with auxiliary request 3. However, it did not take into account the fact that claim 1 of auxiliary request AR8 was directed to a method for producing the meat substitute and not to the meat substitute as such.

1.9 As submitted by the appellant, new auxiliary request AR1A is based on that auxiliary request AR8. This new request addresses an inconsistency in claim 1 of previous auxiliary request AR8, which mentioned "at least two flavor precursors", although the preamble defined combinations of three specific flavour precursors. The other amendments, and in particular the wordings "the meat substitute is further characterized in that" and "enriched with one or more of the particular flavor precursor molecules" are not complex and aim at better defining and distinguishing the

claimed subject-matter from the prior art and/or at mirroring more closely the wording used in the application as filed, e.g. on page 3, lines 17 to 25.

1.10 The scope of claim 1 of auxiliary requests AR1A is not limited to leghaemoglobin, as claim 1 of previous AR8 was, and instead mentions an isolated "heme-containing protein". However, the omission of this limitation is not a complex amendment, and the general definition "heme-containing protein" was present in most of the previously filed requests and is thus not unexpected.

1.11 The other limitations of the claims to the first triple combination of flavour precursors cysteine, ribose and thiamine in AR2 and AR5 or to heme-containing proteins comprising specific sequences reduces the claimed subject-matter and cannot be considered complex either.

1.12 Claim 1 of auxiliary request AR1A differs from claim 1 of auxiliary requests AR1, AR2, AR3 and AR5, filed with the statement setting out the grounds of appeal, in that the wording "wherein the meat substitute is further characterized in that" is used instead of the wording "wherein the meat product is further characterized in that".

1.13 However, the new wording was adopted to address the respondent's objection in the reply to the statement setting out the grounds of appeal that the wording "the meat product is further characterised in that" in claim 1 of the previously filed requests did not comply with the requirements of Articles 84 and 123(2) EPC and that, for this reason, those requests should not be admitted into the appeal proceedings. Since the appellant had to have the chance to address this new

objection, the adoption of the new wording at a later stage of the appeal proceedings was justified.

1.14 For these reasons, auxiliary request AR1A is admitted into the proceedings (Article 12(4) and 13(1) RPBA).

2. *Amendments (Article 123(2) EPC)*

2.1 The respondent considered that the following amendments in claim 1 of auxiliary request AR1A create subject-matter not disclosed in the application as filed:

- the "isolated heme-containing protein"

  However, contrary to the respondent's submissions, the requirement that the heme-containing protein be isolated is directly and unambiguously disclosed on page 3, lines 3 to 13; page 9, line 26; page 14, lines 21 and 24; and in claim 39 (line 217) of the application as filed. These passages do not require the protein to be also purified.

- the combination of the flavour precursors cysteine, glucose and thiamine and the combination of the flavour precursors cysteine, ribose and thiamine

  However, these combinations of flavour precursors are directly and unambiguously disclosed on page 13, lines 6 and 7 of the application as filed, which refers to a mixture of "cysteine, glucose or ribose, and thiamine". Furthermore, these combinations are used to carry out the tests described in example 5 of the application as filed. Thus, the claimed combinations represent disclosed and preferred embodiments of the invention disclosed in the application as filed.

- the feature "*wherein the method comprises a step of combining the isolated heme-containing protein and the flavor precursor molecules, wherein the flavor precursor molecules are added in purified form or are derived from ingredients in the uncooked meat substitute that are enriched with one or more of the particular flavor precursor molecules*"

  However, this feature is disclosed on page 3, lines 17 to 19 and 22 to 25 of the application as filed.

- the feature "*wherein a taste and smell of meat is given to the meat substitute during the cooking process*"

  However, the concept of giving the smell and taste of meat to the meat substitute during the cooking process is the gist or at least the preferred way of carrying out the invention disclosed in the application as filed. This is readily apparent reading, for example, the passages on page 3, lines 16, 21, 22, 23 and 29; page 4, lines 5 to 8; page 18, lines 18 to 23; and the examples of the application as filed, which disclose processes in which the heme-containing protein and the flavour precursors are mixed and subjected to a cooking step. The aforementioned feature is thus also a preferred embodiment of the invention disclosed in the application as filed.

2.2 This means that all the aforementioned features are disclosed in the application as filed. The board does not agree with the respondent that the claimed subject-matter results from a combination of multiple selections from "lists of some length" which are not

disclosed in the application as filed. From the teaching of the application, as a whole, it is evident that the claimed subject-matter is a preferred form of implementing the application as filed. Furthermore, where certain selections have to be made (e.g. between the and/or options set out for using a purified flavour or a flavour derived from ingredients in the uncooked substitute), the "lists" are extremely short, namely they include only two options.

2.3 For this reason, the amendments mentioned by the respondent do not create subject-matter extending beyond the content of the application as filed.

3. *Scope of protection (Article 123(3) EPC)*

3.1 The respondent argued that claim 1 of auxiliary request AR1A extends the scope of protection beyond that conferred by the patent as granted.

3.2 Claim 1 of AR1A is directed to a method of making a meat substitute which is not described in the claims as granted. Claim 1 as granted defines a meat substitute, and claim 11 defines a method for imparting a beef-like flavour.

3.3 However, the board considers that claim 1 of AR1A does not extend the scope of protection beyond that conferred by the patent as granted. The reason is that the method of claim 1 of AR1A can only result in a product as defined in claim 1 as granted (see Case Law of the Board of Appeal of the EPO, 10th edn., 2020, section II.E.2.7.3).

3.4 The respondent suggested that claim 1 as granted defined a meat substitute which, before cooking,

already had the "inherent property" of developing the taste and smell of meat upon cooking. In other words, it contained heme-containing protein and flavour additives which upon cooking developed that smell and taste. Conversely, claim 1 of AR1A did not require the meat substitute to have this "inherent property". It encompassed a method for producing a meat substitute whose taste and smell were conferred by other ingredients, which could be added during the cooking step. Thus, claim 1 of AR1A defined a method in which the meat substitute before cooking did not have the "inherent property" of developing the smell and taste of meat upon cooking. Therefore, according to the respondent, claim 1 of AR1A extended the scope of protection beyond that of the granted patent.

3.5 These arguments are not convincing.

3.6 For assessing compliance with Article 123(3) EPC, both claim 1 as granted and claim 1 of AR1A should be interpreted ruling out interpretations which would be illogical or would not make technical sense. The interpretation should be technically sensible. Furthermore, it should take into account the whole disclosure of the patent (Article 69 EPC) (see Case Law of the Board of Appeal of the EPO, 10th edn., 2020, section II.E.2.7 and subsections).

3.7 Applying this approach, the skilled person would understand that the smell and the taste of both the meat substitute of claim 1 as granted and that obtained by the method of amended AR1A is developed when cooking a mixture of the claimed heme-containing protein and flavour precursors. This interpretation is readily apparent reading the claims with a mind willing to understand the claimed invention. It is further

confirmed by a reading which takes into account the whole disclosure of the patent.

3.8 For this reason, claim 1 of AR1A does not encompass the preparation of meat substitutes which differ from those defined in claim 1 as granted. Accordingly, claim 1 of AR1A does not extend the scope of protection conferred by the granted patent (Article 123(3) EPC).

4. *Clarity (Article 84 EPC)*

4.1 The respondent submitted that the following feature in claim 1 of AR1A is unclear:

- "*a taste and smell of meat is given to the meat substitute during the cooking process*"

4.2 This feature was already present in claim 1 as granted, defining a meat substitute, as such. However, according to the respondent, since the expression was not used in a claim relating to the manufacture of the substitute in the claims as granted, this expression was open to a clarity objection. Posing arguments similar to those presented when discussing compliance with Article 123(3) EPC, the respondent argued that it was unclear whether this feature was an "inherent functional feature" of the meat substitute. In other words, whether the taste and smell of meat was formed during cooking by the reaction between the heme-containing protein and the flavour precursors contained in the meat substitute. Claim 1 could encompass an alternative in which the taste and the smell were given by the addition of other additives, different from the claimed ingredients, during the cooking step.

4.3 These arguments are not persuasive. Analogously to what has been established when discussing Article 123(3) EPC, reading the claims with a mind willing to understand the invention, the skilled person would readily discard the interpretation of claim 1 suggested by the respondent. Thus, that person would not have any doubt as to the meaning of the aforementioned feature.

4.4 The respondent submitted that the following feature in claim 1 of AR1A is unclear:

- *"flavor precursors in purified form"*

As noted by the respondent, this feature does not define specific criteria for defining the purity of the flavour precursors. Nevertheless, the skilled person would understand that, in the context of the method of claim 1, this term means that the flavour precursors used have been subjected to a purification step, increasing their purity, whatever purity might have been achieved. Thus, despite being broad, the feature is clear.

4.5 The respondent also submitted that the following feature in claim 1 of AR1A is unclear:

- "*the flavor precursors [...] are derived from ingredients in the uncooked meat substitute that are enriched with one or more of the particular flavor precursor molecules/flavor precursors*"

According to the respondent, the wording "derived from" was unclear. It did not define whether the flavour precursors are present in ingredients used to prepare the meat substituent or whether further steps are

needed to isolate the precursors from those ingredients before they are used to prepare the meat substitute.

4.6 This argument is not persuasive either. The skilled person would understand that in the context of the method of claim 1, this expression encompasses both the aforementioned options of including the flavour precursors.

4.7 The respondent also argued that there was no antecedent for the "uncooked meat substitute" and the "ingredients [...] enriched with" mentioned in claim 1.

4.8 Nevertheless, despite the absence of an explicit antecedent, the "uncooked flavor precursor" is implicitly disclosed, this being the composition which is cooked to obtain the claimed meat substitute. The same applies to the claimed enriched ingredients. These encompass any ingredient used to prepare the uncooked meat substitute.

4.9 For these reasons, it is concluded that claim 1 is clear.

5. *Sufficiency of disclosure (Article 83 EPC)*

5.1 The respondent argued that the claimed invention was not sufficiently disclosed because it could not be carried out across the entire scope claimed without an undue burden.

5.2 As far as AR1A is concerned, the respondent submitted that there was no evidence and that there were actually serious doubts that the invention could be carried out, in particular when:

- using all the heme-containing proteins possibly encompassed by claim 1

The respondent submitted that the evidence shown in the examples of the patent related merely to one single heme-containing protein, leghaemoglobin. The results obtained using leghaemoglobin could not be generalised to different heme-containing proteins. Furthermore, in its opinion, paragraphs [0030] and [0060] of the patent provided the evidence that particular heme-containing proteins had to be chosen to control the formation of flavour compounds; otherwise undesired flavour compounds were generated changing the taste profile. The patent did not provide sufficient information to select heme-containing proteins inducing the desired taste. A research programme relying on trial and error was necessary. This involved an undue burden.

These arguments are not convincing. The results obtained with leghaemoglobin, e.g. in examples 3 and 5 of the patent, provide evidence that meat substitutes comprising heme-containing proteins and the claimed combination of flavour precursors have the taste of meat. Furthermore, the results of the tests of example 9, shown in Table 9 of the patent, show that volatile flavour compounds present in meat are generated by heating different types of heme-derived proteins with ribose and cysteine, which are flavour precursors according to the invention. Even if thiamine is not present, these tests provide additional evidence that the claimed invention can be carried out using different heme-derived proteins. The respondent's interpretation of paragraphs [0030] and [0060] is not convincing

either. These paragraphs teach, at most, that different smells and tastes can be obtained using different heme-comprising proteins. Yet, they do not teach that the variation is such that the meat substitute will not have the smell and taste of meat. Consequently, these passages do not provide evidence that it is impossible to achieve the claimed effect using the heme-containing proteins encompassed by claim 1.

- using all the flavour precursors mentioned in claim 1, and even less using any precursor concentration and any possible foreseeable pH

These arguments are not persuasive either. In the first place, claim 1 of AR1A has been limited to two flavour precursor combinations, namely: i) cysteine, glucose and thiamine and ii) cysteine, ribose and thiamine. Example 5 shows that combinations comprising these precursor combinations induce the taste of meat when heated with a heme-containing protein. Example 3 shows that other combinations comprising the relevant flavours also induce the desired taste. Furthermore, the examples indicate the concentration of the flavours and the pH used for the tests. Relying on this teaching, the skilled person would be able to find concentrations and pH values suitable for carrying out the method defined in claim 1. Conversely, that person would avoid working at concentrations and pH values which differ significantly from the ones mentioned in the patent, in particular if the claimed effect is not achieved when doing this.

5.3 The respondent mentioned decision T 38/11. However, this decision relates to a completely different technical field. The compounds, the effects, the available evidence and the technical considerations made in that decision differ significantly from those of the current case. Thus, T 38/11 is not relevant for this case.

5.4 For these reasons, the claimed invention is sufficiently disclosed (Article 83 EPC).

6. *Novelty (Article 54 EPC)*

6.1 The respondent argued that the claimed subject-matter was not novel over the disclosure of D13 and D98.

Novelty over D13

6.2 Paragraph [0364] of D13 discloses a method for preparing a meat substitute obtained by cooking (at 140°C for 10 minutes) a mixture of pea flour, sunflower oil and glucose in the presence of reduced leghaemoglobin, a heme-containing protein. From paragraph [0364], it is clear that the wording "in the presence of leghaemoglobin" means that the mixture which was cooked included the leghaemoglobin.

6.3 It is also evident from paragraph [0258] of D13 that, where reduced leghaemoglobin was used, this protein was subjected to an isolation step from soybean root-nodules. Furthermore, it is clear from claims 1 and 12 that the invention disclosed in D13 involves the use of an "isolated and purified protein", the protein being a heme-containing protein, such as haemoglobin. It is therefore clear that the leghaemoglobin used in the

method of paragraph [0364] was an "isolated protein" as meant in claim 1.

6.4 It was undisputed that the method for preparing the meat substitute of paragraph [0364] involved the addition of glucose to the cooked mixture. What was disputed was whether the disclosed method also involved the addition of cysteine, thiamine and ribose.

6.5 According to the respondent, these ingredients were all present in the pea flour used to prepare the meat substitute described in paragraph [0364] of D13. In its opinion, D89 to D92 confirmed that all these ingredients were found in peas and, necessarily, in any flour obtained from peas, including that of paragraph [0364] of D13. The respondent submitted that:

- D89 (page 3), a document from the U.S. Department of Agriculture, showed that peas comprised thiamine

- D90 (page 41) taught that legumes were rich in vitamin B1 (thiamine)

- D91 (see e.g. abstract) taught that cysteine was contained in pea cotyledons

- D92 (Table 2 on page 534) showed that dry pea flower comprised ribose, as well as glucose

6.6 Since pea flour was produced by simple mechanical processing of peas, pea flower necessarily contained the relevant ingredients, including thiamine, cysteine and ribose, present in peas.

6.7 The respondent's arguments are not persuasive. As counter-argued by the appellant, the pea and the pea

flours described in D89 to D92 are not necessarily those used in the tests in D13. The composition of the pea flour of D13, let alone its origin and processing steps, is not mentioned in this document and cannot be established, irrespective of whether the teaching of D89 to D91 is taken into account. In other words, there is no direct and unambiguous disclosure of the presence of cysteine, thiamine and ribose in the pea flour used in the method described in paragraph [0364] of D13.

6.8 D89 and D91 describe the composition of raw green peas or developing cotyledons and not pea flour.

6.9 Furthermore, although D90 states that legumes contain vitamin B1 (thiamine), this document does not refer to peas, let alone to pea flour. The generic reference to "legumes" in the passing reference in the second column of page 41 of D90 does not allow drawing definite conclusions as to the presence of this compound in peas, let alone in pea flour. The statement in D90 that "most legume flours are a good source of [...] the B vitamins" confirms that legumes may exist which contain such vitamins. D91 teaches that pea cotyledons contain cysteine, but there is no reference to already germinated peas, let alone to pea flour obtained from them.

6.10 Furthermore, D92 provides evidence that the composition of pea flour changes considerably, depending on how the pea flour is processed. For example, it shows that whereas considerable amounts of ribose and glucose are present in raw flour, these sugars were not detected in extruded flour (see Table 2, page 534). The respondent argued that the results in D92 were not conclusive and that it was unreasonable to assume that extruded flour did not contain these sugars. However, it was up to the

respondent to provide concrete evidence that the findings in D92 were not correct. Such results have not been provided.

6.11 D89, which according to the respondent shows that every green pea contains glucose and thiamine, does not mention cysteine and ribose, whereas D91, which in its opinion shows that cysteine is always present in peas, does not mention the presence of thiamine. This confirms that the cited documents do not provide a general teaching that any pea type or any flour obtained from peas, including that of paragraph [0364] of D13, contains cysteine, thiamine and ribose.

6.12 Consequently, D13 does not disclose a method involving the use of cysteine, thiamine and one of glucose or ribose. Thus, D13 does not directly and unambiguously disclose the method of claim 1 of auxiliary request AR1A.

Non-admittance of D116 and D118

6.13 To show that pea flour contained cysteine, thiamine, ribose and glucose, with its reply to the statement setting out the grounds of appeal, the respondent filed D116, D117 and D118. The respondent referred to the sections 16.15.1, 16.15.2 and 16.12.2 of D116, to page 22572 of D117, and to pages 10 and 11 and to Table 8 of D118. It argued that its reply to the grounds of appeal was the first opportunity to address the opposition division's finding that the pea flour of D13 did not contain thiamine and cysteine. D116, D117 and D118 were not complex or detrimental to procedural economy. Thus, in its opinion, these documents had to be admitted into the appeal proceedings.

6.14 The board, however, disagrees. As noted by the respondent, D116 describes biological pathways in living plants which involve heme-containing proteins, cysteine, thiamine and glucose. In its opinion, this shows that every plant cell contains cysteine, thiamine, glucose and heme-containing proteins, and hence all relevant ingredients mentioned in the claims. However, D116 does not mention the presence of these ingredients in peas, let alone in pea flour. D117 shows that ribose is present in all plant cells. However, this document does not mention peas, let alone pea flour.

6.15 D118 appears to report the total content of amino acids in pea flour but not the content of free amino acids, e.g. free cysteine, and does not disclose the particular type of pea flour of D13. Furthermore, even assuming that D118 showed that the tested pea flour contains cysteine, it would also show that this flour does not contain thiamine.

6.16 For these reasons, D116, D117 and D118 are not *prima facie* relevant for addressing the opposition division's finding. Furthermore, they raise new complex issues which are detrimental to the economy of the proceedings.

6.17 The issue of novelty over D13 and whether pea flour contained relevant flavour precursors was raised and addressed during the opposition proceedings. The opponent provided evidence to substantiate a new novelty attack at an advanced stage of the opposition proceedings (e.g. by letter dated 20 January 2020). It was at that stage that a complete case on this complex issue could and should have been filed. This is irrespective of the fact that the opposition division

then took an unfavourable and allegedly surprising opinion adverse to the respondent. Thus, D116, D117 and D118 are not admitted into the appeal proceedings.

Novelty over D98

6.18 D98 discloses a "Veggy burger", i.e. a meat substitute comprising, among other ingredients, a soy protein and an "autolyzed yeast extract" (see the table on page 4).

6.19 The respondent did not dispute that D98 does not disclose a heme-containing protein and the claimed flavour precursors. It argued as follows.

- The soy flour of D98 contained a heme-containing protein, as shown in D99, D103, D104 and D106.

  This argument is not persuasive. The ingredients contained in the soy flour used to prepare the Veggy burger are not mentioned in D98, nor can their presence be directly and unambiguously inferred from the teaching of D99, D103, D104 and D106. The reasons are analogous to those set out when dealing with D13. The source and the processing of that soy flour are not indicated in D98. It is thus impossible to ascertain whether the soy used to prepare the soy flower of D98 is the same used to prepare the soy products described in the cited documents. D99 and D104 refer to a certain lipid fraction obtained from soybean and to soybean oil, respectively. However, neither of them refers to a soy flour, as D98 does. Furthermore, as shown in Table 1 and the abstract of D106, the amount of heme-containing proteins in different soybean preparations can vary substantially. For these reasons, the argument presented in the

declaration D103 that the grinding of soy beans inevitably results in a flour containing heme-containing proteins because it does not alter the nature of the proteins in the soy beans is irrelevant. Consequently, it is not possible to directly and unambiguously establish whether the preparation of the Veggy burger of D98 involved the use of a heme-containing protein.

- The wording "an isolated heme-containing protein" did not distinguish the claimed protein from that of D98, let alone in a detectable amount.

  This argument is not convincing either. An isolated protein is a protein which has been substantially separated from other biological materials, such as sugar and fats, which are typically present in the environment in which the protein is produced and stored in nature. Reading claim 1 of auxiliary requests AR1 to AR5, the skilled person would understand that the claimed method includes a step in which a protein which has been substantially isolated from those other materials is added and combined with the flavour precursor molecules. The fact that other materials, including a non-isolated protein, may also be added in this step and included in the meat substitute is irrelevant. What counts is that the method of claim 1 includes a step in which an isolated heme-containing protein is used. The respondent's comparison with the claim of the main request, which defines a composition as such comprising the isolated protein, is not persuasive.

- The flavour precursors mentioned in claim 1 are contained i) in the soy flour of the Veggy burger

of D98, as shown in D90 and D98, and ii) in the autolysed yeast extract of that Veggy burger, as shown in D100, D101, D102 and D105.

This argument is not convincing, substantially for the same reasons presented when analysing D13. As mentioned above, D90 indicates that legumes contain vitamin B1 (thiamine) but does not refer to soy, let alone soy flour. The generic reference to "legumes" in the passing reference in the second column of page 41 of D90 does allow drawing definite conclusions as to the presence of this compound in soy, let alone in soy flour. The statement in D90 that "most legume flours" are a source of "B vitamins" confirms that legumes may exist which do not contain such vitamins. Moreover, Table 6 of D90 shows that the content of different types of ingredients varies considerably in legume flours. Although Table 6 does not mention thiamine, it confirms that the composition of legume flours varies considerably and cannot be generalised.

Similar considerations apply to the "autolyzed yeast extract" used to prepare the Veggy burger. This ingredient is not further characterised in D98. Neither the type of yeast used nor the conditions used for the autolysis are mentioned. These are critical for determining the nature of the mixture obtained during hydrolysis. This is evident from the teaching on page 8, lines 19 to 22 of D100, stating that "depending on the lysis method used, the yeast autolysate may comprise 5'-ribonucleotides in addition to cell wall or cell wall components, proteins, peptides, amino acids, minerals, carbohydrates, B-vitamins". Contrary to the respondent, the board considers that neither

this sentence nor the statement on page 1, lines 11 to 12 of D100 that "'yeast autolysate' has been known for many years as a source of protein, peptides, amino acids, fats, minerals and B-proteins" allows concluding that the autolysate of D98 contained thiamine or other specific amino acids, e.g. cysteine. This conclusion cannot be reached from D102 either. The fact that D102 reads "most post-fermented brewer's yeast [...] as a source of B-vitamins" using the plural when referring to B-vitamin, is not an indication that all B-Vitamins are present in brewer yeast. The same applies to D105 (page 420, last paragraph and Table 2), which refers generically to the presence of "ribonucleotides" and "nucleobases" in autolysed yeast extracts. The board concurs with the appellant that the compounds obtained after an autolysis reaction depend of the composition and conditions used during the reaction. A protein can be hydrolysed only partially to obtain peptides. Moreover, any free amino acid or ribose released from the hydrolysis of proteins or other biological materials can further react with other components present in the reaction mixture to form different compounds. D100 and D101 do not provide any conclusive information as to the composition and the processing of the autolysate used to prepare the Veggy burger of D98.

6.20 D101 was not admitted during the opposition proceedings. In view of the aforementioned finding, there is no need to discuss its admission in appeal.

6.21 For these reasons, it is concluded that D98 does not directly and unambiguously disclose the method for manufacturing a meat substituent involving the use of

isolated heme-containing protein, cysteine, thiamine, ribose and glucose, as defined in claim 1. Consequently, the claimed method is novel over the disclosure of this document.

Non-admittance of D119 and D120

6.22 To show that the autolysed yeast extract disclosed in D98 contained cysteine, ribose and glucose, the respondent filed D119 and D120 with its reply to the statement setting out the grounds of appeal. The respondent referred to certain pages of D119, allegedly showing that an autolysate from a *Saccharomyces cerevisiae* comprised ribose and glucose, and to certain pages of D120, allegedly showing that certain yeast autolysates comprised a mixture of cysteine and methionine. It argued that its reply to the grounds of appeal was the first opportunity to address the opposition division's finding and the appellant's arguments in the statement of grounds of appeal that the autolysed yeast extract did not contain these ingredients. D119 and D120 were not complex or detrimental to procedural economy. Thus, in its opinion, these documents had to be admitted into the appeal proceedings.

6.23 The board does not agree that D119 and D120 should be admitted. As noted by the respondent, D119 contains a compilation of selected pages from a more than 200-page long PhD thesis. Table 8 refers to particular autolysates and states that "almost no glucose" was found in autolysates and that this could be explained by rapid metabolism of the glucose (page 158). This confirms that the product of hydrolysis may further be metabolised. Moreover, D119 states that "more information is required about the chemical composition

for the autolysates". This confirms that D119 does not provide reliable and generalisable information as to the composition of autolysed yeast extracts. D120 relates to yeast extracts prepared under particular conditions employing a long action of lytic enzymes on yeast proteins throughout the autolysis process (see page 555, right-hand column and page 557, right-hand column). Thus, the observed results cannot be generalised either. Furthermore, neither the results in D119 nor those in D120 concern the autolysate of the Veggy burger of D98. The yeast extract and the conditions used for the hydrolysis are not necessarily the same. Consequently, D119 and D120 are not highly relevant for addressing the opposition division's finding and the appellant's arguments. In addition, these documents raise new complex issues which are detrimental to procedural economy.

6.24 The issue of novelty over D98 was raised during the opposition proceedings. The opponent provided evidence to substantiate its novelty attack at an advanced stage of the opposition proceedings (i.e. by letter dated 12 November 2020). It was at that stage that a complete case on this complex issue could and should have been filed. This is irrespective of the fact that the opposition division later took an unfavourable and allegedly surprising opinion adverse to the respondent. Thus, D119 and D120 are not admitted into the appeal proceedings.

7. *Inventive step*

7.1 Claim 1 relates to a method for making a meat substitute having the taste and the smell of meat, regardless of whether it contains animal products. The method involves a step in which an isolated heme-

containing protein, such as leghaemoglobin, is mixed with a combination of three precursor molecules, namely a combination of cysteine, thiamine and glucose OR a combination of cysteine, thiamine and ribose. The mixture is then subjected to cooking. The taste and the smell of meat are given to the substitute during the cooking step. As explained in paragraph [0011] of the patent, the heme-containing protein catalyses reactions generating meaty flavours which are typically found in meat.

7.2 The opposition division decided that the subject-matter did not involve an inventive step over D13, alone or in combination with D3. The board does not concur with this conclusion.

Closest prior art

7.3 The respondent did not dispute the opposition division's finding that D13 was the closest prior art but considered D98 and D39 as alternative starting points.

7.4 D13 relates, like the claimed invention, to a meat substitute and a method for making that substitute. The method involves combining an isolated and purified heme-containing protein with other ingredients, including glucose, one of the claimed flavour precursors. The combined mixture is cooked to obtain the aroma of cooked meat (see claims 1 and 12 and paragraph [0364]). Paragraph [0364] teaches that the heme-containing protein (leghaemoglobin) contributes favourably to the generation of meat aroma. Therefore, as decided by the opposition division and agreed by the parties, D13 is the closest prior art.

7.5 D98 relates to a meat substitute containing a starch, hydrocolloids and a vegetable oil (see paragraphs [0001], [0006] and [0007]; the claims; and the examples). Page 4 describes a "Veggy burger" comprising soy flour, vegan fat mimetic and autolysed yeast extract. However, D98 does not mention the relevance of any particular protein, let alone a heme-containing protein in the generation of meat flavours, this being the gist of the invention in the opposed patent. The relevance of the "flavor precursors" characterising claim 1 is not disclosed either. Thus, D98 is not a suitable starting point for assessing inventive step and is not the closest prior art.

7.6 D39 discloses a process for producing a "flavouring product reminiscent of meat". The process involves the use of a yeast hydrolysate, a protein hydrolysate, a monosaccharide and a sulphur containing substance (see the claims). The composition used to produce the flavouring product of examples 1 and 2 comprises, in addition to all compounds obtained by hydrolysing a yeast extract and a wheat gluten protein, thiamine, cysteine and glucose. However, D13 does not mention the use and the relevance of a heme-containing protein in the generation of relevant flavours. Furthermore, the "flavouring product" of D39 does not appear to be, as such, a "meat substitute" as defined in claim 1. Consequently, D39 is not a suitable starting point for assessing inventive step and is not the closest prior art either.

Distinguishing technical features

7.7 As established when discussing novelty, D13 discloses a method for making a meat substitute involving the use of a combination of a heme-containing protein and

glucose. However, D13 does not disclose a method involving the use of a combination of cysteine, thiamine and one of glucose or ribose. Considering the method involving the use of heme-containing protein and glucose as the starting point, the claimed use differs from that of D13 in the use of the additional flavour precursors cysteine and thiamine.

Technical effect

7.8 The results shown in Tables 8 and 18 of the patent show that the addition of leghaemoglobin (a heme-containing protein) to a combination of cysteine and either glucose or ribose or to a precursor mix containing glucose, ribose, cysteine, thiamine and glutamic acid produces a far larger number of meat aroma compounds than that obtained when the heme-derived protein or the flavour precursors are used alone. More than two thirds of the listed aroma compounds were not produced or were produced less abundantly when either the flavour precursors or the heme-containing protein were used alone. These results provide evidence of the principle underlying the invention, namely that the heme-containing protein enhances the production of desired meat aroma compounds.

7.9 These results differ from those shown in paragraph [0364] of D13. This paragraph identifies only two compounds associated with the aroma of cooked meat, namely 2-octanone and 2-methyl furan, which were found more abundantly when leghaemoglobin was used. D13 mentions that other compounds were produced, but these were not identified. Thus, D13 does not provide any indication or suggestion that a large number of the aroma compounds present in meat, and in particular those mentioned in Tables 8 and 18 of the opposed

patent, can be obtained if cysteine is used in combination with glucose or ribose.

7.10 Furthermore, example 5 of the patent teaches that the addition of thiamine to flavour reaction mixtures comprising a heme-containing protein, cysteine and either glucose or ribose induces the formation of aroma compounds which are present in meat having beefy and meaty taste notes. Specifically, 4-methyl-5-thiazoleethanol, 3,3'-dithiobis[2-methyl]-furan and 4-methylthiazole were formed by a mixture of leghaemoglobin with thiamine, cysteine and a sugar (either glucose or ribose). Comparative reaction mixtures not comprising thiamine did not generate these compounds. These compounds were not generated when heme-proteins were not present in the flavour reaction mixtures either. Furthermore, the flavour reaction samples were evaluated by a blinded trained sensory panel. This panel described the samples with the addition of thiamine as more complex in taste and more beefy, meaty and savoury (see example 5 in paragraphs [0090] to [0092] of the opposed patent).

7.11 The aforementioned results, together, provide convincing evidence that the combination of heme-containing compounds with the three claimed flavour precursors mixture comprising cysteine, thiamine and either glucose or ribose, induces the formation of a larger palette of meat aroma compounds than that of D13, obtained combining a heme-containing protein with glucose alone. The results also show that the claimed combination results in a more beefy, meaty and savoury taste and smell than that described in D13.

Underlying technical problem

7.12 Taking into account the aforementioned results, starting from D13, the underlying problem is the provision of a meat substitute having a more beefy, meaty and savoury taste and smell.

Non-obviousness of the claimed solution

7.13 According to the respondent, the claimed subject-matter did not involve an inventive step over the teaching of D13 in combination with that of D3, D4, D29 and D39. In its opinion, these latter documents would have prompted the skilled person to add pure cysteine, thiamine and ribose to the meat substitute of D13.

7.14 These arguments are not persuasive. D13 does not teach to use the claimed aroma precursor combinations to solve the aforementioned problem. The guidance missing from D13 is also not provided by D3, D4, D29 and D39 either.

- D3 is a 129-page review article on natural and simulated meat flavours. It mentions a wide variety of compounds believed to be potential meat aroma precursors which yield meat aroma compounds during cooking. These compounds are chemically very different and belong to 15 very different classes of organic compounds including glycopeptides, nucleic acids, free nucleotides, nucleosides, peptides, organic acids including free amino acids, sugars, sugar phosphates and amines. Glucose, ribose, cysteine and thiamine are listed along with a large number of other compounds which may, directly or indirectly, contribute to a meat flavour. However, D3 does not mention heme-

containing proteins and their role in the generation of meat aroma compounds during cooking. This is true also for the passages on pages 358, 359, 364, 367 and 399 cited by the respondent. Thus, D3 does not provide any guidance as to which of the multitude of different compounds described can undergo a reaction promoted by a heme-containing protein which yields a meat aroma compound. Consequently, the skilled person would not have found in D3 any incentive to add cysteine, thiamine (and ribose) to the heme-containing mixture used to prepare the meat substitute of D13. That person would not have expected the addition of cysteine and thiamine to result in the formation of the meat aromas and the taste described in the opposed patent, let alone in example 5. Thus, without hindsight, the skilled person starting from D13 would not have arrived at the claimed solution.

- D4 teaches that thiamine is an ingredient used to prepare synthetic meat flavours and that like cysteine, it contributes to a meat-like synthetic flavour. Furthermore, it refers to tests in which an aroma of meat was formed reacting at high temperature ribose with cystine or cysteine. However, like D3, D4 discloses a very large variety of possible precursors and aroma compounds but does not mention the use of an isolated heme-containing protein.

- The teaching of D29 and D39 does not go beyond that of D3 and D4. D29 mentions mixtures comprising, among others, cysteine, cystine or thiamine and a proteinaceous substances, preferably a protein hydrolysate to produce meat-like substances (D29, second page, right-hand column, lines 80 to 87).

D30 mentions the production of compositions reminiscent of meat in which monosaccharides, including ribose, reacted with sulphur comprising compounds such as cysteine and thiamine. Furthermore, it discloses products obtained combining glucose, thiamine and cysteine. However, like D3 and D4, D29 and D39 do not mention combinations comprising heme-contained proteins, let alone in an isolated form.

7.15 Finally, D18, a document titled "The Chemistry and Beef Flavor" prepared by the "National Cattlemen's Beef Association", which can be considered to represent common general knowledge in the field before the relevant date, discourages the use of heme-containing compounds in meat products. These compounds are said to promote oxidation reactions and the production of deleterious off-flavours, which have a negative effect on meat flavour, in particular after cooking (see pages 10 and 11). D18 confirms that the finding in the patent that a heme-containing protein can be combined with the claimed flavour precursors to produce beefy, meaty and flavoury taste would have been unexpected at the relevant date. The respondent submitted that the teaching of D18 was irrelevant because D13 already described meat substitutes comprising heme-containing proteins not having off-taste. However, this argument is unconvincing because D13 does not relate to compositions comprising the flavour precursors of claim 1. These precursors could also be oxidated in the presence of a heme-containing protein to generate off-tastes. From the teaching of the patent, it can be inferred that this does not occur. Moreover, the opponent has not demonstrated the formation of off-tastes using the claimed compounds.

7.16 For these reasons, the subject-matter of claim 1 and the dependent claims of auxiliary request AR1A, which are more limited in scope, involves an inventive step over the cited prior art *(Article 56 EPC)*.

8. *Adaptation of the description*

The appellant filed an amended description adapted to the claims of auxiliary request AR1A. The board sees no reasons to object to the amendments.

Order

For these reasons it is decided that:

The decision of the opposition division is to be set aside, and the patent is maintained on the basis of:

- claims 1 to 9 of auxiliary request 1A (AR1A) filed by letter dated 18 January 2024

- pages 1 to 54 of the description as filed by letter dated 10 December 2024

- Figures 1 and 2 of the patent specification

The Registrar: The Chairman:

K. Götz-Wein A. Haderlein

Decision electronically authenticated