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(54) Title: GEL CASTING METHODS FOR MANUFACTURE OF TEXTILE MATERIALS

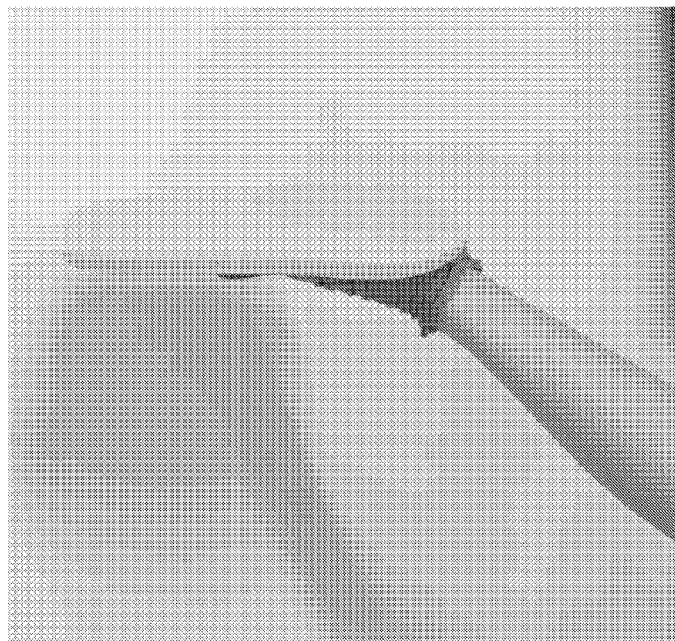


FIG. 1

(57) Abstract: Methods for making a biocomposite material include depositing a fluid mixture into a desired spatial configuration, where the fluid mixture includes a carrier fluid, biomass, and a gelling agent; triggering gelling of the fluid mixture to form a biomass gel; and removing at least a portion of the carrier fluid to form the biocomposite material. Biocomposite materials as disclosed herein may have advantageous mechanical and aesthetic properties that make the materials especially suitable for use as textile materials, including but not limited to leather analog textile materials.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC - INV. D06M 15/19, D06M 15/21, D06M 15/37 (2023.01)
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CPC - INV. D06M 15/19, D06M 15/21, D06M 15/37

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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.
X	US 2022/0000162 A1 (MYCORENA AB) 6 January 2022 (06.01.2022)- entire document especially abstract and para [0029], [0123], [0122], [0124]-[0125], [0026], [0017]	1-3
A	— CN 108905999 A (WUHAN WATER ENGINEERING AND TECH CO LTD) 30 November 2018 (30.11.2018)- entire document	1-3
A	— CN 106861654 A (UNIV LIAONING TECHNICAL) 20 June 2017 (20.06.2017)- entire document	1-3
A	US 2020/0305486 A1 (MARLOW FOODS LIMITED) 1 October 2020 (01.10.2020)- entire document	1-3
A	US 2019/0112396 A1 (CP KELCO APS) 18 April 2019 (18.04.2019)- entire document	1-3

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 23/68125

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.: 4-88, 93-119, 124-131
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 extra sheet

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.:
1-3

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 23/68125

Continuation of Box No. III (Observations where unity of invention is lacking)

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 1-3 are directed towards a method for producing a biocomposite material, comprising: (a) depositing a fluid mixture comprising a carrier fluid, biomass, and a gelling agent, wherein the biomass comprises a fraction that is at most slightly soluble in the carrier fluid, into a desired spatial configuration; (b) triggering gelation of the fluid mixture to form a biomass gel; and (c) removing at least a portion of the carrier fluid from the biomass gel to form the biocomposite material, wherein the carrier fluid makes up no more than about 95 wt%, no more than about 80 wt%, no more than about 65 wt%, or no more than about 50 wt% of the biocomposite material.

Group II: Claims 89-92 and 120-123 are directed towards a biocomposite material/gel, comprising: about 0.01 wt% to about 95 wt%, about 0.01 wt% to about 80 wt%, about 0.01 wt% to about 65 wt%, or about 0.01 wt% to about 50 wt% of a carrier fluid; biomass, wherein the biomass is at most slightly soluble in the carrier fluid; and at least one gelling agent, wherein the biocomposite material has a tensile strength of at least about 3 MPa.

The inventions listed as Groups I-II 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 requires a method for producing a biocomposite material, comprising: (a) depositing a fluid mixture comprising a carrier fluid, biomass, and a gelling agent, wherein the biomass comprises a fraction that is at most slightly soluble in the carrier fluid, into a desired spatial configuration; (b) triggering gelation of the fluid mixture to form a biomass gel; and (c) removing at least a portion of the carrier fluid from the biomass gel to form the biocomposite material, wherein the carrier fluid makes up no more than about 95 wt%, no more than about 80 wt%, no more than about 65 wt%, or no more than about 50 wt% of the biocomposite material, not required by Group II.

Group II requires a biocomposite material/gel, comprising: about 0.01 wt% to about 95 wt%, about 0.01 wt% to about 80 wt%, about 0.01 wt% to about 65 wt%, or about 0.01 wt% to about 50 wt% of a carrier fluid, wherein the biocomposite material has a tensile strength of at least about 3 MPa, not required by Group I.

Shared Technical Features:

Group I-II share the common technical features of a biocomposite material/gel, comprising: no more than about 95 wt%, no more than about 80 wt%, no more than about 65 wt%, or no more than about 50 wt% of a carrier fluid; biomass, wherein the biomass is at most slightly soluble in the carrier fluid; and at least one gelling agent. However, these shared technical features do not represent a contribution over prior art because the shared technical features are being anticipated by US 2022/0000162 A1 to Mycorena AB (hereinafter "Mycorena"). Mycorena teaches a biocomposite material/gel, comprising: no more than about 95 wt%, no more than about 80 wt%, no more than about 65 wt%, or no more than about 50 wt% of a carrier fluid; biomass, wherein the biomass is at most slightly soluble in the carrier fluid; and at least one gelling agent (abstract, the present disclosure relates to a food product comprising a pure fungi biomass; para [0029], the food product may be in the form of a patty, nugget, burger, sausage, fillet, extrudate, granules, cake, meat substitute; para [0026], the pure fungi biomass may have a Water solubility Index (WSI) within the range of from 50% to 80%; para [0125], the mixing of biomass at 60-85% water content with sodium alginate and starch 2% (w/w) each and subsequent treatment with heat in a wet environment (steaming or boiling) led to the gelation of the obtained structure, making it suitable for use in sliceable meat alternative food products. Hence, the food product comprising the pure fungi biomass is the biocomposite material/gel. In addition, the biomass comprises 60-85% of water (applicable carrier fluid), sodium alginate and starch (applicable gelling agents), and is at most slightly soluble in the carrier fluid/water as indicated by the water solubility index range of 50% to 80%; see instant claim 21, wherein the carrier fluid is selected from the group consisting of water; see instant 30 and 32, wherein the gelling agent comprises a polymer, wherein the polymer is a hydrocolloid selected from the group consisting of starch, alginate).

As the shared technical features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups. Therefore, Groups I-II lack unity under PCT Rule 13.

Item 4 Cont.: Claims 4-88, 93-119, and 124-131 are determined unsearchable because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).