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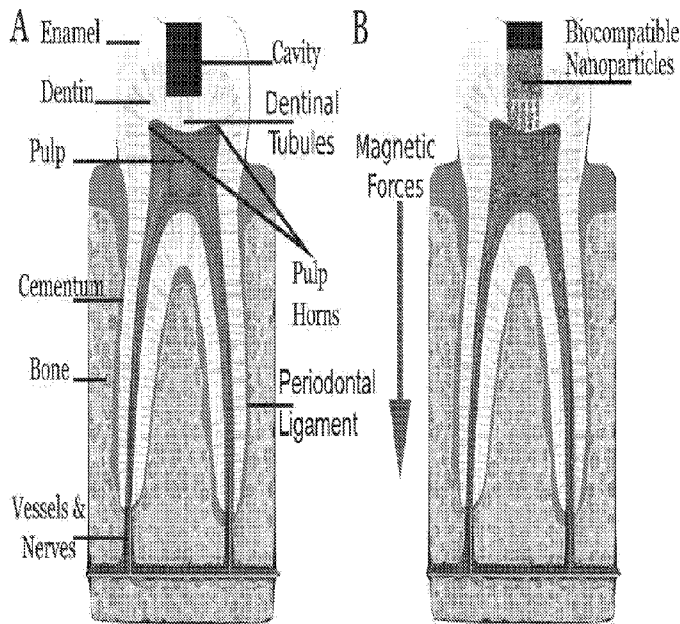
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[Continued on next page]

(54) Title: COMPOSITIONS AND DELIVERY METHODS FOR TREATING DENTAL INFECTIONS, INFLAMMATION, SENSITIVITY, AND FOR USE IN DENTAL RESTORATIONS

FIG. 1



(57) Abstract: The present invention provides a method of treating a condition affecting a tooth or periodontium in a subject, comprising administering to the subject's tooth or periodontium a composition comprising biocompatible magnetic, magnetizable, or magnetically responsive agents; and applying an external magnetic field, wherein the magnetic, magnetizable, or magnetically responsive agents migrate to a desired location in response to the externally applied magnetic field, thereby treating a condition affecting the tooth or periodontium in the subject.

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61C 5/04 (2015.01) CPC - A61C 5/04 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) CPC - A61C 5/04; IPC(8) - A61C 5/04 (2015.01); USPC - 433/224 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - A61C 5/062, A61K 6/0038, A61C 13/235, A61K 2800/47; USPC - 433/81, 433/83 (keyword limited; terms below)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase; Google (Web, Patents, Scholar) Search Terms Used: Dental tooth periodontium Biocompatible safe Magnetic responsive agent External magnetic field force Migrate move control advance location Therapeutic agent Remineralizing bonding inflammatory immunosuppressant analgesic antibiotic antibiody antibacterial anti-fungal anesthetic desensiti		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2007/0275353 A1 (Gharib et al.), 29 November 2007 (29.11.2007), entire document, especially Fig. 3-4, para [0019]-[0020], [0030] and [0040]	1-2, 4, 64-65 and 67 ----- 3 and 66
Y	US 8,651,113 B2 (Seeney et al.), 18 February 2014 (18.02.2014), entire document, especially col 2, ln 41-55	3 and 66
A	US 5,295,832 A (Evans), 22 March 1994 (22.03.1994), entire document	1-4 and 64-67
A	US 6,652,278 B2 (Honkura et al.), 25 November 2003 (25.11.2003), entire document	1-4 and 64-67
A	US 2014/0073835 A1 (Shapiro et al.), 13 March 2014 (13.03.2014), entire document	1-4 and 64-67
A, P	DRBICUSPID STAFF "Researchers Use Nanoparticles to Deliver Drugs into Teeth" DrBicuspid.com, 14 October 2014 (14.10.2014), accessed at < http://www.drbuspid.com/index.aspx?sec=ser&sub=def&pag=dis&ItemID=316088 >, entire document	1-4 and 64-67
A, P	US 2015/0044628 A1 (Flyash), 12 February 2015 (12.02.2015), entire document	1-4 and 64-67
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 November 2015 (02.11.2015)		Date of mailing of the international search report 19 JAN 2016
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/39559

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.: 5-42, 46-63 and 68-119
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:

----- Please see continuation on supplemental 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.:
1-4 and 64-67

- 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.

Continuation of Box III - Lack of Unity

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 1-4 and 64-67, directed to a system for treating a tooth or periodontium wherein magnetically responsive agents migrate to a desired location in response to an externally applied magnetic field.

Group II: Claim 43-45, directed to a composition for treating a tooth or periodontium comprising an effective amount of a therapeutic agent.

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

The invention of Group I includes the special technical feature of applying an external magnetic field wherein the magnetic, magnetizable, or magnetically responsive agents migrate to a desired location in response to the externally applied magnetic field, not required by the claims of Group II.

The invention of Group II includes the special technical feature of an effective amount of a therapeutic agent, wherein the therapeutic agent is selected from the group consisting of a remineralizing agent, a restorative/bonding material, an anti-inflammatory agent, an immunosuppressant, an analgesic, an antibody, an antibiotic, an antibacterial, an anti-fungal, a dental anesthetic, a desensitizing agent, recombinant RNA, recombinant DNA, lipopolysaccharides, a therapeutic protein, and combinations thereof, not required by the claims of Group I.

COMMON TECHNICAL FEATURES

Groups I-II share the common technical features of a composition comprising biocompatible magnetic, magnetizable, or magnetically responsive agents. However, this shared technical feature does not represent a contribution over prior art as being anticipated by US 2007/0275353 A1 to Gharib, et al. (hereinafter 'Gharib'), which discloses a method of filling root canal spaces (Fig. 4) that utilizes a composition (hydrophobic filler material, para [0019]) comprising biocompatible magnetic particles (ferromagnetic particles, para [0020]).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.

Claims 5-42, 46-63 and 68-119 are unsearchable because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a). Accordingly, they are not included with any invention.