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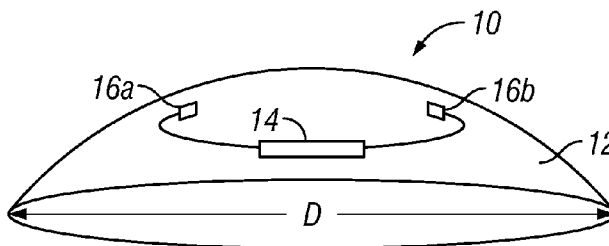
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(54) Title: METHODS AND DEVICES FOR CROSSLINKING OF CORNEAL COLLAGEN AND FOR TREATMENT OF DISORDERS OF THE EYE

FIG. 2A



(57) Abstract: Methods and devices for delivering therapeutic or diagnostic energy (e.g., light, ultrasound, ionizing radiation (e.g., x-ray), vibration, heat energy, etc.) into the eye. An energy emitting device is positioned on the eye and used to deliver energy into the eye. The device may be constructed to allow the subject's eyelids to open and close while the device is positioned on the eye. The device is useable for various energy based or energy-mediated therapies, including crosslinking of corneal collagen, light therapy, photodynamic therapy, photo-activation of drugs, etc.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/23401

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B 18/18 (2012.01)

USPC - 606/4

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)

USPC: 606/4

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

USPC: 606/1, 2, 5, 6, 10, 13, 16, 17, 27, 32, 34, 41;

607/1, 2, 53, 88, 94 (keyword limited; terms below)

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

PubWEST(PGPB, USPT, EPAB, JPAB); Google

Search Terms Used: light, crosslink\$3, collagen, contact lens\$2, LED, light, laser, cross, link\$3, reshap\$3, riboflavin, tetrapyrrole nucleus, porphyrin, chlorine, bacteriochlorin, phthalocyanine, texaphyrin, photosensitiz\$3, antimicrobial, cornea\$, orthokeratology, battery

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 2010/0001926 A1 (AMIRPARVIZ et al) 07 January 2010 (07.01.2010) fig 1, 2, para [0025]-[0026], [0031], [0043]	1-3, 17, 33-35, 37, 39-40 ----- 4-16, 18-32, 36, 38, 41-43
Y	US 2009/0149842 A1 (MULLER et al) 11 June 2009 (11.06.2009) para [0009], [0036]-[0039], [0044]	4-16, 18-32, 36, 43
Y	US 2009/0189974 A1 (DEERING) 30 July 2009 (30.07.2009) fig 61, para [0476]	38
Y	US 5,618,284 A (SAND) 08 April 1997 (08.04.1997) col 12, ln 37-52, col 14, ln 31-54, col 15, ln 26-48	19, 23, 31, 41-43
Y	US 2006/0231107 A1 (GLICKMAN et al) 19 October 2006 (19.10.2006) para [0032], [0066], [0069]	24-26
Y	US 2008/0208177 A1 (MROCHEN et al) 28 August 2008 (28.08.2008) para [0008]-[0009]	28, 30, 31/(30), 32/(30)

Further documents are listed in the continuation of Box C.

* 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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 11/23401

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.: 44
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.:
1-43

- 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 11/23401

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 1-43; directed to device and method for for delivering therapeutic or diagnostic energy to the eye.

Group II: Claims 45-50; directed to use of an 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:

The special technical feature of Group I is an energy-emitting device that allows the eye lids of that eye to open and close while the energy-emitting device is positioned on the eye, which is not present in Group II. The special technical feature of Group II is an agent selected from the group consisting of photoabsorptive agents, photosensitizers and photoactivatable drugs, which is not present in Group I.

The only element of commonality between groups I and II is that of emission into the eye of light from a light emitting device positioned on the subject's eye, which is known in the prior art (ref. US 2010/0001926 A1 to Amirparviz et al.; para [0043]--"The active contact lens 110 places the display 114 light sources, for example LEDs, substantially on the surface of the cornea...At least two illustrative approaches are available for generating a sharp image on a user's retina from light generated by the display 114: i) assembling or fabricating microlenses (not shown) under each pixel of the display 114 to form a collimated beam that may be projected to the retina").

Accordingly, unity of invention is lacking under PCT Rule 13.1.

Claim 44 is a dependent claim and is not drafted in accordance with the second and third sentences of Rule 6.4(a).