

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOTIF FOODWORKS, INC.,
Petitioner,

v.

IMPOSSIBLE FOODS, INC.,
Patent Owner.

Case No. IPR2023-00206
Patent No. 9,943,096

PATENT OWNER'S SUR-REPLY

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I. INTRODUCTION

Petitioner presents a limited reply, responding only to the patent owner's response (POR) with respect to Grounds 2A-2B (Giacino and Brown) and 4A-4C (Giacino, Proulx, and Conrad). Reply, 1. For Grounds 2A-2B, Petitioner's reply arguments confirm that the petition materials advanced an obviousness case riddled with evidentiary holes and contradictions. For Grounds 4A-4C, Petitioner's reply abandons the petition grounds by improperly dropping a reference (Conrad) in its entirety. In doing so, Petitioner is left advancing a motivation to modify Giacino that is facially illogical in view of the remaining reference (Proulx).

For the reasons detailed below, Petitioner fails to meet its burden in establishing the obviousness of the challenged claims based on any of the instituted grounds.

II. GROUNDS 1 AND 3A-3D FAIL

For Grounds 1 and 3A-3D, Petitioner solely "relies on the arguments made in the petition" and does not respond to the POR. Reply, 1. Thus, for Ground 1, Petitioner does not dispute that the petition's anticipation theory, which relied on a claim interpretation contrary to what Petitioner argued in the district court litigation, fails. Specifically, according to its district court construction, Brown's pea flour does not disclose the claimed sulfur-containing compounds because the

sulfur-containing compounds exclude “plant proteins.” POR, 1-2, 7-10, 12-13 (citing EX2019, 17-20). Nor does Petitioner dispute the petition fails to establish that the Brown embodiment relied upon for anticipation is a “food flavor additive composition” as claimed. *Id.*, 2, 13-18.

For Grounds 3A-3D, the Board’s institution decision already found that the petition fails to establish Crane as analogous art and advances an insufficient rationale for modifying Giacino based on Conrad and Crane. Paper 23 (“ID”), 34-37. The response, supported by the testimony of PO’s expert, Dr. Qian, confirms the Board’s preliminary findings, which Petitioner again does not dispute. POR, 36-48.

Accordingly, for the unrebutted reasons outlined in the POR, Grounds 1 and 3A-3D fail.

III. GROUND 2A-2B FAIL

Petitioner’s reply fails to remedy the deficiencies in the petition materials identified in the POR. First, Petitioner fails to meet its burden in establishing that a POSA would have been motivated to modify Giacino’s composition (whatever that may be) to include leghemoglobin in view of Brown. In this respect, the petition was deficient from the outset—it rested on the expert testimony of Dr. Tarté, who identified himself as unqualified to opine on how Brown’s leghemoglobin would impact the flavor and aroma profile of Giacino’s compositions. Dr. Tarté, instead,

deferred to Dr. McGorin who never addressed the combination in the first place. Thus, Petitioner's shell game of witnesses left it without evidence of *prima facie* obviousness. In reply, Petitioner attempts to improperly backfill its petition case through the reply declaration of Dr. McGorin. Notwithstanding being improper new testimony, Dr. McGorin's reply declaration, like Petitioner's case, is plagued with inconsistencies and contradictions. Even if considered, the reply materials demonstrate that, while Petitioner is willing to say anything to advance its litigation objectives, the evidence as a whole reinforces the conclusion that the petition's theory is illogical and unfounded. Moreover, Petitioner's continued evolution and evasion in identifying the particular Giacino composition being modified, despite its own expert opining that such identification is necessary, confirms Petitioner's failure to meet its burden in showing that a POSA would have been motivated to combine Giacino and Brown and reasonably expect to reach what is claimed.

A. Petitioner fails to establish motivation to combine Giacino and Brown with a reasonable expectation of success

1. The petition's motivation to combine Giacino and Brown is unsupported and deficient

Attempting to salvage its unsupported motivation for combining Giacino and Brown, Petitioner contends, in a conclusory manner, that "Dr. Tarté provided a reasoned opinion, based in part on Dr. McGorin's testimony concerning flavor

chemistry”. Reply, 13-14 (citing EX1003, ¶¶170-213). However, Petitioner’s blanket assertion is refuted by a comparison of the expert declarations submitted with the petition.

As the POR observed, in his obviousness analysis for Grounds 2A-2B, Dr. Tarté opined that a POSA would have been motivated to add Brown’s leghemoglobin to a Giacino flavor composition because a POSA would understand that it “would further Giacino’s goal of providing a truer flavor of meat” and it would “only further contribute to the meaty aroma volatiles.” POR, 30-31 (citing EX1003, ¶¶175, 195, 212). However, Dr. Tarté made two key admissions that underscored the lack of evidentiary basis for these opinions: (1) apart from the inclusion of certain Maillard reactants, he did not consider what Giacino composition was being modified (EX2032, 48:14-49:14, 55:16-58:24; POR, 27); and (2) a POSA’s understanding as to how Brown’s leghemoglobin would impact the meaty aroma volatiles of Giacino was “outside [his] area of expertise” and he “defer[red] to Dr. McGorin” on whether “adding leghemoglobin would negatively impact the meaty aroma” or “in any other way.” EX2032, 78:10-25; POR, 31-32; *see also* EX2032, 17:13-15 (admitting to only “a basic understanding” of the Maillard reaction), 75:21-76:71 (deferring to Dr. McGorin on whether “the same catalyzation reaction that occurs in Brown would occur in Giacino”); EX2033, 19:1-4 (confirming Dr. Tarté’s lack of expertise).

But Dr. McGorrin's first declaration, on which Dr. Tarté relied, failed to provide an assessment of any particular composition disclosed in Giacino, or how a POSA would have viewed the impact of Brown's leghemoglobin in combination with Giacino's compositions. *See* Pet., 30, 34 (citing EX1003, ¶¶175, 195, 210-212 (citing EX1005, ¶27, Sections V.B, V.D)); Reply, 13-14 (citing EX1005, Sections V.B, V.D); EX1005, ¶27 (aroma and flavor overview), Sections V.B (general discussion of Maillard chemistry; no mention of Giacino); V.D (general discussion of simulated meat flavoring compositions; no mention of Giacino). The testimony Dr. McGorrin did provide suggested that the overall composition is important to the POSA's understanding of what volatiles and associated aroma are produced by a given reaction and leghemoglobin could lead to off-flavors and aromas, especially when mixed with Maillard reactants. *See, e.g.*, EX1005, ¶¶67 (end products of Maillard reaction dependent on precursor identity), 150-51, 188 (combination of other ingredients affects sensory profile), 163-64 (combination of Maillard reactants and heme-containing protein leads to non-beef-like volatile profile), 167-68, 213 (increasing volatiles adversely affects aroma), 199 (POSA cannot "reasonably predict aroma compound formation, and its sensory impact, merely from reacting isolated components together"). Thus, it is clear Dr. Tarté had insufficient evidentiary basis for his conclusory statement of obviousness, and

in fact, Petitioner’s obviousness assertion is belied by its own competing expert testimony.

In reply, Petitioner backpedals from Dr. Tarté’s initial conclusory oversimplification that Brown’s leghemoglobin “would only further” contribute to Giacino’s meaty aroma volatiles, recasting it as a “figure of speech.” Reply, 12 n.3. It is unclear how an expert’s statement on the POSA’s understanding can be a “figure of speech,” but, even if accepted, it is not apparent what is then left of the petition’s proffered motivation. *See infra*, section III.A.2.c. Further, Petitioner’s attempt to shift the burden onto PO to show nonobviousness through the cross-examination of an expert who did not opine on the subject matter is unavailing. Reply, 13. Dr. McGorin did not testify as to how a POSA would have viewed the combination of Giacino and Brown, making such questioning outside the scope of cross-examination. 37 C.F.R. § 42.53(d)(5)(ii).

Moreover, Dr. McGorin’s reply declaration dispels any notion that Dr. Tarté’s opinions on the POSA’s motivation were supported by the evidence. Throughout his new declaration, Dr. McGorin improperly presents Dr. Tarté’s conclusory declaration testimony as a springboard to “gap-fill,” for the first time, critical content missing from the petition materials—*e.g.*, how or why a POSA would have combined Giacino and Brown. *See, e.g.*, EX1181, ¶¶12, 14, 16-19, 29, 37-41, 43-45, 50, 52, 84, 92. Petitioner’s reply and Dr. McGorin’s second

declaration should be disregarded or given no weight as an improper attempt to “submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.” *See Consolidated Trial Practice Guide* (Nov. 2019), 73-75.

It is Petitioner’s burden to identify, with particularity, the evidence that supports the grounds of challenge in the petition. 35 U.S.C. §312(a)(3). The only “evidence” cited in support of the petition’s asserted reasons motivating the POSA to combine Giacino and Brown was the conclusory testimony of an expert who identified himself as lacking the expertise or evidentiary basis to offer such opinions. Petitioner’s attempt to belatedly supply that missing basis through a reply declaration of Dr. McGorin is thus improper and should be accorded no weight.

2. Petitioner’s reply further highlights deficient rationale

Even if the Board considers Dr. McGorin’s reply declaration, Petitioner’s reply arguments only underscore the illogical and unsubstantiated nature of the petition’s challenge. First, Dr. McGorin’s reply declaration presents improper shifts in theories that contradict other evidence of record. In addition, Dr. McGorin’s reply declaration reveals that Petitioner’s contention that there are “similarities” between Giacino and Brown is incorrect, and in fact, the compositions are even more disparate than suggested in the petition, rendering the

petition's asserted motivation further attenuated. When taken as a whole, the evidence fails to support Petitioner's burden in establishing the obviousness of the challenged claims.

a) Petitioner's new reply theories and contradictions

Faced with the petition's own evidence suggesting negative consequences to combining Giacino and Brown as presented, Petitioner now advances two new modifications to the proposed combination: (1) lipids are now excluded from the modified Giacino composition; and (2) the modified Giacino pre-mix composition is uncooked, mixed together with an unidentified food product, and only the new composite food product composition is heated. Reply, 17. Petitioner presents these modifications to dodge negative effects associated with lipid oxidation caused by the addition of an iron-containing protein, such as leghemoglobin. POR, 32-33; EX2030, ¶¶38-40, 75-80.

As an initial matter, the petition did not predicate its proposed combination of Giacino and Brown on the exclusion of lipids or the downstream mixing of an uncooked pre-mix with food and subsequent heating, despite its own evidence acknowledging the development of undesirable flavors caused by lipid oxidation and storage after heating. See EX1005, ¶¶16, 71 (citing EX1017, 420; EX1048, 287), 137. In fact, as described below, the petition specifically relied on the inclusion of lipids and on the heating of Giacino's pre-mix compositions prior to

addition to food. *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (“It is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”); *see also In re Nuvasive, Inc.*, 841 F.3d 966, 972 (Fed. Cir. 2016) (affirming that changing the thrust of the rejection is improper reply argument in an IPR) (citing *In re Leithem*, 661 F.3d 1316 (Fed. Cir. 2011)).

Moreover, Petitioner never grapples with how its new modifications conflict with the petition case and its own inconsistent arguments at district court. For example, with respect to the reply’s shift to a Giacino composition that lacks any lipids (*see* Reply, 17; EX2033, 24:20-25:16 (Dr. McGorrin confirming that modified Giacino composition does not include oil)), the petition’s independent claim analysis never excluded fats from Giacino’s composition. For the dependent claims, the petition expressly relied on the inclusion of oil. *See* Pet., 36-37 (asserting POSA would have used an edible oil, such as sunflower oil, in Giacino’s composition), 43-44 (proposing use of oil at 95% of the composition by weight); Reply, 17 n.4. Furthermore, Petitioner submitted evidence demonstrating that inclusion of oil impacted the volatile compounds produced by the Maillard reaction it argued would generate the claimed volatile compounds. EX2030, ¶37 (noting “[t]he presence or absence of lipids and water in a matrix can influence the

formation of volatile compounds via the Maillard reaction”) (citing EX1033, 121-122; EX1129, 986; 1017, 421); EX1005, ¶168. This evidence is entirely unaddressed in reply.

Petitioner also inconsistently points to Brown’s use of oil in its composition as evidence that “adding leghemoglobin to compositions contributes favorably to cooked meat aromas” (Reply, 17), while at the same time proposes excluding any oil from Giacino. Additionally, Petitioner overlooks Dr. Qian’s observations regarding the differences between Brown’s composition and Giacino’s flavor additives. As Dr. Qian noted, Brown describes an end food product (*i.e.*, a meat replica)¹ that is heated and then was tested before off-flavors caused by lipid oxidation could occur. EX2030, ¶¶47, 51, 74; EX1182, 82:20-83:19.

In contrast, Dr. Qian explained that Giacino describes flavor additives, which were typically understood to be concentrated products (*e.g.*, a seasoning package) added in minimum quantities to food. EX2030, ¶¶44-46, 74-75. The

¹ As explained in the POR, the composition described in paragraph [00364] of Brown would have been understood to be a meat replica, which according to Petitioner’s district court representations, cannot be a “food flavor additive composition.” POR, 11-12, 14-17. Petitioner does not dispute this. *Supra*, section II.

flavor profiles of such products, which are typically stored prior to use, can be adversely affected by compounds produced via the Maillard reactions and the addition of a heme-containing protein, such as Brown's leghemoglobin, can catalyze this reaction. *Id.*, ¶¶35, 38. These off-flavors can result from lipid oxidation over time or autooxidation, which forms without heating. *Id.*, ¶38; EX1005, ¶71 (Dr. McGorin acknowledging that off-flavors caused by lipid oxidation occur over time). Thus, distinct from Brown, Giacino's additives, as a product that is typically reacted and then stored prior to use, suggest a heightened concern for the formation of off-flavors caused by the addition of leghemoglobin. EX2030, ¶¶74-75, 78-80; EX1182, 84:4-10, 85:2-11; *see also* EX2030, ¶39 (noting other pathways to off-flavors); EX1182, 91:17-18, 92:18-20, 93:4-7, 97:8-14 (noting oxidation is still a concern even in flavorings without lipids).

In this respect, Petitioner's reply adds yet another theory shift regarding the modified Giacino composition: forgo any reaction of the composition until it is added to a food product to be consumed. Reply, 17. However, this added nuance represents another shift away from the analysis presented in the petition and again raises inconsistencies with the petition's case and statements to the district court.²

² See EX2016, 17 ("Motif...argues that a 'food flavor additive composition' must be distinct from the food product itself."); POR, 11.

For instance, the petition never proposed an uncooked food composite—just the opposite—it repeatedly argued heating Giacino’s *pre-mix* compositions satisfied the limitations of the independent claims. *See, e.g.*, Pet., 33 (arguing, for limitation 1[e], “Giacino discloses that ‘the meat flavor of the compositions of the present invention is developed by heating the pre-mix compositions’”) (citing EX1015, 6:15-17), 38 (citing EX1015, 6:26-31); EX1003, ¶¶208-210 (arguing same); EX2033, 27:8-28:13 (Dr. McGorin confirming Dr. Tarté argued heating Giacino’s pre-mix). Indeed, for dependent claims 4 and 24, the petition relied on Giacino’s embodiment in which a composition was “refluxed for four hours” and “then aged for three days” before being spray-dried into a powder. Pet., 35 (citing EX1015, 9:70-10:2) (further arguing POSA would have sought to “stor[e] the powder” as a “seasoning packet” and “flavoring packet”). Further, as Dr. Qian explained, off-flavor development caused by iron catalyzation can still occur even without heating. EX1182, 95:15-97:14.

Lastly, Petitioner tries to downplay the inconsistent argument and testimony given to the district court. Reply, 16. As Dr. McGorin represented to the district court, “plant proteins can contribute to undesirable flavors and aromas” and “a POSITA would understand that plant proteins are not used as flavor precursors.” EX2020, ¶69; *see also* EX2032, 24:20-25:4 (Dr. Tarté confirming leghemoglobin is a plant protein). While Dr. McGorin now claims he did not expressly disparage

“heme-containing” plant proteins (EX1181, ¶59), his district court declaration made no such distinction. Dr. McGorin now makes a distinction he never previously made—he admits later in his reply declaration that his new distinction is of no moment anyway. *See* EX1181, ¶¶63-68, 70, 73-74 (acknowledging heme proteins contribute to undesirable off-flavors). Further, as Dr. McGorin opined in his first declaration, “the combination of Maillard reactants and heme-containing protein with plant proteins” could also lead to undesirable flavors. EX1005, ¶164. Petitioner’s proposed combination expressly relies on adding leghemoglobin to a composition containing reactants that induce a Maillard reaction. *Pet.*, 34. Petitioner never grapples with the inconsistencies between its ever-evolving argument and its own evidence.

b) Differences between Giacino and Brown

Petitioner’s reply newly argues that the rationale to combine Giacino and Brown is based on alleged “similarities” between the compositions of Giacino and Brown. *See* Reply, 7, 18, 20-21. This new argument is remarkable considering that Giacino and Brown do not share a single common ingredient. As discussed, Brown’s relied-upon composition comprises pea flour, sunflower oil, and glucose. EX1012, [00364]; *Pet.*, 29 (citing same). Petitioner’s relied-upon Giacino composition has none of these components, with oil now being expressly excluded by Petitioner. *See* *Pet.*, 30-31; *supra*, section III.A.2.a.

The reply now only points to a generic component class—a “reducing sugar” (glucose in Brown, and ribose in Giacino)—as a point of overlap between the two references. Reply, 18, 20-21; EX1181, ¶¶40 (“a POSITA would recognize that there are certain similarities between the Giacino and Brown compositions, including the presence of Maillard precursors (ribose and glucose, respectively) which are both reducing sugars”), 83 (Giacino and Brown “are similar in certain respects (e.g., as they contain reducing sugars and produce certain volatiles upon heating)”), 89, 96 (comparing “Giacino’s ribose, cysteine, and thiamine” with “Brown’s glucose”).³ However, Dr. McGorin’s first declaration argued the opposite. Pet., 7-8 (citing EX1005, ¶¶94-97). In attacking priority, Dr. McGorin argued that a POSA would have viewed those two sugars as materially different—both structurally and chemically—so as to critically alter the reaction chemistry.

³ As further noted below, to the extent Petitioner relies on Brown’s glucose as a “Maillard precursor,” Petitioner no longer contends that Brown’s pea flour provides the sulfur-containing amino compounds necessary for a Maillard reaction. Reply, 18 (citing EX1181, ¶89; EX1012, [00364]); EX1005, ¶46 (Maillard reaction requires presence of reducing sugars and amino compounds); EX2033, 9:24-10:2 (stating same), 10:22-11:1 (Dr. McGorin suggesting presence of sugar alone is sugar caramelization, not Maillard).

See EX1005, ¶96; EX2033, 28:18-30:7 (confirming differences). Specifically, as Dr. McGorin opined, glucose (as a six-carbon sugar) and ribose (as a five-carbon sugar) each have “a unique chemical structure” that a POSA would have found “significant because it affects the compounds’ chemical reactivity.” EX1005, ¶96. Thus, the only alleged similarity between Giacino and Brown that Petitioner can now point to is the presence of different sugars that Dr. McGorin previously attacked as materially different.

Moreover, while the petition and Dr. Tarté initially argued that Brown teaches a composition with pea flour as a “well-known flavor precursor[]” (Pet., 29 & n.9 (citing EX1012, [00364]); EX1003, ¶¶174, 184-85, 193; EX2032, 38:4-17), that argument is now effectively abandoned. Indeed, as noted in the POR, before the district court, Petitioner argued that the sulfur amino compounds in whole proteins (*e.g.*, pea flour) are **not** flavor precursors. EX2020, ¶¶21, 49 (“A POSITA would understand that proteins themselves are not considered Maillard reactants, however.”), 50-51 (“Maillard reaction precursors are small-molecule compounds”), 68-69 (“plant proteins are neither flavor precursors themselves nor the source of flavor precursors”); POR, 9-10, 34. As noted above (*supra*, section II), Petitioner does not dispute the contrary representations it made to the district court. Indeed, in his reply declaration, Dr. McGorin effectively admits that Dr. Tarté was wrong in his identification of pea flour as a flavor precursor. EX1181,

¶40 (“‘Pea flour’ is itself not a Maillard precursor.”); *cf.* EX1003, ¶174 (“Brown teaches...a composition containing...flavor precursors (*e.g.*, pea flour...)”); EX2032, 38:4-17 (identifying pea flour as Maillard reactant). In reply, Petitioner’s attempt to gloss over its conflicting arguments in front of the Board and at district court only makes matters worse. Specifically, Petitioner now implies a similarity between Brown (*e.g.*, whole pea protein) and Giacino (*e.g.*, protein hydrolysate) in that “both compositions still have...proteins **or** partial proteins.” Reply, 21 (emphasis added). Once again, Dr. McGorin argued the opposite in front of the district court, drawing a critical distinction between a protein hydrolysate and a whole protein. EX2020, ¶49 (stating “proteins themselves are not considered Maillard reactants”; “for a protein to be used as a flavor precursor, it needs to be processed into its components (amino acids),” which “are referred to as ‘hydrolysates’”). Indeed, despite the attorney argument in the reply brief, Dr. McGorin was unable or unwilling to equate a whole protein with a protein hydrolysate. *See* Reply, 21 (citing EX1181, ¶¶40-41).

Accordingly, the admitted differences between the compositions of Giacino and Brown directly undermine the petition’s assertions regarding the POSA’s understanding of how Brown’s leghemoglobin would contribute to Giacino’s composition.

c) Petitioner fails to meet its burden in showing a motivation to combine

It is Petitioner's burden to establish that a POSA would have had a reason to combine Giacino and Brown. As the Board is well-aware, PO has no obligation to prove no motivation. The petition's proffered reason was that adding leghemoglobin to Giacino "would further Giacino's goal of providing a "truer flavor" of meat'" and "would only further contribute" to Giacino's meaty aroma because Brown taught that meaty aroma of its composition was improved by the addition of leghemoglobin. Pet., 29-30 (alteration omitted), 34; *see also* ID, 26, 31. Thus, the issue before the Board is whether Petitioner has shown, by a preponderance of the evidence, that a POSA would have thought that Brown's specific use of leghemoglobin taught adding it to Giacino for the reasons stated in the petition.⁴

There are several facts that weigh against Petitioner. As an initial matter, there is a critical failure of proof in the petition materials. Dr. Tarté deferred to Dr.

⁴ This is true even if the claims do not "require any particular aroma." *See* Reply, 21-22; *Teva Pharms. USA, Inc. v. Corcept Therapeutics, Inc.*, PGR2019-00048 (PTAB Nov. 18, 2020), *aff'd* 18 F.4th 1377 (Fed. Cir. 2021) (holding inappropriate new argument that claims do not require safety—it contradicted

McGorrin who never addressed the matter at issue. The petition should fail for this reason alone. *See supra*, section III.A.1; POR, 30-35. If the evidence is considered further, it weighs distinctly against Petitioner for at least several reasons. First is Dr. McGorrin’s testimony that POSAs knew that the volatiles and aromas produced by the Maillard reaction (which Petitioner relies on for Giacino) depends on the overall makeup of the composition and the conditions under which the reaction occurs. EX1005, ¶¶67, 150-51, 188; EX2020, ¶64 n.2; EX2033, 10:3-12:3 (no meaty aroma where “the concentrations and combinations [are] out of whack”). Second is Dr. McGorrin’s testimony that POSAs expected that plant proteins generally contributed to undesirable aromas. EX2020, ¶69. Third is Dr. McGorrin’s testimony that POSAs viewed leghemoglobin as negatively impacting the flavor of a composition, especially one containing Maillard reactants. *See* EX1005, ¶¶71, 137, 163-64; EX1181, ¶¶63-68, 70, 73-74. Fourth is Dr. McGorrin’s testimony that POSAs understood that merely enhancing the levels of aroma-associated volatiles can lead to an undesirable aroma. EX1005, ¶¶167-68, 213. Fifth is Dr. McGorrin’s testimony that the reaction of components in isolation is not indicative of how they will behave in a full composition. *Id.*, ¶199. Sixth is

argument in petition “because Petitioner’s obviousness rationale incorporates an expectation of safety.”).

the evidence showing that the relied-upon compositions of Giacino and Brown are materially different. *Supra*, sections III.A.2.a-b. All this evidence weighs against the petition's conclusory and unsupported assertions that adding Brown's leghemoglobin to Giacino's composition (whatever that might be) would translate to "a truer meat flavor" and "would only further contribute" to any meaty aroma of Giacino's compositions.

Ultimately, all that Petitioner is essentially left with is a vague and unsubstantiated obvious-to-try rationale. That is, because leghemoglobin improved the meaty aroma profile in one type of composition (*i.e.*, Brown's pea flour, glucose, and sunflower oil composition), the POSA would have tried adding leghemoglobin to other compositions (even an unidentified Giacino composition) and adjusted ingredient and reaction conditions until trial and error eventually led to some improved meaty aroma profile. This is made apparent by Petitioner's repeated fallback to varying parameters until a meaty aroma is achieved. *See* Reply, 8-10, 20. Such argument is insufficient to meet Petitioner's burden in establishing a motivation to combine based on the reasons identified in the petition. *See In re Stepan*, 868 F.3d 1342, 1347 (Fed. Cir. 2017) ("To have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result" (quotations and alteration omitted)).

B. Petitioner fails to establish the combination of Giacino and Brown results in the claimed volatile compounds

Petitioner asserts that, contrary to the POR's observations, the petition did not advance an inherent obviousness theory that rested on the assertion that the inclusion of cysteine, thiamine, and ribose in Giacino's composition modified to include leghemoglobin would induce a Maillard reaction when heated, resulting in the production of the claimed at least two volatile compounds associated with a meaty aroma. Reply, 3-4. However, as detailed below, the petition did in fact advance such reasoning in its analysis of limitation 1[e], which the Board recognized in its institution decision. See Pet., 33-34; ID, 31. Further, while Petitioner attempts to rely on Giacino's reference to a "reaction" that produces a meaty flavor in support of its theory, Petitioner ignores the "reaction" taught by Giacino is a different type of reaction, not a Maillard reaction. And, to the extent a composition can be made that includes precursors to induce a Maillard reaction, Petitioner fails to establish that the claimed volatiles will be produced because Petitioner is further modifying that composition to include leghemoglobin. Further, Petitioner now newly pivots to the different proposition of making a pre-mix, leaving it uncooked, adding it to an unidentified food composition, and cooking the composite food composition. See *supra*, section III.A.2.a.

As an initial matter, Petitioner incorrectly argues that "the Board properly rejected" PO's argument by mischaracterizing the institution decision. Reply, 3-4.

In addressing PO's preliminary response arguments (POPR, 18-19), the institution decision summarized Petitioner's position as relying on the volatiles that are "produced by Giacino's heating step to induce a Maillard reaction with a known meat-associated aroma." ID, 31 (citing EX1003, ¶¶209-210; EX1005, ¶27, Sections V.B, V.D). The resulting Maillard reaction was premised on "heating a composition including cystine, thiamine, and ribose." *Id.*

With respect to this theory, Petitioner argues that Giacino expressly discloses its pre-mix compositions "undergo a 'reaction' when heated to produce a 'meaty flavor,'" and thus, a meaty aroma. Reply, 5 (citing Pet., 33; EX1015, 1:19-25, 1:59-65, 2:5-8, 2:48-52, 6:15-17, 6:20-23; EX1003, ¶¶208-09) (emphasis and alterations omitted). However, the Giacino disclosure Petitioner relies on at best attributes the generation of meaty flavor to a taurine-thiamine reaction, **not** a Maillard reaction. *See, e.g.*, EX1015, 1:59-65 (heating taurine and thiamine results in "a reaction mixture" with meaty flavor), 2:5-8; EX1024, 404 (listing Giacino's reaction as taurine-thiamine); EX1182, 47:4-49:14 (Dr. Qian discussing meaty aroma in the context of Giacino's taurine-thiamine reaction). Indeed, Giacino's preferred compounds fail to contain the precursor components required to induce a Maillard reaction. *See* EX1015, 4:67-5:10 (lacking reducing sugar); *cf.* EX1005, ¶46 (Maillard reaction requires amino compounds and reducing sugars). Thus, the petition's theory, which relies on the additional inclusion of specific precursors to

induce a separate Maillard reaction, is not supported by Giacino's disclosure that the source of its meaty flavor is due to something else, a taurine-thiamine reaction.

Moreover, to the extent Petitioner relies on certain embodiments of Giacino that may optionally include precursors for a Maillard reaction (*i.e.*, cysteine and ribose), this alone does not establish that the Maillard reaction, which was known to also produce volatiles associated with non-meat aromas, would result in the production of the claimed volatiles. See EX2030, ¶35; EX2033, 10:9-21, 11:8-14.

Importantly, Petitioner's combination ultimately rests on *modifying* Giacino's composition to include leghemoglobin. In this regard, it is not sufficient where Petitioner alleges volatiles of Giacino's composition *before* the addition of leghemoglobin and simply assumes the same volatiles *after* the addition. As Petitioner's own evidence illustrates, such a modification will change the volatiles that are produced. See, *e.g.*, EX1012, [00364] (noting volatile compounds produced by leghemoglobin-composition include "consistent differences" between the same composition lacking the protein); EX1181, ¶39 (quoting same). It is for this reason the POR noted a need to identify a particular composition that would be modified as this will influence the volatile compounds. POR, 25-30. Dr. McGorin has repeatedly agreed. See, *e.g.*, EX2033, 10:3-12:3 (no meaty aroma "if you have the concentrations and combinations out of whack, so it's not

balanced.”). Without this foundation, it cannot be said that Petitioner has met its burden in establishing that the proposed combination satisfies limitation 1[e].

IV. GROUNDS 4A-4C FAIL

For Grounds 4A-4C, the petition advanced an obviousness theory based on Giacino, Proulx, and Conrad. *See* Pet., 14 (listing basis for Ground 4A as “Giacino, Proulx, Conrad,” adding Perret and Macleod for Grounds 4B-4C); ID, 37 (characterizing Petitioner’s ground as based on Giacino, Proulx, and Conrad). In reply, Petitioner now seeks to modify its ground to exclude Conrad as a ground reference. *See* Reply, 22 (listing Grounds 4A-4C as “Giacino, Proulx, Perret, Macleod”), 23 (“Conrad is unnecessary to the ground.”); *cf.*, Pet., 57 (listing Grounds 4A-4C as “Giacino, Proulx, Conrad, Perret, Macleod”). Petitioner argues that it can now modify the ground because it only relies on an alleged motivation to “modify Giacino’s compositions to include Proulx’s leghemoglobin” for the “iron fortification/nutritive benefits touted by Proulx.” Reply, 22-23.

As an initial matter, the petition relied on **both** Proulx and Conrad as part of its Grounds 4A-4C; it did not rely on the references in the alternative. Pet., 57 (arguing “Proulx’s and Conrad’s teachings” support modifying Giacino’s flavoring compositions “to include an isolated heme-containing protein”). This is confirmed by the petition’s analysis of the challenged dependent claims. *See id.*, 65 (“a POSITA would use the concentrations of the heme-containing protein in Conrad”).

Thus, Petitioner's attempt to shift its grounds of challenge to one based on only Giacino and Proulx represents an improper new ground and Petitioner's arguments should be rejected for this reason alone.

Even if Petitioner's new Giacino-Proulx ground is considered, Petitioner's alleged motivation to modify Giacino's compositions to include Proulx's leghemoglobin for fortification purposes is illogical. Petitioner entirely abandons any notion that a POSA would have considered flavor as a factor in modifying Giacino's compositions. *See Reply*, 22-23. In doing so, Petitioner's new rationale is now based on the premise that a POSA would have sought to add Proulx's leghemoglobin to Giacino's **flavor** additives for the sole purpose of increasing the additives' iron content, irrespective of the impact that ingredient would have to their flavor. *Id.*, 25.

The Board has already expressed doubts over Petitioner's fortification rationale. *See ID*, 38. Indeed, as confirmed by the evidence, a POSA would not have viewed an ingredient's nutritional content alone as a motivation for modifying flavor additives like Giacino's. For instance, as noted in the POR, the art taught that the "significant function" of flavor additives, as the name itself suggests, "is flavor and not nutrition or functionality." POR, 50-51 (EX2030, ¶¶44-47, 93, 101; EX1038, 139-40).

In this respect, Petitioner’s only response is that flavor additives can also have nutritive benefits. Reply, 26-27. However, this does not support a finding that a POSA would have been motivated to add an ingredient to a flavor additive based on that ingredient’s nutritional content alone. For example, Petitioner cites to “nutritional yeast, garlic, salt, and MSG” as examples of flavor additives that have nutritive benefits. *Id.*, 26. However, in each of these cases, the ingredient has a known, desirable **flavor** impact, therefore making them known as **flavor** additives. See EX1182, 105:8-13 (noting “[n]utritional yeast has a strong flavor that is described as nutty or cheesy, which makes it popular as an ingredient in cheese substitutes”); EX1183, Abstract (nutritional yeast has “meaty, kokumi, umami, and salty” flavors); EX1185, 3 (salt “enhanc[es] flavor”), EX1186, 330 (garlic “has several flavor compounds”); EX1187, Abstract (MSG imparts umami flavor).

The same applies to Petitioner’s citation to PO’s GRAS notification (Reply, 27 (citing Pet., 60; EX1003, ¶394)), where PO described “[t]he **primary** purpose” of leghemoglobin in its products “is to create a flavor impact in ground beef analogue products,” with its “nutritive value as a source of iron” being an additional benefit. EX1052, 7 (emphasis added). Thus, at best, Petitioner’s evidence shows that, in the context of flavor additives, an ingredient’s **flavor** is

what is considered when seeking to add it to a given composition, with any nutritional value added by that ingredient being a bonus.⁵

Proulx does not identify leghemoglobin as a “flavor additive” nor does it describe leghemoglobin as an ingredient that will impart any beneficial flavor to a flavor additive (much less one that will beneficially provide meat flavor). Indeed, as Dr. Qian observed, the author recognized the detrimental effects to flavor and aroma imparted by leghemoglobin to food products. *See* EX2030, ¶76.

Accordingly, Petitioner fails to establish that a POSA would have been motivated to disregard flavor in modifying Giacino’s flavoring compositions to include Proulx’s leghemoglobin for fortification purposes.

V. CONCLUSION

For the reasons set forth above and in the POR, the petition fails to meet its burden of establishing the unpatentability of the challenged claims.

Respectfully submitted,

Date: February 16, 2024

/Michael T. Rosato/
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⁵ By Petitioner’s logic, because garlic provides nutritional benefits, a POSA would have sought to add garlic to any flavor additive, even if that additive concerned an unrelated and incompatible flavor.

CERTIFICATE OF COMPLIANCE

Pursuant to §42.24(d), the undersigned certifies that this paper contains no more than 5,600 words, not including the portions of the paper exempted by §42.24(b). According to the word-processing system used to prepare this paper, the paper contains 5,562 words.

Respectfully submitted,

Date: February 16, 2024

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VI. APPENDIX

EXHIBIT NO.	DESCRIPTION
2001	Request for Certificate of Correction, Certificate of Correction and Petition to Accept Unintentionally Delayed Benefit Claims Under 37 C.F.R. §§ 1.78(c) and 1.78(e) for US Patent No. 9,700,067 and US Patent No. 10,172,381
2002	Goldfine, “A brief history of Impossible Foods: how ‘bleeding’ plant-based burgers started a food industry trend,” The Business of Business, https://www.businessofbusiness.com/articles/impossible-foods-plant-based-burgers-milk-food-industry-trend-data/ , Last Accessed July 27, 2022
2003	Proulx, “Diversified strategies for improving iron bioavailability of maize” Ph.D. Thesis, Iowa State University, 2007
2004	Declaration of Dr. Keith Cadwallader, excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2005	Declaration of Dr. Celeste Holz-Schietinger (dated December 2, 2016), excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2006	Declaration of Dr. Celeste Holz-Schietinger (dated August 17, 2017), excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2007	Declaration of Dr. Devin Grant Peterson, excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2008	Declaration of Dr. S. Christopher Davis, excerpt from ’306 patent prosecution file history, submitted October 17, 2017
2009	Declaration of Dr. David Lipman, excerpt from ’306 patent prosecution file history, submitted October 17, 2017

2010	U.S. Patent Publication No. 2012/0093994 to Hseih et al.
2011	Cerny, “Formation of aroma compounds from ribose and cysteine during the Maillard Reaction” <i>J. Agric. Food Chem.</i> 51:2714-2721 (2003)
2012	File History of U.S. Provisional Application 61/671,069 filed on July 12, 2012.
2013	G. Reineccius, Flavor Chemistry and Technology 2 nd Ed., 2006, Chap. 7, “ <i>Off-Flavors and Taints in Foods</i> ”, p.161-199
2014	Email from the Patent Trial and Appeal Board dated April 3, 2023
2015	Petition to Accept Unintentionally Delayed Benefit Claims Under 37 C.F.R. §§ 1.78(C) and 1.78(E); Petition for Expedited Review under 37 C.F.R. §1.182; Supplemental Application Data Sheet, and Request for Certificate of Correction in U.S. Patent No. 9,943,096 filed on May 30, 2023; including copy of Petitioner’s Opposition to Patent Owner’s Motion Pursuant to 37 C.F.R. §1.323 [Paper 11]; copy of Order Granting Patent Owner’s Motion for Leave to Seek Certificate of Correction [Paper 15] issued May 22, 2023
2016	Claim Construction Order, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. Aug. 15, 2023)
2017	Plaintiff Impossible Foods Inc.’s Opening Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. June 21, 2023)
2018	Declaration of Hal Alper, Ph.D., In Support of Plaintiff Impossible Foods Inc.’s Opening Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. June 14, 2023)
2019	Defendant Motif Foodworks, Inc.’s Answering Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 7, 2023)

2020	Declaration of Dr. Robert McGorin In Support of Motif's Answering Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. June 28, 2023)
2021	Declaration of Dr. Jerrad Legako In Support of Motif's Answering Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. June 28, 2023)
2022	Declaration of Dr. Carl Batt In Support of Motif's Answering Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. June 28, 2023)
2023	Plaintiff Impossible Foods Inc.'s Claim Construction Reply Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 14, 2023)
2024	Reply Declaration of Hal Alper, Ph.D., In Support of Plaintiff Impossible Foods Inc.'s Claim Construction Reply Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 7, 2023)
2025	Declaration of Paul Sarnoski, Ph.D., In Support of Plaintiff Impossible Foods Inc.'s Claim Construction Reply Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 14, 2023)
2026	Defendant Motif Foodworks, Inc.'s Sur-reply Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 19, 2023)
2027	Supplemental Declaration of Dr. Robert McGorin In Support of Motif's Sur-reply Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 14, 2023)
2028	Declaration of Dr. Jerrad Legako In Support of Motif's Sur-reply Claim Construction Brief, <i>Impossible Foods Inc. v. Motif</i>

	<i>Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 14, 2023)
2029	Supplemental Declaration of Dr. Carl Batt In Support of Motif’s Sur-reply Claim Construction Brief, <i>Impossible Foods Inc. v. Motif Foodworks, Inc.</i> , Case No. 1:22-cv-00311-WCB (D. Del. July 14, 2023)
2030	Declaration of Michael C. Qian, Ph.D.
2031	<i>Curriculum Vitae</i> of Michael C. Qian, Ph.D.
2032	Transcript of September 7, 2023, Deposition of Rodrigo Tarté, Ph.D.
2033	Transcript of February 9, 2024, Deposition of Robert McGorin, Ph.D.

CERTIFICATE OF SERVICE

I certify that the foregoing Patent Owner's Sur-Reply and accompanying Exhibit 2033 were served on this 16th day of February 2024, on the Petitioner at the following electronic service addresses:

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