

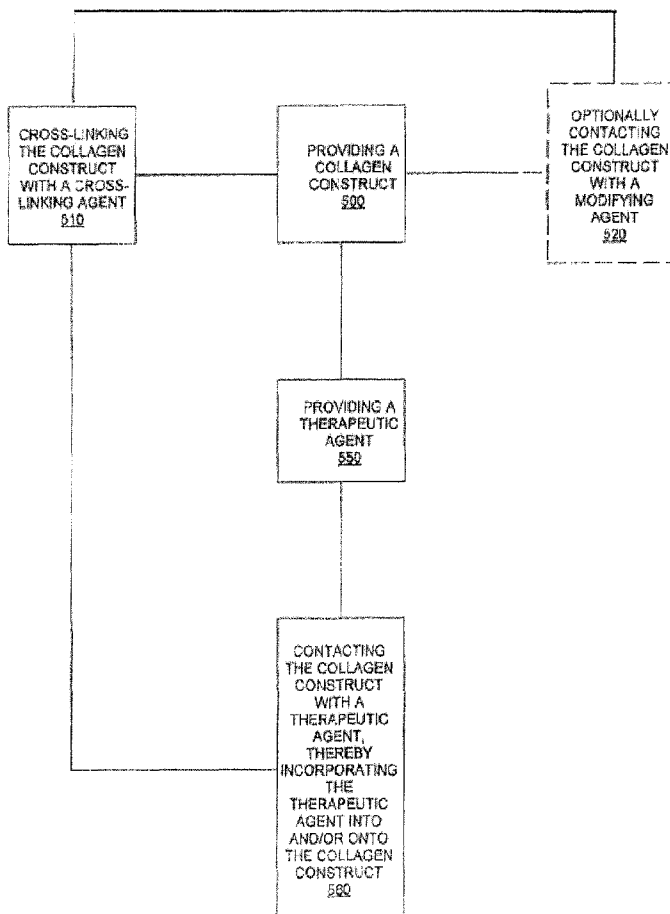


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A61K 38/17 (2006.01)
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

[Continued on next page]

(54) Title: CROSS-LINKED COLLAGEN COMPRISING AN ANTIFUNGAL AGENT

Figure 1



(57) Abstract: The disclosure describes collagen constructs comprising antifungal agents, preferably, copper, and related methods. Also described is a novel vacuum drying device and the use thereof.

WO 2014/078082 A3



DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

— with international search report (Art. 21(3))

(88) Date of publication of the international search report:

17 July 2014

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/67623

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61P 31/00; A61K 38/17; A61L 27/24 (2014.01)

USPC - 424/423, 426, 93.7; 525/54.2; 552/504; 554/71

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)

IPC(8): A61P 31/00; A61K 38/17; A61L 27/24, 27/58, 17/08 (2014.01)

USPC: 424/423, 426, 93.7; 525/54.2; 552/504; 554/71

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

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

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); ProQuest; IP.com; Google/Google Scholar; Key Words: anti*fungal, collagen, cross*link*, copper, construct, in vivo, release, NDGA, sustain* release, burst release, effective amount, administer*

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2012/069559 A1 (MEISEL, J et al.) 31 May 2012; abstract; page 4, lines 10-13; page 6, lines 17-20; page 8, lines 5-9; page 10, lines 28-32; page 11, lines 4-6, 25-26	1-12
Y	WO 2001/000151 A1 (GAVIN, DF et al.) 04 January 2001; page 6, lines 7-10; page 52, lines 7-8; page 60, lines 14-20; claim 1	1-11
Y	WO 2012/065937 A1 (BUEHLER, M et al.) 24 May 2012; pages 2, 19	12
Y	US 8,192,481 B2 (KING, TL) 05 June 2012; abstract; column 9, lines 34-38	9
Y	US 2010/0291182 A1 (PALASIS, M et al.) 18 November 2010; paragraphs [0025], [0037], [0054], [0056], [0059]	10
A	US 4,703,108 A (SILVER, FA et al.) 27 October 1987; entire document	1-12
A	US 7,101,857 B2 (SUNG, HW et al.) 05 September 2006; entire document	1-12

 Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

02 April 2014 (02.04.2014)

Date of mailing of the international search report

21 APR 2014

Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/67623

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:

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 examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-12 are directed toward an antifungal cross-linked collagen construct.

Group II: Claim 13 is directed are directed toward a vacuum dehydration device.

-Continued Within the Next 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.:
Claims 1-12

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.

-Continued From Box III Above: Observations where unity of invention is lacking-

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: the special technical features of Group I include an antifungal cross-linked collagen construct comprising: a cross-linked collagen comprising collagen and one or more cross-linking agents and an antifungal amount of platinum incorporated into the construct, which are not present in Group II; the special technical features of Group II include vacuum dehydration device comprises: (i) a drying housing defining a drying chamber and defining inflow and outflow apertures; and (ii) a porous drying board placed on top of a vacuum table inside the drying chamber, wherein the drying board has a first surface receiving an object to be dehydrated and a second surface opposing to the first surface and is attached to the vacuum table, which are not present in Group I.

There are no common technical features between Groups I-II.

Additionally, the special technical features of Group I lack an inventive step under PCT Article 33(3) as being obvious over WO 2012/069559 A1 to Meisel, et al. (hereinafter 'Meisel') in view of WO 2001/000151 A1 to Gavin, et al. (hereinafter 'Gavin'). Meisel discloses an antifungal cross-linked collagen construct (a nanofiber-based product using crosslinked collagen as carrier material and antifungal substances (antifungal cross-linked collagen construct); abstract; page 8, lines 5-9; page 10, lines 28-32) comprising: a cross-linked collagen (crosslinked collagen nanofibers; page 8, lines 5-9) comprising collagen (using collagen as carrier material; page 8, lines 5-9) and one or more cross-linking agents (using NDGA as crosslinker; page 8, lines 5-9) and copper incorporated into the construct (the product further comprises one auxiliary substance of the group consisting of copper; page 10, lines 28-32). Meisel does not disclose an antifungal amount of copper incorporated into the construct. However, Gavin discloses an antifungal amount of copper incorporated into a construct (it required at least 50ppm of metal ions alone to inhibit fungal growth (antifungal amount) and the composition comprises from 0.1 percent to 2 percent of a metal ion source selected from group consisting of copper salts; page 52, lines 7-8; claim 1). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the construct composition, as previously disclosed by Meisel, in order to have provided an antifungal amount of copper incorporated into the construct, as previously disclosed by Gavin, for providing the advantages such as effective anti-microbial efficacy, while not deteriorating conditioning benefits (Gavin; page 60, lines 14-20).

Since there are no common technical features between Groups I-II, and where the special technical features of Group I are disclosed by Meisel in view of Gavin, Groups I-II lack unity.