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(71) Applicant: **BOTANY AI, INC., DBA UMMINO**
[US/US]; 1400 Lavaca St., Ste. 700, Austin, TX 78701
(US).

(72) Inventors: **AIMUTIS, William**; 1400 Lavaca St., Ste. 700,
Austin, TX 78701 (US). **DYKES, Charles**; 1400 Lavaca
St., Ste. 700, Austin, TX 78701 (US). **THOEN, Christiaan**;
1400 Lavaca St., Ste. 700, Austin, TX 78701 (US).

(74) Agent: **SCHINDLER, Barry J.**; Greenberg Traurig, LLP,
500 Campus Drive, Suite 400, Florham Park, NJ 07932
(US).

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(54) Title: DYNAMICALLY DELIVERING FAT AND FLAVOR POTENTIATORS TO FOODS AND METHODS OF USE THERE-
OF

(57) Abstract: A method and product comprising mixing at least one oil to a converted methylcellulose polymer to result in a methyl-
cellulose polymer-oil mixture, mixing at least one hydrocolloid to the methylcellulose polymer-oil mixture and heating the methylcel-
lulose polymer-oil mixture to result in a microgel structure; and entrapping at least one flavor potentiator within the microgel structure
to result in a peptide-infused microgel structure.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 24/33616

A. CLASSIFICATION OF SUBJECT MATTER
 IPC - INV. A23L 29/262, C08B 11/08 (2024.01)
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CPC - INV. A23L 29/262, C08B 11/08

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 114191381 A (South China Agricultural University) 18 March 2022 (18.03.2022); machine translation - para [n0001], [n0014], [n0019], [n0021], [n0024]-[n0029], [n0038], [n0042], [n0088], original, Fig. 4	1-2, 4-6, 8-9
Y	US 2012/0321751 A1 (Pedersen et al.) 20 December 2012 (20.12.2012); para [0150]-[0151]	1-2, 4-6, 8-9
A	Bascuas et al. "Designing Hydrocolloid-Based Oleogels With High Physical, Chemical, and Structural Stability" Frontiers in Sustainable Food Systems. 24 July 2020 (24.07.2020) vol 4, pg. 1-8; entire document	1-2, 4-6, 8-9
A	US 2019/0075810 A1 (DOW GLOBAL TECHNOLOGIES LLC) 14 March 2019 (14.03.2019); entire document	1-2, 4-6, 8-9
A	US 2017/0143022 A1 (Senomyx, Inc.) 25 May 2017 (25.05.2017); entire document	1-2, 4-6, 8-9
P, X	WO 2023/245070 A2 (BOTANY AL, INC., dba UMMINO) 21 December 2023 (21.12.2023); entire document	1-2, 4-6, 8-9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 24/33616

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
(see supplemental page)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-2, 4-6 and 8-9

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 24/33616

--continued from Box No. III--

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I+: Claims 1-16, directed to method of claim 1, comprising: mixing at least one oil to a converted gelator polymer to result in a gelator polymer-oil mixture, mixing at least one hydrocolloid to the gelator polymer-oil mixture and heating the gelator polymer-oil mixture to result in a microgel structure, wherein the heating of the microgel structure to a sufficient temperature to result in a liquid phase. The method of claim 1 will be searched to the extent that it encompasses the first species of claim 1, represented by mixing at least one oil to a converted gelator polymer, which is the first gelator polymer listed, ethylcellulose (see instant specification, para [0017]); and one peptide which is umami; and entrapping one flavor potentiator, which is the first flavor potentiator, monosodium glutamate (see instant specification, para [0045]) (wherein optional groups are omitted). It is believed that claims 1-2, 4-6 and 8-9 read on this first named invention, and thus these claims will be searched without fee. This first named invention has been selected based on the guidance set forth in section 10.54 of the PCT International Search and Preliminary Examination Guidelines. Applicant is invited to elect additional compounds of claim 1, wherein each additional compound elected will require one additional invention fee. Applicants must specify the claims that encompass any additionally elected compound. Applicants must further indicate, if applicable, the claims which encompass the first named invention, if different than what was indicated above for this group. Failure to clearly identify how any paid additional invention fees are to be applied to the '+' group(s) will result in only the first claimed invention to be searched. Additionally, an exemplary election wherein different actual variables are selected is suggested. An exemplary election would be a method of claim 1 comprising mixing at least one oil to a converted gelator polymer, which is the first gelator polymer listed, ethylcellulose (see instant specification, para [0017]); and one peptide which is kokumi; and entrapping one flavor potentiator, which is the first flavor potentiator, monosodium glutamate (see instant specification, para [0045]) (wherein optional groups are omitted) (i.e., claims 1-2, 4-6, 8 and 10).

Group II: Claims 17-20, directed to a composition comprising: a peptide-infused microgel structure.

The group of inventions listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Special Technical Features:

Group I+ includes the technical feature of a unique method of claim 1 comprising a unique gelator polymer-oil mixture, which is not required by any other invention of Group I+ or II.

Common Technical Features:

The inventions of Groups I+ share the technical feature of a method of claim 1.

The inventions of Groups I+ and II share the technical feature of a composition comprising: a peptide-infused microgel structure wherein the microgel structure comprises: a) at least one oleogel, b) at least one peptide selected from a group consisting of an umami peptide and a kokumi peptide, and c) at least one flavor potentiator, wherein the at least one flavor potentiator sufficiently entrapped within the microgel structure so as to result in, when exposed to sufficient heating, the peptide-infused microgel structure releases the entrapped flavor potentiator in a controlled release.

These shared technical features, however, do not provide a contribution over the prior art, as being obvious over CN 114191381 A to South China Agricultural University (hereinafter South) in view of US 2012/0321751 A1 to Pedersen et al. (hereinafter Pedersen). South discloses a method (machine translation - para [n0001]: double gel simulating plastic fat with controllable oral texture and digestive behavior, and the preparation and application thereof) comprising: mixing at least one oil to a converted gelator polymer (machine translation - para [n0027]: ethyl cellulose) (as evidenced by instant specification, para [0017]) to result in a gelator polymer-oil mixture (machine translation - para [n0024]-[n0026]), mixing at least one hydrocolloid (machine translation - para [n0028]) to the gelator polymer-oil mixture and heating (machine translation - para [n0029]) the gelator polymer-oil mixture to result in a microgel structure (original, Fig. 4, machine translation - para [n0042]), wherein the heating of the microgel structure to a sufficient temperature to result in a liquid phase (machine translation - para [n0038], [n0088]), wherein the microgel structure comprises the following properties: a) at least one oleogel (para [n0019]) wherein the peptide-infused microgel structure comprises the following property: a.) when exposed to sufficient heating, the peptide-infused microgel structure releases the entrapped material in a controlled release (machine translation - para. [n0038], [n0088]), and further discloses oil soluble active ingredients comprising food flavoring (machine translation - para [n0021]), but does not disclose and b) at least one peptide selected from a group consisting of umami, kokumi, and another sensory peptide; and entrapping at least one flavor potentiator within the microgel structure to result in a peptide-infused microgel structure. However, Pedersen discloses a umami peptide and entrapping at least one flavor potentiator (para [0150]-[0151]). It would have been obvious to one with skill in the art to utilize the method disclosed by South; to encapsulate various desired oil soluble food flavoring compounds, as disclosed by Pedersen, such a umami peptide and entrapping at least one flavor potentiator in the disclosed microstructure through mixing said materials.

As said compound was known in the art, these cannot be considered special technical features that would otherwise unify the inventions of Groups I+ or II. The inventions of Group I+ and II thus lack unity under PCT Rule 13.