

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CARGILL, INCORPORATED
Petitioner

v.

BUNGE LODERS CROKLAAN USA, LLC
Patent Owner

Case No. IPR2024-01360
Patent 7,645,473

**DECLARATION OF ALEJANDRO G. MARANGONI, PH.D.
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 7,645,473**

CARGILL EXHIBIT 1003
Cargill v. Bunge Loders Croklaan

Declaration of Alejandro G. Marangoni in Support of
Petition for *Inter Partes* Review of U.S. Patent No. 7,645,473

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EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 7,645,473, issued on January 12, 2010 to A. Herzing <i>et al.</i> (“the ’473 Patent”)
1002	File History of U.S. Patent Application No. 11/451,606, filed on June 13, 2006
1004	<i>Curriculum Vitae</i> of Alejandro G. Marangoni
1007	Petrauskaite, V., W. De Greyt, M. Kellens, and A. Huyghebaert. “Physical and Chemical Properties of Trans-Free Fats Produced by Chemical Interesterification of Vegetable Oil Blends.” <i>Journal of the American Oil Chemists' Society</i> , vol. 75, no. 4 (April 1998): 489-493.
1008	Hustedt, H. H. “Interesterification of Edible Oils.” <i>Journal of the American Oil Chemists' Society</i> , vol. 53, no. 6, Part2 (June 1976): 390-392.
1009	Idris, Nor Aini, Kurt G. Berger, and Augustine S. H. Ong. “Evaluation of Shortenings Based on Various Palm Oil Products” <i>Journal of the Science of Food and Agriculture</i> , vol. 46, no. 4 (January 1989): 481-493.
1010	Sreenivasan, B. “Interesterification of Fats.” <i>Journal of the American Oil Chemists' Society</i> , vol. 55, no. 11 (November 1978): 796-805.
1011	Neff, W. E., M. A. El-Agaimy, and T. L. Mounts. “Oxidative Stability of Blends and Interesterified Blends of Soybean Oil and Palm Olein.” <i>Journal of the American Oil Chemists' Society</i> , vol. 71, no. 10 (October 1994): 1111-1116.
1012	Gunstone, Frank D., John L. Harwood, and Fred B. Padley. <i>The Lipid Handbook</i> . 2nd ed. London: Chapman & Hall, © 1994.
1013	Kalenuik, Ron. <i>Simply Delicious Cooking 2</i> . Scarborough, Ontario, Canada: Magnanimity House Publishers, ©1994.

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EXHIBIT	DESCRIPTION
1014	Deffense, E. “Fractionation of Palm Oil.” <i>Journal of the American Oil Chemists’ Society</i> , vol. 62, no. 2 (February 1985): 376-385.
1015	Idris, Nor Aini, and Noor Lida Habi Mat Dian. “Interesterified Palm Products as Alternatives to Hydrogenation.” <i>Asia Pacific Journal of Clinical Nutrition</i> , vol. 14, no. 4 (2005): 396-401.
1016	Mensink, Ronald P., and Matijn B. Katan. “Effect of Dietary Trans Fatty Acids on High-Density and Low-Density Lipoprotein Cholesterol Levels in Healthy Subjects.” <i>New England Journal of Medicine</i> , vol. 323, no. 7 (16 August 1990): 439-445.
1017	List, G. R., E. A. Emken, W. F. Kwolek, T. D. Simpson, and H. J. Dutton. “Zero Trans Margarines: Preparation, Structure and Properties of Interesterified Soybean Oil-Soy Trisaturate Blends.” <i>Journal of the American Oil Chemists’ Society</i> , vol. 54, no. 10 (October 1977): 408-413.
1018	Bailey, Alton E. <i>Industrial Oil and Fat Products</i> . New York: Interscience Publishers, 1945.
1019	<i>CRC Handbook of Chemistry and Physics</i> . 95th ed. Boca Raton, FL: CRC Press, c2014.
1020	American Oil Chemists' Society. <i>Calculated Iodine Value</i> . AOCS Recommended Practice Cd 1c-85. Urbana, IL: American Oil Chemists' Society, 2009.
1021	Duns, M.L. “Palm Oil in Margarines and Shortenings.” <i>Journal of the American Oil Chemists’ Society</i> , vol. 62, no. 2 (February 1985): 408-410.

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EXHIBIT	DESCRIPTION
1022	Marangoni, A.G. and Rousseau, D. “The Influence of Chemical Intersterification on Physicochemical Properties of Complex Fat Systems 1. Melting and Crystallization.” <i>Journal of the American Oil Chemists’ Society</i> , vol. 75, no. 10 (1988): 165-1271.

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I, Alejandro G. Marangoni, hereby state as follows:

I. INTRODUCTION

1. I have been retained by Buchanan Ingersoll & Rooney (“Counsel”) on behalf of Cargill Incorporated (“Petitioner”) as an independent expert consultant in this *inter partes* review (“IPR”) proceeding before the United States Patent and Trademark Office (“PTO”).

2. I have been asked by Counsel to provide opinions regarding Claims 1, 6-9, and 11-24 of United States Patent No. 7,645,473 (“the ’473 Patent”). My opinions and the bases for my opinions are set forth below.

3. I am being compensated at my ordinary and customary consulting rate for my work, which is \$450 per hour. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other financial interest in this proceeding.

4. This report is based on information currently available to me. I reserve the right to continue my investigation and analysis, which may include a review of documents and information not listed above. I also reserve the right to expand or otherwise modify my opinions and conclusions as my investigation and study

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continues, and to supplement my opinions and conclusions in response to any additional information that becomes available to me.

II. BACKGROUND AND QUALIFICATIONS

5. All my opinions stated in this declaration are based on my own personal knowledge and professional judgment. In forming my opinions, I have relied on my knowledge and experience in designing, developing, researching, and teaching the technology referenced in this declaration.

6. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein. I understand that a copy of my current curriculum vitae, which details my education and professional and academic experience, is being submitted as EX1004. The following provides a brief overview of some of my experience that is relevant to the matters set forth in this declaration.

7. I am a Professor and Tier I Canada Research Chair in Food, Health and Aging at the University of Guelph, Canada. My work concentrates on the physical properties of food materials in foods, cosmetics and biolubricants, with particular emphasis on sustainability, preservation of biodiversity and health.

8. I have published over 500 refereed research articles, 90 book chapters, 18 books, and over 40 patents.

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9. I received the 2013 AOCS Stephen Chang award, the 2014 IFT Chang Award in Lipid Science, the 2014 AOCS Supelco/Nicholas Pelick Award, the 2015 ISF Kaufmann Medal, the 2017 AOCS Alton E. Bailey Medal, and the 2019 European Lipid Technology Award from EuroFed Lipids.

10. I am a fellow of the American Oil Chemists' Society, the Institute of Food Technologists and the Royal Society of Chemistry (U.K.). I am the Editor in Chief of both Current Opinion and Current Research in Food Science.

11. I founded and commercialized 3 major technology platforms with global reach.

12. I was honored as one of the 10 most influential Hispanic Canadians in 2012, a Fellow of the Royal Society of Canada in 2018, and an Officer of the Order of Canada in 2021.

13. I received a Ph.D. in food chemistry from the University of Guelph in 1989. I received a Bachelor in Agricultural Chemistry from the McGill University in 1986. I received an International Baccalaureate from the Lester B. Pearson College of the Pacific (UWC) in 1983.

III. INFORMATION CONSIDERED

14. In preparing this declaration, I have reviewed the '473 Patent and the exhibits and documents referenced herein. In addition, my opinions are further based on my education, training, experience, and knowledge in the relevant field.

IV. RELEVANT LEGAL STANDARDS

15. I am not an attorney and offer no legal opinions. For the purposes of this Declaration, I have been informed about certain aspects of the law that are relevant to my analysis, as summarized below.

A. Claim Interpretation

16. I have been informed that during an *inter partes* review proceeding, claims are to be construed in light of the specification as would be read by a person of ordinary skill in the relevant art at the time the application was filed. I have been informed that claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the relevant art in the context of the entire disclosure. A claim term, however, will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the claim term in the specification. In that case, the claim term will receive the definition set forth in the patent.

B. Perspective of One of Ordinary Skill in the Art

17. I have been informed that a patent is to be understood from the perspective of a hypothetical “person of ordinary skill in the art” (“POSITA”). Such an individual is considered to possess normal skills and knowledge in a particular technical field (as opposed to being a genius). I have been informed that in considering what the claims of a patent require, what was known prior to that patent, what a prior art reference discloses, and whether an invention is obvious or not, one must use the perspective of such a POSITA.

C. Anticipation

18. I have been informed that a claim is not patentable if it is anticipated. I have been informed that anticipation of a claim requires that every element of a claim is disclosed expressly or inherently in a prior art reference, arranged as in the claim, when considered from the perspective of a person of ordinary skill in the relevant art. I have been informed that when the structure recited in a reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. I have been informed that extrinsic evidence may be used to explain but not expand the meaning of terms and phrases used in the reference relied upon as anticipatory of the claimed subject matter.

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D. Obviousness

19. I have been informed that a patent claim is obvious under 35 U.S.C. § 103, and therefore invalid, if the claimed subject matter, as a whole, would have been obvious to a POSITA as of the priority date of the patent based on one or more prior art references and/or the knowledge of a POSITA.

20. I have been informed that an obviousness analysis must consider (1) the scope and content of the prior art, (2) the differences between the claims and the prior art, (3) the level of ordinary skill in the pertinent art, and (4) secondary considerations, if any, of non-obviousness (such as unexpected results, commercial success, long- felt but unmet need, failure of others, copying by others, and skepticism of experts).

21. I have been informed that a prior art reference may be combined with other references to disclose each element of the invention under 35 U.S.C. § 103. I have been informed that a reference may also be combined with the knowledge of a POSITA, and that this knowledge may be used to combine multiple references. I have been informed that a POSITA is presumed to know the relevant prior art. I have been informed that the obviousness analysis may take into account the inferences and creative steps that a POSITA would employ.

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22. In determining whether a prior art reference would have been combined with other prior art or other information known to a POSITA, I have been informed that the following principles may be considered:

- whether the references to be combined involve non-analogous art;
- whether the references to be combined are in different fields of endeavor than the alleged invention in the patent;
- whether the references to be combined are reasonably pertinent to the problems to which the inventions of the patent are directed;
- whether the combination is of familiar elements according to known methods that yields predictable results;
- whether a combination involves the substitution of one known element for another that yields predictable results;
- whether the combination involves the use of a known technique to improve similar items or methods in the same way that yields predictable results;
- whether the combination involves the application of a known technique to a prior art reference that is ready for improvement, to yield predictable results;

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- whether the combination is “obvious to try”;
- whether the combination involves the known work in one field of endeavor prompting variations of it for use in either the same field or a different one based on design incentives or other market forces, where the variations are predictable to a POSITA;
- whether there is some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- whether the combination requires modifications that render the prior art unsatisfactory for its intended use;
- whether the combination requires modifications that change the principle of operation of the reference;
- whether the combination is reasonably expected to be a success;
and
- whether the combination possesses the requisite degree of predictability at the time the invention was made.

23. I have been informed that in determining whether a combination of prior art references renders a claim obvious, it is helpful to consider whether there is

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some teaching, suggestion, or motivation to combine the references and a reasonable expectation of success in doing so. I have been informed, however, that a teaching, suggestion, or motivation to combine is not required.

V. SUMMARY OF OPINIONS

24. It is my opinion that Claims 1, 6-9, and 11-24 of the '473 Patent would have been obvious on the following grounds:

Ground	References	Basis	Claims Challenged
1	Petrauskaite (EX1007) in view of knowledge generally available in the art	103	1, 6-9, 11-17, and 20
2	Petrauskaite in view of Idris (EX1009)	103	18, 19, 21-24

VI. THE CHALLENGED '473 Patent

25. The '473 Patent contains 20 claims. I have been asked to opine on the validity of Claims 1, 6-9, and 11-24.

VII. LEVEL OF ORDINARY SKILL IN THE ART

26. I have been informed that POSITA is presumed to be aware of all pertinent art, thinks along conventional wisdom in the art, and is a person of ordinary creativity.

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27. I believe that a POSITA would have at least (1) a bachelor's degree in food science, biology, chemistry, or a related discipline (or equivalent course work) and 10 years of work experience in the food industry, or (2) a master's degree or Ph.D. in food science, biology, chemistry, or a related discipline (or equivalent course work) and at least 3 years of work experience in the food industry. A POSITA could also be part of a team of food scientists, including baking and confectionary chemists.

VIII. TECHNICAL BACKGROUND

A. The Purported Invention

28. The purported invention of the '473 Patent relates to a vegetable fat composition comprising triglycerides. EX1001, Abstract.

B. Vegetable oil blends were well-known prior to the '473 Patent.

29. Techniques for blending vegetable oils and chemically modifying them by hydrogenation, interesterification, or fractionation were known before the priority date. EX1015, 396. These methods were employed because it was known that most native vegetable oils have only limited applications in their original forms. EX1007, 489. However, partial hydrogenation reactions led to the formation of *trans* isomers, *i.e.*, *trans* fatty acids (TFAs). And, it had been determined as of the early 1990s that there is a direct relationship between TFAs and an increased risk for coronary heart

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disease. EX1016, Abstract. As a result of this controversy, the food industry sought to replace partially hydrogenated oils with other fat sources to lower *trans* content. EX1015, 396.

30. As mentioned above, interesterification was a known alternative to the partial hydrogenation process that could be used to provide fats and oils with the functionality desired by the food industry. In fact, interesterification had been applied since at least the 1940s to modify the physical properties of lard, *e.g.*, improve its poor creaming properties. EX1010, 802; EX1015, 397. Further, interesterification of blends of fully hydrogenated vegetable oil with a liquid oil had been used to produce a zero-*trans* solid fat with the industry's desired properties throughout the 1990s. EX1017, Abstract and 413. These interesterified vegetable fat blends were found to be suitable for use in soft tub-type margarines and as confectionary fat basestocks. EX1007, 489.

31. Thus, the zero- or low-*trans* content vegetable compositions suitable for baking and confections described in the '473 Patent had already been developed well before June 13, 2006—the filing date of the '473 Patent.

C. The '473 Patent Examination History

32. The '473 Patent issued from U.S. Application No. 11/451,606, filed on June 13, 2006. EX1001, Face Page. The '473 Patent issued on January 12, 2010. EX1001, Face Page.

D. Summary of the Applied Prior Art

1. "Petrauskaite" (EX1007)

33. Petrauskaite describes the physical and chemical properties of *trans*-free fats produced by chemical interesterification of vegetable oil blends. EX1007, Title. In particular, "[f]at blends, formulated by mixing a highly saturated fat (palm stearin or fully hydrogenated soybean oil) with a native vegetable oil (soybean oil) in different ratios from 10:90 to 75:25 (wt%), were subjected to chemical interesterification reactions." EX1007, Abstract. "Starting and interesterified blends were investigated for triglyceride composition, solid fat content, free fatty acid content, and *trans* fatty acid (TFA) levels." EX1007, Abstract. Petrauskaite relies on a soybean oil having an iodine value (IV) of 134.3 and a palm stearin having an IV of 26.0. EX1007, Table 1.

34. Petrauskaite demonstrates that "[t]he interesterified blends ... had plasticity curves in the range of commercial shortenings and stick-type margarines." EX1007, Abstract. Further, Petrauskaite demonstrates that "[c]onfectionery fat

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basestocks could be prepared from interesterified fat blends.” EX1007, Abstract. Finally, “TFA levels of interesterified blends were low (0.1%) compared to 1.3-12.1% in commercial food fats.” EX1007, Abstract.

2. “Hustedt” (EX1008)

35. Hustedt discusses the interesterification of edible oils. EX1008, Title. In particular, Hustedt teaches the various types of interesterification processes and the resulting expected fatty acid distribution (including positional isomers) among the interesterified oils. EX1008, Abstract, 390-391.

3. “Idris” (EX1009)

36. Idris discusses evaluating shortenings based on various palm oil products. EX1009, Title. In particular, “[s]everal formulations based on blends of hydrogenated palm oil ... and palm stearin (IV 44) with other liquid oils, on direct blends of palm stearin with other liquid oils, and on 100% inter-esterified palm olein, were used as feedstocks in shortening production.” EX1009, Abstract. The “[p]hysicochemical characteristics, creaming properties and baking performance of the shortenings were evaluated and compared with the best shortening on the market.” EX1009, Abstract. Idris demonstrates that in applications for both aerated cream and cakes, the experimental shortenings had excellent performance. EX1009, Abstract; *see also* EX1009, 492.

4. “Neff” (EX1011)

37. Neff discloses the fatty acid distribution of a soybean oil having an IV of 132.6. The IV value is determined by adding proportions of the wt% of all triglycerides comprising unsaturated fatty acids that make up soybean oil. EX1020. Here, those unsaturated fatty acids are oleic acid, linoleic acid, and linolenic acid (labeled as “18:1,” “18:2,” and “18:3” respectively in Table 1 of EX1011, 1112 reproduced below).¹ The wt% of the various saturated and unsaturated fatty acids of a soybean oil having an IV of 132.6 (“SBO”) are listed in Table 1 (see red box).

TABLE 1

Calculated Oxidizability (OX)^a, Fatty Acid Composition^b and Ratios of Linoleic (L) and Linolenic (Ln) Acid to Oleic (O) Acid for Soybean Oil (SBO), Palm Olein (PO) and Their Blends and Interesterified Blends

	OX	Fatty acid area percent							L/O	Ln/O
		14:0	16:0	18:0	18:1	18:2	20:0	18:3		
SBO	0.679	—	10.0	4.2	25.4	53.4	—	7.0	2.10	0.28

5. “Deffense” (EX1014)

38. Deffense discloses the wt% of the various saturated and unsaturated fatty acids of a palm stearin having an IV of 24.9 (see red box of Table IV, reproduced below from EX1014, 380).

¹ The IV value for soybean oil is $(0.860 \times 25.4) + (1.732 \times 53.4) + (2.616 \times 7.0) = 132.6$. EX1020, Calculation #1.

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TABLE IV

Alfa Laval Oleins and Stearins from Single Stage Fractionation

Palm oil	Indonesia		Crude
Origin	Stearin	Olein	Stearins
Fraction			
Code	230		223-2
Iodine value (GLC)	24.9	58.0	28.0
Yield (%) (calc.)	20	80	17
Slip melting point (C)	55.9	19.0	55.3
SFC (%) by pulsed NMR			
5 C	92.0	49.2	91.4
10 C	92.1	32.7	90.0
15 C	90.8	9.2	84.9
20 C	86.6	—	79.8
25 C	78.0		71.5
30 C	68.2		61.6
35 C	57.0		51.8
40 C	46.0		41.9
45 C	35.8		32.2
50 C	25.0		22.5
55 C	9.3		7.9
Fatty acids (% wt as Me)			
C 16:0	68.8	40.0	66.2
C 18:0	5.1	4.3	4.8
C 18:1	19.1	40.8	21.6
C 18:2	4.5	12.3	5.0
FFA (mol wt 256) (%)	2.2	3.9	2.2
Diglyceride (% wt)	3.6	6.5	2.8
Triglyceride (% wt)	96.4	93.4	97.2
Triglyceride composition (area %) by HPLC			
S ₃	46.1	.2	42.0
S ₂ U	43.9	50.9	41.4
SU ₂	9.2	43.2	14.2
U ₃	.8	5.7	2.4
Cloud point (C)	—	9.8	—
Cold test at 22 C (days)	—	4	—

IX. CLAIM CONSTRUCTION

39. For purposes of my analysis in this IPR proceeding, I have been informed that terms that appear in the claims of the '473 Patent should be interpreted

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according to their plain and ordinary meaning under the *Phillips* standard. In determining the ordinary and customary meaning, I have been informed that the words of a claim are first given their plain meaning that those words would have had to a POSITA at the time of the alleged invention. I also have been informed that the claims, specification, and file history may be used to better construe a claim insofar as the plain meaning of the claims cannot be understood. I have been informed that even treatises and dictionaries may be used under limited circumstances to determine the meaning attributed by a POSITA to a claim term at the time of filing.

40. I have reviewed the '473 Patent and its prosecution history as well as additional documents in considering each claim term's plain-meaning.

41. I believe that resolution of this Petition does not depend on which constructions are used because these features of the claims are disclosed by the prior art regardless of the construction.

42. However, the '473 Patent does provide statements as to how certain claim terms should be interpreted.

A. "S₂U"

43. The '473 Patent states that "S₂U refers to combined SSU and SUS." EX1001, 1:32-33. Further, the '473 Patent state that "a pure triglyceride containing three saturate fatty acid residues is denoted SSS (or S₃) and a triglyceride having

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saturated fatty acids at the 1 and 3 positions and an unsaturated fatty acid at the 2-position is denoted SUS.” EX1001, 1:28-32.

44. So, I understand the term S_2U to mean a genus of triglycerides encompassing saturated fatty acids at the 1 and 3 positions and an unsaturated fatty acid at the 2-position (*e.g.*, SUS), saturated fatty acids at the 1 and 2 positions and an unsaturated fatty acid at the 3-position (*e.g.*, SSU) and saturated fatty acids at the 2 and 3 positions, and an unsaturated fatty acid at the 1-position (*e.g.*, USS).

B. “ SU_2 ”

45. The '437 Patent states that “ SU_2 refers to combined SUU and USU.” EX1001, 1:33. Accordingly, I understand the term SU_2 to mean a genus of triglycerides encompassing unsaturated fatty acids at the 1 and 3 positions and a saturated fatty acid at the 2-position (*e.g.*, USU), unsaturated fatty acids at the 1 and 2 positions and a saturated fatty acid at the 3-position (*e.g.*, UUS), and unsaturated fatty acids at the 2 and 3 positions and a saturated fatty acid at the 1-position (*e.g.*, SUU).

C. “ N_{10} ”

46. The '473 Patent states that “N values are based on unstabilized fats [and] the term N_x refers to solid fat content, measured by NMR pulse techniques on unstabilized fats.” EX1001, 4:19-21. The patent further explains that

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“[u]nstabilized meaning that the fat was melted at 80°C., kept at 60°C. for 5 minutes, cooled to 0°C., kept at 0°C. for 1 hour and kept at measurement temperature for 30 minutes.” EX1001, 4:22-24.

47. As such, I understand the term N_{10} to mean a solid fat content, measured by pulse NMR techniques on unstabilized fats, wherein the measurement temperature is 10°C.

D. “ N_{20} ”

48. Likewise, I understand the term N_{20} to mean a solid fat content, measured by pulse NMR techniques on unstabilized fats, wherein the measurement temperature is 20°C. EX1001, 4:14-24.

E. “ N_{30} ”

49. I understand the term N_{30} to mean a solid fat content, measured by pulse NMR techniques on unstabilized fats, wherein the measurement temperature is 30°C. EX1001, 4:14-24.

F. “essentially free of trans fatty acid residues”

50. The '473 Patent states that “[p]referably, the composition of the invention is essentially free of trans fatty acid residues.” EX1001, 4:25-26. As examples, the patent states that “the composition may contain trans fatty acid

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residues in the triglycerides in an amount of less than 1% by weight, more preferably less than 0.5% by weight, such as less than 0.1% by weight.” EX1001, 4:26-29.

51. Thus, at a minimum, I understand that the term “essentially free of trans fatty acid residues” encompasses a composition that contains trans fatty acid residues in the triglycerides in an amount of less than 1% by weight.

X. Claims 1, 6-9, 11-17, and 20 Would Have Been Obvious Over Petruskaite in view of Knowledge Generally Available in the Art (Ground 1)

52. In my opinion, Claims 1, 6-9, 11-17, and 20 would have been obvious over Petruskaite and knowledge generally available in the art.

53. The following sections explain where each element of these claims is found in this prior art.

A. Claim 1 (Preamble): A vegetable fat composition comprising glycerides, wherein the triglyceride content of the composition is:

54. The preamble of Claim 1 is disclosed in Petruskaite.

55. Petruskaite discloses “[f]at blends, formulated by mixing a highly saturated fat (palm stearin or fully hydrogenated soybean oil) with a native vegetable oil (soybean oil).” EX1007, Abstract. Palm oil, soybean oils, and fractions thereof were all known in the art to be vegetable fats that comprise triglycerides. *See, e.g.*, EX1012, 82-86, 96-97.

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56. In my opinion, Petruskaite discloses the requirements of the preamble of Claim 1.

**1. [1.1]: 6 to 20% SSS,...all percentages are by weight based
on the total triglycerides present in the composition**

57. Element [1.1] is disclosed in Petruskaite (EX1007) and knowledge generally available in the art.

58. Table 2 of Petruskaite lists SSS (*i.e.*, “S₃”) as a molar percentage based on the total triglycerides present in the composition (*i.e.*, “mol%”). EX1007, 490. Petruskaite suggests that all triglycerides, *i.e.*, total triglycerides, are accounted for. EX1007, 490. Petruskaite discloses two blends of palm stearin and soybean oil (after interesterification) that have a SSS triglyceride mol% of 6.3% and 10.4%: Palm stearin/soybean oil (Pst/SBO) fat blends “40:60” and “50:50,” respectively. EX1007, 490.

59. Petruskaite is silent with respect to the wt% of the listed triglycerides. However, the wt% of Petruskaite’s fat blends can easily be calculated based on the generally available prior art knowledge of fatty acid compositions of palm stearin and soybean oil. Here, the molecular weights and relative proportions of the various fatty acids in palm stearin and soybean oil were within the general knowledge of a POSITA.

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60. The general knowledge in the art includes documents, such as Neff (EX1011), Deffense (EX1014), Bailey (EX1018), and the CRC (EX1019).

**a) Determining Average Molecular Weight of Saturated
and Unsaturated Fatty Acids in 100% Palm Stearin
and 100% Soybean Oil**

61. The claims recite the contributions of various saturated (S) and unsaturated (U) fatty acids to the triglyceride content of the vegetable fat composition.

62. Accordingly, the first step in converting Petrauskaite's triglyceride mol% to wt% requires determining the average molecular weight of saturated and unsaturated fatty acids in the individual components of Petrauskaite's "40:60" and "50:50 fat blends. That is, the average molecular weight of saturated and unsaturated fatty acids in 100% palm stearin and (separately) 100% soybean oil needs to be determined. This is done by multiplying the relative proportions of each fatty acid with their respective molecular weight. I provide the equations I relied on to determine the average molecular weight of saturated and unsaturated fatty acids in 100% palm stearin below:

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Avg. Mol. Wt for Saturated Fatty Acids

$$= (\text{Mol. Wt of Palmitic Acid})^2 * \frac{\text{wt\% of Palmitic Acid}^3}{\text{Total wt\% of Saturated Fatty Acids}} +$$

$$(\text{Mol. Wt of Stearic Acid})^4 * \frac{\text{wt\% of Stearic Acid}}{\text{Total wt\% of Saturated Fatty Acids}}$$

Avg. Mol. Wt for Unsaturated Fatty Acids

$$= (\text{Mol. Wt of Oleic Acid})^5 * \frac{\text{wt\% of Oleic Acid}^6}{\text{Total wt\% of Unsaturated Fatty Acids}} +$$

$$(\text{Mol. Wt of Linoleic Acid})^7 * \frac{\text{wt\% of Linoleic Acid}}{\text{Total wt\% of Unsaturated Fatty Acids}}$$

63. Palm stearin is known to be comprised of the following fatty acids with the reported wt% and molecular weights found in Deffense (EX1014, Table IV) and Bailey (EX018, Tables 2 and 4), respectively:

Table 1

	Saturated Fatty Acids		Unsaturated Fatty Acids	
	Palmitic Acid (C _{16:0})	Stearic Acid (C _{18:0})	Oleic Acid (C _{18:1})	Linoleic Acid (C _{18:2})
wt%	68.8	5.1	19.1	4.5

² Mol. Wt of Palmitic Acid obtained from Bailey, EX1018, Table 2.

³ Wt% of Palmitic Acid and Stearic Acid (and the total wt% of all saturated fatty acids) obtained from Deffense, EX1014, Table IV.

⁴ Mol. Wt of Stearic Acid obtained from Bailey, EX1018, Table 2.

⁵ Mol. Wt of Oleic Acid obtained from Bailey, EX1018, Table 4.

⁶ Wt% of Oleic Acid and Linoleic Acid (and the total wt% of all unsaturated fatty acids) obtained from Deffense, EX1014, Table IV.

⁷ Mol. Wt of Linoleic Acid obtained from Bailey, EX1018, Table 4.

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Mol. Wt (g/mol)	256.42	284.47	282.44	280.43
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64. When I performed this first multiplication step for palm stearin, I determined that the average molecular weight for saturated fatty acids of 100% palm stearin is 258.4 g/mol and the average molecular weight for unsaturated fatty acids of 100% palm stearin is 282.1 g/mol. See below for the respective calculations:

Avg. Mol. Wt for Saturated Fatty Acids =

$$\left(256.42 \frac{\text{g}}{\text{mol}}\right) * \frac{68.8}{(68.8 + 5.1)} + \left(284.47 \frac{\text{g}}{\text{mol}}\right) * \frac{5.1}{(68.8 + 5.1)} = 258.4 \frac{\text{g}}{\text{mol}} \text{ saturated fatty acid}$$

Avg. Mol. Wt for Unsaturated Fatty Acids

$$= \left(282.44 \frac{\text{g}}{\text{mol}}\right) * \frac{19.1}{(19.1 + 4.5)} + \left(280.43 \frac{\text{g}}{\text{mol}}\right) * \frac{4.5}{(19.1 + 4.5)}$$

$$= 282.1 \frac{\text{g}}{\text{mol}} \text{ unsaturated fatty acid}$$

65. Likewise, soybean oil is known to be comprised of the following fatty acids with the reported wt% and molecular weights found in Neff (EX1011, Table 1) and Bailey (EX1018, Tables 2 and 4), respectively:

Table 2

	Saturated Fatty Acids		Unsaturated Fatty Acids		
	Palmitic Acid (C _{16:0})	Stearic Acid (C _{18:0})	Oleic Acid (C _{18:1})	Linoleic Acid (C _{18:2})	Linolenic Acid (C _{18:3})
wt%	10	4.2	25.4	53.4	7

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Mol. Wt (g/mol)	256.42	284.47	282.44	280.43	278.41
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66. When I performed this first multiplication step for soybean oil, I determined that the average molecular weight for saturated fatty acids of 100% soybean oil is 264.7 g/mol and the average molecular weight for unsaturated fatty acids of 100% soybean oil is 280.8 g/mol. See below for the respective calculations:

Avg. Mol. Wt for Saturated Fatty Acids

$$\begin{aligned}
 &= (\text{Mol. Wt of Palmitic Acid}) * \frac{\text{wt\% of Palmitic Acid}^8}{\text{Total wt\% of Saturated Fatty Acids}} + \\
 &(\text{Mol. Wt of Stearic Acid}) * \frac{\text{wt\% of Stearic Acid}}{\text{Total wt\% of Saturated Fatty Acids}} \\
 &\left(256.42 \frac{\text{g}}{\text{mol}}\right) * \frac{10.0}{(10.0 + 4.2)} + \left(284.47 \frac{\text{g}}{\text{mol}}\right) * \frac{4.2}{(10.0 + 4.2)} \\
 &= 264.7 \frac{\text{g}}{\text{mol}} \text{ saturated fatty acid}
 \end{aligned}$$

Avg. Mol. Wt for Unsaturated Fatty Acids

$$= (\text{Mol. Wt of Oleic Acid}) * \frac{\text{wt\% of Oleic Acid}^9}{\text{Total wt\% of Unsaturated Fatty Acids}} +$$

⁸ Wt% of Palmitic Acid and Stearic Acid (and the total wt% of all saturated fatty acids) obtained from Neff, EX1011, Table 1.

⁹ Wt% of Oleic Acid, Linoleic Acid, and Linolenic Acid (and the total wt% of all unsaturated fatty acids) obtained from Neff, EX1011, Table 1.

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$$\begin{aligned}
 & (\text{Mol. Wt of Linoleic Acid}) * \frac{\text{wt\% of Linoleic Acid}}{\text{Total wt\% of Unsaturated Fatty Acids}} \\
 & + (\text{Mol. Wt of Linolenic Acid})^{10} * \frac{\text{wt\% of Linolenic Acid}}{\text{Total wt\% of Unsaturated Fatty Acids}} \\
 & \left(282.44 \frac{\text{g}}{\text{mol}} \right) * \frac{25.4}{(25.4 + 53.4 + 7.0)} + \left(280.43 \frac{\text{g}}{\text{mol}} \right) * \frac{53.4}{(25.4 + 53.4 + 7.0)} + (278.41) \\
 & * \frac{7.0}{(25.4 + 53.4 + 7.0)} = 280.8 \frac{\text{g}}{\text{mol}}
 \end{aligned}$$

**b) Determining Average Molecular Weight of
Triglyceride Species in 100% Palm Stearin and 100%
Soybean Oil**

67. The claims recite the contributions of various triglyceride species to the vegetable fat composition.

68. Accordingly, the second step in converting Petrauskaite's triglyceride mol% to wt% requires determining the average molecular weights for various triglyceride species within 100% palm stearin and 100% soybean oil. As each triglyceride molecule contains 3 fatty acids and 1 glycerol molecule (and the loss of 3 water molecules through condensation reactions), the average molecular weight of each triglyceride species can be determined by simply (i) adding the average molecular weight of each of the 3 fatty acids of the triglyceride species to the molecular weight of glycerol (EX1019, 3-284), and (ii) subtracting the molecular

¹⁰ Mol. Wt of Linolenic Acid obtained from Bailey, EX1018, Table 4.

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weight of 3 water molecules (EX1019, 4-98). I provide the equations I relied on to determine the average molecular weight of various triglyceride species in 100% palm stearin below:

Avg. Mol. Wt for SSS Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) * 3 + (\text{Mol. Wt of Glycerol}^{11}) \\ &- (\text{Mol. Wt of Water}^{12}) * 3 \end{aligned}$$

Avg. Mol. Wt for UUU Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) * 3 + (\text{Mol. Wt of Glycerol}) \\ &- (\text{Mol. Wt of Water}) * 3 \end{aligned}$$

Avg. Mol. Wt for SU2 Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) \\ &+ (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) * 2 + (\text{Mol. Wt of Glycerol}) \\ &- (\text{Mol. Wt of Water}) * 3 \end{aligned}$$

Avg. Mol. Wt for S2U Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) * 2 \\ &+ (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) + (\text{Mol. Wt of Glycerol}) \\ &- (\text{Mol. Wt of Water}) * 3 \end{aligned}$$

69. When I performed this second addition/subtraction step, I determined that the average molecular weight for the various triglycerides of 100% palm stearin as follows (summarized in Table 3):

¹¹ Mol. Wt of glycerol obtained from CRC, EX1019, 4-98.

¹² Mol. Wt of water obtained from CRC, EX1019, 3-284.

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Avg. Mol. Wt for SSS Triglyceride =

$$258.4 \frac{\text{g}}{\text{mol}} * 3 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 813.2 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for UUU Triglyceride =

$$282.1 \frac{\text{g}}{\text{mol}} * 3 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 884.4 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for SU₂ Triglyceride =

$$258.4 \frac{\text{g}}{\text{mol}} + 282.1 \frac{\text{g}}{\text{mol}} * 2 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 860.7 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for S₂U Triglyceride =

$$258.4 \frac{\text{g}}{\text{mol}} * 2 + 282.1 \frac{\text{g}}{\text{mol}} + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 837.0 \frac{\text{g}}{\text{mol}}$$

Table 3

	Triglyceride Species			
	SSS	UUU	SU₂	S₂U
Avg. Mol. Wt (g/mol)	813.2	884.4	860.7	837.0

70. Likewise, I determined the average molecular weight for the various triglycerides in 100% soybean oil and provide them below (summarized in Table 4):

Avg. Mol. Wt for SSS Triglyceride

$$= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) * 3 + (\text{Mol. Wt of Glycerol})$$

$$- (\text{Mol. Wt of Water}) * 3$$

$$264.7 \frac{\text{g}}{\text{mol}} * 3 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 832.3 \frac{\text{g}}{\text{mol}}$$

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Avg. Mol. Wt for UUU Triglyceride

$$= (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) * 3 + (\text{Mol. Wt of Glycerol}) \\ - (\text{Mol. Wt of Water}) * 3 \\ 280.8 \frac{\text{g}}{\text{mol}} * 3 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 880.5 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for SU₂ Triglyceride

$$= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) \\ + (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) * 2 + (\text{Mol. Wt of Glycerol}) \\ - (\text{Mol. Wt of Water}) * 3 \\ 264.7 \frac{\text{g}}{\text{mol}} + 280.8 \frac{\text{g}}{\text{mol}} * 2 + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 864.4 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for S₂U Triglyceride

$$= (\text{Avg. Mol. Wt of Saturated Fatty Acid}) * 2 \\ + (\text{Avg. Mol. Wt of Unsaturated Fatty Acid}) + (\text{Mol. Wt of Glycerol}) \\ - (\text{Mol. Wt of Water}) * 3 \\ 264.7 \frac{\text{g}}{\text{mol}} * 2 + 280.8 \frac{\text{g}}{\text{mol}} + 92.1 \frac{\text{g}}{\text{mol}} - 3 * 18.0 \frac{\text{g}}{\text{mol}} = 848.3 \frac{\text{g}}{\text{mol}}$$

Table 4

	Triglyceride Species			
	SSS	UUU	SU ₂	S ₂ U
Avg. Mol. Wt (g/mol)	832.3	880.5	864.4	848.3

**c) Determining Average Molecular Weight of
Triglyceride Species in Palm Stearin/Soybean Oil
Blends**

71. The third step in converting Petrauskaite's triglyceride mol% to wt% requires determining the average molecular weight for the various triglyceride species within Petrauskaite's "40:60" and "50:50" Pst/SBO fat blends. This is done by multiplying the average molecular weight of each triglyceride species in each of 100% palm stearin and 100% soybean oil with their relative wt% contribution to the fat blend.

72. When I performed this third multiplication step, I determined that the average molecular weight for the various triglycerides of the "40:60" and "50:50" Pst/SBO fat blends as follows (summarized in Table 5):

Avg. Mol. Wt for SSS Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of SSS Triglyceride of 100\% Palm Stearin}) * 0.4 \\ &+ (\text{Avg. Mol. Wt of SSS Triglyceride of 100\% Soybean Oil}) * 0.6 \end{aligned}$$

$$813.2 \frac{\text{g}}{\text{mol}} * 0.4 + 832.3 \frac{\text{g}}{\text{mol}} * 0.6 = 824.7 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for UUU Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of UUU Triglyceride of 100\% Palm Stearin}) * 0.4 \\ &+ (\text{Avg. Mol. Wt of UUU Triglyceride of 100\% Soybean Oil}) * 0.6 \end{aligned}$$

$$884.4 \frac{\text{g}}{\text{mol}} * 0.4 + 880.5 \frac{\text{g}}{\text{mol}} * 0.6 = 882.1 \frac{\text{g}}{\text{mol}}$$

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Avg. Mol. Wt for SU2 Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of SU2 Triglyceride of 100\% Palm Stearin}) * 0.4 \\ &+ (\text{Avg. Mol. Wt of SU2 Triglyceride of 100\% Soybean Oil}) * 0.6 \\ &860.7 \frac{\text{g}}{\text{mol}} * 0.4 + 864.4 \frac{\text{g}}{\text{mol}} * 0.6 = 862.9 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Avg. Mol. Wt for S2U Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of S2U Triglyceride of 100\% Palm Stearin}) * 0.4 \\ &+ (\text{Avg. Mol. Wt of S2U Triglyceride of 100\% Soybean Oil}) * 0.6 \\ &837.0 \frac{\text{g}}{\text{mol}} * 0.4 + 848.3 \frac{\text{g}}{\text{mol}} * 0.6 = 843.8 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Avg. Mol. Wt for SSS Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of SSS Triglyceride of 100\% Palm Stearin}) * 0.5 \\ &+ (\text{Avg. Mol. Wt of SSS Triglyceride of 100\% Soybean Oil}) * 0.5 \\ &813.2 \frac{\text{g}}{\text{mol}} * 0.5 + 832.3 \frac{\text{g}}{\text{mol}} * 0.5 = 822.7 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Avg. Mol. Wt for UUU Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of UUU Triglyceride of 100\% Palm Stearin}) * 0.5 \\ &+ (\text{Avg. Mol. Wt of UUU Triglyceride of 100\% Soybean Oil}) * 0.5 \\ &884.4 \frac{\text{g}}{\text{mol}} * 0.5 + 880.5 \frac{\text{g}}{\text{mol}} * 0.5 = 882.5 \frac{\text{g}}{\text{mol}} \end{aligned}$$

Avg. Mol. Wt for SU2 Triglyceride

$$\begin{aligned} &= (\text{Avg. Mol. Wt of SU2 Triglyceride of 100\% Palm Stearin}) * 0.5 \\ &+ (\text{Avg. Mol. Wt of SU2 Triglyceride of 100\% Soybean Oil}) * 0.5 \end{aligned}$$

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$$860.7 \frac{\text{g}}{\text{mol}} * 0.5 + 864.4 \frac{\text{g}}{\text{mol}} * 0.5 = 862.6 \frac{\text{g}}{\text{mol}}$$

Avg. Mol. Wt for S2U Triglyceride

$$= (\text{Avg. Mol. Wt of S2U Triglyceride of 100\% Palm Stearin}) * 0.5$$

$$+ (\text{Avg. Mol. Wt of S2U Triglyceride of 100\% Soybean Oil}) * 0.5$$

$$837.0 \frac{\text{g}}{\text{mol}} * 0.5 + 848.3 \frac{\text{g}}{\text{mol}} * 0.5 = 842.7 \frac{\text{g}}{\text{mol}}$$

Table 5

	Triglyceride Species for Fat Blends			
	SSS	UUU	SU₂	S₂U
Avg. Mol. Wt (g/mol) 40:60 Pst/SBO	824.7	882.1	862.9	843.8
Avg. Mol. Wt (g/mol) 50:50 Pst/SBO	822.7	882.5	862.6	842.7

d) Determining Total Weight and Wt% of Triglyceride Species in Petrauskaite’s Interesterified Pst/SBO Fat Blends

73. A modified version of Petrauskaite’s Table 2 (“I” column) is provided below, wherein only measured triglyceride mol% for the “40:60” and “50:50” interesterified Pst/SBO fat blends are listed:

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Table 6

	UUU (mol%)	SU ₂ (mol%)	SSS (mol%)	S ₂ U ¹³ (mol%)
40:60 (Pst/SBO wt%)	23.0	33.6	6.3	37.1
50:50 (Pst/SBO wt%)	21.0	29.3	10.4	39.3

74. The fourth step in converting Petruskaite’s triglyceride mol% to wt% requires determining the average weight for the various triglyceride species within Petruskaite’s “40:60” and “50:50” Pst/SBO fat blends.

75. I determined the total weight of each triglyceride species in each of Petruskaite’s fat blends by multiplying the reported prior art mol% with the average molecular weights provided above. See Table 7 below.

Table 7

	UUU			SU ₂		
	Mol%	Avg. Mol Wt. (g/mol)	Weight (g)	Mol %	Avg. Mol Wt. (g/mol)	Weight (g)
40:60 (Pst/SBO wt%)	23.0	882.1	20288.3	33.6	862.9	28993.4
50:50 (Pst/SBO wt%)	21.0	882.5	18532.5	29.3	862.6	25274.2

¹³ Petruskaite notes that “[m]onounsaturated (S₂U) can be calculated by subtraction (S₂U = 100 – U₃ – U₂S – S₃).” EX1007, 490.

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	SSS			S ₂ U		
	Mol %	Avg. Mol Wt. (g/mol)	Weight (g)	Mol%	Avg. Mol Wt. (g/mol)	Weight (g)
40:60 (Pst/SBO wt%)	6.3	824.7	5195.6	37.1	843.8	31305.0
50:50 (Pst/SBO wt%)	10.4	822.7	8556.1	39.3	842.7	33118.1

76. I also determined the sums of all triglyceride species in the “40:60” and “50:50” interesterified Pst/SBO fat blends are 85782.3 g and 85480.9 g, respectively.

77. Finally, the fifth step in converting Petrauskaite’s triglyceride mol% to wt% requires determining the wt% of each triglyceride species in each of Petrauskaite’s fat blends by dividing the weights of individual triglyceride species over the total weight (*i.e.*, sum) of all triglyceride species. See Table 8 below.

Table 8

	UUU			SU ₂		
	Mol%	Weight (g)	Wt%	Mol%	Weight (g)	Wt%
40:60 (Pst/SBO wt%)	23.0	20288.3	23.7	33.6	28993.4	33.8
50:50 (Pst/SBO wt%)	21.0	18532.5	21.7	29.3	25274.2	29.6

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	SSS			S ₂ U		
	Mol%	Weight (g)	Wt%	Mol%	Weight (g)	Wt%
40:60 (Pst/SBO wt%)	6.3	5195.6	6.1	37.1	31305.0	36.5
50:50 (Pst/SBO wt%)	10.4	8556.1	10.0	39.3	33118.1	38.7

78. I determined the “40:60” and “50:50” fat blends to comprise 6.1 and 10.0 wt% of SSS, respectively. *See* yellow boxes of Table 8.

79. Because the combination of Petrauskaite and knowledge generally available in the art discloses fat blends that recite SSS wt% between 6 to 20 wt% based on the total triglycerides present in the composition (*i.e.*, 6.1 and 10.0 wt%), the combination discloses Element [1.1].

80. In my opinion, the combination of Petrauskaite and knowledge generally available in the art discloses the requirements of Element [1.1].

2. [1.2]: 5 to less than 20% SUS...all percentages are by weight based on the total triglycerides present in the composition

81. Petrauskaite in combination with knowledge generally available in the art discloses Element [1.2].

82. As discussed above for Element [1.1], the fatty acid composition of palm stearin and soybean oil are well-known. The randomized distribution of fatty acids in triglyceride molecules of interesterified fats and oils was also well-known

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in the art. For example, Hustedt states that “[a]fter interesterification of an ester, the random distribution occurs whereby in the molecule type GS₂U 2/3 of the unsaturated acid appears in position 1 and 1/3 in position 2.” EX1008, 391. Thus, the mol% of SUS and SSU can be calculated from S₂U for interesterified compositions. Here, the mol% of SUS is 1/3 of the mol% of S₂U.

83. Accordingly, I calculated the mol% of SUS for the “40:60” fat blend to be 1/3 of 37.1 mol%, *i.e.*, 12.4 mol%. And, I calculated the mol% of SUS for the “50:50” fat blend to be 1/3 of 39.3 mol%, *i.e.*, 13.1 mol%.

84. When each of these SUS mol% is multiplied by the average molecular weight of the S₂U triglyceride calculated above, I determined the total weight of the SUS triglyceride content. See Table 9 below.

Table 9

	S ₂ U					
	SUS			SSU		
	Mol %	Avg. Mol Wt. (g/mol)	Weight (g)	Mol %	Avg. Mol Wt. (g/mol)	Weight (g)
40:60 (Pst/SBO wt%)	12.4	843.8	10463.1	24.7	843.8	20841.9
50:50 (Pst/SBO wt%)	13.1	842.7	11039.4	26.2	842.7	22078.7

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85. Finally, I determined the wt% of the SUS triglyceride species in each of Petrauskaite’s fat blends by dividing the weights of individual SUS triglyceride species over the total weight of all triglyceride species (85782.3 g and 85480.9 g for “40:60” and “50:50” Pst/SBO fat blends, respectively). See Table 10 below.

Table 10

	S ₂ U					
	SUS			SSU		
	Mol%	Weight (g)	Wt%	Mol%	Weight (g)	Wt %
40:60 (Pst/SBO wt%)	12.4	10463.1	12.2	24.7	20841.9	24.3
50:50 (Pst/SBO wt%)	13.1	11039.4	12.9	26.2	22078.7	25.8

86. Accordingly, I determined the wt% of SUS of the “40:60” and “50:50” fat blends described in Petrauskaite are 12.2 and 12.9 wt%, respectively. See yellow boxes of Table 10.

87. Because Petrauskaite in combination with knowledge generally available in the art discloses fat blends that recite SUS wt% between 5 to less than 20 wt% based on the total triglycerides present in the composition (*i.e.*, 12.2 and 12.9 wt%), the combination discloses Element [1.2].

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88. In my opinion, the combination of Petruskaite and knowledge generally available in the art discloses the requirements of Element [1.2].

3. [1.3]: 5 to less than 25% SSU...all percentages are by weight based on the total triglycerides present in the composition

89. Petruskaite in combination with knowledge generally available in the art discloses Element [1.3].

90. As discussed above with respect to Element [1.2], “[a]fter interesterification of an ester, the random distribution occurs whereby in the molecule type GS₂U 2/3 of the unsaturated acid appears in position 1 and 1/3 in position 2.” EX1008, 391.

91. Accordingly, the wt% of SSU of the “40:60” fat blend described in Petruskaite is 24.3 wt%. *See* green box of Table 10.

92. Because Petruskaite in combination with knowledge generally available in the art discloses a fat blend that recites SSU wt% between 5 to less than 25 wt% based on the total triglycerides present in the composition (*i.e.*, 24.3 wt%), the combination discloses Element [1.3].

93. In my opinion, the combination of Petruskaite and knowledge generally available in the art discloses the requirements of Element [1.3].

4. [1.4]: 10 to 39 SU₂ and...all percentages are by weight based on the total triglycerides present in the composition

94. Petruskaite in combination with knowledge generally available in the art discloses Element [1.4].

95. As discussed above for Element [1.1], the wt% of SU₂ of the “40:60” and “50:50” fat blends described in Petruskaite are 33.8 and 29.6 wt%, respectively. *See* green boxes of Table 8.

96. Because Petruskaite in combination with knowledge generally available in the art discloses fat blends that recite SU₂ wt% between 10 to 39 wt% based on the total triglycerides present in the composition (*i.e.*, 33.8 and 29.6 wt%), the combination discloses Element [1.4].

97. In my opinion, the combination of Petruskaite and knowledge generally available in the art discloses the requirements of Element [1.4].

5. [1.5]: at least 20% U₃,...all percentages are by weight based on the total triglycerides present in the composition

98. Petruskaite in combination with knowledge generally available in the art discloses Element [1.5].

99. As discussed above for Element [1.1], the wt% of U₃ of the “40:60” and “50:50” fat blends described in Petruskaite are 23.7 and 21.7 wt%, respectively. *See* orange boxes of Table 8.

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100. Because Petrauskaite in combination with knowledge generally available in the art discloses fat blends that recite U₃ wt% of at least 20 wt% based on the total triglycerides present in the composition (*i.e.*, 23.7 and 21.7 wt%), the combination discloses Element [1.5].

101. In my opinion, the combination of Petrauskaite and knowledge generally available in the art discloses the requirements of Element [1.5].

6. [1.6]: wherein S is a saturated fatty acid residue having 16 to 24 carbon atoms and U is an unsaturated fatty acid residue having at least 18 carbon atoms

102. Petrauskaite in combination with knowledge generally available in the art discloses Element [1.6].

103. As discussed above with respect to Element [1.1], the “40:60” and “50:50” fat blends of Petrauskaite comprising palm stearin and soybean oil comprise saturated fatty acid residues having 16 to 24 carbons and unsaturated fatty acid residues having at least 18 carbon atoms. EX1011, Table 1; EX1014, Table IV.

104. Because (i) palm stearin is comprised of unsaturated fatty acid residues having at least 18 carbon atoms and saturated fatty acid residues having 16 to 24 carbon atoms, and (ii) soybean oil is comprised of unsaturated fatty acid residues having at least 18 carbon atoms and saturated fatty acid residues having 16 to 24 carbon atoms, the combination discloses Element [1.6].

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105. In my opinion, the combination of Petrauskaite and knowledge generally available in the art discloses the requirements of Element [1.6].

7. [1.7]: the weight ratio of SUS/SSU is between 0.5 and 2.0

106. As discussed above, Hustedt discloses that it was generally known in the art that “[a]fter interesterification of an ester, the random distribution occurs whereby in the molecule type GS₂U 2/3 of the unsaturated acid appears in position 1 and 1/3 in position 2.” EX1008, 391.

107. Thus, both the molar and weight ratios of SUS/SSU is 1/3:2/3 (*i.e.*, 0.5). Thus, the knowledge generally available in the art discloses a weight ratio of interesterified SUS/SSU that is between 0.5 and 2.0. Should it be asserted that an SUS/SSU ratio of 0.5 is not between 0.5 and 2.0, I disagree. There is nothing in the claim or patent specification that leads me to believe that the Patent Owner did not mean to include the endpoints of the range. Nevertheless, I understand that it is generally accepted that differences in ranges will not support patentability of subject matter encompassed by the prior art unless there is evidence indicating such difference is critical. Here, I did not observe any evidence of criticality associated with an SUS/SSU ratio slightly more than the stated endpoint of 0.5

108. In my opinion, the knowledge generally available in the art discloses the requirements of Element [1.7].

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8. **[1.8]: the weight ratio of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms) in the total S content of the triglycerides is less than 0.2**

109. Petrauskaite in combination with knowledge generally available in the art discloses Element [1.8].

110. As discussed above, the fatty acid composition of the “40:60” and “50:50” fat blends of Petrauskaite can be determined because the fatty acid composition of palm stearin and soybean oil are well-known. As discussed above, Neff and Deffense disclose such fatty acid compositions. EX1011, Table 1; EX1014, Table IV.

111. I provide the fatty acid compositions of the “40:60” and “50:50” fat blends below in Tables 11 and 12.

Table 11

Fatty Acid	Palm Stearin (wt%)	Soybean Oil (wt%)	Palm Stearin as 40% of “40:60” fat blend	Soybean Oil as 60% of “40:60” fat blend	“40:60” fat blend (wt%)
C _{16:0}	68.8	10	27.5	6	33.5
C _{18:0}	5.1	4.2	2.0	2.5	4.5
C _{18:1}	19.1	25.4	7.6	15.2	22.8
C _{18:2}	4.5	53.4	1.8	32.0	33.8
C _{18:3}	0	7	0	4.2	4.2

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Table 12

Fatty Acid	Palm Stearin (wt%)	Soybean Oil (wt%)	Palm Stearin as 50% of “50:50” fat blend	Soybean Oil as 50% of “50:50” fat blend	“50:50” fat blend (wt%)
C _{16:0}	68.8	10	34.4	5	39.5
C _{18:0}	5.1	4.2	2.6	2.1	4.7
C _{18:1}	19.1	25.4	9.6	12.7	22.3
C _{18:2}	4.5	53.4	2.3	26.7	29
C _{18:3}	0	7	0	3.5	3.5

112. Based on Tables 11 and 12, I determined that the total wt% of saturated fatty acid residues having 18 to 24 carbon atoms (*i.e.*, C_{18:0}) for the “40:60” and “50:50” fat blends are 4.5 and 4.7 wt%, respectively.

113. Further, I determined that the total wt% of saturated fatty acid residues having 16 carbon atoms (*i.e.*, C_{16:0}) for the “40:60” and “50:50” fat blends are 33.5 and 39.5 wt%, respectively.

114. Accordingly, I determined that the weight ratios of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms) in the total S content of the triglycerides for the “40:60” and “50:50” fat blends of Petrauskaite are 0.13 and 0.12, respectively.

115. Because the fat blends of Petrauskaite have weight ratios of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms) in the total S content of the triglycerides that are less than

0.2, Petrauskaite in combination with knowledge generally available in the art discloses Element [1.8].

116. In my opinion, Petrauskaite, in combination with knowledge generally available in the art, discloses the requirements of Element [1.8].

9. [1.9]: and the triglycerides contain less than 3% of arachidic and behenic acid residues based on the total fatty acid residue content of the triglycerides

117. Petrauskaite in combination with knowledge generally available in the art discloses Element [1.9].

118. As discussed above, palm stearin does not disclose arachidic (C_{20:0}) or behenic acid residues (C_{22:0}). EX1014, Table IV.

119. Likewise, soybean oil contains no arachidic acid or behenic acid. EX1011, Table 1.

120. In the context of the “40:60” and “50:50” fat blends taught by Petrauskaite, the total amount of arachidic acid is 0 wt%.

121. In the context of the “40:60” and “50:50” fat blends taught by Petrauskaite, the total amount of behenic acid is 0 wt%.

122. Because the fat blends of Petrauskaite contain less than 3% of arachidic and behenic acid residues based on the total fatty acid residue content of the triglycerides, the combination discloses Element [1.9].

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123. In my opinion, the combination of Petrauskaite and the knowledge generally available in the art discloses the requirements of Element [1.9].

10. [1.10]: and wherein the saturated fatty acid residue content of the triglycerides is less than 45% by weight of the total fatty acid residues in the triglycerides.

124. Petrauskaite in combination with knowledge generally available in the art discloses Element [1.10].

125. Based on Tables 11 and 12 above, the average total wt% of saturated fatty acid residues having 16 to 24 carbon atoms for the “40:60” and “50:50” fat blends are 38 and 44.2 wt%, respectively.

126. Because the fat blends of Petrauskaite have a saturated fatty acid residue content of the triglycerides that is less than 45% by weight of the total fatty acid residues in the triglycerides, Petrauskaite in combination with knowledge generally available in the art discloses Element [1.10].

127. In my opinion, Petrauskaite, in combination with knowledge generally available in the art, discloses the requirements of Element [1.10].

B. Claim 6: Composition as claimed in claim 1, wherein the S₂U content is less than 35%.

128. Petrauskaite in combination with knowledge generally available in the art renders obvious the additional limitation of Claim 6.

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129. As discussed above with respect to Element [1.1], the S₂U content of the “40:60” interesterified fat blend of Petruskaite is 36.5 wt%.

130. I understand that it is generally accepted that differences in concentration will not support patentability of subject matter encompassed by the prior art unless there is evidence indicating such claimed concentration is critical. Here, I did not observe any evidence of criticality associated with a S₂U content range of less than 35 wt%.

131. It is also my opinion that the claimed range of less than 35 wt% and the prior art S₂U content of 36.5 wt% are so mathematically close that the difference between the claimed range is virtually negligible.

132. In my opinion, the combination of Petruskaite and the knowledge generally available in the art discloses the requirements of Claim 6.

C. Claim 7: Composition as claimed in claim 1, wherein the S₃ content is greater than 8%.

133. Petruskaite in combination with knowledge generally available in the art discloses the additional limitation of Claim 7.

134. As discussed above with respect to Element [1.1], the combination discloses a fat blend that has a S₃ content that is greater than 8% (*i.e.*, 10.0 wt%).

135. In my opinion, the combination of Petruskaite and the knowledge generally available in the art discloses the requirements of Claim 7.

D. Claim 8: Composition as claimed in claim 1, wherein the weight ratio of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms) in the total S content of the triglycerides is less than 0.15.

136. Petruskaite in combination with knowledge generally available in the art discloses the additional limitation of Claim 8.

137. As discussed above with respect to Element [1.8], the combination discloses weight ratios of (saturated fatty acid residues having 18 to 24 carbon atoms)/(saturated fatty acid residues having 16 carbon atoms) in the total S content of the triglycerides for the “40:60” and “50:50” fat blends of Petruskaite of 0.13 and 0.12, respectively.

138. In my opinion, the combination of Petruskaite and the knowledge generally available in the art discloses the requirements of Claim 8.

E. Claim 9: Composition as claimed in claim 1, wherein the saturated fatty acid residue content of the triglycerides is less than 40% by weight of the total fatty acid residues in the triglycerides.

139. Petruskaite in combination with knowledge generally available in the art discloses the additional limitation of Claim 9.

140. As discussed above with respect to Element [1.10], the combination discloses fat blends having a saturated fatty acid residue content of the triglycerides that is less than 40% by weight of the total fatty acid residues in the triglycerides (*i.e.*, 38 wt%).

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141. In my opinion, the combination of Petruskaite and the knowledge generally available in the art discloses the requirements of Claim 9.

F. Claim 11: Composition as claimed in claim 1 having an N₁₀ of 20 to 50.

142. Petruskaite discloses the additional limitation of Claim 11.

143. As discussed in §IX.C., “N₁₀” is a term of art that provides the percentage of fat which exists in solid form at 10°C. Petruskaite discloses that for the “40:60” and “50:50” interesterified fat blends, the N₁₀ value is 34.6% and 43.0%, respectively. EX1007, 492, Table 4.

144. Because Petruskaite’s fat blends’ N₁₀ values fall between 20 to 50, Petruskaite discloses the additional limitation of Claim 11.

145. In my opinion, Petruskaite discloses the requirements of Claim 11.

G. Claim 12: Composition as claimed in claim 1 having an N₁₀ of 30 to 40.

146. Petruskaite discloses the additional limitation of Claim 12. As discussed above for Claim 11, Petruskaite discloses that the “40:60” interesterified fat blend has an N₁₀ value of 34.6%. EX1007, 492, Table 4. Because Petruskaite’s fat blend N₁₀ value falls between 30 to 40, Petruskaite discloses the additional limitation of Claim 12.

147. In my opinion, Petruskaite discloses the requirements of Claim 12.

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H. Claim 13: Composition as claimed in claim 1 having an N₂₀ of 10 to 35.

148. Petruskaite discloses the additional limitation of Claim 13.

149. As discussed in §IX.D., “N₂₀” is a term of art that provides the percentage of fat which exists in solid form at 20°C.

150. Petruskaite discloses that for the “40:60” and “50:50” interesterified fat blends, the N₂₀ value is 17.5% and 24.1%, respectively. EX1007, 492, Table 4.

151. Because Petruskaite’s fat blends’ N₂₀ values fall between 10 to 35, Petruskaite discloses the additional limitation of Claim 13.

152. In my opinion, Petruskaite discloses the requirements of Claim 13.

I. Claim 14: Composition as claimed in claim 1 having an N₂₀ of 15 to 30.

153. Petruskaite discloses the additional limitation of Claim 14.

154. As discussed above for Claim 13, Petruskaite discloses that the “40:60” and “50:50” interesterified fat blends have N₂₀ values of 17.5% and 24.1%, respectively. EX1007, 492, Table 4.

155. Because Petruskaite’s fat blends’ N₂₀ values fall between 15 to 30, Petruskaite discloses the additional limitation of Claim 14.

156. In my opinion, Petruskaite discloses the requirements of Claim 14.

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J. Claim 15: Composition as claimed in claim 1 having an N₃₀ of less than 18.

157. Petruskaite discloses the additional limitation of Claim 15.

158. As discussed in §IX.E., “N₃₀” is a term of art that provides the percentage of fat which exists in solid form at 30°C.

159. Petruskaite discloses that for the “40:60” and “50:50” interesterified fat blends, the N₃₀ value is 8.7% and 12.2%, respectively. EX1007, 492, Table 4.

160. Because Petruskaite’s fat blends’ N₃₀ values are less than 18, Petruskaite discloses the additional limitation of Claim 15.

161. In my opinion, Petruskaite discloses the requirements of Claim 15.

K. Claim 16: Composition as claimed in claim 1 having an N₃₀ of 3 to 15.

162. Petruskaite discloses the additional limitation of Claim 16.

163. As discussed above for Claim 15, Petruskaite discloses that the “40:60” and “50:50” interesterified fat blends have N₃₀ values of 8.7% and 12.2%, respectively. EX1007, 492, Table 4.

164. Because Petruskaite’s fat blends’ N₃₀ values fall between 3 to 15, Petruskaite discloses the additional limitation of Claim 16.

165. In my opinion, Petruskaite discloses the requirements of Claim 16.

L. Claim 17: Composition as claimed in claim 1 which is essentially free of trans fatty acid residues.

166. Petruskaite discloses the additional limitation of Claim 17.

167. As discussed in §IX.F., the '473 Patent states that a composition is “essentially free of trans fatty acid residues” when it contains an “amount of less than 1% by weight.” EX1001, 4:25-33.

168. Petruskaite discloses producing interesterified fat blends having “low (0.1%)” trans fatty acids. EX1007, Title and Abstract.

169. Because Petruskaite’s fat blends contain less than 1% by weight of trans fatty acid residues, Petruskaite discloses the additional limitation of Claim 17.

170. In my opinion, Petruskaite discloses the requirements of Claim 17.

M. Claim 20: The use of the composition of claim 1 as an ingredient in baking.

171. Petruskaite discloses the additional limitation of Claim 20.

172. Petruskaite teaches that its “interesterified [fat] blends ... were suitable for use in soft tub-type margarines.” EX1007, Abstract. Petruskaite teaches that “[c]onfectionary fat basestocks could be prepared from [its] interesterified fat blends.” EX1007, Abstract; *see also* EX1007, 491 (“Randomized mixtures of ... Pst and SBO (40:60) produced basestocks that are suitable for shortening oil formulations.”); 492 (“chemical randomization of 20-50% highly

saturated fat (Pst ...) with a soft vegetable oil (SBO) can be used as an alternative to partial hydrogenation to produce a plastic fat phase that is suitable for manufacture of shortenings, stick or tub-type margarines, and confectionary fats.”).

173. Because shortenings, stick and tub-type margarines, and confectionary fats are ingredients in baking (EX1013, 627, 631, 653, 675-676, 686, 691), Petruskaite discloses the additional limitation of Claim 20.

174. In my opinion, Petruskaite discloses the requirements of Claim 20.

N. Explanation of Why Claims 1, 6-9, 11-17, and 20 Would Have Been Obvious

175. In my opinion, Claims 1, 6-9, 11-17, and 20 would have been obvious over Petruskaite and knowledge generally available in the art.

1. Difference between the claimed invention and the prior art.

176. As discussed in §§X.A.-M., Petruskaite in combination with knowledge generally available in the art discloses all of the features of Claims 1, 6-9, 11-17, and 20.

177. While Petruskaite discloses the claimed interesterified fat blends, knowledge generally available in the art provides specific (i) molecular weights and weight ratios for the various fatty acids that make up palm stearin and soybean oil and (ii) a method for determining the SUS and SSU triglyceride content of interesterified fat blends.

2. A POSITA would have had motivation to combine the disclosures of Petrauskaite and knowledge generally available in the art.

178. A POSITA would have had a motivation to combine Petrauskaite and knowledge generally available in the art because combining such prior art elements according to known methods would have yielded nothing more than predictable results. A POSITA would naturally have turned to these references to understand Petrauskaite's components better.

3. A POSITA would have been motivated to find and combine references disclosing the fatty acid distributions of palm stearin and soybean oil with the disclosure of Petrauskaite's interesterified Pst/SBO fat blends.

179. In my opinion, a POSITA would have been motivated to combine the disclosures of Petrauskaite and the known fatty acid compositions of palm stearin and soybean oil.

180. As discussed above, Petrauskaite discloses the claimed interesterified fat blends with triglyceride content presented as mol%.

181. In my opinion, a POSITA would have looked to old and contemporary references for the fatty acid distribution of palm stearin and soybean oil to determine the corresponding wt% of Petrauskaite's fat blends because this information was readily-available and well-known in the art.

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182. For example, “The Lipid Handbook” states that “[t]he characterization of oils and fats has been the subject of academic study for over 200 years.” EX1012, 47. Further, “it is immediately apparent that the available information is voluminous.” EX1012, 47. Indeed, this same textbook acknowledges that “[f]atty acid compositional data are easily accessible for the majority of common oils and fats” as of at least the mid-1990s. EX1012, 47.

183. Thus, it is my opinion that combining the interesterified fat blend mol% of Petrauskaite with the fatty acid distribution generally known in the art would have yielded nothing more than predictable results.

4. A POSITA would have been motivated to find and combine prior art formulas for determining S₂U species content in interesterified fat compositions with the disclosure of Petrauskaite’s interesterified fat blends.

184. As discussed above, Petrauskaite discloses an interesterification process, wherein the fat blend is heated to 90°C in the presence of a sodium methoxide catalyst for 90 minutes. EX1007, Abstract. Such a process results in “random rearrangement” of the triglyceride fatty acids. EX1008, 391 (describing “technological procedure” of interesterification and outlining both random rearrangement and directed interesterification methods).

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185. It was widely known in the art that “[f]ormulas for calculating the random distribution of fatty acids” after interesterification had been developed based on experimentally derived data. EX1008, 390 and FIG. 3.

186. Because (i) Petrauskaite already discloses the GS₂U/S₂U mol% of fat blends comprised of 50:50 and 40:60 interesterified palm stearin and soybean oil (and inherently the wt% of the same) and (ii) the number of isomers within the GS₂U/S₂U genus is small (*i.e.*, 2 isomers), in my opinion, a POSITA would have had a motivation to use the known formula/method known in the art to better understand and determine the individual SUS and SSU isomer contributions to the overall GS₂U/S₂U content of the Petrauskaite 50:50 and 40:60 fat blends.

187. Further, it is my opinion that using the prior art formula for determining isomer contributions in interesterified fat blends would have yielded predictable results.

188. As explained, “[r]andom distribution is most frequent because in a liquid phase the normal ester rearrangement or esterification of acids with glycerine proceeds at random with the attainment of an equilibrium composition.” EX1008, 390. And, “[a]fter interesterification of an ester, the random distribution occurs whereby in the molecule type GS₂U 2/3 of the unsaturated acid appears in position 1 and 1/3 in position 2.” EX1008, 391.

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189. Thus, because (i) the interesterification process of fat blends was well-understood in the art and (2) the resulting interesterified triglyceride structures and their relative amounts were both expected and foreseeable, in my opinion, a POSITA would have found using the prior art formula for determining isomer contributions in Petrauskaite's interesterified fat blends to yield predictable results.

5. A POSITA would have had a reasonable expectation of success based on the disclosures Petrauskaite and knowledge generally available in the art.

190. A POSITA would have had a reasonable expectation of success of making this combination because the art describes an *experimentally confirmed*, well-known, and previously described relationship between the chemical interesterification of fat blends and the resulting interesterified triglyceride structures and their relative amounts.

191. For example, it was well known in the art that “[n]ature endows every oil and fat with a certain distribution pattern of fatty acids among the glycerides.” EX1010, 796. Further, it was understood in the art that “[i]nteresterification alters the original order of distribution of fatty acids in the glycerol moiety producing fats.” EX1010, 796. Furthermore, knowledge generally available in the art confirms the basis of the prior art formula for determining isomer contributions: “because of the random rearrangement of the fatty acids of the parent oil,” the chemical

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interesterification process “is also commonly referred to as *randomization*” and “ultimately attains an equilibrium when all possible combinations of glycerol and fatty acids have taken place.” EX1010, 796 (“The equilibrium referred to above may be simplified and represented as follows: $SSS \rightleftharpoons (SUS \rightleftharpoons SSU) \rightleftharpoons (SUU \rightleftharpoons USU) \rightleftharpoons UUU$ wherein S is a saturated acid and U is an unsaturated acid.” and “the composition of such a randomly rearranged oil or fat can be calculated from probability considerations.”).

192. Experimental confirmation of the statistical composition resulting from chemical interesterification/randomization had been obtained across numerous studies for numerous oils. EX1010, 796 and 800 (“These studies have confirmed that ... at equilibrium the postulated statistical distribution of fatty acid is achieved.” and “Composition of the interesterified oil agrees closely with that calculated for random distribution.”).

193. Thus, in my opinion, a POSITA would have had a reasonable expectation of successfully arriving at the claimed invention based on the combination of Petruskaite and knowledge generally available in the art because the prior art formula for determining isomer contributions had been experimentally confirmed numerous times in the prior art.

XI. Claims 18, 19, and 21-24 Would Have Been Obvious Over Petrauskaite in view of Idris and Knowledge Generally Available in the Art (Ground 2)

194. In my opinion, Claims 18, 19, and 21-24 would have been obvious over Petrauskaite in view of Idris and knowledge generally available in the art.

195. The following sections explain where each element of Claims 18, 19, and 21-24 is found in the prior art.

A. Claim 18: A method of producing a baked product which comprises preparing a mixture and baking the mixture, and which comprises the step of incorporating the composition of claim 1 in the mixture.

196. As discussed above, Petrauskaite in view of knowledge generally available in the art discloses the composition of Claim 1. Specifically, Petrauskaite teaches fat blends for use as shortenings, stick and tub-type margarines, and confectionary fats—all ingredients in baking.

197. Idris teaches the remaining limitations of Claim 18. In particular, Idris teaches the use of shortenings in a Madeira cake formulation, wherein the shortening is composed of palm stearin and soybean oil fat blends, such as in ratios of “50:50.” EX1009, 485, Table 2; 483, Table 1 (“Group 2, Formulation 2A). According to Idris, “[s]hortening was mixed” with the ingredients of Table 2. *Id.* “The batter was placed into four round cake baking tins [and] baked at 180°C in a Rotary Simon oven for 1 h 15 min.” *Id.*

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198. Thus, Idris teaches a method of producing a baked product which comprises preparing a mixture and baking the mixture, and incorporating a shortening.

199. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 18.

B. Claim 19: A method of produced [sic] an iced confectionary product which comprises applying to a baked product an icing comprising the composition of claim 1.

200. As discussed with respect to Claims 18 and 23, Petrauskaite in view of Idris and knowledge generally available in the art discloses a method of producing a baked product.

201. Further, as discussed with respect to Claim 22, Petrauskaite in view of Idris, and knowledge generally available in the art discloses an icing composition comprising the composition of Claim 1.

202. A POSITA would have known that icing compositions are routinely applied to baked products to produce iced confectionary products. EX1013, 654 (describing a recipe for Orange Chiffon Cake that has almost all of the same ingredients as Idris' Madeira cake formulation, and directs the baker to "Frost with [a] Creamy Orange Frosting" recipe that includes an edible fat, sugar and water). In particular, a POSITA would have known that the icing composition produced by

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Idris' creaming method would be suitable for application to the Madeira cake baked product also taught by Idris.

203. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 19.

C. Claim 21: Bakery composition comprising the composition of claim 1 and one or more other baking ingredients.

204. As discussed with respect to Claim 18, Petrauskaite in view of knowledge generally available in the art discloses the composition of Claim 1.

205. Idris teaches a method of producing a bakery composition comprising a shortening—a use of the fat blends disclosed in Petrauskaite. Idris' Madeira cake formulation comprises one or more baking ingredients: flour, sugar, egg, salt, etc.

206. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 21.

D. Claim 22: Icing composition comprising the composition of claim 1, sugar and water.

207. As discussed above, Petrauskaite in combination with knowledge generally available in the art discloses the composition of Claim 1.

208. Petrauskaite teaches fat blends for use as shortenings. Idris teaches the remaining limitations of Claim 18.

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209. In particular, Idris teaches that “[s]hortenings are used in the preparation of many foods such as ... icings.” EX1009, 482. Further, Idris describes a creaming test as follows:

Icing sugar (260g) and *shortening* (170g) were mixed sufficiently using a palette knife to avoid sugar being thrown out of the bowl when the Kenwood was started. The two were then mixed ..., *adding water* (14 g) during that time.

EX1009, 484 (emphasis added).

210. Thus, Idris teaches an icing composition comprising a shortening, sugar, and water.

211. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 22.

E. Claim 23: Baked product comprising the composition of claim 1.

212. As discussed with respect to Claim 18, Petrauskaite in combination with knowledge generally available in the art discloses the composition of Claim 1.

213. Idris teaches a method of producing a baked product comprising a shortening—a use of the fat blends disclosed in Petrauskaite.

214. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 23.

F. Claim 24: Iced confectionary product comprising the composition of claim 1.

215. As discussed above with respect to Claim 19, Petrauskaite in combination with Idris and knowledge generally available in the art discloses a method of making an iced confectionary product comprising the composition of Claim 1.

216. In my opinion, the combination of Petrauskaite, Idris, and knowledge generally available in the art discloses Claim 24.

G. Explanation of Why Claims 18, 19, and 21-24 Would Have Been Obvious

217. In my opinion, Claims 18, 19, and 21-24 would have been obvious over Petrauskaite, Idris, and knowledge generally available in the art.

1. Difference between the claimed invention and the prior art

218. As discussed in §§XI.A-F., Petrauskaite, Idris, and knowledge generally available in the art together disclose all of the features of Claims 18, 19, and 21-24.

219. While the combination of Petrauskaite and knowledge generally available in the art teaches the triglyceride content of interesterified fat blends, none of these references expressly discloses bakery compositions or icing compositions comprising the same and additional ingredients, baked products or iced

confectionary products comprising the same, or methods for using the same to produce baked products or iced confectionary products.

220. In my opinion, Idris discloses all of these missing limitations.

2. A POSITA would have had motivation to combine the disclosures of Petrauskaite with Idris

221. In my opinion, a POSITA would have had a motivation to combine Petrauskaite with Idris because Idris discloses the use of known techniques to improve similar baked and confectionary products in the same way.

222. Idris discloses evaluating shortenings based on various palm oil products. EX1009, Title. In particular, Idris “evaluate[d] the physicochemical characteristics, creaming properties and baking performance of shortenings based on blends of hydrogenated palm oil and palm stearin with other liquid oils, direct blends of palm stearin with other liquid oils, and a 100% inter-esterified palm olein.” EX1009, 482. Two of the shortening formulations evaluated in Idris were (i) a “direct blend[] of 50% palm stearin with 50% other liquid oils” and (ii) inter-esterified palm olein (IE POo).” EX1009, 482; *see also id.*, Table 1 (listing “50% Palm stearin (IV 44) [and] 50% Soya bean oil” as formulation “2A” to be tested).

223. Importantly, formulation 2A of Idris corresponds to the “50:50” palm stearin and soybean oil fat blend disclosed in Petrauskaite prior to interesterification. Idris’ known techniques include a “Creaming test” and a “Baking test.” EX1009,

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484-485. Idris also discloses that formulation 2A “showed good baking performance” with a specific cake volume of 96%, and had “creaming properties ... better than those of the standard shortening.” EX1009, 487, 489, 492, Table 4.

224. Thus, Idris discloses known baking and creaming techniques for baked and confectionary products that make use of “50:50” palm stearin and soybean oil fat blends.

225. In my opinion, a POSITA would have known that baked and confectionary products would have been improved with the incorporation of interesterified oils.

226. For example, it was well-known in the art that “interesterification changes the melting and crystallization characteristics, [and thus] finds applications in such fields as shortenings, margarines and confectionary fats where these characteristics are important.” EX1010, 802. For nutritional margarine blends, “[f]lavor and oxidative stability of the margarines made from interesterified oils were observed to be good.” EX1010, 803. For confectionary fats, interesterified oils are “responsible for the rapid melt in the mouth” and “have better gloss-producing and quick set-up properties.” EX1010, 803. Indeed, interesterified palm oil and fractions thereof as well as fat blends comprising the same were well known for their “applications in margarines and shortenings.” EX1021, Abstract; EX1022, Abstract.

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They were particularly known for their use in edible fat-based products and confectionary and their advantages of being “soft and easily spreadable” with reduced “graininess.” EX1021, Abstract, 409.

227. Because (i) Idris discloses known creaming and baking techniques and baked and confectionary products that incorporate “50:50” palm stearin and soybean oil fat blends and (ii) the prior art recognized that such baked and confectionary products would be improved with the use of interesterified palm oil-based fractions, in my opinion, a POSITA would have been motivated to use the known techniques of Idris to improve similar baked and confectionary products in the same way.

228. In my opinion, a POSITA would also have been motivated to combine Petrauskaite, with Idris because they are in the same field of endeavor—providing and using interesterified edible oils.

229. Finally, all of the references recognize that the “[u]se of interesterification of fat and oil mixtures in the industry is very important and is extremely versatile.” EX1008, 392; *see also* EX1007, 489; and EX1009, 482 (“[m]odification processes such as ... interesterification are commonly applied to oils and fats for specific uses.”).

3. A POSITA would have had a reasonable expectation of success based on the disclosures Petrauskaite, Idris, and knowledge generally available in the art.

230. In my opinion, a POSITA would have had a reasonable expectation of success of making this combination because Petrauskaite teaches using its interesterified fat blends as shortenings and Idris demonstrated that interesterified palm oil-based fractions “showed good baking performance” and had “creaming properties ... better than those of the standard shortening.” EX1007, Abstract; EX1009, 487, 492, Table 4 (see references to formulation “4A”).

231. In my opinion, a POSITA would have had a reasonable expectation of success in incorporating the interesterified fat blends of Petrauskaite to make baked and confectionary products using the techniques of Idris.

XII. SECONDARY CONSIDERATIONS

232. As discussed herein, it is my opinion that all elements of Claims 1, 6-9 and 11-24 are known in the art, and any differences between the claims of the '473 Patent and Petrauskaite, Idris, and knowledge generally available in the art would have been obvious to a POSITA based on the disclosures of the applied references and the knowledge in the art.

233. I am not aware of any secondary considerations evidence bearing any nexus to the purported claimed invention. Any purported evidence of secondary

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considerations that Patent Owner may present in this proceeding would be insufficient to overcome the strong evidence of obviousness of Claims 1, 6-9 and 11-24.

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XIII. CONCLUSION

234. For the reasons set forth above, it is my opinion that all elements of Claims 1, 6-9, and 11-24 of the '473 Patent are disclosed or suggested by the prior art. In my opinion, Claims 1, 6-9, and 11-24 of the '473 Patent would have been anticipated or obvious over the prior art.

235. In signing this Declaration, I understand that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

236. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: _____

27.08.2024



Alejandro G. Marangoni