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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *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))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
19 June 2014

(54) Title: GEOMETRIC OPTICAL POWER MEASUREMENT DEVICE

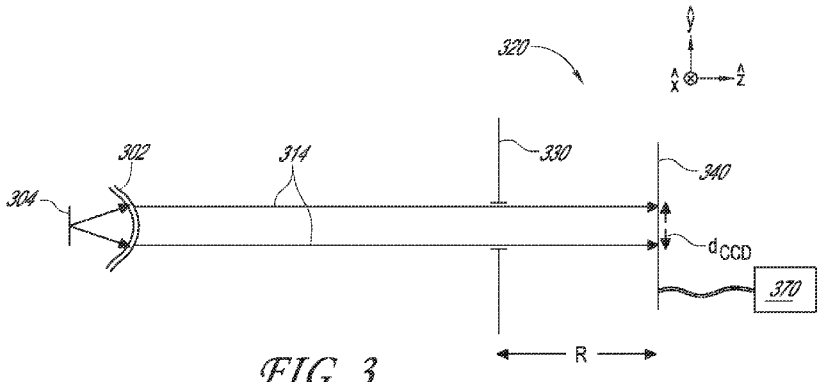

FIG. 3

(57) Abstract: An ophthalmic optical power measurement device (e.g., 320, 420, 720, 820, 920) can include a light source (e.g., 910) configured to direct an input beam of light into the eye of a patient. The ophthalmic optical power measurement device can also include an aperture (e.g., 330, 430, 730, 830, 930) configured to receive an output beam that consists of light from the input beam that scatters from a location on the retina of the eye and exits through the pupil of the eye. The ophthalmic optical power measurement device can also include a detector (e.g., 340, 440, 740, 840, 940) configured to receive the output beam after it has passed through the aperture. A processor (e.g., 370, 470, 770, 870, 970) can be configured to determine the size of a spot created by the output beam on the detector, and to determine the optical power of the eye based upon the size of the spot.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 13/61729

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61B 3/13 (2014.01)
USPC - 351/205
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: 351/205
IPC(8) - A61B 3/13 (2014.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 623/6.11,6.12; 351/200,205,210,212; 382/117; 396/18 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase; Google Patents; Google Scholar
Keywords: ophthalmic or eye, power measurement device, light source, input beam, aperture, detector, retina, pupil, processor, spot, optical power, width of the spot, spherical and cylindrical power, axis, aperture, microscope, cataract, handheld, surgery, diopter, aphakic

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 2005/0068497 A1 (HANEBUCHI et al.) 31 March 2005 (31.03.2005), entire document, especially; para [0004], [0007], [0017]-[0019], [0027]-[0031], [0035], [0036], [0046], [0049]	1-12, 20, 21 ---------- 13-19, 22
Y	US 2010/0152847 A1 (PADRICK et al.) 17 June 2010 (17.06.2010), entire document, especially; para [0011], [0012], [0038], [0042], [0062], [0063], [0066], [0067]	13, 14, 16-19, 22
Y	US 2005/0110949 A1 (GOLDFAIN et al.) 26 May 2005 (26.05.2005), entire document, especially; para [0006], [0012]	15
A	US 2011/0013141 A1 (HOLLADAY et al.) 20 January 2011 (20.01.2011), entire document, especially; para [0022]	18
A	US 6,736,510 B1 (VAN HEUGTEN) 18 May 2004 (18.05.2004), entire document	1-22
A	US 5,777,719 A (WILLIAMS et al.) 07 July 1998 (07.07.1998), entire document	1-22

☐ 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	Date of mailing of the international search report
01 April 2014 (01.04.2014)	22 APR 2014
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. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 13/61729

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 1-22: drawn to a device for making opthalmic optical power measurements which includes a light source, an aperture, a detector and a processor which is configured to determining the size of a spot created by the output beam on the detector and to determine the optical power of the eye based upon the size of the spot.

Group II: claims 23-37: drawn to a method for making opthalmic optical power measurement which includes the steps of inputting a beam of light into the eye which produces and output beam through the pupil of the eye and determining the angular size of the output beam and determining the optical power of the eye based on the angular size of the output beam.

-- 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.:
1-22

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.
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Continuatuion of Box No. III - Observations where unity of invention is lacking

The inventions listed as Groups I and 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:

Groups I-II are related as an apparatus (Group I) and a method for use thereof (Group II) and share the technical features of an opthalmic optical power measurement device comprising a light source for directing an input beam of light into a patient's eye such that the input beam scatters from a location on the retina, creating an output beam that exits through the pupil of the eye; an aperture configured to receive the output beam; a detector configured to receive the output beam after it has passed through the aperture; and a processor for determining the optical power of the eye based on a measurement of the output beam. However, these shared technical features do not represent a contribution over prior art, because the shared technical features are disclosed by US 2005/0068497 A1 to Hanebuchi et al. (hereinafter 'Hanebuchi'). Hanebuchi discloses an ophthalmic optical power measurement device comprising a light source configured to direct an input beam of light into the eye of a patient (para [0017]); the output beam of light comprising light from the input beam that scatters from a location on the retina of the eye and exits through the pupil of the eye (para [0004], [0007], [0019], [0028]); an aperture configured to receive the output beam (abstract; para [0019]-[0020]); a detector configured to receive the output beam after it has passed through the aperture (abstract, para [0018]); and a processor configured to determine the size of a spot created by the output beam on the detector, and to determine the optical power of the eye (para [0018], [0029], image processing part, [0049], a ring image of the size corresponding to an error of the spherical refractive component).

As the 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.

Additionally, Group I requires determining the optical power of the eye based on the size of a spot created by the output beam on the detector, not required by Group II; while Group II requires determining the optical power of the eye based on the angular size of the output beam, not required by Group I.

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