IP & Patents
What, Why and How
(An introduction)

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Dr. Jaume Pujol
(jaume.pujol@upc.edu)

- Professor, Universitat Politècnica de Catalunya (UPC)
  Optics and Optometry department (1984-)
- Co-founder Visiometrics (www.visiometrics.com) 2001
  The company was sold in 2015 at Halma
  (case of success)
- 17 patents:
  10 licensed
  7 Visiometrics
  3 Davalor

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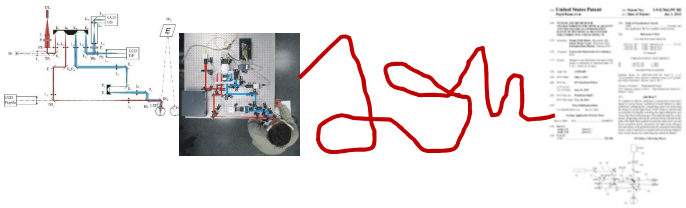
Aims

- ✓ To give you some (basic) ideas about:
  - ✓ WHAT IS Intellectual property/ patents.
  - ✓ WHY IS necessary IP/patents
  - ✓ HOW to go from the idea to the patent.



3

Aims

MOTIVATE YOU TO EXPLORE THE POSSIBILITY OF PATENTING YOUR R&D

Useful to promote the creation of new and better products

You can become rich!!!!!

Before to start……..

some important actors in the IP and patent process

Patent Agent:

Someone who is able to prepare, file, and execute applications for patents on behalf of individuals or clients.

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Before to start……..

some important actors in the IP and patent process

PTO (Patent and Trademark Office):

Patent and trademark Office governmental entities in charge of carrying out the whole process relating to a patent (patent prosecution)

www.uspto.gov

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Before to start……..

some important actors in the IP and patent process

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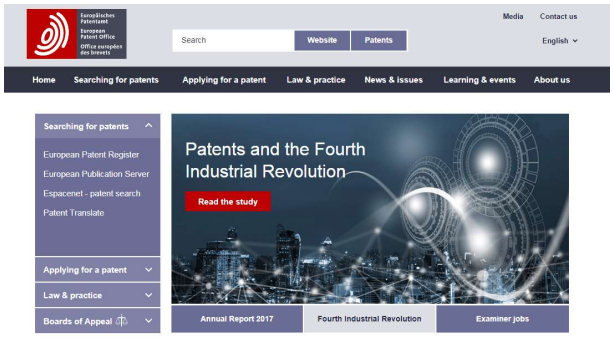

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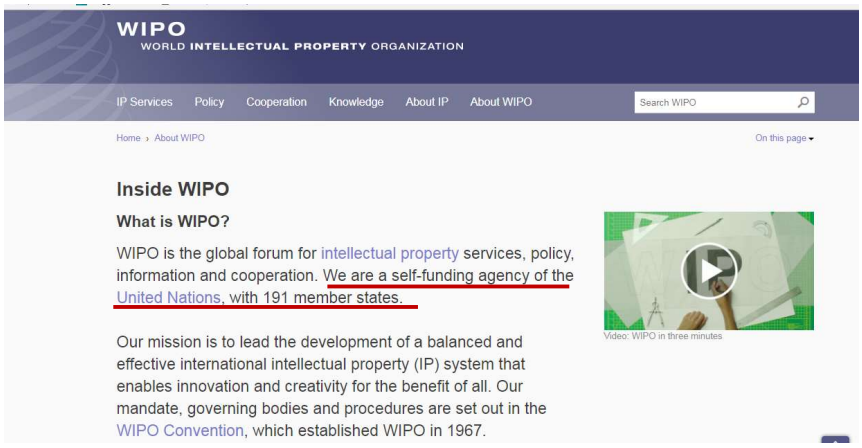
Before to start……..

some important actors in the IP and patent process



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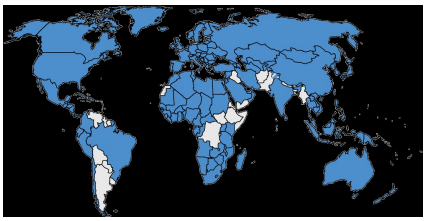
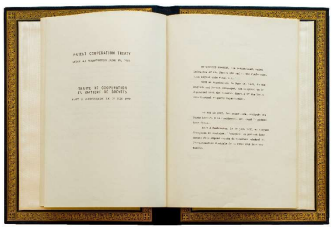
Before to start……..

some important actors in the IP and patent process

PCT – The International Patent System

The Patent Cooperation Treaty (PCT) assists applicants in seeking patent protection internationally for their inventions, helps patent Offices with their patent granting decisions, and facilitates public access to a wealth of technical information relating to those inventions. By filing one international patent application under the PCT, applicants can simultaneously seek protection for an invention in a very large number of countries.





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Intellectual property

Intellectual property refers to creations of the mind: inventions; literary and artistic works; and symbols, names and images used in commerce.

- Intellectual property is divided into two categories:
  - Industrial Property includes **patents for inventions**, trademarks, industrial designs and geographical indications.
  - Copyright covers literary works (such as novels, poems and plays), films, music, artistic Works (e.g., drawings, paintings, photographs and sculptures) and architectural design.

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Intellectual property

- Intellectual property rights are like any other property right.

They allow creators, or owners, of patents, trademarks or copyrighted works to benefit from their own work or investment in a creation.

These rights are outlined in Article 27 of the Universal Declaration of Human Rights, which provides for *the right to benefit from the protection of moral and material interests resulting from authorship of scientific, literary or artistic productions.*

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Intellectual property

Why promote and protect intellectual property?

There are several compelling reasons.

- The progress and well-being of humanity rest on its capacity to create and invent new works in the areas of technology and culture.
- The legal protection of new creations encourages the commitment of additional resources for further innovation.
- The promotion and protection of intellectual property spurs economic growth, creates new jobs and industries, and enhances the quality and enjoyment of life.

The intellectual property system helps to find a balance between the interests of innovators and the public interest, providing an environment in which creativity and invention can flourish, for the benefit of all.

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Intellectual property

How does the average personal benefit?

Intellectual property rights reward creativity and human endeavor, which fuel the progress of humankind.

Some examples:

- Many innovative industries could not survive without the patent system (e.g., Pharmaceuticals), since cost of copying is a fraction of the cost of R&D. Also, the multibillion dollar film, recording, publishing and software industries – which bring pleasure to millions of people worldwide – would not exist without copyright protection.
- **Without the rewards provided by the patent system, researchers and inventors would have little incentive to continue producing better and more efficient products for consumers.**
- Consumers would have no means to confidently buy products or services without reliable, International trademark protection and enforcement mechanisms to discourage counterfeiting and piracy.

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Patents

Why does anyone need a patent system?

- Patents and IP laws are **legal tools created by society** (governments worldwide) to **foster technical progress** and innovation.
- The patent system seeks to **reward inventors** and **enterprises** for taking risks in innovating and exploring beyond the limits of science and technology.
- **Patent and patent applications are published** (typically 18 months after filing), which **prevents** relevant technical advances to become **hidden** from general knowledge. A patent is a compensation to an inventor for making its **invention accessible to the public**.
- Publication of patents further **stimulates competition** since it provides an incentive to the market to go beyond existing knowledge and IP rights.

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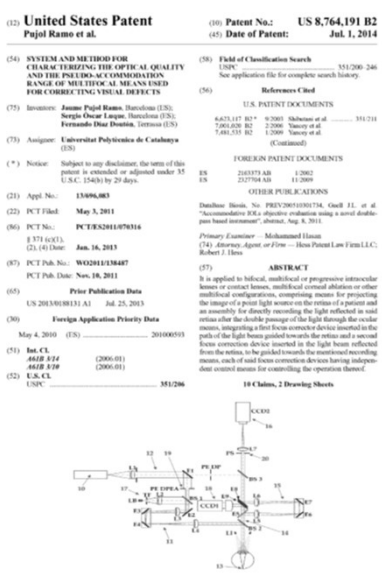
Patents

What is a Patent?.



(12) **United States Patent**
Pujol Ramo et al.

(10) **Patent No.: US 8,764,191 B2**
(45) **Date of Patent: Jul. 1, 2014**

(54) **SYSTEM AND METHOD FOR CHARACTERIZING THE OPTICAL QUALITY AND THE PSEUDO-ACCOMMODATION RANGE OF MULTIFOCAL MEANS USED FOR CORRECTING VISUAL DEFECTS**

(75) Inventors: **Jaume Pujol Ramo**, Barcelona (ES); **Sergio Oscar Luque**, Barcelona (ES); **Fernando Diaz Doutón**, Terrassa (ES)

(73) Assignee: **Universitat Politècnica de Catalunya** (ES)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 29 days.

(21) Appl. No.: **13/696,083**

(22) PCT Filed: **May 3, 2011**

(86) PCT No.: **PCT/ES2011/070316**
§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2011/138487**
PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

(30) **Foreign Application Priority Data**
May 4, 2010 (ES) 201000593

(51) **Int. Cl.**
A61B 3/14 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200-246
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
6,623,117 B2 * 9/2003 Shibutani et al. 351/211
7,001,020 B2 2/2006 Yancey et al.
7,481,535 B2 1/2009 Yancey et al.
(Continued)
FOREIGN PATENT DOCUMENTS
ES 2163373 AB 1/2002
ES 2127704 AB 11/2009
OTHER PUBLICATIONS
Database Biosis, No. PREV200510301734, Guell J.L. et al. "Accommodative IOLs objective evaluation using a novel double-pass based instrument", abstract, Aug. 8, 2011.

Primary Examiner — Mohammed Hasan
(74) *Attorney, Agent, or Firm* — Hess Patent Law Firm LLC; Robert J. Hess

(57) **ABSTRACT**
It is applied to bifocal, multifocal or progressive intraocular lenses or contact lenses, multifocal corneal ablation or other multifocal configurations, comprising means for projecting the image of a point light source on the retina of a patient and an assembly for directly recording the light reflected in said retinas after the double passage of the light through the ocular means, integrating a first focus corrector device inserted in the path of the light beam guided towards the retina and a second focus correction device inserted in the light beam reflected from the retina, to be guided towards the mentioned recording means, each of said focus correction devices having independent control means for controlling the operation thereof.

10 Claims, 2 Drawing Sheets

- A patent is an **exclusive right granted for an invention** (a product or process that provides a new way of doing something, or that offers a new technical solution to a problem).
- A patent **provides patent owners with protection for their inventions**. Protection is granted for a limited period, generally **20 years.**
- A patent **protects an invention, not necessarily a product.** An invention can be understood as a new and inventive solution to a technical problem.

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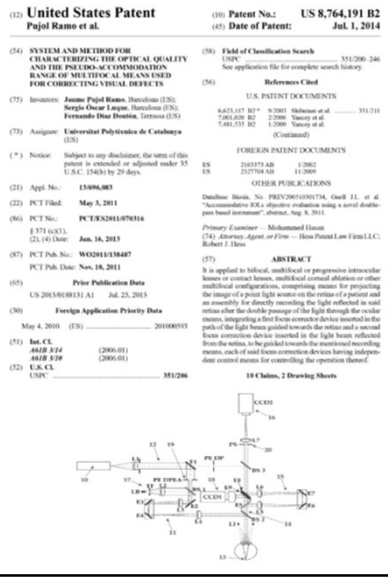
Patents

What is a Patent?.



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10 Claims, 2 Drawing Sheets

A patent provide a **NEGATIVE RIGHT:**

The **owner** of the patent has the right to prevent or stop others from **making, using, offering for sale, selling or importing** a product or a process including the patented invention without the owner's permission.

A patent **does NOT** provide a **POSITIVE "FREEDOM TO USE"** right, i.e., the right to make or sell a product or an invention.

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Patents

What is a Patent?

A patent provide a **NEGATIVE RIGHT**, i.e., the **right to stop others** from making unauthorized use of an invention. A patent **does NOT** provide a **POSITIVE "FREEDOM TO USE"** right, i.e., the right to make or sell a product or an invention.

Example :

- 'Pharma-Com' obtains a patent on a new drug for the potential treatment of cancer.
- The patent does not entitle 'Pharma-Com' to commercialize the drug, since the drug needs authorization from governmental health care institutions (such as the FDA in the US, CE in Europe). For instance, the drug might be effectively patented but become rejected by the FDA because of some unexpected adverse effects found in late stage clinical trials.
- 'Pharma-Com' will only retain the right to stop other from using commercially the drug.

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Patents

What is a Patent?

- A patent **protects an invention, not necessarily a product.** An invention can be understood as a new and inventive solution to a technical problem.

HD Analyzer is the product that manufactures and commercialize VISIOMETRICS

It is protected at least with **8 patents.**

Apple had 17 patents for multiple inventions used in a cell phone before the first iphone.

For the iphone 5 it had **1298 patents**, and more than 500 lawsuits.

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Patents

Protection rights

- In contrast to other forms of IP rights (i.e. copyrights, trademarks, semiconductor layouts,..) which mainly protect form/appeareance, a patent **protects the solution** itself, regardless of the form (unless the form is an important aspect of the solution itself).
    - **In general terms, a patent might protect,**
      A physical, constructional aspect of a product, system or **device**.
      A **method** or **process**.

- As many IP rights, patents provide a **territorial right** awarded by a national or regional office, which is subject to national or regional laws. There is **no** such an **international or worldwide patent**.

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Patents

Patent on a system and method

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Pujol Ramo et al.

(10) **Patent No.: US 8,764,191 B2**
(45) **Date of Patent: Jul. 1, 2014**

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(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200, 246
See application file for complete search history.

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10 Claims, 2 Drawing Sheets

Patent on a method

(12) **United States Patent**
Pujol Ramo et al.

(10) **Patent No.: US 9,750,406 B2**
(45) **Date of Patent: Sep. 5, 2017**

(54) **METHOD FOR THE DETECTION OF VISUAL FUNCTION LOSSES**

(71) Applicant: **UNIVERSITAT POLITÈCNICA DE CATALUNYA**, Barcelona (ES)

(72) Inventors: **Jaume Pujol Ramo**, Barcelona (ES); **Juan Carlos Ondategui Parra**, Barcelona (ES); **Maritxell Vilaseca Ricart**, Barcelona (ES); **Montserrat Arjona Carbonell**, Barcelona (ES); **Rosa Borràs García**, Barcelona (ES)

(73) Assignee: **UNIVERSITAT POLITECNICA DE CATALUNYA**, Barcelona (ES)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 17 days.

(21) Appl. No.: **14/398,976**

(22) PCT Filed: **May 3, 2013**

(86) PCT No.: **PCT/ES2013/070275**
§ 371 (c)(1),
(2) Date: **Nov. 4, 2014**

(87) PCT Pub. No.: **WO2013/164509**
PCT Pub. Date: **Nov. 7, 2013**

(65) **Prior Publication Data**
US 2015/0103314 A1 Apr. 16, 2015

(30) **Foreign Application Priority Data**
May 4, 2012 (ES) 201230673

(51) **Int. Cl.**
A61B 3/00 (2006.01)
A61B 3/12 (2006.01)
A61B 3/103 (2006.01)
A61B 3/117 (2006.01)
A61B 3/13 (2006.01)
A61B 3/14 (2006.01)
A61B 3/028 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
CPC ***A61B 3/12*** (2013.01); ***A61B 3/0025*** (2013.01); ***A61B 3/028*** (2013.01); ***A61B 3/103*** (2013.01); ***A61B 3/117*** (2013.01); ***A61B 3/13*** (2013.01); ***A61B 3/14*** (2013.01); *A61B 3/102* (2013.01)

(58) **Field of Classification Search**
CPC ... A61B 3/12; A61B 3/13; A61B 3/14; A61B 3/102; A61B 3/103; A61B 3/117
USPC 351/206, 246
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
8,488,851 B2 7/2013 Artal Soriano et al.
2008/0118855 A1 1/2008 Larichev et al.
2010/0195876 A1 8/2010 Artal Soriano et al.
FOREIGN PATENT DOCUMENTS
ES 2365225 A1 2/2007
ES 2391192 A1 11/2012
WO WO 2008/135018 A1 11/2008
WO WO 2013/164509 A1 11/2013
Primary Examiner — Jack Dinh
(74) *Attorney, Agent, or Firm* — Robert J. Hess; Hess Patent Law Firm

(57) **ABSTRACT**
The invention relates to a method for the detection of visual function losses. The method comprises analysing the optical quality of a patient's eye based on one or more retinal images thereof or based on information relating to retinal images corresponding to an eye having an anterior segment and intraocular means that are healthy. The method comprises: detecting a visual function loss of the visual system of functional or pathological etiology, based on the result of the aforementioned analysis; and determining if this loss is due to a reduced and/or limited neural response, which induces alterations in the innervation of the intrinsic ocular muscles of the eye.

8 Claims, No Drawings

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Patents

What kinds of inventions can be protected?

An invention must, in general, fulfill the following conditions to be protected by a patent:

Novelty : An invention must show some new characteristic that is not part of the body of existing knowledge in its particular technical field. That body of existing knowledge is called "prior art".

Inventiveness: An invention must be non-obvious, involving an inventive step with respect to prior-art that could not be deduced by a person with average knowledge of the technical field.

Industrial application: An invention needs to be applicable to a product or process, it can not be a mere mental act. (In many countries, scientific theories, mathematical methods, plant or animal varieties, discoveries of natural substances, commercial methods or methods of medical treatment are not generally patentable.

Scope of protection and requirements of patentability are highly dependent on national laws.

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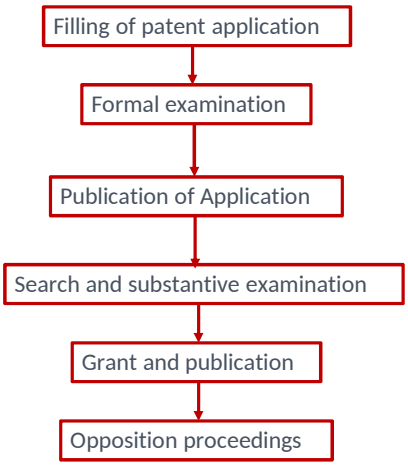
Patents

Patent examination



Patent Offices worldwide (usually Patent and Trademark Offices or PTOs) conduct an **exam** upon each patent application to check whether conditions for patentability are met.

This is a graph for the general scheme of patent granting procedures.

This procedures can vary amongst patent offices.

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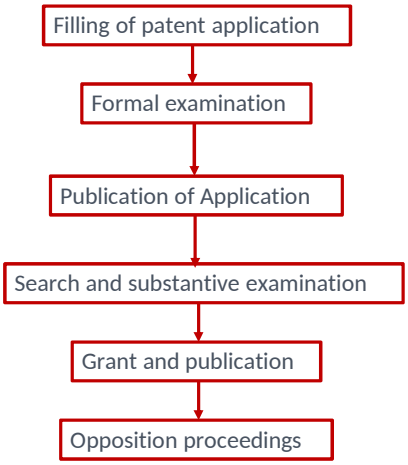
Patents

Patent examination



Filing of Patent Application – Filing in a national or regional PTO (e.g., USPTO, EPO).

Formal Examination – Administrative requirements checked (e.g., relevant documents submitted and fee paid).

Publication of Application – In most countries, patent applications are published 18 months after the first filing date.

Prior-Art Search – Prior related technical documents (e.g. patent and patent applications, scientific/technical papers) are searched to contrast the application.

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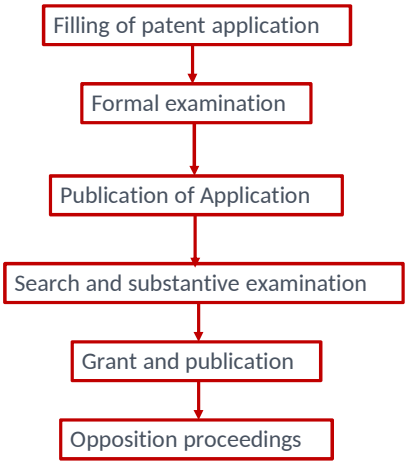
Patents

Patent examination



Substantive Examination – Patentability against prior-art analysis is done by most PTOs. Exam involves writing opinions ('office actions') from examiner and response from applicant. Usually patent protection scope is reduced during examination.

Grant and Publication – Upon a positive conclusion from exam, final patent text as allowed is published.

Opposition – Several patent offices provide a period during which third parties may oppose the grant of a patent. They might be pre-grant or post-grant.

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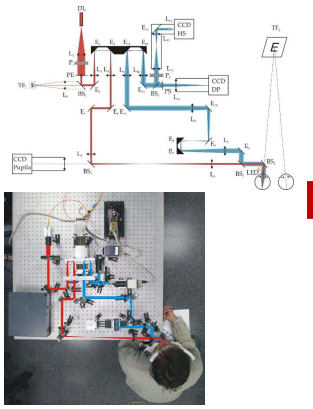
Patent Prosecution

Patent prosecution describes the **interaction between applicants and their representatives, and a patent office** with regard to a patent. Broadly, patent prosecution can be split into **pre-grant prosecution**, which involves negotiation with a patent office for the grant of a patent, and **post-grant prosecution**, which involves issues such as post-grant amendment and opposition.



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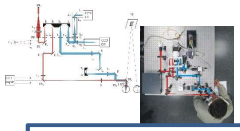
Patent Prosecution

General Steps



Inventor interview

Identifying and defining invention

Prior-Art search

Drafting Patent Application

PATENT AGENT

Filling patent application at PTO

Prior-art search

Appl. Publication

Office action

Application amendment

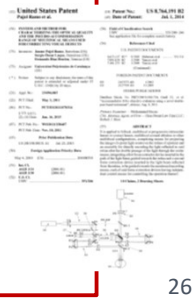
Allowance/Rejection

Issuance

PATENT AGENT

Appeal

Issuance/Rejection



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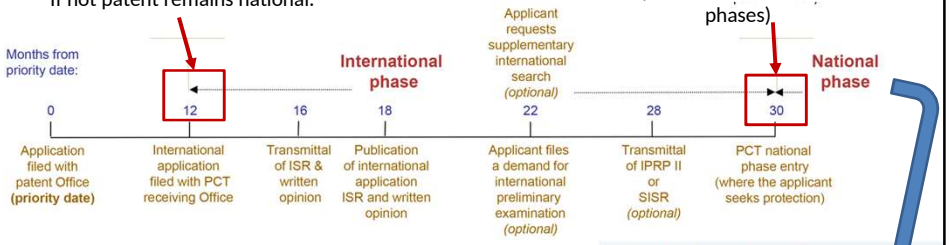
Patent Prosecution

Time line

Deadline (month 12) to present the international application.
If not patent remains national.

Decision on whether to enter on national phases or not.
(if the patent has been licensed to a company normally it decide to enter in national phases)

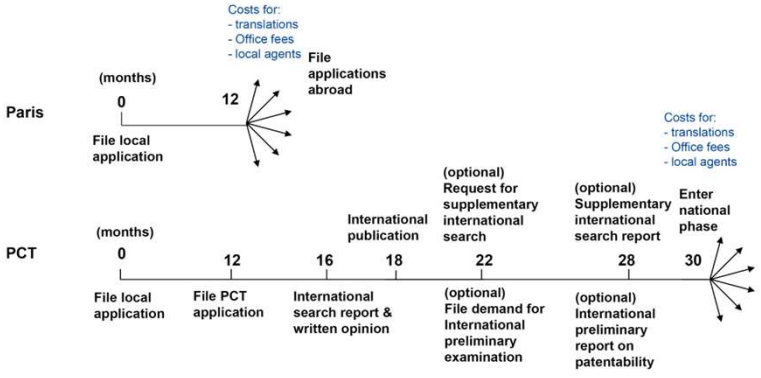


US – USA
JP – Japan
CN – China
IN – India
KR – Korea
MX – Mexico
BR – Brazil
RU - Russia

ES – Spain
DE – Germany
FR – France
GB – UK
IT – Italy
NL – The Netherlands

Patent Prosecution

Time line



PCT way gives you more time to decide on whether to enter on national phases or not

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Patent Structure

First Page

Title and Patent Numbers
Inventor/s, applicant, address
Abstract
Filing date, publication date, priority documents, international classification.

Description (Patent Specification)

Object, field and background of the invention
Summary of the invention
Brief description of the drawings / list of Figures
Detailed description of the invention and preferred embodiments

Claims:

Define the legal scope of protection for the device, or process for which protection is sought

Drawings

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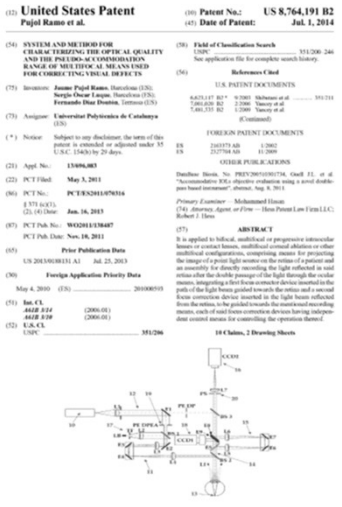
Patent Structure

A patent is a technical document


(12) **United States Patent**
Pujol Ramo et al.

(10) **Patent No.: US 8,764,191 B2**
(45) **Date of Patent: Jul. 1, 2014**

(54) **SYSTEM AND METHOD FOR CHARACTERIZING THE OPTICAL QUALITY AND THE PSEUDO-ACCOMMODATION RANGE OF MULTIFOCAL MEANS USED FOR CORRECTING VISUAL DEFECTS**

(75) Inventors: **Jaume Pujol Ramo**, Barcelona (ES); **Sergio Oscar Luque**, Barcelona (ES); **Fernando Díaz Doutón**, Terrassa (ES)

(73) Assignee: **Universitat Politècnica de Catalunya** (ES)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 20 days.

(21) Appl. No.: **13/696,083**

(22) PCT Filed: **May 3, 2011**

(86) PCT No.: **PCT/ES2011/070316**
§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2011/138487**
PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

(30) **Foreign Application Priority Data**
May 4, 2010 (ES) 201000595

(51) **Int. Cl.**
A61B 3/14 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200, 246
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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(Continued)

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ES 2127768 AB 11/2009

OTHER PUBLICATIONS

Database Biosis, No. PREV200701501734, Graff, J.L. et al. "Accommodative IOLs: objective evaluation using a novel double-pass based instrument", abstract, Aug. 8, 2011

Primary Examiner – Mohammed Hasan
(74) *Attorney, Agent, or Firm* – Hess Patent Law Firm LLC; Robert J. Hess

(57) **ABSTRACT**

It is applied to bifocal, multifocal or progressive intraocular lenses or contact lenses, multifocal corneal ablation or other multifocal configurations, comprising means for projecting the image of a point light source on the retina of a patient and an assembly for directly recording the light reflected in said retina after the double passage of the light through the ocular means, integrating a first focus corrector device inserted in the path of the light beam guided towards the retina and a second focus corrector device inserted in the light beam reflected from the retina, to be guided towards the mentioned recording means, each of said focus correction devices having independent control means for controlling the operation thereof.

10 Claims, 2 Drawing Sheets

- A patent is a **TECHNICAL, PUBLIC DISCLOSURE** of an invention.
- It needs to contain **sufficient technical disclosure** such that an average practitioner in the technical field of the patent is able to bring the invention to reality.
- Patent applications are usually **published within 18 months** after the first filing, i.e., before the granting of the patent rights. This enables general public to be aware of technology progress, and stimulate further innovation.
- Disclosure of the invention is a price the inventor needs to pay in exchange of acquiring an **option** to a patent grant. (*keeping inventions as trade secrets is an option*)

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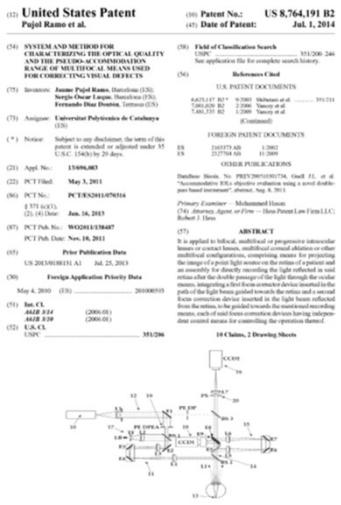
Patent Structure

A patent is a legal document



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PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

(30) **Foreign Application Priority Data**
May 4, 2010 (ES) 201000593

(51) **Int. Cl.**
A61B 3/14 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200–246
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
6,623,117 B2 * 9/2003 Shibutani et al. 351/211
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7,481,535 B2 1/2009 Yancey et al.
(Continued)
FOREIGN PATENT DOCUMENTS
ES 2163373 AB 1/2002
ES 2327704 AB 11/2009
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DataBase Biosis, No. PREV200510301734, Guell J.L. et al. "Accommodative IOLs objective evaluation using a novel double-pass based instrument", abstract, Aug. 8, 2011.

Primary Examiner — Mohammed Hasan
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10 Claims, 2 Drawing Sheets

- A patent is a **LEGAL EXCLUSION RIGHT** granted by a Patent Office for a new invention.
- A patent can be seen as a **CONTRACT** between the inventor and/or the applicant and the granting state.
- **Every word** in a patent has both a technical meaning and a **legal implication**. Words are usually to be interpreted as customary by the 'skilled in the art person' unless the patent provides an explicit definition (each patent is its own dictionary).

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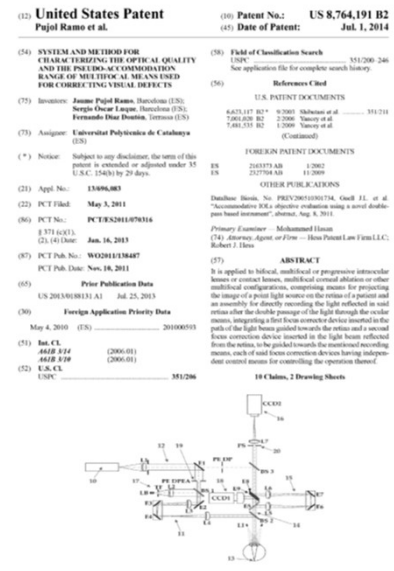
Patent Structure - Headers



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10 Claims, 2 Drawing Sheets

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Patent Structure – INID Codes

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(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

INID: Internationally agreed Numbers for the Identification of (bibliographic) Data".

Some relevant INID codes are:

- [10] Identification of patent, SPC or patent document
  - [11] Number of the patent, SPC or patent document
- [20] Date concerning the application for a patent or SPC:
  - [22] Date of filing
  - [24] Dates from which IP rights may have effects
- [30] Data related to priority rights
  - [31] Numbers assinged to priority application(s)
  - [32] Dates of filing of priority application
- [40] Dates of making available to the public (i.e. 'publicaton')
  - [41] Publication date for an unexamined patent document which was still not granted.
  - [45] Granting Date
- [50] Technical Information
  - [51] International Classification (Int.Cl.)
  - [54] Title of Invention
  - [56] List of prior art documents if separate from descriptive text
  - [57] Abstract or claim
- [60] Priority Documents
- [70] Identification of parties
  - [71] Name of aplicants
  - [72] Name of inventors (see also [75] and [76])
  - [73] Name of grantee(s), assingee(s), holder(s) or owner(s)

33

Patent Structure – Title and Inventors

(12) **United States Patent**
Pujol Ramo et al.

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(87) PCT Pub. No.: **WO2011/138487**
PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

Title [54]
Should be descriptive of the invention.
Does not need to be particularly original (e.g., multiple patents titled ' refractometer' might exist).
(Patent and Trademark Offices ('PTO') might decide a change in the patent title to make patent search easier).

Inventors [75]
All and only those individuals who have **contributed in an inventive manner** to the creation of an invention should be listed as inventors.

While **correctly listing** the names of the inventors is irrelevant in most of the countries, this is a **key issue in the US** since inventors by default own certain rights upon the invention. For instance, expressly omitting an inventor from the list might result in an **unenforceable US patent**.

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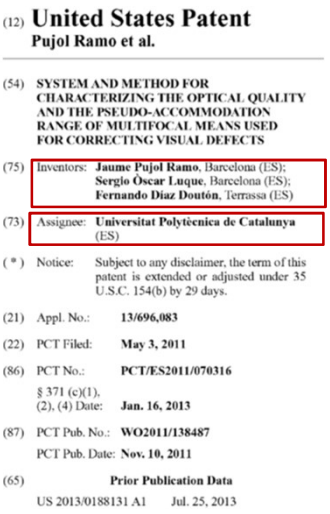
Patent Structure – Inventors and assignee



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(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

Inventors [75]
Except for some referencing and indexing purposes, **order of inventors is not particularly relevant** and does not provide different rights to inventors.

Assignee [73]
Is the owner of the patent rights. Most commonly, the **company employing** the inventor.

In the US, by default the inventor owns the rights upon the patent, and an **'Assignment of Rights'** document signed by the inventor is required to **transfer the rights** of the patent to the company.

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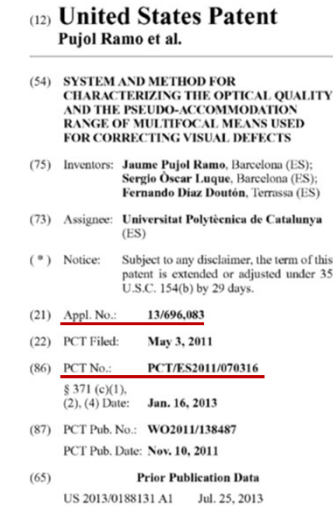
Patent Structure – Patent numbers



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Patent Number [10]
It is the reference number for the patent as **granted**.
Include a code **'B'** (B1 or B2) after the number.
B1 means patent is granted yet still subject to oposition (e.g.Europe).
B2 means granting is not subject to oposition.

Patent application number [21]
It is the reference code used by the PTO to identify a patent file since it is constant throughout the whole prosecution from the filing date.

PCT application number [86]
A patent might claim priority from a PCT application. Such a PCT application is numbered:
PCT/CCYYYY/SSSSS
where CC is the code for the PCT filing authority (i.e. country: US, EP,..), YYYY is the year and SSSSS a serial number.

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Patent Structure – Patent numbers

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Patent Application Publication Numbers

Patent applications are published within 18 months from first filing/priority date. Publications are identified with a serial number followed by an '**A**' **code**.

A1 means application publication includes ISR (International Search Report)

A2 means application publication does not include ISR.

PCT publications are referenced with a code **WOYYSSSSSS**, where WO stands for 'world', YY is the year of filing and SSSSSS is a serial number.

NOTE: *a document including an A in the serial number is still a patent application, not a patent. An application does not confere any rights to the assignee yet.*

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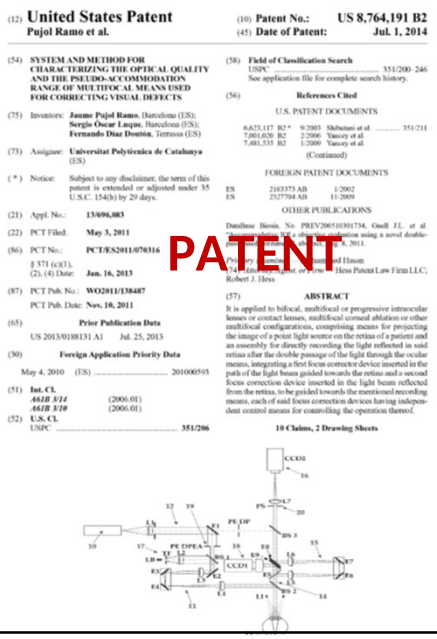
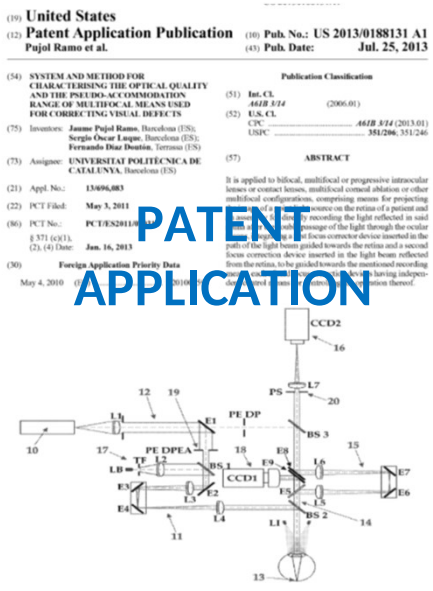
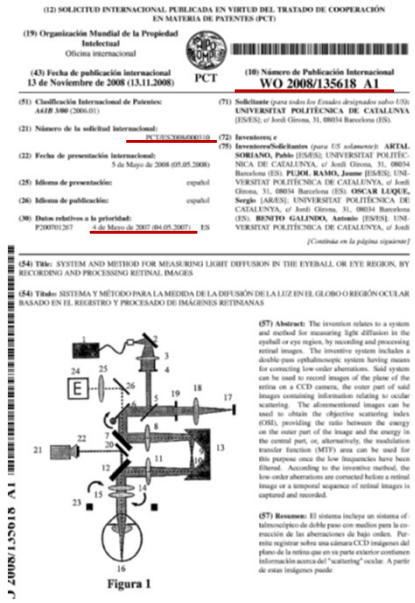
Patent Structure – Patent numbers





Patent Structure – PCT applications



(12) SOLICITUD INTERNACIONAL PUBLICADA EN VIRTUD DEL TRATADO DE COOPERACIÓN EN MATERIA DE PATENTES (PCT)

(19) Organización Mundial de la Propiedad Intelectual
Oficina internacional

PCT

(43) Fecha de publicación internacional
13 de Noviembre de 2008 (13.11.2008)

(10) Número de Publicación Internacional
WO 2008/135618 A1

(51) Clasificación Internacional de Patentes:
A61B 3/00 (2006.01)

(21) Número de la solicitud internacional:
PCT/ES2008/000310

(22) Fecha de presentación internacional:
5 de Mayo de 2008 (05.05.2008)

(25) Idioma de presentación: español

(26) Idioma de publicación: español

(30) Datos relativos a la prioridad:
P200701267 4 de Mayo de 2007 (04.05.2007) ES

(71) Solicitante *(para todos los Estados designados salvo US)*: UNIVERSITAT POLITÈCNICA DE CATALUNYA [ES/ES]; c/ Jordi Girona, 31, 08034 Barcelona (ES).

(72) Inventores; e

(75) Inventores/Solicitantes *(para US solamente)*: ARTAL SORIANO, Pablo [ES/ES]; UNIVERSITAT POLITÈCNICA DE CATALUNYA, c/ Jordi Girona, 31, 08034 Barcelona (ES). PUJOL RAMO, Jaume [ES/ES]; UNIVERSITAT POLITÈCNICA DE CATALUNYA, c/ Jordi Girona, 31, 08034 Barcelona (ES). OSCAR LUQUE, Sergio [AR/ES]; UNIVERSITAT POLITÈCNICA DE CATALUNYA, c/ Jordi Girona, 31, 08034 Barcelona (ES). BENITO GALINDO, Antonio [ES/ES]; UNIVERSITAT POLITÈCNICA DE CATALUNYA, c/ Jordi

[Continúa en la página siguiente]

(54) Title: SYSTEM AND METHOD FOR MEASURING LIGHT DIFFUSION IN THE EYEBALL OR EYE REGION, BY RECORDING AND PROCESSING RETINAL IMAGES

(54) Título: SISTEMA Y MÉTODO PARA LA MEDIDA DE LA DIFUSIÓN DE LA LUZ EN EL GLOBO O REGIÓN OCULAR BASADO EN EL REGISTRO Y PROCESADO DE IMÁGENES RETINIANAS

(57) Abstract: The invention relates to a system and method for measuring light diffusion in the eyeball or eye region, by recording and processing retinal images. The inventive system includes a double-pass ophthalmoscopic system having means for correcting low-order aberrations. Said system can be used to record images of the plane of the retina on a CCD camera, the outer part of said images containing information relating to ocular scattering. The aforementioned images can be used to obtain the objective scattering index (OSI), providing the ratio between the energy on the outer part of the image and the energy in the central part, or, alternatively, the modulation transfer function (MTF) area can be used for this purpose once the low frequencies have been filtered. According to the inventive method, the low-order aberrations are corrected before a retinal image or a temporal sequence of retinal images is captured and recorded.

(57) Resumen: El sistema incluye un sistema oftalmoscópico de doble paso con medios para la corrección de las aberraciones de bajo orden. Permite registrar sobre una cámara CCD imágenes del plano de la retina que en su parte exterior contienen información acerca del "scattering" ocular. A partir de estas imágenes puede

Figura 1

The **Patent Cooperation Treaty (PCT)** route offers a **unified way** (141 member countries) to cover the first stages of patent prosecution at an international level:

- International Search Report (prior-art search)
- Written Opinion (preliminar opinion on patentability, not an exam)

A PCT file is a **patent application**, **not a patent.** A 'wordwide patent' does not exist, rights are to be granted nationally/regionally after the PCT phase.

PCT applications can be filed directly (through WIPO or another PTO), or after a national filing (**after 12 months**).

PCT **application numbers** are PCT/CCYYYY/SSSSSS

PCT **publication numbers** are WO YYYY/SSSSSS

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Patent Structure – PCT applications

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(30) Datos relativos a la prioridad:
P200701267 4 de Mayo de 2007 (04.05.2007) ES

(71) Solicitante *(para todos los Estados designados salvo US)*: UNIVERSITAT POLITÈCNICA DE CATALUNYA [ES/ES]; c/ Jordi Girona, 31, 08034 Barcelona (ES).

(72) Inventores; e

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[Continúa en la página siguiente]

(54) Title: SYSTEM AND METHOD FOR MEASURING LIGHT DIFFUSION IN THE EYEBALL OR EYE REGION, BY RECORDING AND PROCESSING RETINAL IMAGES

(54) Título: SISTEMA Y MÉTODO PARA LA MEDIDA DE LA DIFUSIÓN DE LA LUZ EN EL GLOBO O REGIÓN OCULAR BASADO EN EL REGISTRO Y PROCESADO DE IMÁGENES RETINIANAS

The PCT application route:
Provides a unified, 'centralized' means of prosecuting patent application internationally.

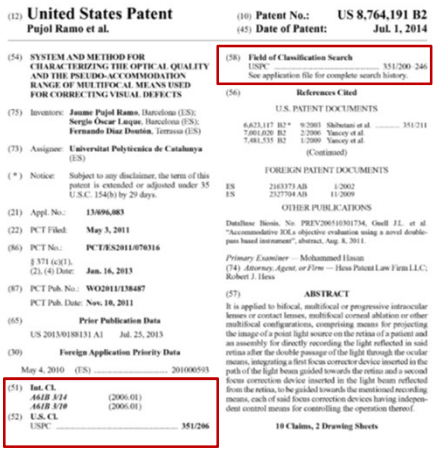
Entering national stage can be delayed 30 months without loosing priority.

Some useful country codes are:

US – USA	**ES** – Spain
JP – Japan	**DE** – Germany
CN – China	**FR** – France
IN – India	**GB** – UK
KR – Korea	**IT** – Italy
MX – Mexico	**NL** – The Netherlands
BR – Brazil	
RU - Russia	

40

Patent Structure – International Classification



(12) **United States Patent**
Pujol Ramo et al.

(10) **Patent No.: US 8,764,191 B2**
(45) **Date of Patent: Jul. 1, 2014**

(54) **SYSTEM AND METHOD FOR CHARACTERIZING THE OPTICAL QUALITY AND THE PSEUDO-ACCOMMODATION RANGE OF MULTIFOCAL MEANS USED FOR CORRECTING VISUAL DEFECTS**

(75) Inventors: **Jaume Pujol Ramo**, Barcelona (ES); **Sergio Oscar Luque**, Barcelona (ES); **Fernando Diaz Doutón**, Terrassa (ES)

(73) Assignee: **Universitat Politècnica de Catalunya** (ES)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 29 days.

(21) Appl. No.: **13/696,083**

(22) PCT Filed: **May 3, 2011**

(86) PCT No.: **PCT/ES2011/070316**
§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2011/138487**
PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
US 2013/0188131 A1 Jul. 25, 2013

(30) **Foreign Application Priority Data**
May 4, 2010 (ES) 201000593

(51) **Int. Cl.**
A61B 3/14 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200-246
See application file for complete search history.

(56) **References Cited**
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Primary Examiner — Mohammed Hasan
(74) *Attorney, Agent, or Firm* — Hess Patent Law Firm LLC; Robert J. Hess

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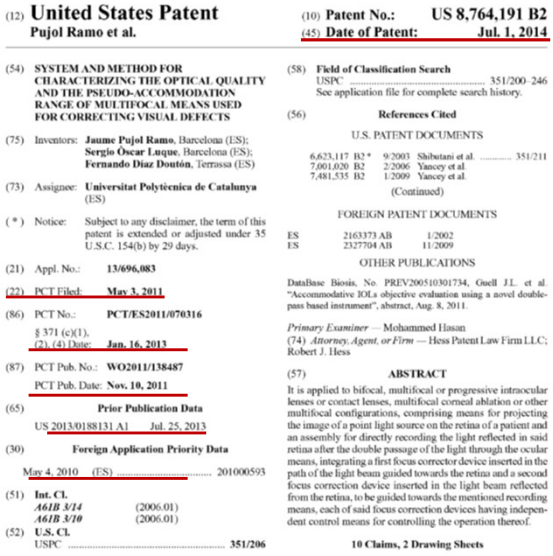
10 Claims, 2 Drawing Sheets

International Classification (Int.Cl.) [51]

- Patents and patent applications include a classification code as a function of its subject matter.
- The WIPO edits an International Patent Classification (IPC) handbook describing the code structure.
- National PTOs might add their own patent classification numbers.
- Patent classification numbers are useful in searches particularly for automatic filtering and sorting engines.

A HUMAN NECESSITIES
B PERFORMING OPERATIONS; TRANSPORTING
C CHEMISTRY; METALLURGY
D TEXTILES; PAPER
E FIXED CONSTRUCTIONS
F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING
G PHYSICS
H ELECTRICITY

Patent Structure – Dates



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10 Claims, 2 Drawing Sheets

Some Relevant Dates appear in:
[20] Date concerning the application for a patent :
[22] Date of filing
[24] Dates from which IP rights may have effects
[30] Data related to priority rights
[32] Dates of filing of priority application
[40] Dates of making available to the public (i.e. 'publicaton')
[41] Publication date for an unexamined patent document which was still not granted.
[45] Granting Date
[60] Priority Documents

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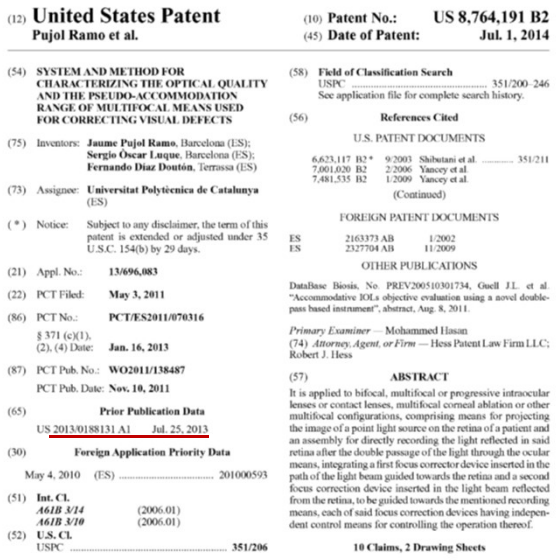
Patent Structure – Publication Dates



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10 Claims, 2 Drawing Sheets

Publication Dates

Patent applications are published usually within **18 months** from the '**first priority date**'.

Patent applications are **secret** within that period.

Generally speaking, an **unpublished**, secret patent application **is not** '**prior-art'** for other patents, **except for those filed in the same PTO**.

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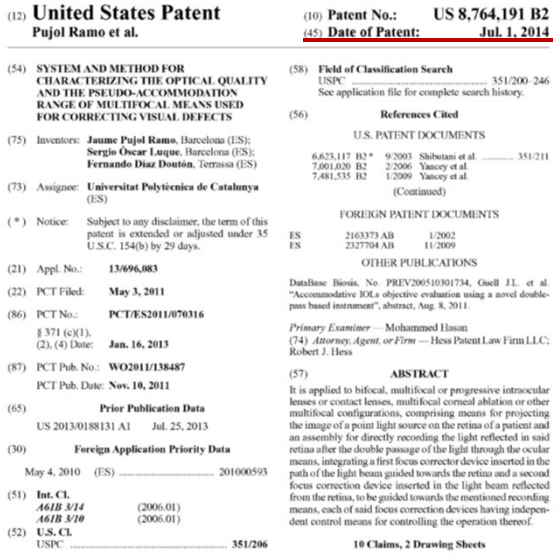
Patent Structure – Granting Date



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10 Claims, 2 Drawing Sheets

Granting Date [45]
It is the date when the **rights of the patentee become effective.**

No legal enforcement actions can be taken **before** the patent is granted, as before granting the scope of protection is still not defined (the patent is still under examination).

Several national laws (e.g. US, Germany) entitle the patentee to, under certain conditions, **claim damages** for patent infringement prior to the granting date, but in any event the formal claimming can not be exercise until the granting date.

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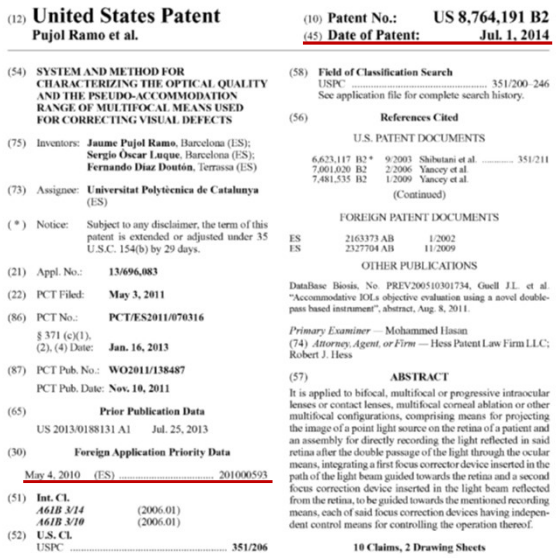
Patent Structure – Filling Date



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10 Claims, 2 Drawing Sheets

Filing Date (Foreign Application Priority Data)

It is the date the patent application is filed at the corresponding PTO.

In some cases (e.g. when the application is the first filing for the invention) it might coincide with the '**first priority date**', which is the most relevant date when assessing the patentability of the invention and duration of rights **(20 years).**

45

Patent Structure – Priority Dates

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Priority Dates

By **claiming priority** from a previously filed document, the patent application benefits from the **earlier date of filing**.

All applications claiming priority from a common document constitute a **patent family**

46

Patent Structure – Description

Object, Field and Background of the invention

1

SYSTEM AND METHOD FOR CHARACTERIZING THE OPTICAL QUALITY AND THE PSEUDO-ACCOMMODATION RANGE OF MULTIFOCAL MEANS USED FOR CORRECTING VISUAL DEFECTS

FIELD OF THE INVENTION

The invention described herein is encompassed within the field of visual optics, ophthalmology and optometry and is suitable for characterizing the optical quality and the pseudo-accommodation range of multifocal means including in said term bifocal, multifocal or progressive intraocular lenses or contact lenses, multifocal corneal ablation or other multifocal configurations, using a modification in the so-called double-pass technique based on projecting the image of a point object on the retina of a patient and directly recording the light reflected thereon, after the double passage of the light through the ocular means.

The present invention generally relates to a system and a method for evaluating/characterizing the optical quality and the pseudo-accommodation range of multifocal means suitable to be implemented both in vivo and in vitro.

BACKGROUND OF THE INVENTION

"Determination of the point-spread function of human eyes using a hybrid optical-digital method", J. Opt. Soc. Am. A, 4, 1100-1114 (1987) by J. Santamarta, P. Artal, J. Benoís describes the mentioned double-pass technique based on projecting a point light beam on the retina of the patient and directly recording the light reflected from it following the double passage of the light through the ocular means which allows obtaining the objective measurement of aberration and scattering contributions to ocular optical quality (F. Díaz-Doutón, A. Benito, J. Pujol, M. Arjona, J. L. Güell, P. Artal, "Comparison of the retinal image quality obtained with a Hartmann-Shack sensor and a double-pass instrument", Inv. Ophthal. Vis. Sci., 47, 1710-1716 (2006)).

The in vitro evaluation of the optical quality of multifocal intraocular lenses or contact lenses can be carried out using single-pass systems consisting of forming the image of an object on a CCD camera before the passage of the light through the multifocal means (Artigas J. M, Menezo J. L, Peris C, Felipe A., Díaz-Llopis M., "Image quality with multifocal intraocular lenses and the effect of pupil size", J Cataract Refract Surg 2007; 33:2111-2117 2007, Pieh S., Fiala W, Malz A, Stork W, "In Vitro Strehl Ratios with Spherical, Aberration-Free, Average, and Customized Spherical Aberration-Correcting Intraocular lenses" Invest. Ophthalmol. Vis. Science 50:1264-1270 (2009), Maxwell W. A., Lane S. S., Zhou F., "Performance of presbyopia-correcting intraocular lenses in distance-optical bench tests" J Cataract Refract Surg. 2009; 35:166-171). To take these measurements it is necessary to use an artificial eye where the multifocal system can be placed. The ISO 11979-2 [ISO-00] standard is available today providing the guidelines on how this eye should be and what conditions must be met to enable taking the measurements.

Double-pass technique with a conventional design in which the focus corrector is the same in the first and second passage has been used for evaluating the optical quality in multifocal intraocular lenses and contact lenses (Pujol, J.; Güpets, J.; Arjona, M. "Optical performance in eyes wearing two multifocal contact lens designs". Ophthalmic Physiol Opt., 2003, vol. 23, no. 4, p. 347-60, Güpets, J.; Arjona, M.; Pujol, J. "Image quality in wearers of a centre distance concentric design bifocal contact lens". Ophthalmic Physiol Opt., 2002, vol. 22, no. 3, p. 221-33, P. Artal, S. Marcos, R. Navarro, J. Miranda, and M. Ferro, "Through focus image quality of eyes implanted with monofocal and multifocal intraocular lenses" Opt. Eng. 34, 772-779 (1995), Fernández-Vega L, Madrid-Costa D., Alfonso J. F., Montés-Micó R., Pons-López A., "Optical and visual performance of diffractive intraocular lens implantation after myopic laser in situ keratomileusis" J Cataract Refract Surg. 2009; 35:825-832, Castillo-Gómez A, Camposa-González D., Martínez-de-la-Casa J. M., Palomino-Bautista C, García-Feijoo J., "Evaluation of image quality after implantation of 2 diffractive multifocal intraocular lens models" J Cataract Refract Surg 2009; 35:1244-1250). This technique can be used for taking measurements in vivo and in vitro, nevertheless it has a very significant limitation. In the first passage, upon forming the image of a point object on the retina, it will only be focused on a position of the focus corrector (generally the one corresponding to far vision), and upon introducing any other defocus for evaluating other vision conditions (near vision for example) this image will be defocused on the retina of the patient and therefore the image recorded on the camera in the second passage will be affected by the defocus occurring in the first passage.

The measurement of the ocular aberrations has also been used for characterizing the optical quality of multifocal intraocular lenses or contact lenses (Jaroog, T. M.; Mesaos, M.; Yoon, G. "Measurement of wave-front aberration in the soft contact lenses by use of a Shack-Hartmann wave-front sensor". Applied Optics, 2005, vol. 44, no. 21, p. 4423-7, Martín, J. A.; Rocoda, A. "Predicting and assessing visual performance with multizone bifocal contact lenses". Optom. Vis. Sci., 2003, vol. 80, no. 12, p. 812-19, Peyne, C.; Fanserg, I.; Gutlad, D. "Comparison of high-order optical aberrations induced by different multifocal contact lens geometries". J Ev Optimalmol., 2005, vol. 28, no. 6, p. 599-604). This technique also has significant limitations. On one hand, depending on the configuration of the sensor used for measuring ocular aberrations, it may have the same limitation as the conventional double-pass technique due to the defocus of the image of a point object on the retina formed in the first passage of the light through the eye. Another limitation of all these sensors is due to the difficulty in measuring the aberrations in discontinuous optical areas such as those found in multifocal intraocular lenses or contact lenses, particularly those having a refractive design. In fact, this difficulty or impossibility have been shown clearly in different published works (Charman W. N, Montés-Micó R., Radhakrishnan H., "Problems in the Measurement of Wavefront Aberration for Eyes Implanted With Diffractive Bifocal and Multifocal Intraocular lenses". Journal of Refrective Surgery Volume 24 March 2008, Jenditrra B. B., Kzorr M. C, Morton S., "Wavefront-guided Excimer Laser Vision Correction After Multifocal IOL Implantation", Journal of Refractive Surgery Volume 24 March 2008).

By analyzing the quality of images obtained for different defocuses, it is possible to determine the range in which the patient can see the images sharply enough, corresponding to the pseudo-accommodation range. Application WO2009133224 belonging to two of the present inventors describes a method and a system for the objective measurement of ocular accommodation wherein the mentioned double-pass technique is also used for its implementation.

BRIEF DESCRIPTION OF THE INVENTION

The invention is intended for providing a system for characterizing the optical quality and the pseudo-accommodation

Every patent specification starts framing the **context** of the invention. This helps in making the whole specification more readable for the public and for the patent examiners.

The **field of the invention** describes broadly the technical area in which the invention is framed (e.g. 'visual optics' 'hyperspectral imaging techniques', 'lasers' 'mobile communication systems and devices',).

The **background** part of this section describes broadly what is the state-of- the-art in the field, and particularly, what are the main limitations and drawbacks of the existing solutions to the problem the invention is addressing.

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Patent Structure – Description

Object, Field and Background of the invention

The **object** of the invention describes the purpose of the invention,i.e., the problem or problems the invention is addressing and trying to solve.

Any discussion on the **prior-art** should be **limited to this section**. It is advisable not to mix discussions on the prior-art later on the specification.

The **background and object** descriptions are important in helping to assess the merits of the invention (i.e. **non-obviousness**) compared to the prior-art.

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Patent Structure – Description

Summary of the invention

BRIEF DESCRIPTION OF THE INVENTION

The invention is intended for providing a system for characterizing the optical quality and the pseudo-accommodation range of multifocal means used for correcting visual defects through retinal image analysis wherein devices for projecting the image of a point object on the retina of a patient and devices for directly recording the light reflected in said retina after the double passage of the light through the ocular means, are used, comprising at least one focus corrector device which is traversed by the light beam in its access path to the retina (illumination path) and by the light beam reflected from the retina (recording path).

According to the proposal of the invention, there is provided a system with a first focus correction device inserted in the path of the light beam guided towards the retina and a second focus correction device inserted in the light beam reflected from the retina, to be guided towards the mentioned recording means, each of said focus correction devices having independent control means for controlling the operation thereof, such that it allows focusing the image of a point light source in a differentiated manner on the retina of the patient through any of the foci of the intraocular lens and recording the double-pass image for different defocuses, including far and near vision, obtained with the second focusing system. According to an embodiment of the invention, said focus correction devices are formed by respective motorized optometers forming part of a double-pass ophthalmoscopic device which includes two lenses and two mirrors with an adjustable relative distance between them. However, this same optometer may have other configurations such as only two lenses with a variable distance between them, for example.

In an alternative embodiment it has been envisaged that at least one of said focus correction devices of the proposed system is made up of a lens with variable power.

The system has means which will be indicated in the following detailed description for displaying a fixation stimulus to the patient which overlaps the light beam striking the retina.

Likewise, the system of the invention will include means for viewing a patient's eye by means of an illumination system and a system for forming the image of the eye in a recording means such as a camera.

After the background discussion, a **summary on the overall invention** follows (sometimes background and summary are grouped into one section), which should discuss in broad terms:

- Overall structure of the invention
- Functionality of the invention
- Operation of the invention

The summary is a general description on the solution to the problem or problems the invention is aiming to solve.

This section also includes the benefits and advantages of the invention with respect to the prior-art.

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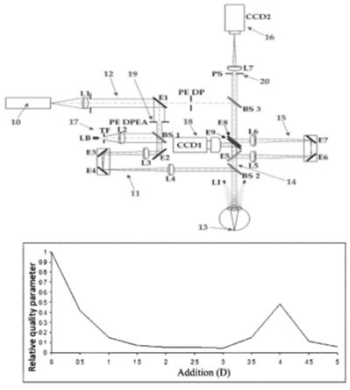
Patent Structure – Description

List of figures – Drawing descriptions



BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a diagram of a possible construction of a system according to the proposal of this invention, wherein the focus correction devices have been implemented in the form of a motorized optometer having a pair of mirrors and lenses.

FIG. **2** shows an example of a defocus curve, the diopters applied are shown in the x-axis and the relative quality parameter for each case is shown in the y-axis.

List of Figures

Each figure in the patent specification is to be listed, numbered (e.g. 'Fig.1') and described in a very succinct way.

It is advisable to organize figures such as the more general come first.

Drawings

Drawings in patents are quite sketch-like rather than accurate lay-outs. They are exemplary of the structure and function, but do not need to be to scale. Hand made drawings are usually allowed.

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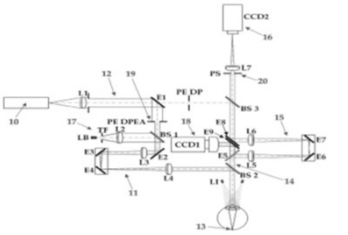
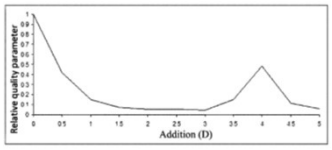
Patent Structure – Description

List of figures – Drawing descriptions





BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a diagram of a possible construction of a system according to the proposal of this invention, wherein the focus correction devices have been implemented in the form of a motorized optometer having a pair of mirrors and lenses.

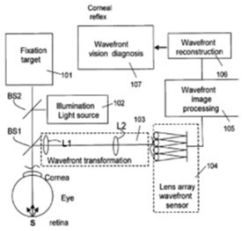
FIG. **2** shows an example of a defocus curve, the diopters applied are shown in the x-axis and the relative quality parameter for each case is shown in the y-axis.

Drawings

Main categories of drawings are:

- Structural parts for mechanically supported inventions.
- Flow-chart elements in case of method/process inventions.
- Block diagrams that outline functional blocks in complex systems (e.g. mobile phone).

Invention elements are numbered rather than described in drawings. Numbers are linked to drawing for entire components) or for individual elements



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Patent Structure – Description

Detailed description and preferred embodiments

DETAILED DESCRIPTION

The diagram of FIG. **1** shows means for projecting the image of a point light source on the retina of a patient and means for directly recording the light reflected in said retina after the double passage of the light through the ocular means according to the principles of the present invention.

A point light source **10** and a first focus correction device **11** formed by a motorized optometer including two lenses L3, L4 and two mirrors E3, E4 with an adjustable relative distance between them, inserted in the path of the collimated light beam **12** guided towards retina **13**, and a second focus correction device **15** made up of a motorized optometer including two lenses L5, L6 and two mirrors E6, E7 with an adjustable relative distance between them inserted in the light beam **14** reflected from the retina **13** to be guided towards a camera **16** or other recording means can thus be seen. According to the proposal of this invention, each of said focus correction devices **11**, **15** has independent control means for controlling the operation thereof, such that it allows focusing the point light source **10** on the retina **13** of the patient through any of the focal points of the intraocular lens and introducing any defocus in the recording path at the same time.

Alternatively, and even though it has not been depicted, it is indicated that said focus correction devices only comprise two lenses with a variable distance between them or a lens with a variable power.

This section is used to describe in the **detail** the structure and elements of your invention so that a '**skilled in the art**' person is able to practice at least one form of the invention. (This requirement is called '**enablement**' in the US)

This section is not to explain the theory or science behind the invention, i.e., **does not need to explain why the invention works**. The primary objective of this section is to provide details on the construction of the invention.

It is useful to provide explanations on **how the invention works**, how the invention **functions and operates** to overcome the technical problem it is addressing. This helps in providing means for assessing the non-obviousness.

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Patent Structure – Description

Detailed description and preferred embodiments

DETAILED DESCRIPTION

The diagram of FIG. **1** shows means for projecting the image of a point light source on the retina of a patient and means for directly recording the light reflected in said retina after the double passage of the light through the ocular means according to the principles of the present invention.

A point light source **10** and a first focus correction device **11** formed by a motorized optometer including two lenses L**3**, L**4** and two mirrors E**3**, E**4** with an adjustable relative distance between them, inserted in the path of the collimated light beam **12** guided towards retina **13**, and a second focus correction device **15** made up of a motorized optometer including two lenses L**5**, L**6** and two mirrors E**6**, E**7** with an adjustable relative distance between them inserted in the light beam **14** reflected from the retina **13** to be guided towards a camera **16** or other recording means can thus be seen. According to the proposal of this invention, each of said focus correction devices **11**, **15** has independent control means for controlling the operation thereof, such that it allows focusing the point light source **10** on the retina **13** of the patient through any of the focal points of the intraocular lens and introducing any defocus in the recording path at the same time.

Alternatively, and even though it has not been depicted, it is indicated that said focus correction devices only comprise two lenses with a variable distance between them or a lens with a variable power.

The **writing of the patent specification is the most relevant part of the patent engineering effort**. While other parts of the patent can be substantially changed during prosecution (e.g. the claims), **the spec becomes virtually frozen for the rest of the prosecution** and **only the subject matter that has been properly disclosed in the spec might be claimed afterwards**.

It is useful to provide several **examples** on how the invention can be brought to practice. The more the details are provided, the greater the options to protect later on multiple aspects of the invention.

Make sure embodiments are introduced as **exemplary cases** of the invention without any limiting purpose. It should be made clear in the writing that other forms of the invention are possible.

(In the US, it is mandatory to disclose '**the best mode'** of the invention, i.e., the emobodiment or embodiments that 'works better' or are 'advantageous' to the eyes of the inventor, hidding the 'best mode' would result in patent invalidation)

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Patent Structure – Drawings

(12) **United States Patent**
Pujol Ramo et al.

(10) **Patent No.: US 8,764,191 B2**
(45) **Date of Patent: Jul. 1, 2014**

(54) **SYSTEM AND METHOD FOR CHARACTERIZING THE OPTICAL QUALITY AND THE PSEUDO-ACCOMMODATION RANGE OF MULTIFOCAL MEANS USED FOR CORRECTING VISUAL DEFECTS**

(75) Inventors: **Jaume Pujol Ramo**, Barcelona (ES); **Sergio Oscar Luque**, Barcelona (ES); **Fernando Diaz Doutón**, Terrassa (ES)

(73) Assignee: **Universitat Politècnica de Catalunya** (ES)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 29 days.

(21) Appl. No.: **13/696,083**

(22) PCT Filed: **May 3, 2011**

(86) PCT No.: **PCT/ES2011/070316**
§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2011/138487**
PCT Pub. Date: **Nov. 10, 2011**

(65) **Prior Publication Data**
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(30) **Foreign Application Priority Data**
May 4, 2010 (ES) 201000593

(51) **Int. Cl.**
A61B 3/14 (2006.01)
A61B 3/10 (2006.01)

(52) **U.S. Cl.**
USPC **351/206**

(58) **Field of Classification Search**
USPC 351/200-246
See application file for complete search history.

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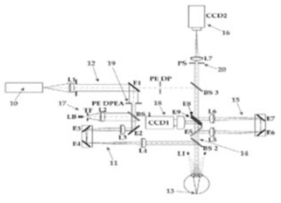
OTHER PUBLICATIONS
DataBase Biosis, No. PREV200501301734, Gnell J.L. et al. "Accommodative IOLs objective evaluation using a novel double-pass based instrument", abstract, Aug. 8, 2011.

Primary Examiner — Mohammed Hasan
(74) *Attorney, Agent, or Firm* — Hess Patent Law Firm LLC; Robert J. Hess

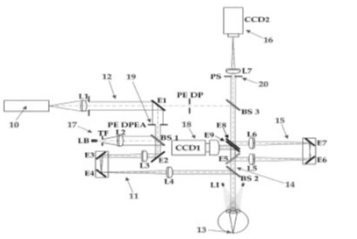
(57) **ABSTRACT**
It is applied to bifocal, multifocal or progressive intraocular lenses or contact lenses, multifocal corneal ablation or other multifocal configurations, comprising means for projecting the image of a point light source on the retina of a patient and an assembly for directly recording the light reflected in said retina after the double passage of the light through the ocular means, integrating a first focus corrector device inserted in the path of the light beam guided towards the retina and a second focus correction device inserted in the light beam reflected from the retina, to be guided towards the mentioned recording means, each of said focus correction devices having independent control means for controlling the operation thereof.

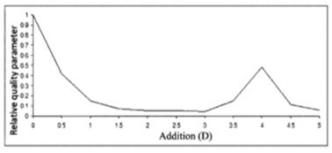
10 Claims, 2 Drawing Sheets



There are a drawing in the first page of the patent (Normally Fig. 1)

All the drawings should be included in the patent in a specific section (just after the first page (US), at the end (Spain)).





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Patent Structure – Claims

The invention claimed is:

1. A method for detecting visual function losses, comprising:

a) carrying out an exploration of an anterior segment and an intraocular media of an eye of a patient and determining, based on a result of said exploration, that both the anterior segment and the intraocular media of said eye are healthy;

b) carrying out an optical quality analysis on at least one retinal image of said eye having a healthy anterior segment and healthy intraocular media as determined in step a) or from information related to said retinal image, wherein said optical quality analysis comprises analyzing the contents related to intraocular scattering and aberrations or to just intraocular scattering based on said retinal image, whereby the calculation of an objective scatter index, OSI, resulting from the relationship between the light energy found in a peripheral area of the retina plane image (E_{ext}) and the light energy found in a central area thereof (E_c), according to the expression:

$$OSI = \frac{E_{ext}}{E_c}$$

is considered as a parameter indicative of optical quality; and

c) obtaining an indication of a functional aetiological or pathological visual function loss of the visual system depending on a result of said calculated OSI parameter.

2. The method according to claim **1**, wherein said exploration of the anterior segment and the intraocular media of said eye is carried out with a technique selected from the use of a biomicroscope, optical coherence tomography or ultrasonics echography.

3. The method according to claim **1**, further comprising determining that the retina of said healthy eye suffers from a pathological or structural alteration by means of an exploration of said anterior segment and intraocular media sub-

Claims: Define the legal scope of protection.

- **No protection** is obtained for **any subject matter that is not claimed** in the claim section (even if it is described in the patent specification).
- **Claims are examined** by PTO according to national patentability rules. During examination, claims might be amended to overcome the objections raised by the examiner. This is an iterative process until either at least one claim is allowed or the patent becomes rejected.

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Patent Structure – Claims

The invention claimed is:

1. A method for detecting visual function losses, comprising:

a) carrying out an exploration of an anterior segment and an intraocular media of an eye of a patient and determining, based on a result of said exploration, that both the anterior segment and the intraocular media of said eye are healthy;

b) carrying out an optical quality analysis on at least one retinal image of said eye having a healthy anterior segment and healthy intraocular media as determined in step a) or from information related to said retinal image, wherein said optical quality analysis comprises analyzing the contents related to intraocular scattering and aberrations or to just intraocular scattering based on said retinal image, whereby the calculation of an objective scatter index, OSI, resulting from the relationship between the light energy found in a peripheral area of the retina plane image (E_{ext}) and the light energy found in a central area thereof (E_c), according to the expression:

$$OSI = \frac{E_{ext}}{E_c}$$

is considered as a parameter indicative of optical quality; and

c) obtaining an indication of a functional aetiological or pathological visual function loss of the visual system depending on a result of said calculated OSI parameter.

2. The method according to claim **1**, wherein said exploration of the anterior segment and the intraocular media of said eye is carried out with a technique selected from the use of a biomicroscope, optical coherence tomography or ultrasonics echography.

3. The method according to claim **1**, further comprising determining that the retina of said healthy eye suffers from a pathological or structural alteration by means of an exploration of said anterior segment and intraocular media sub-

When granted, claims become the most relevant part of the patent.

- The patent assignee has the right to **exclude from the market products that meet the terms of at least one claim**
- **One** infringed claim is enough to determine patent infringement.
- **One valid, patentable claim is enough** to own the right to exclude others from practicing the invention covered by the claim, even if the other claims are invalid.

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Patent Structure – Claims

The invention claimed is:

1. A method for detecting visual function losses, comprising:

a) carrying out an exploration of an anterior segment and an intraocular media of an eye of a patient and determining, based on a result of said exploration, that both the anterior segment and the intraocular media of said eye are healthy;

b) carrying out an optical quality analysis on at least one retinal image of said eye having a healthy anterior segment and healthy intraocular media as determined in step a) or from information related to said retinal image, wherein said optical quality analysis comprises analyzing the contents related to intraocular scattering and aberrations or to just intraocular scattering based on said retinal image, whereby the calculation of an objective scatter index, OSI, resulting from the relationship between the light energy found in a peripheral area of the retina plane image (E_{ext}) and the light energy found in a central area thereof (E_c), according to the expression:

$$OSI = \frac{E_{ext}}{E_c}$$

is considered as a parameter indicative of optical quality; and

c) obtaining an indication of a functional aetiological or pathological visual function loss of the visual system depending on a result of said calculated OSI parameter.

Claims are usually constructed through:

- a **preamble**,
- a **transition word or words**,
- and a set of **limiting features**.

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Patent Structure – Claims

Limiting features

The invention claimed is:

1. A method for detecting visual function losses, comprising:

a) carrying out an exploration of an anterior segment and an intraocular media of an eye of a patient and determining, based on a result of said exploration, that both the anterior segment and the intraocular media of said eye are healthy;

b) carrying out an optical quality analysis on at least one retinal image of said eye having a healthy anterior segment and healthy intraocular media as determined in step a) or from information related to said retinal image, wherein said optical quality analysis comprises analyzing the contents related to intraocular scattering and aberrations or to just intraocular scattering based on said retinal image, whereby the calculation of an objective scatter index, OSI, resulting from the relationship between the light energy found in a peripheral area of the retina plane image (E_{ext}) and the light energy found in a central area thereof (E_c), according to the expression:

$$OSI = \frac{E_{ext}}{E_c}$$

is considered as a parameter indicative of optical quality; and

c) obtaining an indication of a functional aetiological or pathological visual function loss of the visual system depending on a result of said calculated OSI parameter.

Patent Structure – Claims

Independent and dependent claims

- An independent claim is the broadest claim

A method comprising steps A, B, and C.

The invention claimed is:

1. A method for detecting visual function losses, comprising:

a) carrying out an exploration of an anterior segment and an intraocular media of an eye of a patient and determining, based on a result of said exploration, that both the anterior segment and the intraocular media of said eye are healthy;

b) carrying out an optical quality analysis on at least one retinal image of said eye having a healthy anterior segment and healthy intraocular media as determined in step a) or from information related to said retinal image, wherein said optical quality analysis comprises analyzing the contents related to intraocular scattering and aberrations or to just intraocular scattering based on said retinal image, whereby the calculation of an objective scatter index, OSI, resulting from the relationship between the light energy found in a peripheral area of the retina plane image (E_{ext}) and the light energy found in a central area thereof (E_c), according to the expression:

$$OSI = \frac{E_{ext}}{E_c}$$

is considered as a parameter indicative of optical quality; and

c) obtaining an indication of a functional aetiological or pathological visual function loss of the visual system depending on a result of said calculated OSI parameter.

Patent Structure – Claims

Independent and dependent claims

- Each dependent claim refers to an independent claim and includes all of its features, and then adds further detail to the independent claim.
  - The method of Claim 1, further comprising step D.
  - The method of Claim 2, further comprising step E.
  - The method of Claim 1, further comprising step F.

  ……..

- One dependent claim can refers to a dependent claim (at the same time this dependent claim refers to an independent claim)

2. The method according to claim 1, wherein said exploration of the anterior segment and the intraocular media of said eye is carried out with a technique selected from the use of a biomicroscope, optical coherence tomography or ultrasonics echography.

3. The method according to claim 1, further comprising determining that the retina of said healthy eye suffers from a pathological or structural alteration by means of an exploration of said anterior segment and intraocular media subsequent to said optical quality analysis.

4. The method according to claim 3, wherein said exploration of the retina is performed with a technique selected from the use of a direct or indirect ophthalmoscope, a retinography scan or an angiography, optical coherence tomography, laser scan tomography or a polarized laser scan.

5. The method according to claim 1, wherein said at least one retinal image of step b) is obtained by carrying out the following steps:

projecting a pinpoint light beam into the retina of said patient's eye; and

recording at least one image of the retina plane, or retinal image, resulting from the light reflected in the retina by said pinpoint light.

6. The method according to claim 5, further comprising: carrying out said steps with a double-pass ophthalmoscopic system.

7. The method according to claim 1, further comprising: carrying out the optical quality analysis of said information related to the retinal image of step b) by measuring the aberration content of said information to thereby obtain a measurement and utilizing said measurement as a parameter indicative of optical quality.

8. The method according to claim 7, further comprising: obtaining said information related to the retinal image and said measurement of the aberration content by means of an aberrometer, said information being derived from the wave function obtained through the aberrometer.

Patent Structure – Claims

Independent and dependent claims

In the **US** a patent might include **many independent** claims, while in **EPO** usually only **one single independent claim** per patent is allowed.

1. A method comprising steps A, B, and C.
2. The method of Claim 1, further comprising step D.
3. The method of Claim 2, further comprising step E.
4. The method of Claim 1, further comprising step F.
5. A method comprising steps A, B, and G.
6. The method of Claim 5, further comprising step C.

There is **no limitation on the number of dependent claims** that might be included in a patent (although many PTOs charge extra fees for claims beyond a certain number, e.g., 20 claims).

Independent claims provide the '**broadest**' coverage for the patent, while dependent claims necessarily provide a '**narrower**' scope of protection.

If a **dependent claim is infringed**, then its **independent claim needs to be infringed as well**.

A **dependent** claim might be found **valid** (novel, inventive and useful) **even** if an **independent** claim **is invalid**.

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Take home messages

✓ **Ask yourself if some results or developments of your research (inventions) can be patented?**

To have the right answer:

✓ Have an interview with a patents agent.

✓ Propose a preliminary prior-art search.

ESSENTIAL: BEFORE ANY PUBLICATION (Conference, Paper….etc)

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Take home messages

- ✓ **Fil a patent if you think it can have commercial interests and therefore a company (or your own company) can have the patent licensed.**
  - ✓ Publication of patents provides an incentive develop new knowledge and solutions to existing technical problems.
  - ✓ Patents allow to patentee (and inventor) to earn money.

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Take home messages

- ✓ **Start the patent prosecution process with a patents agent.**
  - ✓ Process and interaction with PTO could be long and complex.
  - ✓ Language is very specific.
  - ✓ Some words included or not in the application can mean allowance or rejection of the patent and infringement or no infringement.

FIL THE PCT APPLICATION (BEFORE 12 MONTHS). ENTER TO NATIONAL PHASES NORMALY IS DECIDED IF THE PATENT HAS BEEN LICENCED

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And…….

Good luck with the examiners (like a reviewers in a paper)

Remember that if you become rich thaks to this talk my commission is only 10%

Thank you !

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