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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001

CONFIRMATION NO. 1095

POWER OF ATTORNEY NOTICE

115626
Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue, N.W.
Washington, DC 20005

OC000000097207362

Date Mailed: 02/07/2018

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/31/2018.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/yteferra/

Luxottica Ex. 1003 (1 of 3)
IPR Petition USP 8,905,541

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001

CONFIRMATION NO. 1095

POA ACCEPTANCE LETTER

58249
COOLEY LLP
ATTN: Patent Group
1299 Pennsylvania Avenue, NW
Suite 700
Washington, DC 20004

OC00000097207417

Date Mailed: 02/07/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/31/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/yteferra/

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 58249

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 58249

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

e-Vision, LLC
1144 Tallevast Road, Suites 113-115
Sarasota, Florida 34243

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	1/25/10
Name	Joel D. Zychick	Telephone	516 680 2715
Title	President & CEO		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	31662597
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	115626
Filer:	Christopher M. Colice/Donna Doyle
Filer Authorized By:	Christopher M. Colice
Attorney Docket Number:	3373.0570001
Receipt Date:	31-JAN-2018
Filing Date:	17-NOV-2011
Time Stamp:	22:15:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	USP8905541-Statement.pdf	79422 6e28db00c3ad1529b1ed2875ffd25db49c89a0ee	no	1

Warnings:

Information:					
2	Power of Attorney	EVSO-PREAIA-POA.pdf	836830 94637c80e27d533ff723d0eaffb4555c2c3f315f	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	916252	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Blum et al.

Application No./Patent No.: 8,905,541 Filed/Issue Date: 12-09-2014

Titled: ELECTRONIC SPECTACLE FRAMES

e-Vision, LLC (Name of Assignee) , a Corporation (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [x] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made) the patent application/patent identified above, by virtue of either:

A. [ ] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____ , Frame _____ , or for which a copy therefore is attached.

OR

B. [x] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Blum et al. To: PIXELOPTICS, INC
The document was recorded in the United States Patent and Trademark Office at
Reel 027663 , Frame 0561 , or for which a copy thereof is attached.

2. From: PIXELOPTICS, INC To: HPO ASSETS LLC
The document was recorded in the United States Patent and Trademark Office at
Reel 033240 , Frame 0931 , or for which a copy thereof is attached.

3. From: HPO ASSETS LLC To: MITSUI CHEMICALS, INC.
The document was recorded in the United States Patent and Trademark Office at
Reel 034099 , Frame 0969 , or for which a copy thereof is attached.

4. From: MITSUI CHEMICALS, INC. To: E-VISION, LLC
The document was recorded in the United States Patent and Trademark Office at
Reel 044643 , Frame 0722 , or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[x] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Christopher Max Colice/ Signature — January 31, 2018 Date

Christopher Max Colice Printed or Typed Name — Reg. No. 65,634 Title

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	12/09/2014	8905541	3373.0570001	1095

115626 7590 11/19/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 417 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Ronald D. Blum, Roanoke, VA;
Joshua N. Haddock, Roanoke, VA;
Claudio Dalla Longa, Valdobbiadene-TV, ITALY;
Mark Graham, Leesburg, VA;
Yongping Wang, Philadelphia, PA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	2	of	4	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	EN	US-4,907,860	3/13/90	Noble	
	EO	US-4,967,268	10/30/90	Lipton et al.	
	FA	US-5,182,585	1/26/93	Stoner	
	FB	US-5,835,185	11/10/98	Kallman et al.	
	FC	US-6,097,450	8/1/00	Humphrey	
	FD	US-6,582,075	6/24/03	Swab et al.	
	FE	US-6,595,634	07-22-2003	Pilat, Jr.	
	FF	US-6,626,532	09-30-2003	Nishioka et al.	
	FG	US-6,866,386	03-2005	Chen, Joy	
	FH	US-7,009,757	3/7/06	Nishioka et al.	
	FI	US-7,063,420	06-20-2006	Lerner et al.	
	GA	US-7,104,645	09-12-2006	Pilat, Jr.	
Change(s) applied to document, /S.X.R./ 9/24/2014	GB	US-7,140,727	~~12-26-2006~~	Pilat, Jr. et al.	November 28, 2006
	GC	US-7,425,066	09-16-2008	Blum e tal.	
	GD	US-7,784,935	8/31/10	Jackson et al.	
	GE	US-7,813,048	10/12/2010	Lynch et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	GF	WO 2010/080999	7/15/10	PixelOptics, Inc.		☐
	HA	EP 1647854	4/19/06	Sunshine Optical Company		
	IA	WO 2009/098719	8/13/09	Laura Maria Cozzani		
	JA	WO 2008/002388	1/3/08	PixelOptics, Inc.		
	KA	WO 2009/081542	7/2/09	Panasonic Corp.		
	KB	WO 2010/062504	6/3/2010	CJoahrneson & Johnson Vision		
	LA	DE 2304134	8/30/73	Gould Inc.		
	LB	GB 2170613	08-06-1986	Olympus Optical Co., Ltd.		

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

64056449 v1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	2	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-6,336,250	1/8/02	Takeda et al.	
	AB	US-5,760,869	6/2/98	Mitamura	
	AC	US-5,657,107	8/12/97	Wagner et al.	
	AD	US-4,991,258	2/12/91	Drlik	
	AE	US-2010/0177277	7/15/10	Kokonaski et al.	
	AF	US-2930857	3/29/60	Hollingsworth	
	AG	US-2007/121061	5/31/07	~~Young~~ Kim	
	AH	US-2008/273166	11/6/08	Kokonaski	

Change(s) applied to document.
/S.X.R./
9/24/2014

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AI	WO 2009/081542	7/2/09	Panasonic Corp.		☐

NON PATENT LITERATURE DOCUMENTS

Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	AJ	Copy of the US provisional patent application no. 61/361,110, filed on July 2, 2010	☐
	AK	Copy of the US provisional patent application no. 61/376,719, filed on August 25, 2010	☐
	AL	Copy of the US provisional patent application no. 61/415,391, filed on November 19, 2010	☐

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

63986902 v1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 11/06/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER	
DANG, HUNG XUAN	

ART UNIT	PAPER NUMBER
2872	

MAIL DATE	DELIVERY MODE
11/06/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Response to Rule 312 Communication	Application No. 13/298,992	Applicant(s)
	Examiner	Art Unit

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

1. ☒ The amendment filed on *04 November 2014* under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/Rahel Tekle/

Publishing Division

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115626 7590 08/05/2014
Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

TITLE OF INVENTION: ELECTRONIC SPECTACLE FRAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/05/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
DANG, HUNG XUAN	2872	351-113000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Sterne, Kessler,
2 Goldstein & Fox
3 P.L.L.C.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Mitsui Chemicals, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Toyko, Japan

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☒ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 19-0036 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date 11/4/2014
Typed or printed name John C. Molluzzo Registration No. 41,186

PTOL-85 Part B (10-13) Approved for use through 10/31/2013 OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 1095
BLUM *et al.*	Art Unit: 2872
Appl. No.: 13/298,992	Examiner: DANG, Hung Xuan
Filed: November 17, 2011	Atty. Docket: 3373.0570001
For: **Electronic Spectacle Frames**	

Amendment Under 37 C.F.R. § 1.312

Mail Stop Issue Fee

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

Submitted herein is an Amendment Under 37 C.F.R. § 1.312. As payment of the issue fee has not yet been made or is filed herewith, Applicants respectfully submit that filing under 37 C.F.R. § 1.312 is proper. (M.P.E.P. § 714.16.)

Amendments to the Specification begin on page 2 of this paper.

Remarks begin on page 3 of this paper.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments to the Specification

Please amend paragraph [0296] as follows:

In some embodiments, the housing module **1603** may comprise a portion of the temple **1602**. That is, for instance and as shown in FIG. **16**, the housing module may be disposed between a portion of the temple **1602** and the lens housing. This may be preferred in some embodiments because it may allow for each component to be manufactured in separate processes and then assembled at a later point in time. The housing module **1603** and another portion of the temple (e.g. the end portion of the temple **1602**) and/or the lens housing may be attached in any suitable manner. As shown in the exemplary embodiment in FIG. **16**, the core **1601** may be common to at least a part of the temple **1602** and the housing module **1603** so as to couple the components. ~~In addition, in some embodiments,~~

Remarks

None of the amendments add new matter, and are only to correct a typographical error.

Entry of the above Amendments are respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

John P. McGroarty
Attorney for Applicants
Registration No. 41,186

Date: 11/4/2014

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600
1925017_1

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 10/09/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

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OCT 14 2014
Sterne Kessler Goldstein & Fox, P.L.L.C.

EXAMINER	
DANG, HUNG XUAN	
ART UNIT	PAPER NUMBER
2872	

MAIL DATE	DELIVERY MODE
10/09/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 13298992
Applicant : Blum
Filing Date : 11/17/2011
Date Mailed : 10/09/2014

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Stephanie Smart/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 13298992

IDENTIFICATION OF APPLICATION DEFICIENCIES

☐ Applicant must provide legible text for the following item(s).

- ☐ Specification filed , page(s) .
- ☐ Claims filed , claim(s) .
- ☐ Oath/declaration filed .
- ☐ Other: .

☒ Applicant must provide missing information on the following page(s) of the specification by amending the specification to add the missing text. No new matter may be added. page 97 line 32

☐ The specification refers to one or more applications by attorney docket number and does not show the U.S. application number(s). Applicant must supply the U.S. application number in place of each attorney docket number.

☐ Applicant must provide an Abstract of the Disclosure.

☐ Applicant has submitted a DECLARATION (37 CFR 1.63) FOR A UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76) (e.g., form PTO/SB/01A). The Application Data Sheet, however, is not present with the filed application. Applicant must submit an Application Data Sheet or file a new oath or declaration (e.g., PTO/SB/01) executed by the inventors and containing the information required in 37 CFR 1.63.

☐ Applicant must provide an executed declaration.

☐ Applicant must provide the missing page(s) of the oath/declaration or Application Data Sheet filed

☐ Applicant must provide a declaration signed by inventor(s) .

☐ The oath/declaration filed shows non-initialed and/or non-dated alterations. Applicant must file a new oath/declaration in compliance with 37 CFR 1.67(a).

☐ Applicant(s) in the latest-filed oath/declaration or Application Data Sheet (ADS) did not show the inventor's residence at all, or did not show both a city and state in the U.S. inventor's residence, or did not show both a city and country in the non-U.S. inventor's residence. Applicant must supply an oath/declaration or Application Data Sheet (ADS) that shows each U.S. inventor's city and state of residence and each non-U.S. inventor's city and country of residence.

Electronic Patent Application Fee Transmittal

Application Number:	13298992
Filing Date:	17-Nov-2011
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Filer:	John P. McGroarty/Amy Norris
Attorney Docket Number:	3373.0570001

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	20605586
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	115626
Filer:	John P. McGroarty/Amy Norris
Filer Authorized By:	John P. McGroarty
Attorney Docket Number:	3373.0570001
Receipt Date:	04-NOV-2014
Filing Date:	17-NOV-2011
Time Stamp:	17:26:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$960
RAM confirmation Number	3895
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		IssueFee_amdt.pdf	969914 656597519961795a1da20247c2d2a2d8a024ed84	yes	8

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Transmittal Letter	1	1
Issue Fee Payment (PTO-85B)	2	2
Amendment after Notice of Allowance (Rule 312)	3	3
Specification	4	4
Applicant Arguments/Remarks Made in an Amendment	5	5
Miscellaneous Incoming Letter	6	8

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30399 865d62dd29abcbf5bb70d55a482da8f20e80bfcb	no	2

Warnings:

Information:

Total Files Size (in bytes):	1000313

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

JOHN P. MCGROARTY
DIRECTOR
(202) 772-8882
JMCGROARTY@SKGF.COM

Sterne Kessler Goldstein Fox
ATTORNEYS AT LAW

November 4, 2014

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 1095
Mail Stop Issue Fee

Re: Allowed U.S. Utility Patent Application
Appl. No. 13/298,992; Filed: November 17, 2011
For: **Electronic Spectacle Frames**
Inventors: BLUM *et al.*
Our Ref: 3373.0570001

Commissioner:

In response to the **Notice of Allowance and Fee(s) Due** dated August 5, 2014 and Notice to File Corrected Application Papers dated October 9, 2014, the following documents are transmitted for appropriate action by the U.S. Patent and Trademark Office:

1. Online Credit Card Payment Authorization for **$960.00** to cover:

   $960.00 - Issue Fee;

2. Issue Fee Transmittal (Form PTOL-85);

3. Amendment Under 37 C.F.R. §1.312;

4. A copy of the Notice to File Corrected Application Papers mailed October 9, 2014.

The above-listed documents are filed electronically through EFS-Web.

Fee payment is provided through online credit card payment. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

John P. McGroarty
Attorney for Applicants
Registration No. 41,186

JPM/I-S/amn/amz
Enclosures

1925000_1.docx

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 10/09/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER	
DANG, HUNG XUAN	
ART UNIT	**PAPER NUMBER**
2872	

MAIL DATE	DELIVERY MODE
10/09/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 13298992
Applicant : Blum
Filing Date : 11/17/2011
Date Mailed : 10/09/2014

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See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Stephanie Smart/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 13298992

IDENTIFICATION OF APPLICATION DEFICIENCIES

☐ Applicant must provide legible text for the following item(s).

- ☐ Specification filed , page(s) .
- ☐ Claims filed , claim(s) .
- ☐ Oath/declaration filed .
- ☐ Other: .

☒ Applicant must provide missing information on the following page(s) of the specification by amending the specification to add the missing text. No new matter may be added. page 97 line 32

☐ The specification refers to one or more applications by attorney docket number and does not show the U.S. application number(s). Applicant must supply the U.S. application number in place of each attorney docket number.

☐ Applicant must provide an Abstract of the Disclosure.

☐ Applicant has submitted a DECLARATION (37 CFR 1.63) FOR A UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76) (e.g., form PTO/SB/01A). The Application Data Sheet, however, is not present with the filed application. Applicant must submit an Application Data Sheet or file a new oath or declaration (e.g., PTO/SB/01) executed by the inventors and containing the information required in 37 CFR 1.63.

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☐ Applicant must provide the missing page(s) of the oath/declaration or Application Data Sheet filed

☐ Applicant must provide a declaration signed by inventor(s) .

☐ The oath/declaration filed shows non-initialed and/or non-dated alterations. Applicant must file a new oath/declaration in compliance with 37 CFR 1.67(a).

☐ Applicant(s) in the latest-filed oath/declaration or Application Data Sheet (ADS) did not show the inventor's residence at all, or did not show both a city and state in the U.S. inventor's residence, or did not show both a city and country in the non-U.S. inventor's residence. Applicant must supply an oath/declaration or Application Data Sheet (ADS) that shows each U.S. inventor's city and state of residence and each non-U.S. inventor's city and country of residence.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 09/18/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER	
DANG, HUNG XUAN	
ART UNIT	PAPER NUMBER
2872	

MAIL DATE	DELIVERY MODE
09/18/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Corrected Notice of Allowability	**Application No.** 13/298,992	**Applicant(s)** BLUM ET AL.	
	Examiner HUNG DANG	**Art Unit** 2872	**AIA (First Inventor to File) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *5/16/14*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *48 and 50-67*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 2/20/13
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HUNG DANG/
Primary Examiner, Art Unit 2872

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number / Number Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
				Cozzani, Laura Maria	

No document number and date. HD

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]	Number[4]	Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AA	WO	01/02895		01/11/2001	E-Vision, LLC		☐

NON PATENT LITERATURE DOCUMENTS

Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	AB	Copy of the International Preliminary Report on Patentability corresponding to the PCT/US2011/042882 application	☐

Examiner Signature	/Hung Dang/ (09/16/2014)	Date Considered	09/16/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

KILPATRICK TOWNSEND 64857264 1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

115626 7590 08/05/2014
Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER
DANG, HUNG XUAN

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 08/05/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

TITLE OF INVENTION: ELECTRONIC SPECTACLE FRAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/05/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

115626 7590 08/05/2014
Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

TITLE OF INVENTION: ELECTRONIC SPECTACLE FRAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	11/05/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
DANG, HUNG XUAN	2872	351-113000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 08/05/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER	
DANG, HUNG XUAN	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 08/05/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/298,992	Applicant(s) BLUM ET AL.	
	Examiner HUNG DANG	Art Unit 2872	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *5/16/14*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *48 and 50-67*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 2/7/13, 2/17/12, 2/20/13, 2/28/12 and 3/23/13
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/HUNG DANG/
Primary Examiner, Art Unit 2872

Examiner's Amendment

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Amendment to the specification:

Please replace paragraph [0001] with the following replacement paragraph:

--[0001] This application is a continuation-in-part of U.S. Application No. 13/175,633 filed on July 1,2011, now U.S. Patent No. 8,783,861 and U.S. Application No. 13/175,634 filed on July 1,2011, now abandoned which applications claim the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 61/361,110 filed on July 2, 2010; U.S. Provisional Patent Application No. 61/376,719 filed on August 25, 2010; and U.S. Provisional Patent Application No. 61/415,391 filed on November 19, 2010. This application is also a continuation-in-part of U.S. Application No. 13/179,219 filed on July 8,2011, which application further claims the benefit under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application No. 61/362,877 filed July 9, 2010 and U.S. Provisional Patent Application No. 61/481,353 filed on May 2, 2011. The entire

disclosure of each of the above mentioned applications is incorporated herein by reference for all purposes.--

Claims Allowed

Claims 48 and 50-67 are allowed.

Reasons For Allowance

The following is an Examiner's Statement of Reasons for Allowance:

Claims 48 and 50-67 are considered allowable for reasons set forth on pages 6-13 of the Remarks by Applicant filed on 5/16/14.

Any comments considered necessary by applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably **accompany** the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HUNG X. DANG whose telephone number is (571)272-2326. The examiner can normally be reached on Monday to Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Pham, can be reached on 571-272-3689. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

7/14 /Hung X Dang/

Primary Examiner, Art Unit 2873

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("20080273166").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/07/21 13:19
L2	119755	eyeglass spectacle eyewear	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:45
L3	6945143	electronic	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:45
L4	11536458	controll$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:45
L5	10297770	power battery	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:45
L6	7512	2 and 3 and 4 and 5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:46
L7	2270317	insulating	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:46
L8	1027	6 and 7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/07/21 13:46

			DERWENT; IBM_TDB			
L10	16925	blum.in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:54
L11	555	2 and 10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 13:54
L12	241	8 and ((G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/07/21 14:16

7/ 21/ 2014 2:17:04 PM

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-4,991,951	2/12/91	Mizuno Mitsuyoshi	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AB	GB	1563929		4/2/80	American Cyanamid Co		☐

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
No date	AC	Copy of the International Search Report corresponding to the PCT/US2011/042882 application.	☐

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

63992792 v1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-2011/0058141	3/2011	Cozzani, Laura Maria	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AB	WO	01/35159		5/17/01	PPG Industries Ohio, Inc.		☐

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
No date	AC	Copy of the International Search Report corresponding to the PCT/US2012/051202 application	☐

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

KILPATRICK TOWNSEND 64847475 1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
				Cozzani, Laura Maria	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AA	WO	01/02895	01/11/2001	E-Vision, LLC		☐

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
No date	AB	Copy of the International Preliminary Report on Patentability corresponding to the PCT/US2011/042882 application	☐

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

KILPATRICK TOWNSEND 64857264 1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	4	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-5463428	10/31/95	Lipton et al.	
	BA	US-2008/316420	10/25/08	Agazarova Mazal	
	CA	US-5764338	6/9/98	Carol Anne Mack	
	DA	US-4,418,990	12/6/83	Gerber	
	DB	US-5,742,379	4/21/98	Reifer	
	DC	US-6,115,177	9/5/00	Vossler	
	DD	US- 6,719,425	4/13/04	Conner	
	DE	US-2001/0007493	7/2001	Masunaga et al.	
	DF	US-2001/0043266	11/22/01	Robinson et al.	
	DG	US-2002/0140899	10-2002	Blum et al.	
	DH	US-2004/000733	1/1/04	Swab et al.	
	DI	US-2005/0225723	10/13/05	Pilu	
	DJ	US-2005/0237485	10/27/2005	Blum et al.	
	DK	US-2005/0242771	11/3/2005	Blum et al.	
	DL	US-2005/0264752	12-01-2005	Howell et al.	
	DM	US-2005/078274	4/14/05	Howell et al.	
	DN	US-2005/270479	12/8/05	Canavan et al.	
	EA	US-2005/270481	12/8/05	Blum et al.	
	EB	US-2006/023158	2/2/06	Howell et al.	
	EC	US-2006/092340	5/4/06	Blum et al.	
	ED	US-2006/203186	9/14/06	Ifergan	
	EE	US-2007/0296918	12-2007	Blum et al.	
	EF	US-2007/258039	11/8/07	Duston et al.	
	EG	US-2008/0106695	05-08-2008	Kokonaski et al.	
	EH	US-2010/0201938	8/12/10	Jackson et al.	
	EI	US-2010/0309426	12/9/2010	Howell et al.	
	EJ	US-4,152,846	5/8/79	Witt	
	EK	US-4,283,127	8/11/81	Rosenwinket et al.	
	EL	US-4,756,605	07-12-1988	Okada etal.	
	EM	US-4,875,030	10/17/89	Chiu	

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	EN	US-4,907,860	3/13/90	Noble	
	EO	US-4,967,268	10/30/90	Lipton et al.	
	FA	US-5,182,585	1/26/93	Stoner	
	FB	US-5,835,185	11/10/98	Kallman et al.	
	FC	US-6,097,450	8/1/00	Humphrey	
	FD	US-6,582,075	6/24/03	Swab et al.	
	FE	US-6,595,634	07-22-2003	Pilat, Jr.	
	FF	US-6,626,532	09-30-2003	Nishioka et al.	
	FG	US-6,866,386	03-2005	Chen, Joy	
	FH	US-7,009,757	3/7/06	Nishioka et al.	
	FI	US-7,063,420	06-20-2006	Lerner et al.	
	GA	US-7,104,645	09-12-2006	Pilat, Jr.	
	GB	US-7,140,727	12-28-2006	Pilat, Jr. et al.	
	GC	US-7,425,066	09-16-2008	Blum e tal.	
	GD	US-7,784,935	8/31/10	Jackson et al.	
	GE	US-7,813,048	10/12/2010	Lynch et al.	

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	GF	WO 2010/080999	7/15/10	PixelOptics, Inc.		☐
	HA	EP 1647854	4/19/06	Sunshine Optical Company		
	IA	WO 2009/098719	8/13/09	Laura Maria Cozzani		
	JA	WO 2008/002388	1/3/08	PixelOptics, Inc.		
	KA	WO 2009/081542	7/2/09	Panasonic Corp.		
	KB	WO 2010/062504	6/3/2010	CJoahrneson & Johnson Vision		
	LA	DE 2304134	8/30/73	Gould Inc.		
	LB	GB 2170613	08-06-1986	Olympus Optical Co., Ltd.		

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(Use as many sheets as necessary)				Examiner Name	TBA
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	LC	WO	2007/142520		12-13-2007	Varibel BV.		
	LD	EP	1916561		04-30-2008	Varibel BV.		
	LE	EP	1727393		11-29-2006	Varibel BV.		
	LF	WO	99/21400		04-29-1999	Technische Universiteit Delft		
	LG	WO	2004/028203		04-01-2004	Stichting Voor De Technische Wetenschappen		
	LH	WO	2008/046858		04-24-2008	Essilor International		
	LI	JP	09294654		12-17-2009	Scalar Corp.		
	LJ	WO	2009/136667		11-12-2009	Scalar Corp.		
	LK	EP	2233964		9/29/10	Panasonic Corp.		
	LL	WO	2009/126946		10/15/09	PixelOptics, Inc.		
	LM	EP	0061002		9/29/82	Desil SPA Occhialeria		
	LN	JP	2008/083299		4/10/08	Biito KK		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
No date	LO	Copy of the International Search Report corresponding to the PCT/US2011/061505 application	☐
No date	LP	Copy of the International Search Report corresponding to the PCT/US2011/061495 application	
	LQ	U.S. provisional patent application no. 61/441,817 filed on February 11, 2011	

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

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Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	4	of	4	Attorney Docket Number	91904-817521(008512US)

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Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
No date	LR	International Search Report and Written Opinion in corresponding PCT/US2008/058056 application.	
No date	LS	Partial International Search Report in corresponding PCT/US2010/020498 application.	
No date	LT	European Search Report in related EP07852880.9 application	
	LU	"Hearing Mojo: Varibel Hearing-Aid Glasses Integrate Eight Directional Microphones," February 27, 2009, pages 1-4 *URL-http://hearingmojo.com/b/og-mt/blog-mt/2006/04/varibel_hearingaid_glasses_dou.html*	
No date	MA	International Search Report corresponding to the PCT/US2011/061505 application	
No date	MB	International Search Report corresponding to the PCT/US2011/061495 application	
No date	MC	International Search Report corresponding to the PCT/US2011/043591 application	

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

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64056449 v1

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	Art Unit
	HUNG DANG	2872

CPC- SEARCHED		
Symbol	Date	Examiner
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.	2/10/14	HD
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083)	7/21/14	HD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.	2/10/14	HD
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083)	7/21/14	HD

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
351	158, 49, 41	2/10/14	HD
All	Update	7/21/14	HD

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	2/10/14	HD
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.	2/10/14	HD
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083)	7/21/14	HD
EAST	7/21/14	HD

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
	(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083)	7/21/14	HD
Same	as above	7/21/14	HD

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	**Art Unit**
	HUNG DANG	2872

CPC						
Symbol					**Type**	**Version**
G02C		7	/	101	F	2013-01-01
G02C		5	/	2236	I	2013-01-01
G02C		5	/	146	I	2013-01-01
G02C		1	/	10	I	2013-01-01
G02C		7	/	081	I	2013-01-01
G02C		11	/	10	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	19	
/HUNG DANG/ Primary Examiner.Art Unit 2872	07/21/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	Art Unit
	HUNG DANG	2872

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION												
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED							
351	158	G	0	2	C	1 / 00 (2006.01.01)								
CROSS REFERENCE(S)														
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)													
351	41													

NONE	Total Claims Allowed:	
(Assistant Examiner) (Date)	19	
/HUNG DANG/ Primary Examiner.Art Unit 2872 07/21/2014	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner) (Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	**Art Unit**
	HUNG DANG	2872

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17		33		49	17	65						
	2		18		34	2	50	18	66						
	3		19		35	3	51	19	67						
	4		20		36	4	52								
	5		21		37	5	53								
	6		22		38	6	54								
	7		23		39	7	55								
	8		24		40	8	56								
	9		25		41	9	57								
	10		26		42	10	58								
	11		27		43	11	59								
	12		28		44	12	60								
	13		29		45	13	61								
	14		30		46	14	62								
	15		31		47	15	63								
	16		32	1	48	16	64								

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/HUNG DANG/ Primary Examiner.Art Unit 2872 (Primary Examiner)	07/21/2014 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office Part of Paper No. 20140721

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	AB	US-5,760,869	6/2/98	Mitamura	
	AC	US-5,657,107	8/12/97	Wagner et al.	
	AD	US-4,991,258	2/12/91	Drlik	
	AE	US-2010/0177277	7/15/10	Kokonaski et al.	
	AF	US-2930857	3/29/60	Hollingsworth	
	AG	US-2007/121061	5/31/07	Young	
	AH	US-2008/273166	11/6/08	Kokonaski	

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	AI	WO 2009/081542	7/2/09	Panasonic Corp.		☐

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	AJ	Copy of the US provisional patent application no. 61/361,110, filed on July 2, 2010	☐
	AK	Copy of the US provisional patent application no. 61/376,719, filed on August 25, 2010	☐
	AL	Copy of the US provisional patent application no. 61/415,391, filed on November 19, 2010	☐

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	BA	Copy of the US non-provisional patent application no. 12/684,490, filed on January 8, 2010	☐
	BB	Copy of the U.S. non-provisional application no. 13/175,633 filed on July 1, 2011	☐
	BC	Copy of the U.S. non-provisional application no. 13/175,634 filed on July 1, 2011	☐
	BD	Copy of the U.S. provisional patent application no. 61/362,877 filed July 9, 2010	☐
	BE	Copy of the US non-provisional patent application no. 13/179,219, filed on July 8, 2011	☐
	BF	Copy of the U.S. provisional patent application no. 61/481,353 filed on May 2, 2011	☐
No date.	BG	Copy of the International Search Report corresponding to the PCT/US2011/042883 application.	☐

Examiner Signature	/Hung Dang/ (08/04/2014)	Date Considered	08/04/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

63986902 v1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 1095
BLUM *et al.*	Art Unit: 2872
Appl. No.: 13/298,992	Examiner: DANG, Hung Xuan
Filed: November 17, 2011	Atty. Docket: 3373.0570001
For: **Electronic Spectacle Frames**	

Amendment and Reply Under 37 C.F.R. § 1.111

Mail Stop Amendment

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

In reply to the Office Action dated February 19, 2014, Applicants submit the following Amendment and Remarks.

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 6 of this paper.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1.-47. (Canceled)

48. (Currently Amended) A first device, comprising:

a frame comprising a first temple and a second temple, wherein the frame comprises a housing module coupled to a structural member;

a first lens and a second lens coupled to the frame; and

an electronics module, wherein the electronics module is located within the housing module; [[and]]

wherein the electronics module comprises at least any two of: a power source; a controller; and a sensing mechanism; and

wherein an insulating layer is disposed between one or more electronic components located within the electronics module and the frame of the first device.

49. (Canceled)

50. (Currently Amended) The first device of claim [[49]] 48, wherein the housing module comprises the insulating layer.

51. (Previously Presented) The first device of claim 50, wherein the electronics module comprises a conductive material.

52. (Currently Amended) The first device of claim [[49]] 48, wherein the housing module comprises a conductive material; and

wherein the insulating layer is disposed between at least a portion of the housing module and the electronics module.

53. (Currently Amended) The first device of claim [[49]] 48, wherein the insulating layer comprises a portion of the electronics module.

54. (Previously Presented) The first device of claim 53, wherein the housing module comprises a conductive material.

55. (Previously Presented) The first device of claim 48, wherein the electronics module is removably coupled to the housing module.

56. (Previously Presented) The first device of claim 55, wherein the electronics module is adapted to be removed and recoupled to the housing module.

57. (Previously Presented) The first device of claim 48, wherein the housing module comprises a first end, a second end, and a body disposed between the first end and the second end;

wherein the first end comprises an opening; and

wherein the electronics module is configured to be inserted into the opening.

58. (Previously Presented) The first device of claim 57, wherein the electronics module is pressure fitted to the housing module.

59. (Previously Presented) The first device of claim 57, wherein the electronics module is located within the body of the housing module.

60. (Previously Presented) The first device of claim 48, wherein the structural member comprises a cavity in the first temple; and wherein the housing module is configured to be selectively placed within the cavity.

61. (Previously Presented) The first device of claim 48, wherein the housing module further comprises an aperture disposed on an outer side of the housing module.

62. (Previously Presented) The first device of claim 61, wherein the sensing mechanism comprises a touch sensitive switch exposed substantially through the aperture.

63. (Previously Presented) The first device of claim 62, wherein the touch sensitive switch is a capacitance switch.

64. (Previously Presented) The first device of claim 48, wherein the structural member comprises the first temple.

65. (Previously Presented) The first device of claim 64, wherein the first temple comprises a first portion and second portion, and wherein the housing module comprises the first portion of the first temple.

66. (Previously Presented) The first device of claim 48, wherein the housing module has a thickness that is less than or equal to approximately .7 mm.

67. (Previously Presented) A method of fabricating a device,

wherein the device comprises

a frame having a first temple and second temple; and

a housing module comprising:

a first end and a second end, wherein the first end comprises an opening; and

a body disposed between the first and second end, wherein the body comprises a cavity;

wherein the method comprises inserting an electronics module into the opening of the first end of the housing module such that the electronics module is disposed in the cavity of the body of the housing module.

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 48 and 50-67 are pending in the application, with claims 48 and 67 being the independent claims. Independent claim 48 is amended to recite features previously recited in dependent claim 49. Accordingly, claim 49 is canceled without prejudice to or disclaimer of the subject matter therein. Claims 50, 52, and 53 are amended to provide proper dependency. These changes are believed to introduce no new matter, and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicants respectfully request that the Examiner reconsider all outstanding rejections and that they be withdrawn.

I. Request for Full Examination

Applicants request full examination of claims 50-67, and allowance of these claims. If the rejections of these claims are maintained after such full examination, Applicants request that the Office's statements of rejection be at least as complete and informative as to satisfy the applicable statutory and regulatory requirements for rejection. Presently, the Office's rejections of these claims do not meet these required standards.

Specifically, the Office provides no support for the rejections of any of these claims. The rejections include neither analysis nor even a comparison of the elements of the pending claims to those of the applied reference. Rather, the Office appears to have simply "cut and pasted" the language of these claims and asserted that Kokonaski discloses each claimed invention. This is inadequate to satisfy the Office's burden to

establish that "*each and every element as set forth in the claim* is found, either expressly or inherently described, in a single prior art reference." (*See* MPEP § 2131 (*citing Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987) (emphasis added).) Further, as stated in 37 C.F.R. § 1.104(c)(2):

> In rejecting claims, for want of novelty or for obviousness, the examiner must cite the best references at his or her command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, ***the particular part relied on must be designated*** as nearly as practicable. *The* ***pertinence of each reference, if not apparent, must be clearly explained*** and each rejected claim specified.

(Emphasis added.) The Office's failure to address *any* feature of these claims axiomatically does not "clearly explain" the pertinence of any reference applied and does not designate any part relied on. This deficiency is a clear violation of 37 C.F.R. § 1.104(c)(2), as quoted above. Indeed, these rejections are uninformative to such an extent that they prevent Applicants from recognizing and seeking to counter the grounds for rejection, which will unnecessarily prolong prosecution.

Further, such cursory rejections, lacking any supporting rationale, are invalid as arbitrary and capricious under the Administrative Procedures Act (APA) (5 U.S.C. § 706), a standard to which all Actions by the USPTO must adhere. (*See Dickenson v. Zurko*, 527 U.S. 150 (1999).) As recognized by the Federal Circuit, "The [APA], which governs the proceedings of administrative agencies ..., establishes a scheme of 'reasoned decisionmaking.' Not only must an agency's decreed result be within the scope of its lawful authority, but the process by which it reaches that result must be logical and rational. This standard ***requires*** that the agency not only have reached a sound decision,

but have ***articulated the reasons*** for that decision." (*In re Lee*, 277 F.3d 1338, 1342 (Fed. Cir. 2002) (emphasis added).) The Office's failure to articulate reasons for the rejections of claims 50-67 is a clear violation of the APA.

The Office's rejections do not provide any indication of *how* the applied reference is believed to disclose each and every element as set forth in the claims, and therefore fail to establish the purported rejections. The rejections do not even show any recognition of the elements of the claims, much less what elements of Kokonaski are believed to correspond. Applicants are not required to guess at the reasons underlying the Office's rejections. It is the Office's burden to establish the propriety of any rejection set forth by articulating these reasons. (*See Lee* at 1342). Absent the proper establishment of a rejection, as here, Applicants are entitled to allowance of the claims. (*See* 35 U.S.C. § 102.) If the Office disagrees, the Office is required to support any rejection in a subsequent Office Action in a manner sufficient to at least satisfy the statutory and regulatory requirements by which the Office is bound.

At least because claims 50-67 have not been properly rejected, Applicants are entitled to their allowance. Applicants respectfully request prompt confirmation that these claims are allowed. Alternatively, if these claims are not allowed, Applicants request that the Office set forth legally sufficient rejections of these claims that are supported in such a manner as to provide Applicants an opportunity to recognize and respond thereto. This will allow Applicants to consider and address any concerns the Office may have with the claims and advance prosecution of this application.

II. Rejections under 35 U.S.C. § 112

Claims 48-65 and 67 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Applicants respectfully traverse this rejection.

A. The "Electronics Module" Is Clearly Defined in the Specification

The Office asserts: "it's not clear which structure feature is means [*sic*] by term 'electronics module'." (Office Action, p. 3.) The claimed "electronics module" is clearly defined in the specification, for example at paragraph [0070] of the published application, which states:

> As used herein, an "electronics module" may refer to a housing or container that comprises a plurality of electrical components. For instance, an electronics module may comprise a power source (such as a battery), a sensing mechanism (such as a capacitance switch, which may activate or deactivate the electronics) and/or a controller (such as a microprocessor).

Accordingly, Applicants respectfully assert that the electronics module is clearly defined and request that the rejection under 35 U.S.C. § 112 be withdrawn.

B. The "Structural Member" Is Clearly Defined in the Specification

The Office asserts: "It's not clear what is meant by term 'structure member' [*sic*] whether that structural member is even part of the frame, or how it could be connected with the part of the frame." (Office Action, p. 3.) The claimed "structural member" is clearly defined in the specification, for example at paragraph [0259] of the published application, which states:

> The frame may also comprise a housing module attached to a structural member. A "structural member" may refer to any portion of the frame including, by way of example, the lens housing, either of the temples, a cavity within a temple, the lenses themselves, etc. The housing module may be attached (or coupled) to the structural member in any suitable manner, including using one or more fastening devices (such as a screw), an adhesive, a common frame component (such as a core element), etc.

Accordingly, Applicants respectfully assert that the structural member is clearly defined and request that the rejection under 35 U.S.C. § 112 be withdrawn.

C. The "Controller" Is Clearly Defined in the Specification

The Office asserts: "It is not clear which function the controller has, an [*sic*] which function the first device has." (Office Action, p. 3.) The claimed "controller" is clearly defined in the specification, for example at paragraph [0279] of the published application, which states:

> In some embodiments, in the first device as described above where the first lens is electrically connected to the electronics module, the electronics module may comprise a controller that is configured to generate a time varying signal to supply to the first lens from the power source. ... In some embodiments, the controller may include firmware. While firmware may be preferred in some embodiments because it may reduce the space required by the controller, embodiments are not so limited and the controller may comprise any combination of software and firmware to provide a desired functionality. In some embodiments, the controller may include a voltage multiplier.

Paragraph [0335] of the published application further describes that:

> The controller may include a microprocessor that may receive signals from the fall sensor and determine whether a fall has occurred. The controller may also comprise preprogrammed instructions (e.g. stored in a memory device) to execute one or more functions so as to provide an alarm or notification service (e.g. the controller may be configured to send a signal via a transmitter indicating that a fall has occurred, such as dialing or connection to a phone number such as 9-1-1; sending an email; etc).

Thus, it is clear from the specification that the controller is a component of the first device and that it has a particular function. Accordingly, Applicants respectfully assert that the controller and the first device are clearly defined and request that the rejection under 35 U.S.C. § 112 be withdrawn.

D. Claim 48 Does Not Lack an Essential Feature

The Office asserts: "Claim 48 lacks the essential feature that the electronics module is connected with an electro-active lens." (Office Action, p. 3.) First, claim 48 does not recite "an electro-active lens", nor do any of the other pending claims. Second, the claimed invention does not necessarily require the feature suggested by the Office. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 112 be withdrawn.

III. Rejections under 35 U.S.C. § 102

Claims 48-65 and 67 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Publication No. 2008/0273166 to Kokonaski *et al.* ("Kokonaski"). Applicants respectfully traverse this rejection.

A. Independent Claim 48 Is Patentable Over Kokonaski

Despite the Office's failure to properly address each of the pending claims, in order to advance prosecution, Applicants have amended independent claim 48 to recite features previously recited by dependent claim 49. The Office rejected dependent claim 49 by merely asserting that "Kokonaski et al discloses the insulating layer between electronic components and frame ***implicitly*** states [*sic*] otherwise there would be short circuit, the wires ***can have*** insulating material." (Office Action, p. 4 (emphasis added).) But the Office fails to meet its burden of presenting a *prima facie* case of anticipation.

While MPEP § 2112 permits that "express, implicit, and inherent disclosures of a prior art reference may be relied upon in the rejection of claims under 35 U.S.C. 102 or 103", there are strict requirements for relying these principles. Specifically, MPEP § 2112 IV states:

> ***The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency*** of that result or characteristic. *In re Rijckaert,* 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) ... "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is ***necessarily present*** in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, ***may not be established by probabilities or possibilities***. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson,* 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). (Emphasis added.)

Kokonaski does not disclose each and every feature recited by independent claim 48, as amended. The Office attempts to rely on the theory that the features are "implicitly" disclosed, suggesting that "the wires *can have* insulating material." So the Office acknowledges this is merely one "possibility", which is insufficient to satisfy the standard quoted above. The Office does not show that the missing feature is "necessarily present", as required. Indeed, there are other ways in which Kokonaski could prevent a short circuit. For example, if the frame is not electrically conductive, the components of the electronics module could contact the frame without creating a short circuit. Thus, Kokonaski does not require the claimed elements.

Because the Office's reasoning is flawed regarding the "implicit" disclosure of the claimed features, Kokonaski fails to anticipate independent claim 48, as amended. Claims 50-66 depend from and add features to independent claim 48 and are therefore also patentable for at least these same reasons. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 102(b) be withdrawn and that the claims be allowed.

B. Independent Claim 67 Is Patentable Over Kokonaski

As discussed above in Section I, the Office provides no support for the rejection of independent claim 67. The rejection includes neither analysis nor a comparison of the

elements of the pending claims to those of the applied reference. Applicants assert that Kokonaski fails to disclose each and every element recited by claim 67, as is required for anticipation. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 102(b) be withdrawn and that the claim be allowed.

Rejections under 35 U.S.C. § 103

Claim 66 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kokonaski. Applicants respectfully traverse this rejection.

As discussed above with respect to independent claim 48, from which it depends, Kokonaski fails to disclose each and every feature recited by the claim, explicitly or implicitly. Therefore, claim 66 is also patentable for at least the same reasons discussed above. Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn and that the claim be allowed.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.



Jason A. Fitzsimmons
Attorney for Applicants
Registration No. 65,367

Date: May 16, 2014
1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600
1851380_1

Electronic Acknowledgement Receipt

EFS ID:	19055007
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	115626
Filer:	Jason Alan Fitzsimmons/cj .
Filer Authorized By:	Jason Alan Fitzsimmons
Attorney Docket Number:	3373.0570001
Receipt Date:	16-MAY-2014
Filing Date:	17-NOV-2011
Time Stamp:	17:12:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		3373_0570001_AMD.pdf	1754178 544472829d59c3c6b4090eb96b01b406f31cf22d	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Amendment/Req. Reconsideration-After Non-Final Reject	2	2
	Claims	3	6
	Applicant Arguments/Remarks Made in an Amendment	7	15
Warnings:			
Information:			
	Total Files Size (in bytes):	1754178	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

JASON A. FITZSIMMONS
ASSOCIATE
(202) 772-8701
JFITZSIMMONS@SKGF.COM

Sterne Kessler Goldstein Fox
ATTORNEYS AT LAW

May 16, 2014

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 1095
Art Unit 2872

Re: U.S. Utility Patent Application
Appl. No. 13/298,992; Filing Date: November 17, 2011
For: **Electronic Spectacle Frames**
Inventors: BLUM *et al.*
Our Ref: 3373.0570001

Commissioner:

Transmitted herewith for appropriate action is the following document:

1. Amendment and Reply Under 37 C.F.R. § 1.111.

The above-listed document is filed electronically through EFS-Web.

In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

Jason A. Fitzsimmons
Attorney for Applicants
Registration No. 65,367

JAF/cj
Enclosure

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PTO/SB/06 (09-11)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/298,992	Filing Date 11/17/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **05/16/2014**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/eugenia v. hardy/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/298,992	11/17/2011	Ronald D. Blum	3373.0570001	1095

115626 7590 02/19/2014

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

EXAMINER	
DANG, HUNG XUAN	
ART UNIT	PAPER NUMBER
2872	
MAIL DATE	DELIVERY MODE
02/19/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/298,992	Applicant(s) BLUM ET AL.	
	Examiner HUNG DANG	Art Unit 2872	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/7/12*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *48-67* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *48-67* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *2/17/12, 2/28/12, 3/23/12, 2/7/13, 2/20/13 and 9/13/13*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

Information Disclosure Statement

The prior art documents submitted by applicant in the Information disclosure Statements filed on 2/17/12, 2/28/12, 3/23/12, 2/7/13, 2/20/13 and 9/13/13 have been considered and made of record (noted attached copy of form PTO-1449)

It is noted that the foreign patent has been considered to the best of the ability of the examiner without benefit of translation.

Claims Rejection Under 35 U.S.C. 112

The following is a quotation of 35 U.S.C. 112(b):

(B) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 48-65 and 67 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claims 48 and 67 are unclear for the following reasons:

It's not clear which structure feature is means by term "electronics module". It appears to be a sum of electronic components which may or may not be connected with one another and may or may not be close to one another.

It is not clear what is meant by term "structure member" whether that structural member is even part of the frame, or how it could be connected with the part of the frame.

It is not clear which function the controller has, an which function the first device has.

Claim 48 lacks the essential feature that the electronics module is connected with an electro-active lens.

The remaining claims 47-65 are dependent upon the above rejected base claim and thus inherit the deficiency thereof.

Claims Rejection Under 35 USC - 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 48-65 and 67 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by **Kokonaski et al** (2008/0273166, in IDS filed on 2/17/12).

Regarding claim 48, Kokonaski et al discloses electronic eyeglass frame comprises a frame comprising a first temple (110) and a second temple (110), wherein the frame comprises a housing module (202, 203)) coupled to a structural member (102); a first lens (612) and a second lens (612) coupled to the frame; and an electronics module (201), wherein the electronics module (201) is located within the housing module (202, 203); and wherein the electronics module (201) comprises at least any two of: a power source (battery, see [0075] figure 2); a controller; and a sensing mechanism (a manual touch switch 206).

Regarding claim 49, Kokonaski et al discloses the insulating layer between electronic components and frame implicitly states otherwise there would be short circuit, the wires can have insulating material.

Regarding claim 50, Kokonaski et al discloses the housing module with insulating layer either the box is insulating or it is insulated against the electronic components, which would otherwise the device not work.

Regarding claim 51, Kokonaski et al discloses the electronics module comprises a conductive material.

Regarding claim 52, Kokonaski et al discloses wherein the housing module comprises a conductive material; an wherein the insulating layer is disposed between at least a portion of the housing module and the electronics module.

Regarding claim 53, Kokonaski et al discloses the insulating layer comprises a portion of the electronics module.

Regarding claim 54, Kokonaski et al discloses the housing module comprises a conductive material.

Regarding claim 55, Kokonaski et al discloses the electronics module is removably coupled to the housing module, whereby the electronic components are normally exchangeable; alternatively.

Regarding claim 56, Kokonaski et al discloses the electronics module is adapted to be removed and recoupled to the housing module; whereby the electronic components are normally exchangeable; alternatively.

Regarding claim 57, Kokonaski et al discloses the electronic module inserted into the opening of the housing module.

Regarding claim 58, Kokonaski et al discloses the electronics module is pressure fitted to the housing module.

Regarding claim 59, Kokonaski et al discloses the electronics module is located within the body of the housing module.

Regarding claim 60, Kokonaski et al discloses the structural member comprises a cavity in the first temple; and wherein the housing module is configured to be selectively placed within the cavity.

Regarding claim 61, Kokonaski et al discloses wherein the housing module is configured to be selectively placed within the cavity.

Regarding claim 62, Kokonaski et al discloses the sensing mechanism comprises a touch sensitive switch exposed substantially through the aperture.

Regarding claim 63, Kokonaski et al discloses the touch sensitive switch is a capacitance switch.

Regarding claim 64, Kokonaski et al discloses the structural member comprises the first temple.

Regarding claim 65, Kokonaski et al discloses the first temple comprises a first portion and second portion, and wherein the housing module comprises the first portion of the first temple.

Regarding claim 67, Kokonaski et al discloses a frame having a first temple and second temple; and a housing module comprising: a first end and a second end, wherein the first end comprises an opening; an a body disposed between the first and second end, wherein the body comprises a cavity; wherein the method comprises inserting an electronics module into the opening of the first end of the housing module such that the electronics module is disposed in the cavity of the body of the housing module.

Claims Rejection Under 35 USC - 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 66 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kokonaski et al** (2008/0273166, in IDS filed on 2/17/12).

Regarding claim 66, Kokonaski et al does not discloses the housing module has a thickness that is less than or equal to approximately .7 mm.

Although the Kokonaski et al device does not teach the exact thickness of the housing module as that claimed by Applicant, the thickness differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HUNG X. DANG whose telephone number is (571)272-2326. The examiner can normally be reached on Monday to Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Pham, can be reached on 571-272-3689. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

2/14 /Hung X Dang/

Primary Examiner, Art Unit 2873

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L5	115592	eyeglass spectacle eyewear	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/02/10 13:54
L6	4477281	electronic	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:55
L7	13611	5 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:55
L8	11118122	controll$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:55
L9	9728676	power battery	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:55
L10	6112229	switch$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:56
L11	4444	7 and 8 and 9 and 10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:56
L12	2721589	module	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:56
L13	2097	11 and 12	US-PGPUB; USPAT;	OR	OFF	2014/02/10 13:56

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
L14	302	13 AND ((G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/02/10 13:58

2/ 10/ 2014 1:58:39 PM

PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-2011/0058141	3/2011	Cozzani, Laura Maria	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AB	WO	01/35159		5/17/01	PPG Industries Ohio, Inc.		☐

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	AC	Copy of the International Search Report corresponding to the PCT/US2012/051202 application	☐

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	Art Unit
	HUNG DANG	2872

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/10/2014								
	1	-								
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CLAIM		DATE								
Final	Original	02/10/2014								
	37	-								
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	67	✓								

PTO/SB/08A&B (07-09)

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-6,336,250	1/8/02	Takeda et al.	
	AB	US-5,760,869	6/2/98	Mitamura	
	AC	US-5,657,107	8/12/97	Wagner et al.	
	AD	US-4,991,258	2/12/91	Drlik	
	AE	US-2010/0177277	7/15/10	Kokonaski et al.	
	AF	US-2930857	3/29/60	Hollingsworth	
	AG	US-2007/121061	5/31/07	Young	
	AH	US-2008/273166	11/6/08	Kokonaski	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AI	WO 2009/081542	7/2/09	Panasonic Corp.		☐

NON PATENT LITERATURE DOCUMENTS

Examiner Initials *	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	AJ	Copy of the US provisional patent application no. 61/361,110, filed on July 2, 2010	☐
	AK	Copy of the US provisional patent application no. 61/376,719, filed on August 25, 2010	☐
	AL	Copy of the US provisional patent application no. 61/415,391, filed on November 19, 2010	☐

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	2	of	2	Attorney Docket Number	91904-817521(008512US)

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	BA	Copy of the US non-provisional patent application no. 12/684,490, filed on January 8, 2010	☐
	BB	Copy of the U.S. non-provisional application no. 13/175,633 filed on July 1, 2011	☐
	BC	Copy of the U.S. non-provisional application no. 13/175,634 filed on July 1, 2011	☐
	BD	Copy of the U.S. provisional patent application no. 61/362,877 filed July 9, 2010	☐
	BE	Copy of the US non-provisional patent application no. 13/179,219, filed on July 8, 2011	☐
	BF	Copy of the U.S. provisional patent application no. 61/481,353 filed on May 2, 2011	☐
	BG	Copy of the International Search Report corresponding to the PCT/US2011/042883 application.	☐

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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U.S. PATENT DOCUMENTS

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	AA	US-5463428	10/31/95	Lipton et al.	
	BA	US-2008/316420	10/25/08	Agazarova Mazal	
	CA	US-5764338	6/9/98	Carol Anne Mack	
	DA	US-4,418,990	12/6/83	Gerber	
	DB	US-5,742,379	4/21/98	Reifer	
	DC	US-6,115,177	9/5/00	Vossler	
	DD	US- 6,719,425	4/13/04	Conner	
	DE	US-2001/0007493	7/2001	Masunaga et al.	
	DF	US-2001/0043266	11/22/01	Robinson et al.	
	DG	US-2002/0140899	10-2002	Blum et al.	
	DH	US-2004/000733	1/1/04	Swab et al.	
	DI	US-2005/0225723	10/13/05	Pilu	
	DJ	US-2005/0237485	10/27/2005	Blum et al.	
	DK	US-2005/0242771	11/3/2005	Blum et al.	
	DL	US-2005/0264752	12-01-2005	Howell et al.	
	DM	US-2005/078274	4/14/05	Howell et al.	
	DN	US-2005/270479	12/8/05	Canavan et al.	
	EA	US-2005/270481	12/8/05	Blum et al.	
	EB	US-2006/023158	2/2/06	Howell et al.	
	EC	US-2006/092340	5/4/06	Blum et al.	
	ED	US-2006/203186	9/14/06	Ifergan	
	EE	US-2007/0296918	12-2007	Blum et al.	
	EF	US-2007/258039	11/8/07	Duston et al.	
	EG	US-2008/0106695	05-08-2008	Kokonaski et al.	
	EH	US-2010/0201938	8/12/10	Jackson et al.	
	EI	US-2010/0309426	12/9/2010	Howell et al.	
	EJ	US-4,152,846	5/8/79	Witt	
	EK	US-4,283,127	8/11/81	Rosenwinket et al.	
	EL	US-4,756,605	07-12-1988	Okada etal.	
	EM	US-4,875,030	10/17/89	Chiu	

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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64056449 v1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.D./

PTO/SB/08A&B (07-09)

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	EN	US-4,907,860	3/13/90	Noble	
	EO	US-4,967,268	10/30/90	Lipton et al.	
	FA	US-5,182,585	1/26/93	Stoner	
	FB	US-5,835,185	11/10/98	Kallman et al.	
	FC	US-6,097,450	8/1/00	Humphrey	
	FD	US-6,582,075	6/24/03	Swab et al.	
	FE	US-6,595,634	07-22-2003	Pilat, Jr.	
	FF	US-6,626,532	09-30-2003	Nishioka et al.	
	FG	US-6,866,386	03-2005	Chen, Joy	
	FH	US-7,009,757	3/7/06	Nishioka et al.	
	FI	US-7,063,420	06-20-2006	Lerner et al.	
	GA	US-7,104,645	09-12-2006	Pilat, Jr.	
	GB	US-7,140,727	12-28-2006	Pilat, Jr. et al.	
	GC	US-7,425,066	09-16-2008	Blum e tal.	
	GD	US-7,784,935	8/31/10	Jackson et al.	
	GE	US-7,813,048	10/12/2010	Lynch et al.	

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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	GF	WO 2010/080999	7/15/10	PixelOptics, Inc.		☐
	HA	EP 1647854	4/19/06	Sunshine Optical Company		
	IA	WO 2009/098719	8/13/09	Laura Maria Cozzani		
	JA	WO 2008/002388	1/3/08	PixelOptics, Inc.		
	KA	WO 2009/081542	7/2/09	Panasonic Corp.		
	KB	WO 2010/062504	6/3/2010	CJoahrneson & Johnson Vision		
	LA	DE 2304134	8/30/73	Gould Inc.		
	LB	GB 2170613	08-06-1986	Olympus Optical Co., Ltd.		

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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PTO/SB/08A&B (07-09)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	3	of	4	Attorney Docket Number	91904-817521(008512US)

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	LC	WO	2007/142520		12-13-2007	Varibel BV.		
	LD	EP	1916561		04-30-2008	Varibel BV.		
	LE	EP	1727393		11-29-2006	Varibel BV.		
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	LH	WO	2008/046858		04-24-2008	Essilor International		
	LI	JP	09294654		12-17-2009	Scalar Corp.		
	LJ	WO	2009/136667		11-12-2009	Scalar Corp.		
	LK	EP	2233964		9/29/10	Panasonic Corp.		
	LL	WO	2009/126946		10/15/09	PixelOptics, Inc.		
	LM	EP	0061002		9/29/82	Desil SPA Occhialeria		
	LN	JP	2008/083299		4/10/08	Biito KK		

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	LO	Copy of the International Search Report corresponding to the PCT/US2011/061505 application	☐
	LP	Copy of the International Search Report corresponding to the PCT/US2011/061495 application	
	LQ	U.S. provisional patent application no. 61/441,817 filed on February 11, 2011	

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	4	of	4	Attorney Docket Number	91904-817521(008512US)

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	LR	International Search Report and Written Opinion in corresponding PCTIUS2008/058056 application.	
	LS	Partial International Search Report in corresponding PCT/US2010/020498 application.	
	LT	European Search Report in related EP07852880.9 application.	
	LU	"Hearing Mojo: Varibel Hearing-Aid Glasses Integrate Eight Directional Microphones," February 27, 2009, pages 1-4 *URL-http://hearingmojo.com/b/og-mt/blog-mt/2006/04/varibel_hearingaid_glasses_dou.html*	
	MA	International Search Report corresponding to the PCT/US2011/061505 application	
	MB	International Search Report corresponding to the PCT/US2011/061495 application	
	MC	International Search Report corresponding to the PCT/US2011/043591 application	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13298992	BLUM ET AL.
	Examiner	Art Unit
	HUNG DANG	2872

CPC- SEARCHED		
Symbol	Date	Examiner
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.	2/10/14	HD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
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US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
351	158, 49, 41	2/10/14	HD

SEARCH NOTES		
Search Notes	Date	Examiner
EAST	2/10/14	HD
(G02B27/017 OR G02B2027/0178 OR G02B2027/0138 OR G02B2027/014 OR G02B5/30 OR G02B6/0056 OR G02B6/105 OR G02C11/10 OR G02C11/04 OR G02C7/00 OR G02C7/083).CPC.	2/10/14	HD

INTERFERENCE SEARCH			
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SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/298,992	11/17/2011	351	2872	3373.0570001

APPLICANTS

INVENTORS

Ronald D. Blum, Roanoke, VA;
Joshua N. Haddock, Roanoke, VA;
Claudio Dalla Longa, Valdobbiadene-TV, ITALY;
Mark Graham, Leesburg, VA;
Yongping Wang, Philadelphia, PA;

**** CONTINUING DATA ***************************

This application is a CIP of 13/175,633 07/01/2011
and is a CIP of 13/175,634 07/01/2011 ABN
and said 13/175,633 07/01/2011
claims benefit of 61/361,110 07/02/2010
and claims benefit of 61/376,719 08/25/2010
and claims benefit of 61/415,391 11/19/2010
This application 13/298,992 11/17/2011
is a CIP of 13/179,219 07/08/2011
which claims benefit of 61/362,877 07/09/2010
This application 13/298,992 11/17/2011
claims benefit of 61/481,353 05/02/2011

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
12/01/2011

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /HUNG XUAN DANG/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		VA	30	20	2

ADDRESS

Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005
UNITED STATES

TITLE

ELECTRONIC SPECTACLE FRAMES

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1690	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____

BIB (Rev. 05/07).

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				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-4,991,951	2/12/91	Mizuno Mitsuyoshi	

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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)			Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	AB	GB	1563929		4/2/80	American Cyanamid Co		☐

NON PATENT LITERATURE DOCUMENTS			
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	AC	Copy of the International Search Report corresponding to the PCT/US2011/042882 application.	☐

Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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				Cozzani, Laura Maria	

FOREIGN PATENT DOCUMENTS							
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	AA	WO	01/02895	01/11/2001	E-Vision, LLC		☐

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	AB	Copy of the International Preliminary Report on Patentability corresponding to the PCT/US2011/042882 application	☐

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Substitute for form 1449/PTO

FIFTH SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	13/298,992
Filing Date	November 17, 2011
First Named Inventor	Ronald D. BLUM
Art Unit	2872
Examiner Name	DANG, Hung Xuan
Attorney Docket Number	3373.0570001

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	US1	5,319,397	06-07-1994	Ryden	
	US2	5,455,638	10-03-1995	Kallman et al.	
	US3	6,163,926	12-26-2000	Watanabe	
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	US6	2005/0237477 A1	10-27-2005	Lindahl	
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	FP1	WO 2005/016057 A1	02-24-2005	Lewis et al.		
	FP2	WO 2006/086155 A2	08-17-2006	Colgate-Palmolive Company		
	FP3	WO 2006/126881 A2	11-30-2006	Varibel BV		
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Examiner Signature	/Hung Dang/ (02/10/2014)	Date Considered	02/10/2014

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Sheet 1 of 1

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Examiner Name	DANG, Hung Xuan
Attorney Docket Number	3373.0570001

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	NPL3	International Search Report directed to related International Patent Application No. PCT/US2010/020498, mailed June 25, 2010; 5 pages.	
	NPL4	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/US2010/020498, issued July 12, 2011; 9 pages.	
	NPL5	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/US2011/061505, issued May 21, 2013; 14 pages.	
	NPL6	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/US2011/043591, issued January 15, 2013; 10 pages.	
	NPL7	U.S. Patent Application No. 13/890,809, BLUM et al., "Moisture-Resistant Eye Wear," filed May 9, 2013.	

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	US11	2013/0010256 A1	01-10-2013	Haddock et al.	

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	FP2	WO 2006/086155 A2	08-17-2006	Colgate-Palmolive Company		
	FP3	WO 2006/126881 A2	11-30-2006	Varibel BV		
	FP4	WO 2008/051520 A2	05-02-2008	PixelOptics, Inc.		

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(Use as many sheets as necessary)				Art Unit	2872
				Examiner Name	DANG, Hung Xuan
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(71) Applicant and
(72) Inventor: **LEWIS, Gene, Lee, Cheyenne** [GB/GB]; 42 Redwood Close, Watford Hertfordshire WD19 6HQ (GB).

(74) Agent: **MESSULAM, Alec, Moses**; 43-45 High Road, Bushey Heath, Bushey Hertfordshire WD23 1EE (GB).

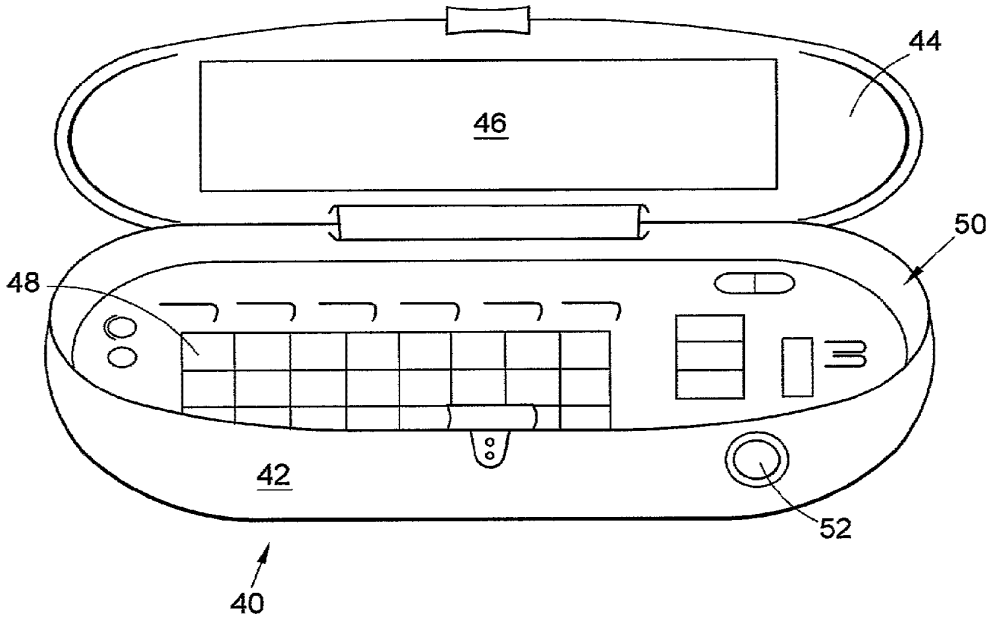
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(54) Title: CASE FOR SPECTACLES



(57) Abstract: A case (40) is disclosed for receiving a pair of spectacles formed integrally with at least an earpiece, a microphone, a rechargeable power source and a radio communication circuit. In the invention, the case includes means for recharging the power source of the spectacles.

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CASE FOR SPECTACLES

Field of the invention

This invention relates to a case for receiving a pair of spectacles formed integrally with at least an earpiece, a microphone, a rechargeable power source and a radio communication circuit.

Background of the invention

The popularity of cellular phones has led to several concerns regarding the safety of their use. Aside from the possible danger that exposure to electromagnetic radiation during prolonged use of a cellular phone may cause cancer, there is also a risk of road accidents if such phones are used while driving. A driver using one hand to hold a mobile phone to his ear compromises his ability to drive safely and legislation is therefore being passed in many countries to make the use of hand held phones illegal while driving.

For these and other reasons, it has already been proposed to provide cellular phones with hands free kits. These consist of an earpiece placed within or next to the ear and a mouthpiece that hangs down on a wire to lie on the chest of the user. The wire may then connect into the phone unit. This has the advantage that no hands need be used to support the phone, leaving the driver unencumbered to control the vehicle. It also results in the phone being located away from the user's head. Since electromagnetic radiation intensity follows an inverse square law, remotely locating the phone will reduce the exposure of the user to electromagnetic radiation emitted by the phone.

Though this still leaves a problem that functions need to be controlled, the use of voice recognition instead of a keypad allows the answering and making of calls to be

performed without viewing a screen or touching a keypad, thereby making operation easier and safer when driving.

The advent of recent improved technology, namely Bluetooth®, has enabled a wireless connection between the phone and the hands free kit. The resulting hands free apparatus takes the form of an earpiece with workings which rest on the ear, having a boom which extends towards the mouth, for supporting a microphone.

While functionally adequate, such wireless hands free kits are somewhat bulky, and unattractive as well as being uncomfortable when used over long periods, due to their weight being supported entirely on one ear.

A proposed solution has been to incorporate such a hands free kit into into a pair of spectacles, thereby enabling the phone to be used comfortably while leaving the user with his hands free.

Incorporating hands free kit in a pair of spectacles, and in particular sunglasses which are intended to be included within the meaning of the term spectacles, effectively creates a dual purpose fashion accessory that is both attractive and functional. Since spectacles are supported by the ears, they enable easy and comfortable positioning of a suitably placed speaker or earpiece.

Object of the invention

The present invention seeks to improve further on the technology of incorporating mobile communication equipment in spectacles.

Summary of the invention

The present invention provides in its broadest aspect a case for receiving a pair of spectacles formed integrally with at least an earpiece, a microphone, a rechargeable power source and a radio communication circuit, wherein the case includes means for recharging the power source of the spectacles.

The radio communication circuit of the spectacles is intended to allow the spectacles to communicate with a remote unit which may not necessarily be a mobile telephone, though that is believed to be the primary application for the spectacles of the present invention. The remote unit may alternatively be a PDA, a portable or desktop computer, all of which are currently available with Bluetooth® technology.

As a further possibility, the communication circuit of the spectacles may itself function as a mobile telephone handset. However, to reduce the radiation hazard referred to above, it is preferred for it to act only as a hands free kit that communicates with a remote unit which itself acts as a telephone handset.

The remote unit with which the circuitry mounted in the spectacles communicates is preferably mounted within the case, thereby allowing the case to act as both mobile telephone and charger and case for the handsfree kit.

The term mobile telephone is used herein to refer either to a cellular phone or to a wireless telephone extension that communicates with a base unit connected to a land line.

It is preferred for the lenses of the spectacles to be photo-chromic. Because photo-chromic lenses darken

automatically when exposed to bright light, they enable the spectacles to be used under all lighting conditions.

Mobile phones often have screens for displaying relevant information. In an embodiment of the invention, a display screen, for example and LCD screen, is incorporated into a lens of the spectacles.

The internal power source of the spectacles is preferably a rechargeable battery. A jack plug, coupling the spectacles to the case, may be provided to enable the battery to be charged, alternatively, the spectacles may be recharged by means of an inductive loop, simply by inserting them into the case.

It is possible to incorporate control buttons into the frame of the spectacles and these are preferably mounted on the inner side of the frame arms.

Brief description of the drawings

The present invention will now be described further by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a pair of spectacles,

Figure 2 is a similar perspective view of an alternative design of spectacles of, and

Figure 3 shows a case for the spectacles of Figure 1.

Detailed description of the preferred embodiment

The spectacles 10 shown in Figure 1, which in this example are sunglasses, are outwardly conventional in appearance. They comprise two lenses, 12a and 12b intended to be positioned in front of the eyes of a user. The lenses are supported by a frame 14 shaped in the usual manner to

support the weight of the spectacles on the bridge of the nose. The frame, as is conventional, may be made of metal or a plastics material and its style may vary widely depending on the preference of the user, the spectacles illustrated being aimed at the sports market.

The frame 14 has two arms 16a and 16b folding about hinges 18a and 18b, respectively. The hinges allow the spectacles to be folded for easier storage when not in use. The arms 16a and 16b extend rearwards from the frame and rest above the ears of a user, to locate the lenses 12a and 12b in relation to the eyes.

A microphone 22 is incorporated into the bridge piece of the frame 14. Furthermore, an earpiece 20 intended for insertion into, or to lie next to, the ear of the user depends from either or both arms 16a and or 16b, as required by the user. The ear piece maybe be foldable or retractable so that it may be moved clear of the ear so as to minimise intrusion or any discomfort when the spectacles are not functioning as a hands free kit.

In order to function as a hands free kit, spectacles 10 require a signal and power. For this purpose, the frame 10 acts also serves to house a battery and a radio link (not visible in the drawing).

The radio link communicates with a mobile phone or a remote unit such as a PDA or a computer. This may be achieved via any of the several existing wireless protocols such as Bluetooth® or 802.11b.

Answering and making of calls with such arrangement can be achieved by means of voice activation which is commonly known in the art with reference to existing hands free kits.

A further embodiment of the spectacles, shown in Figure 2, incorporates an entire cellular phone into the frame 14 of the spectacles 10. Modern mobile phones have removed unsightly aerials and produced smaller technology which enables the microprocessor of the unit to be hidden within the frame, retaining the design of the spectacles. Similarly to the simpler hands free spectacles described in reference to Figure 1, known voice recognition technology may be employed in order to control the basic features of the phone.

Alternatively, in order to operate the phone, the embodiment of Figure 2 provides buttons 26, arranged on the inside of arms 16a and 16b. For further convenience, a primary function key 26a may be provided on the outside rim of the frames of the spectacles. Such a button can be easily reached whilst the spectacles are being used and may be programmed to provide the most important features of the phone simply by pressing one button.

Conventional mobile phones have an LCD display screen for indicating dialled numbers and other information such as battery and signal strength, such information may be displayed on a similar panel (not shown) located on the frame 14, or alternatively by incorporated an screen, such as an LCD screen, into lens 12a or 12b. A simpler version may employ coloured LEDs arranged on the frame of the spectacles just within the field of view of the user. These provide a lower cost method of indicating a lack of signal or low battery.

The spectacles have a rechargeable battery mounted in the frame 14. In the present invention, the charging station used to recharge the battery is built into the carrying case for the spectacles. While it would be possible when using a case such as that shown in Figure 3, a wire could be used to establish a connection between the spectacles and the

charging circuit in the case, it is preferred to use an inductive loop 50 to charge the battery in the spectacles without the need for cumbersome connecting wires. The case 40 derives its own power by a jack plug connection 52 with a mains power source.

The carrying case or hard case 40, as shown in Figure 3, has a container section 42 and hinged a lid 44. In addition to serving as a means for recharging the internal battery of the spectacles, it may act in the case of the embodiment of Figure 1 as the remote unit. Hence, the carrying case may comprise a mobile telephone. For such features and others described in more detail below, the case 40 would require its own internal rechargeable power supply.

Where the spectacles 10 incorporate a cellular phone, the hard case 40 may act as more than simply a charger. Modern cellular phones have many functions such as settings for ringing tones and volumes, calendars, diaries, calculators, and web access via WAP, GPRS, 3G and other protocols. With such control over functionality, simple voice control is not sufficient to enable access to all the features.

The hard case 40 may provide access to these functions by interacting with the spectacles 10, either by wire or more preferably, wireless communication. The case doubles as the carrier of many of the functions of the phone and therefore is provided with means for data entry and retrieval. Such means may include a keyboard 48 and a display screen (or touch screen) 46, arranged conveniently around the inside of the container section 42 and lid 46.

The hard case 40 can provide features not normally associated with a cellular phone. These include a GPS antenna and receiver, which combined with a database and software, can allow the user to find his way whilst driving,

or alternatively as a pedestrian trying to navigate on foot around an unfamiliar city. This can be achieved by looking directly at the display in the case, or by viewing and listening to whatever instructions are transmitted to the spectacles 10.

Further features may of course be employed such as internet access via the case 40 as well as the features of any PDA (personal digital assistant) computer, with the added benefit that any or all the information can be conveniently uploaded, or displayed via wireless communication with the spectacles 10.

With such hardware already in place, the hard case is capable of providing many more features, such as acting as a games console, or with provision of an aerial, and a suitable tuner, a radio or television. Equally with sufficient memory, either internal or in the form of memory sticks, the hard case may be easily configured to function as a portable MP3 player, or any other format of music or video. Again, use of the spectacles conveniently enables these features to be employed silently through the ear piece, therein avoiding offending surrounding people, yet conveniently without the use of wires.

Similarly, the case may also be capable of playing footage taken by camcorder or acting as a portable display screen to view still pictures taken from a remote digital camera. Alternatively the case itself can serve as a self contained camera, already having suitable display and control means.

With the potential for this number of features, the case is a likely target for theft. It would therefore be prudent to include security features. These could consist of the use of personal identification numbers, or potentially finger print or retinal scanners.

Claims

1. A case for receiving a pair of spectacles formed integrally with at least an earpiece, a microphone, a rechargeable power source and a radio communication circuit, characterised in that the case includes means for recharging the power source of the spectacles.

2. A case as claimed in claim 1, where the means for recharging includes jack plug for insertion into a socket provided on the spectacles.

3. A case as claimed in claim 1, wherein the means for recharging includes an inductive loop.

4. A case as claimed in any preceding claim, further having a wireless link for communicating with the spectacles in order to upload or download information.

5. A case as claimed in any preceding claim, further having means for displaying and means for inputting information.

6. A case as claimed in any preceding claim, further having a GPS aerial and receiver for enabling the case to be used as a navigation device.

7. A case as claimed in any preceding claim, in combination with a pair of spectacle formed integrally with at least an earpiece, a microphone, a rechargeable power source and a radio communication circuit.

8. A combination as claimed in claim 7, wherein the radio communication circuit of the spectacles serves to establish a wireless connection between the earpiece and microphone and a nearby remote unit.

9. A combination as claimed in claim 7 or 8, wherein the radio communication circuit of the spectacles serves to enable the spectacles to perform as a self-contained mobile or cellular telephone.

10. A combination as claimed in any of claims 7 to 9 wherein the means for recharging the spectacles is supplemented by a solar panel mounted on the case.

11. A combination as claimed in any of claims 7 to 10, wherein the spectacles are provided with controls buttons for operating the radio communication circuit.

12. A combination as claimed in any of claims 7 to 11, wherein the earpiece depends from an arm of the spectacles.

13. A combination as claimed in any of claims 7 to 12, wherein the spectacles further comprise a display screen, connected to the radio communication circuit.

14. A combination as claimed in claim 13, wherein the display screen is incorporated into a lens of the spectacles in the form of an LCD.

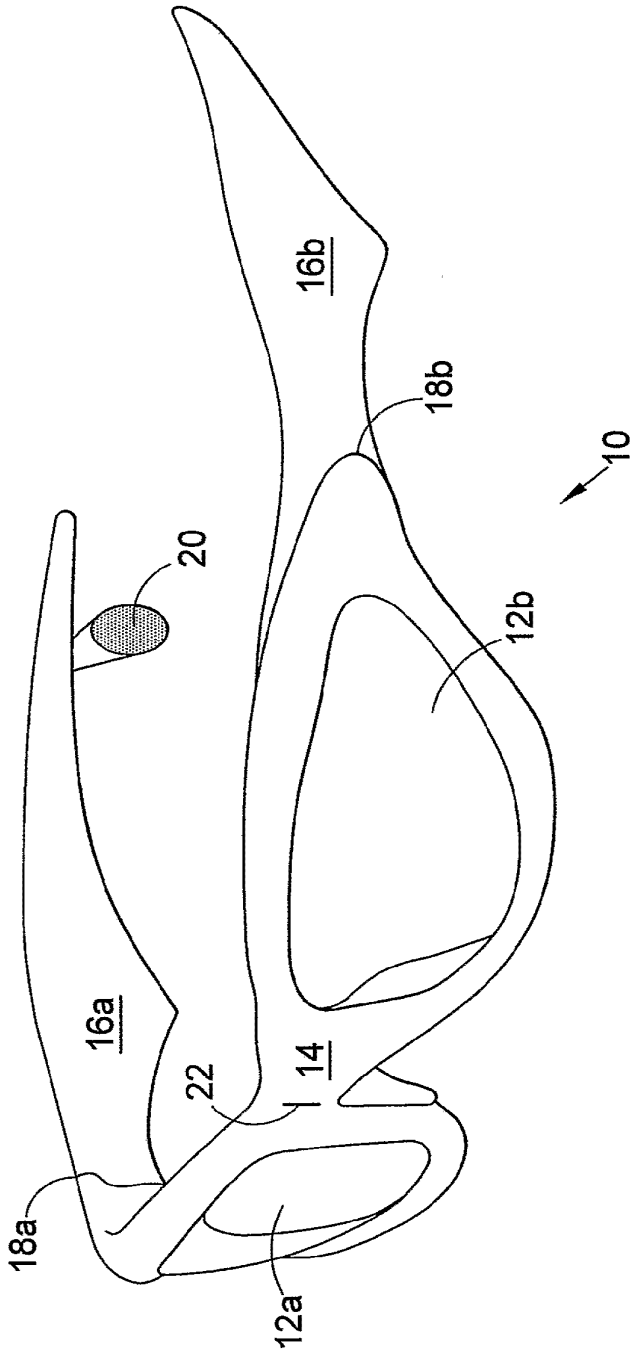


Fig.1

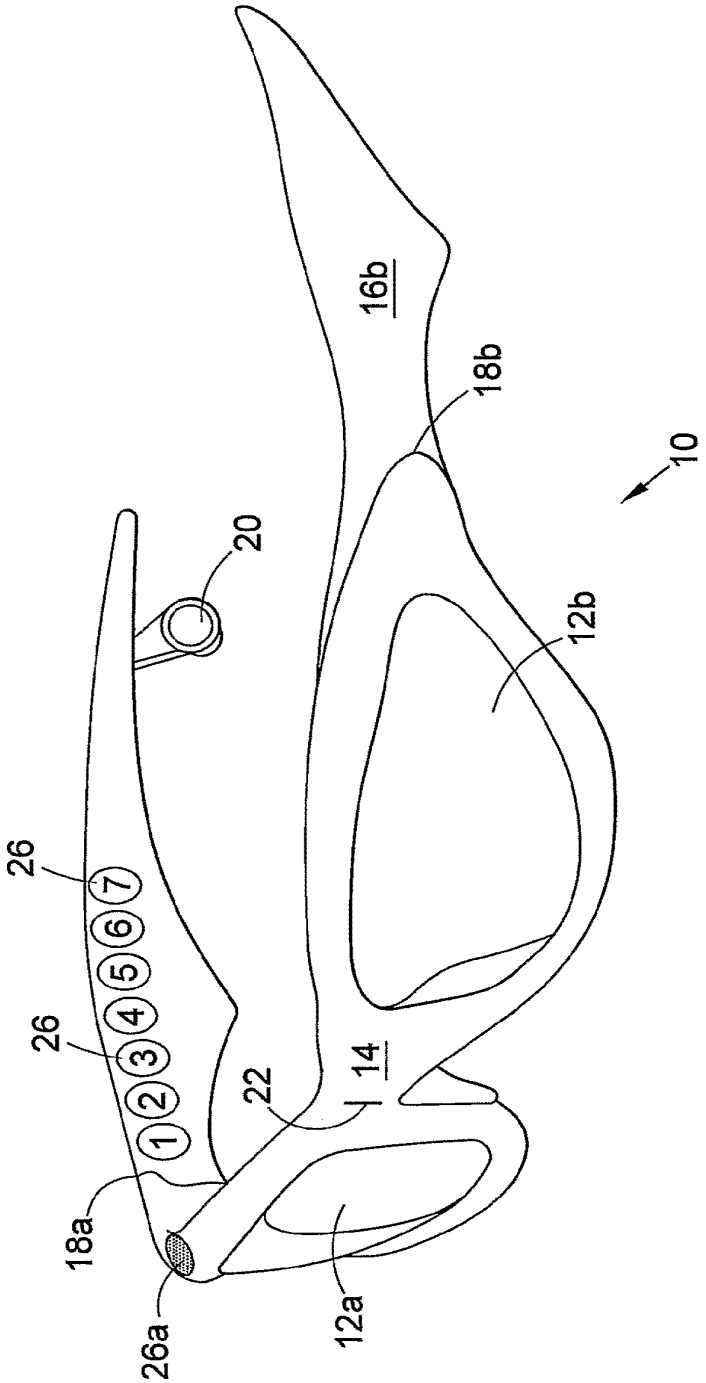


Fig.2

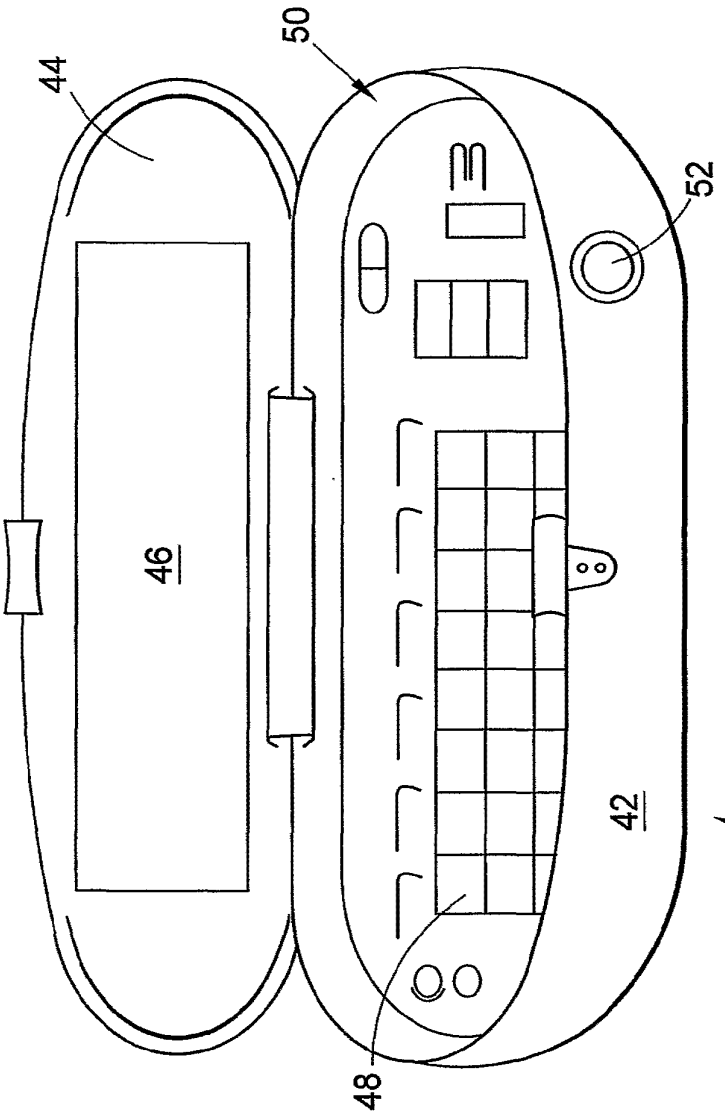


Fig.3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A45C11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

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 5 455 637 A (KALLMAN WILLIAM R ET AL) 3 October 1995 (1995-10-03) column 1, line 8 - line 22 column 12, line 55 - column 13, line 6 column 17, line 29 - line 65; claims 1,2,11; figures 4,5	1-3 4-6
A	-----	7-14
Y	US 2002/159023 A1 (SWAB GREGORY) 31 October 2002 (2002-10-31) paragraphs '0003!, '0009! - '0012!; figures	4-6
A	-----	
	WO 03/056970 A (CONTOUR OPTIK INC ; CHAO DAVID (US)) 17 July 2003 (2003-07-17) page 1, line 15 - line 25; claims; figures	1-14

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[X] Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Acerbis, G

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 757 788 A (ERICH SCHUMANN) 26 September 1956 (1956-09-26) the whole document	1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/GB2004/003344

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5455637 A	03-10-1995	NONE	
US 2002159023 A1	31-10-2002	CA 2445952 A1 WO 02089496 A2	07-11-2002 07-11-2002
WO 03056970 A	17-07-2003	US 2003085137 A1 WO 03056970 A1	08-05-2003 17-07-2003
GB 757788 A	26-09-1956	FR 1074617 A	07-10-1954

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(71) Applicant *(for all designated States except US)*: **COLGATE-PALMOLIVE COMPANY** [US/US]; 300 Park Avenue, New York, New York 10022 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **WAGUESPACK, Kenneth** [US/US]; 46 Princess Drive, North Brunswick, New Jersey 08902 (US).

(74) Agent: **WOLIN, Harris, A.**; COLGATE-PALMOLIVE COMPANY, 909 River Road, P.O. Box 1343, Piscataway, NJ 08855-1343 (US).

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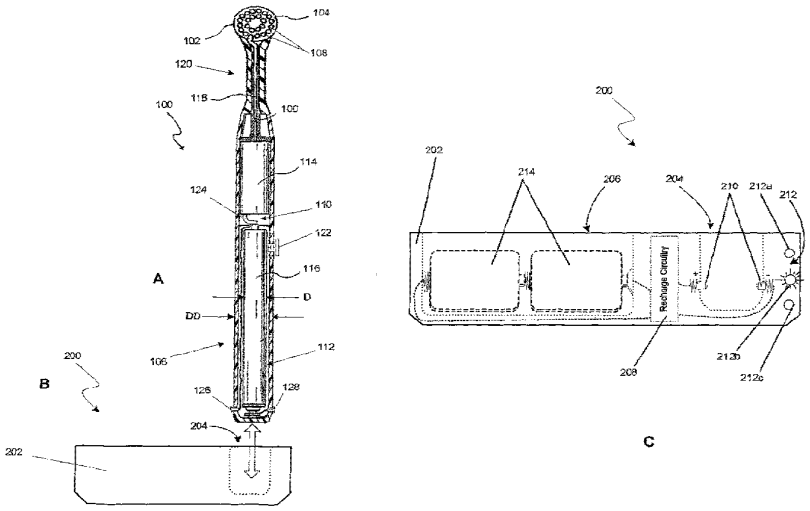
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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(54) Title: RECHARGEABLE POWERED DEVICE



(57) Abstract: A rechargeable device is provided having a motor and a small-capacity battery coupled to the motor. The small-capacity battery has a storage capacity sufficient for an average use of the device up to a few average uses of the device. A charger may also be provided for charging a rechargeable device. The charger may have charging circuitry and an indicator indicating a recharge state of the rechargeable device. The charger may have a large-capacity battery with a storage capacity greater than a small-capacity battery of the rechargeable device. The large-capacity battery provides sufficient electrical power to recharge the small-capacity battery. The charger may also have a power cord for receiving power from an alternating current power source. Methods for using a rechargeable device and for charging a rechargeable device are also provided.

WO 2006/086155 A2

RECHARGEABLE POWERED DEVICE

FIELD OF THE INVENTION

[01] The present invention relates to a rechargeable powered device. In particular, the present invention relates to a rechargeable powered device having a small-capacity, quickly-rechargeable battery, such as a quickly-rechargeable powered toothbrush, and to a charging unit for charging the device.

BACKGROUND OF THE INVENTION

[02] Powered toothbrushes have been available for some time. Powered toothbrushes have advantages over manual (non-powered) toothbrushes in that they impart movement to the bristles at much higher speeds than possible manually, and may impart different types and directions of motion. These motions, generally in combination with manual movement of the toothbrush by the user, may provide superior cleaning than manual toothbrushes. Conventional powered toothbrushes are powered by disposable or rechargeable batteries that power an electric motor, which in turn drives the toothbrush head. The batteries of conventional powered toothbrushes are bulky standard-sized batteries that provide enough power for numerous (more than a few) average cleaning sessions without being replaced or recharged.

[03] Fig. 1 shows an example of a powered toothbrush as depicted in U.S. Pat. No. 6,813,793 to Eliav. The toothbrush 5 has a disc-shaped bristle carrier that is driven in a vibrating or oscillating manner along with bristles attached thereto. Toothbrush 5 has a handle portion 10 at a proximal end of the toothbrush and a head 11 at a distal end of the toothbrush. The handle portion 10 has compartments for containing a motor 14 and

batteries 15 and 16. The head 11 includes a generally circular bristle holder 13. A rotatable shaft 12 extends from the motor 14 to the head 11. A shaft coupling 17 may be located along the shaft 12 and may be configured to provide for the shaft 12 to be separated at a point between the motor 14 and the head 11. This can permit the shaft to be removed from the toothbrush 5, e.g., for cleaning or replacement.

[04] Batteries 15 and 16 of conventional powered toothbrushes are bulky, standard-sized batteries, such as AA size batteries. The batteries store sufficient power to operate motor 14 for numerous (more than a few) average cleaning sessions without requiring replacement batteries or without recharging the batteries.

SUMMARY OF THE INVENTION

[05] Aspects of the present invention provide a rechargeable device having a motor and a small-capacity battery coupled to the motor. The small-capacity battery may have a storage capacity sufficient for an average use of the device up to a few average uses of the device.

[06] Aspects of the present invention also provide a charger for charging a rechargeable device. In one construction, the charger indicates when the brush has sufficient power for at least one average use. The charger may have charging circuitry and an indicator indicating a recharge state of the rechargeable device. The charger may have a large-capacity battery with a storage capacity greater than a small-capacity battery of a corresponding rechargeable device to be charged by the charger. The large-capacity battery provides sufficient electrical power to recharge the small-capacity battery. The

charger may also have a power cord for receiving power from an alternating current power source to recharge the small-capacity battery.

[07] Other aspects of the present invention provide methods for using a rechargeable device and for charging a rechargeable device. These and other aspects are addressed in relation to the figures and related description.

BRIEF DESCRIPTION OF THE DRAWINGS

[08] Fig. 1 is a cross-sectional view a conventional powered toothbrush;

[09] Fig. 2A is a cross-sectional view of a rechargeable powered toothbrush according to an embodiment of the present invention;

[10] Fig. 2B is a cross-sectional view of a toothbrush charger that may be used with the toothbrush of Fig. 2A according to another embodiment of the invention;

[11] Fig. 2C is a side view of the toothbrush charger of Fig. 2B showing functional aspects of the charger;

[12] Fig. 3 is a side view of a toothbrush charger according to a further embodiment of the invention;

[13] Fig. 4 is a flow diagram illustrating a method for using a rechargeable device according to an additional embodiment of the invention; and

[14] Fig. 5 is a flow diagram illustrating a method for recharging a rechargeable device according to a further embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[15] A rechargeable powered toothbrush 100 is shown in Fig. 2A for supporting one or more aspects of the invention. It is understood, however, that aspects of the invention may be

applicable to a wide variety of powered devices that can take advantage of a relatively quick recharging configuration, a relatively low-capacity battery configuration sufficient for one or a few uses, and/or a portable charging configuration. For example, aspects of the invention may be applicable to powered toothbrushes having one or more movable bristle carriers, one or more movable cleaning elements, and/or other powered sections (e.g., vibrating sections, electrically charged elements, pumping devices to pump a cleaning solution, etc.). Further, aspects of the invention may be applicable for a wide variety of other powered devices. For instance, powered brushes such as shoe polishers, powered grooming devices such as nose-hair clippers or nail clippers, powered food-preparation devices such as can openers or hand mixers, and other powered devices may take advantage of aspects of the invention.

[16] In the example embodiment of Figure 2A, a rechargeable powered toothbrush 100 has a head portion 102 at one end supporting a movable bristle carrier 104, and a handle portion 106 at the opposite end. The handle portion 106 has one or more compartments 110 and 112 for containing a powered motor 114 and a battery 116. The motor 114 is operatively connected to the movable bristle carrier 104, such as by a rotatable shaft 118 extending from the motor to the head portion. The motor may drive the movable bristle carrier in various ways, such as by vibrating, rotating or oscillating it along with bristles 108 attached thereto. Further, other powered toothbrush configurations are contemplated in which the motor drives the bristles to vibrate, lift or otherwise move without the use of a movable carrier. For example, the toothbrush may vibrate as disclosed in U.S. Patent No. 6,802,097 to Häfliger et al., which is incorporated herein by reference.

[17] As shown, toothbrush 100 includes a neck portion 120 connecting the handle portion and the head portion, which also supports the shaft 118. The neck 120 may be configured to be separated at a point between the motor and the head portion. This can permit the head portion to be removed from the toothbrush for interchangeability with other head portions, for cleaning and for replacement, etc.

[18] Motor 114 is electrically connected with battery 116 and a switch 122. It may also be connected to optional control apparatus (not shown). For example, battery charging circuitry may be included to control the recharge rate of the battery, or speed control circuitry may be used to provide the user with several speed options. The motor 114, battery 116 and switch 122 are connected in series, with the positive pole of the battery being connected to the motor via a spring lead 124. The negative lead of the battery is connected to the motor through switch 122 (negative lead connection to the motor is not shown). Charging connectors 126 and 128 extend through a bottom region of handle portion 106 for receiving an electrical charging input. Respective ones of the connectors 126, 128 are connected directly to one of the leads for battery 116. They may also be connected to battery charging circuitry (not shown), which may be connected to the battery for controlling the recharge rate of the battery and/or to reduce the possibility of overcharging or otherwise damaging the battery.

[19] Although battery 116 is shown as a single unit, it is understood that the battery may include a single unit or a plurality of primary and/or secondary units or cells arranged in parallel, in series or in a combination thereof. Further, it is understood that the term "battery" as used herein means a device that stores electrical energy, converts stored

energy into electrical energy and/or generates electrical energy. For example, the term battery may include a capacitor, a bank of capacitors, a condenser or a bank of condensers, which store electric potential. In another example, the term battery may include a dry chemical cell(s), such as a conventional alkaline battery, or may include a wet cell(s), such as a conventional lead-acid cell battery, which convert energy stored in a chemical form into electrical energy. In a further example, the term battery may include a fuel cell that generates electrical energy via a chemical process between a fuel (e.g., hydrogen) and an oxidant.

[20] Motor 114 is a conventional DC motor, which, for example purposes, is adapted to operate with a 3-4 volt power source. For normal uses of the toothbrush, the motor provides about 1 ounce-inch of torque, rotates about 3,000 revolutions per minute, and draws about 200 milliamps of current. It is understood that the motor could have a variety of torques and speeds depending on the desired configuration and that could operate with a variety of power sources. For example, motor 114 may be adapted to operate with a power source of about 3 volts to about 12 volts. It may provide torque of about one to 10 ounce-inches of torque, rotate about 2,000-5,000 revolutions per minute, and draw about 10 to 100 milliamps of current.

[21] It is further understood that alternate configurations for motor 114 and example embodiment 100 are possible that have a broad range of performance characteristics, which may be greater or less than that of conventional powered toothbrushes. For instance, a small torque motor may be appropriate for toothbrush configurations in which the bristles lift or vibrate rather than rotate, or a large torque motor may be appropriate

for toothbrush configurations in which multiple bristle sections move simultaneously. In an alternate example toothbrush configuration that applies an electrical charge in a user's mouth without moving bristle sections, the motor may be omitted completely and the battery may be used to provide the electrical charge.

[22] For example embodiment 100, battery 116 is a rechargeable battery that is adapted to be charged relatively quickly and to provide a relatively consistent output voltage. As noted above, battery 116 may be a plurality of batteries or battery cells connected in series and/or in parallel, as needed, to provide a desired voltage and storage capacity. Further, battery 116 may make use of a variety of rechargeable battery technologies, either alone or in combination, such as nickel-cadmium, nickel-metal hydride, lithium ion, alkaline or other rechargeable battery technologies. For the example configuration of toothbrush 100, battery 116 is a nickel-metal hydride battery having three small, serially-connected, 1.2 volt cells (not shown), which each have an overall diameter of about 10mm. Battery 116 provides a collective output of 3.6 volts and has a storage capacity of about 50 milliamp-hours. As such, battery 116 is able to drive motor 114 for about 15 minutes when fully charged based on the motor drawing about 200 milliamps of current (i.e., 50 milliamp-hour battery / 200 milliamp current x 60 minutes/hour).

[23] Motor 114 and battery 116 are configured such that the battery is able to operate motor 114 for a few average uses or sessions of the toothbrush, which may each be about one to five minutes. As used herein, a single average use or session refers to a period or range of periods for operating the powered device, which is a normal period of a single use for most users of the particular type of device. For powered toothbrush 100, an average use

is the period or range of periods for which most persons use a powered toothbrush to brush their teeth in a single brushing.

[24] In one construction, toothbrush 100 is configured such that a single average use is provided by less than a full charge of the battery. Only about 10% to 30% of battery 116 is required for the example configuration of toothbrush 100 in order to power it for a single average use. Small capacity battery 116 at its full capacity of 50 milliamp-hours can drive motor 114 for about 15 minutes, which is about three or more average uses of the toothbrush. Moreover, battery 116 can provide power for an average use of about one to 5 minutes when the battery is charged to about 1/3 of its storage capacity.

[25] It is understood that many other configurations are possible that can permit the respective powered device to operate for a single use up to a few uses when fully charged. For instance, a range of less-fully charge battery states may power the respective device for an average single use, such as about 10% to 90% of the battery storage capacity. For instance, in a low capacity configuration, the battery may provide for a single use of the device based on a substantially full charge, which may about 90% to 95% of its capacity. In an extended use configuration, about 70% to 90% of its storage capacity may power a single use with additional capacity for powering an extended use. In a moderate capacity configuration, the battery may have sufficient capacity to power the respective device for a few uses when the battery is fully charged. In a high capacity configuration of toothbrush 100, the toothbrush may be able to operate for several uses (e.g., about 4 to 6 average uses) when fully charged. Such a higher powered configuration may be advantageous for a toothbrush having interchangeable head portions 108 for use with

multiple users. As such, a single charge permits a few users to operate the toothbrush substantially continuously over a short period without recharging it between uses by the different users.

[26] In general, however, battery 116 is a relatively small capacity battery that has the advantage of being quickly rechargeable to full capacity, and/or being quickly rechargeable to a less-than full capacity sufficient for a single use or for a few uses. Thus, a user can have the toothbrush quickly recharged enough to permit it to be used within a short period. The relatively small capacity of battery 116 permits it to be recharged quickly to its full capacity in comparison with conventional, large-capacity batteries. In addition to its small capacity, the recharge rate of battery 116 can be further improved by providing a high charging current in comparison with the current requirements of the motor. For instance, providing a high recharge current of about 1000 milliamps to battery 116, which is significantly higher than the 200 milliamp current provided by battery 116 to motor 114 during operation, will substantially charge the battery in about 4.5 minutes. This assumes a recharge factor of about 1.5 for the battery and charger configurations. If battery 116 has a capacity of about 50 milliamp hours and if the recharge current is about 1000 milliamps, the ideal recharge time would be about 0.05 hours (50 milliamp hours / 1000 milliamps) or about 3 minutes. With the assumption of a 1.5 recharge factor, the estimated recharge time drops to around 4.5 minutes. Thus, motor 114 in the example configuration can operate toothbrush 100 for about 15 minutes on a single charge of battery 116, and the battery can be recharged in about 4.5 minutes.

[27] Battery 116 is also rechargeable within a shorter period such that it has a capacity sufficient for a single use. For instance, battery 116 can be recharged to about 34% capacity (i.e., about 17 milliamp hours) in about one-third of the amount of recharge time (i.e., about 1.5 minutes) of a full recharge. Thus, in a little more than one minute, toothbrush 100 can be sufficiently charged to provide the user with a single average use.

[28] Toothbrush 100 is a small, lightweight powered toothbrush that is comparable in size and weight to a conventional manual toothbrush. This is largely due to the small-capacity, quickly-rechargeable battery 116, that is relatively small and lightweight compared with conventional disposable batteries and rechargeable batteries. The small size and weight may be desirable for many users, and provides cost savings associated with savings in toothbrush materials. For instance, if battery 116 has a 7mm diameter, which is almost a 50% reduction in size from a standard AA battery (about 14.5mm diameter), toothbrush 100 may have an overall size reduction of about 20% to 40% compared with a conventional powered toothbrush using an AA-sized battery or a pair of axially aligned AA-sized batteries. As many conventional powered toothbrushes include a pair of AA-sized batteries disposed side-by-side, the weight and size reduction may be even more substantial. The outer diameter DD of toothbrush 100 shown in Fig. 2A at handle portion 106 may be about 10 mm, which is about the size of a manual toothbrush handle. It is contemplated that other handle sizes are possible based on the battery size and arrangement. For instance, battery 116 may have a diameter D of about 5 mm to about 13 mm, or more particularly about 10 mm. Various sizes of toothbrush handles that are smaller than conventional powered toothbrushes may be provided via the use of smaller-diameter batteries in various arrangements, such as a linear arrangement.

[29] Referring now to Figs. 2B and 2C, a charger 200 is generally shown according to an embodiment of the invention. Charger 200 is a combination charger/holder unit that recharges toothbrush 100, as well as holds it during storage. It is understood that various embodiments of charger 200 are possible that cooperate with other powered devices and that may not store the respective powered device. As illustrated in Fig. 2B, charger 200 includes a base unit 202 having a cradle 204 formed at a top portion of the base unit. The cradle is adapted to receive an end region of handle portion 106 for supporting toothbrush 100 while it is being stored between uses.

[30] As shown in Fig. 2C, charger 200 may be a portable, battery-operated unit. As such, charger 200 includes a battery compartment 206 formed in the base unit 202, recharge circuitry 208, and charging contacts 210. It may also include charging indicators 212. Battery compartment 206 is configured to accept one or more replaceable batteries 214. The battery-operated unit provides a portable charger/toothbrush combination, which can take advantage of the benefits of lightweight toothbrush 100 while retaining the advantages of a portable system.

[31] Batteries 214 provide a power source for recharging the toothbrush 100. The batteries are conventional disposable batteries, such as D-sized batteries, and/or rechargeable batteries. They may also include an alternative portable power supply, such as a fuel cell, for providing electric power. As shown, charger 200 is configured to operate using four standard-sized batteries, such as D-size batteries, which provide a power source for charger 200. The D-sized batteries provide about 1.5 volts of output each, and are serially-connected to provide about 6 volts of output collectively. The storage capacity

for the D-size batteries is about 12,000 milliamp hours, which is a large capacity in comparison with the small-capacity battery 116 used in powered toothbrush 100. A fresh set of D-size batteries 214 storing 12,000 milliamp hours of power can charge small-capacity battery 116, which has a capacity of about 50 milliamp hours, about 240 times (i.e., 12,000 milliamp hours / 50 milliamp hours). The estimation of 240 recharges assumes a 25% loss in the recharging process, as the four batteries 214 provide about 6 volts of electricity to charge the 4.5 volt, small-capacity battery 116.

[32] As shown in Fig. 2C, batteries 214 may be connected to recharge circuitry 208, which may optionally be located in toothbrush 100. Recharge circuitry 208 includes conventional recharge circuitry that controls the rate at which the rechargeable batteries are recharged, and which could include a microcontroller (not shown) for controlling the charging process. For instance, recharge circuitry 208 may initially provide a high current for a rapid recharge of batteries 116 according to instructions from the microcontroller, and then reduce the current to provide a trickle charge for longer-term storage of toothbrush 100 within charger 200. Recharge circuitry may also alter the charging current as needed to reduce memory effects on battery 116 or to otherwise improve the charging process or to protect apparatus or persons. It may also cease to charge batteries 116 to avoid overcharging them or to avoid an unsafe condition.

[33] As shown in Fig. 2C, charging contacts 210 are electrically connected to recharge circuitry 208. The charging contacts are adapted to make electrical contact with charging connectors 126 and 128 on toothbrush 100. As shown, charging contacts 210 are spring-loaded pins that are biased toward contact with charging connectors 126 and 128 while

toothbrush 100 is stored within the charger. Other recharging embodiments are also contemplated for use with the present invention, such as a primary coil in charger 200 that recharges batteries 116 of a powered device by inducing a current in a secondary coil of the powered device. Thus, direct electrical contact between the charger and the powered device may not be required to recharge the powered device.

[34] As shown, charger 200 includes indicators 212 that provide charging status or other information to the user. For instance, a first indicator 212a flashes or lights up to indicate that toothbrush 100 does not have a sufficient charge for a single use. A second indicator 212b flashes or lights up to indicate that toothbrush 100 has a sufficient charge for a single use. A third indicator 212c flash or lights up to indicate that toothbrush 100 has been substantially fully charged. Indicators 212 are connected to and controlled by recharge circuitry 208, which uses power from batteries 214 to light up the indicators. Recharge circuitry 208 evaluates the charging current accepted by powered device 100 to determine the amount of charge stored in its batteries 116. In other embodiments, circuitry within the powered device may evaluate the capacity condition of its batteries and provide such information to the charger, which may activate the appropriate indicator. Overall, the indicators inform the user of the recharge state of the respective powered device. For instance, if the user of toothbrush 100 places it in charger 200 when it has a substantially discharged battery 116, indicator 212a flashes or lights up to indicate a low charge condition. After battery 116 is charged for about one to one and a half minutes to about 34% of its capacity such that it can power the toothbrush for a single use, indicator 212b is activated to indicate that toothbrush 100 may be used for a single use. If the user continues to leave toothbrush 100 within charger 200, when

battery 116 is substantially completely charged, indicator 212b ceases to flash or light up and indicator 212c then illuminates to indicate a fully charged condition.

[35] Referring now to Fig. 3, a charger 300 is shown according to another embodiment of the invention. Charger 300 generally includes the same aspects as charger 200, except as discussed below. As with charger 200, charger 300 may be used with toothbrush 100 or other powered rechargeable devices. Charger 300 differs from charger 200 in that it is powered by an alternating current power source rather than a direct current power source. As such, charger 300 includes an AC-to-DC rectifier/transformer circuitry 302 and an alternating current power cord 304, rather than battery compartment 206 with batteries 214. Although shown as logically separate entities, circuit 302 and recharger circuit 208 may be co-located in a single circuit.

[36] Circuitry 302 is conventional rectifier circuitry, which rectifies alternating current electricity provided via cord 304 into a direct current output, and transforms it into an appropriate voltage for providing a charging current. Thus, charger 300 receives a conventional 110 volt alternating power supply and converts it to a 6 volt direct current power supply via circuit 302. In a manner similar to charger 200, recharge circuitry 208 then controls the direct current power supply as needed to recharge battery 116 of toothbrush 100.

[37] In an alternate configuration (not shown), the charger may include the battery compartment 206 of charger 200 along with batteries 214, as well as circuitry 302 and power cord 304 of charger 300. Such a combination charger could operate as a unit plugged into an alternating current power supply, or as a portable battery-operated unit,

according to the needs or desires of the user. Further, such a combination configuration could provide an operational unit in the event of alternating-current power outage.

[38] Referring now to Fig. 4, a method 400 is shown for using a rechargeable powered device, such as a powered toothbrush, according to an embodiment of the invention. Method 400 will be discussed using the example toothbrush 100 and charger 200 as discussed above. However, it is understood that method 400 may be practiced with a wide variety of rechargeable devices and charger units.

[39] As shown, method 400 includes the step 402 of coupling a substantially discharged, rechargeable device into a charging configuration with a charger. For example, a user may place toothbrush 100 into a storage/charging configuration with charger 200. Another step 404 includes waiting a period between about 30 seconds and 5 minutes and/or performing the step 406 of receiving an indication that the rechargeable device is sufficiently charged for a single use of the device. For instance, the user waits about 30 seconds to about 5 minutes after installing toothbrush 100 into charger 200, and/or may see indicator 212b flashing to show toothbrush 100 has a charge sufficient for a single use. The user then performs the step 408 of de-coupling the rechargeable device from the charger and the step 410 of using the rechargeable device for a single use. For instance, the user may remove toothbrush 100 from charger 200 and proceed to brush his teeth. Method 400 may continue by repeating process as needed when the rechargeable device is substantially discharged.

[40] Referring now to Fig. 5, a method 500 is shown for recharging a powered device, such as a powered toothbrush, according to a further embodiment of the invention. Method 500

will also be discussed using the example toothbrush 100 and charger 200. However, it is understood that method 500 may be practiced with a wide variety of rechargeable devices and charger units.

[41] As shown, method 500 includes the step 502 of sensing a rechargeable device being coupled with a charger and the step 504 of determining the recharge state of the rechargeable device. For example, recharge circuitry may sense a connection between contacts 210 of charger 200 and connectors 126, 128 of toothbrush 100 when the toothbrush is placed in the charger. Recharge circuitry may further evaluate the recharge state of the battery 116 within toothbrush 100. This may be done, for example, by providing a maximum charging power supply to connectors 126 and 128, determining the voltage potential from batteries 214, and comparing the charging current accepted by toothbrush 100 with charging current curves for toothbrush 100. For instance, if toothbrush 100 draws a maximum current of 1000 milliamps when batteries 214 provide a full voltage of 6 volts, recharging circuitry may determine that batteries 116 are substantially discharged. These steps may be substantially performed by a microcontroller (not shown) within recharging circuitry 208. If the recharge state of the rechargeable device is determined to be substantially discharged, the charger then performs the step 506 of indicating a substantially discharged state and the step 508 of charging the rechargeable device. For example, charger 200 may flash indicator 212c to show that toothbrush 100 is substantially discharged and proceed to charge the toothbrush.

[42] The charger may repeatedly perform the step 504 of determining the recharge state of the rechargeable device. If the charger determines that the rechargeable device has sufficient capacity for a single use, the charger performs the step 510 of indicating a state of being charged sufficiently for a single use. If the charger determines that the rechargeable device has been substantially fully charged, the charger performs the step 512 of indicating a state of being fully charged. If the charger has previously indicated the state of being substantially discharged or being charged sufficiently for a single use, the charging performs the step 514 of removing an indication of a previous state when it determines that the previous state has changed. As example, charger 200 may initially flash indicator 212c to signify a substantially discharged state, and then turn off indicator 212c and flash indicator 212b to signify toothbrush 100 has been charged sufficiently for a single use. As charging continues and toothbrush 100 becomes substantially charged, charger 200 may turn off indicator 212b and flash indicator 212a.

[43] While the present invention has been described in connection with the illustrated embodiments, it will be appreciated and understood that modifications may be made without departing from the true spirit and scope of the invention. In particular, the invention may apply many different rechargeable devices, chargers, and/or methods for use the same.

What is claimed is:

1. A portable charger system for a rechargeable powered toothbrush, the charger system comprising:

a rechargeable powered toothbrush having a motor and a small-capacity battery coupled to the motor, the small-capacity battery having a first maximum storage capacity sufficient for at least a single average use of the toothbrush; and

a charger electrically coupled to the rechargeable toothbrush, the charger comprising a large-capacity battery configured for charging the small-capacity battery to the first maximum storage capacity, the large-capacity battery having a second maximum storage capacity greater than the first maximum storage capacity.

2. The system of claim 1, wherein the first maximum storage capacity is sufficient for powering the toothbrush for a plurality of the single average uses.

3. The system of claim 1, wherein the second maximum storage capacity is two or more times greater than the first maximum storage capacity.

4. The system of claim 1, wherein the second maximum storage capacity is ten or more times greater than the first maximum storage capacity.

5. The system of claim 1, wherein the first maximum storage capacity is sufficient for powering the toothbrush for up to five minutes and the system is configured to charge the small-capacity battery in a charging period within about 30 seconds to about 5 minutes from the

substantially discharged state to a single-use state for operating the toothbrush for the single average use.

6. The system of claim 1, wherein the charger further comprises an indicator indicating a state of the small-capacity battery, the state including a single use state when the small-capacity battery is charged to a single-use capacity sufficient to power the rechargeable toothbrush for the single average use, the single-use capacity being less than the first maximum storage capacity.

7. A rechargeable powered toothbrush comprising:

a motor; and

a small-capacity battery coupled to the motor, the small-capacity battery having a maximum storage capacity sufficient for powering the motor between about one to about thirty minutes.

8. The rechargeable toothbrush of claim 7, wherein the small-capacity battery has a single use storage capacity sufficient for powering the motor between about one to about five minutes, the single use storage capacity being less than the maximum storage capacity.

9. The rechargeable toothbrush of claim 8, wherein the system is configured to substantially charge the small-capacity battery within about 30 seconds to about 5 minutes from a substantially discharged state to the single use storage capacity.

10. The toothbrush of claim 7, wherein the small-capacity battery is selected from the group consisting of a capacitor, a nickel-metal hydride battery, a nickel-cadmium battery, a lithium-ion battery, and a rechargeable alkaline battery.

11. A charger for charging a rechargeable device having a small-capacity battery, the small-capacity battery having a first maximum storage capacity, the charger comprising:

charging contacts providing a charging current to the rechargeable device; and

an indicator indicating a state of the small-capacity battery, the indicator indicating a single use state when the small-capacity battery is charged to a single use capacity, the single use capacity being more than a substantially discharged state of the small-capacity battery and less than the first maximum storage capacity.

12. The charger of claim 11, wherein the single use capacity is a charge sufficient for powering the rechargeable device for a single average use.

13. The charger of claim 11, further comprising a large-capacity battery having a second maximum storage capacity greater than the first maximum storage capacity, the large-capacity battery providing sufficient electrical power to substantially recharge the small-capacity battery to the first maximum storage capacity.

14. The charger of claim 11, wherein the charger is adapted for connection to an alternating current power supply.

15. The charger of claim 11, further comprising a recharge circuit controlling the charge rate of the small-capacity battery.

16. The charger of claim 15, wherein the indicator indicates a discharged state when the small-capacity battery has insufficient capacity to power the device for a single average use.

17. The charger of claim 16, wherein the indicator indicates a fully charged state when the small-capacity battery is substantially charged to the first maximum storage capacity.

18. The charger of claim 16, wherein the indicator changes between the discharged state, the single use state and the fully charged state as the small-capacity battery is being charged from the substantially discharged state to the fully charged state.

19. A method for charging a rechargeable device, the method comprising:

sensing the rechargeable device being coupled with a charger;

monitoring a recharge state of the rechargeable device;

charging the device; and

indicating a single use state of the rechargeable device when the rechargeable device is charged sufficiently for a single use of the device without being fully charged.

20. The method of claim 19, wherein the rechargeable device is a powered toothbrush.

PRIOR ART

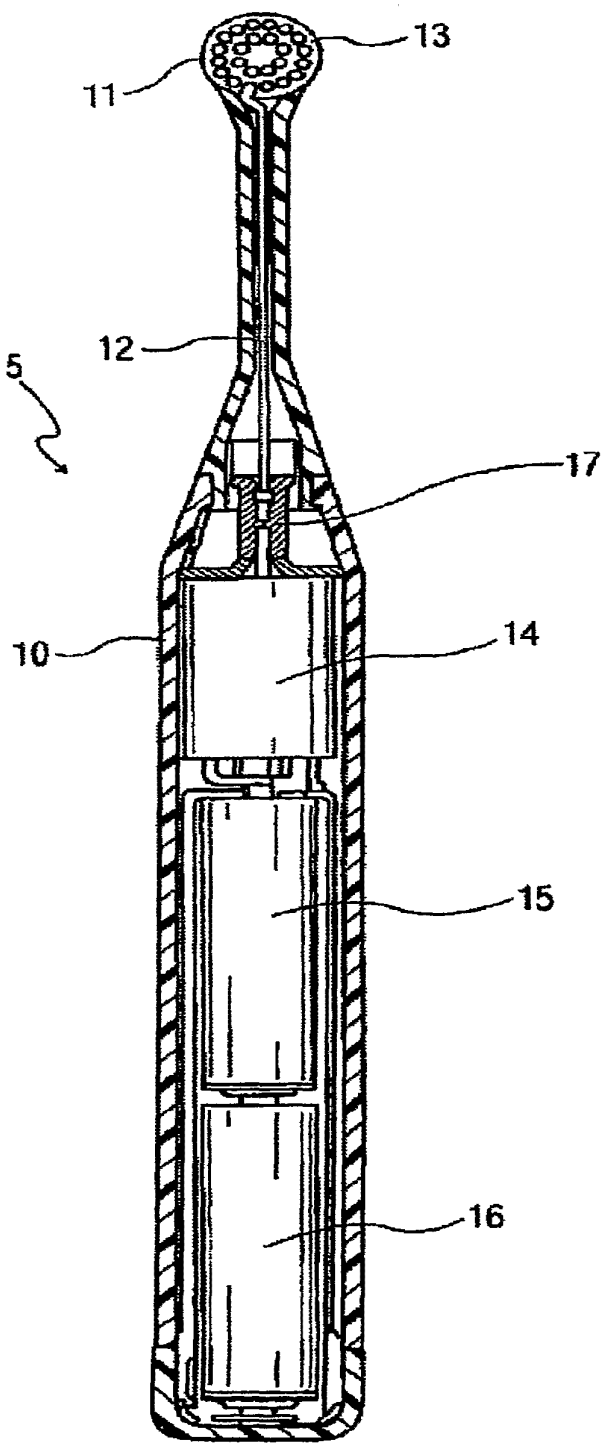


Figure 1

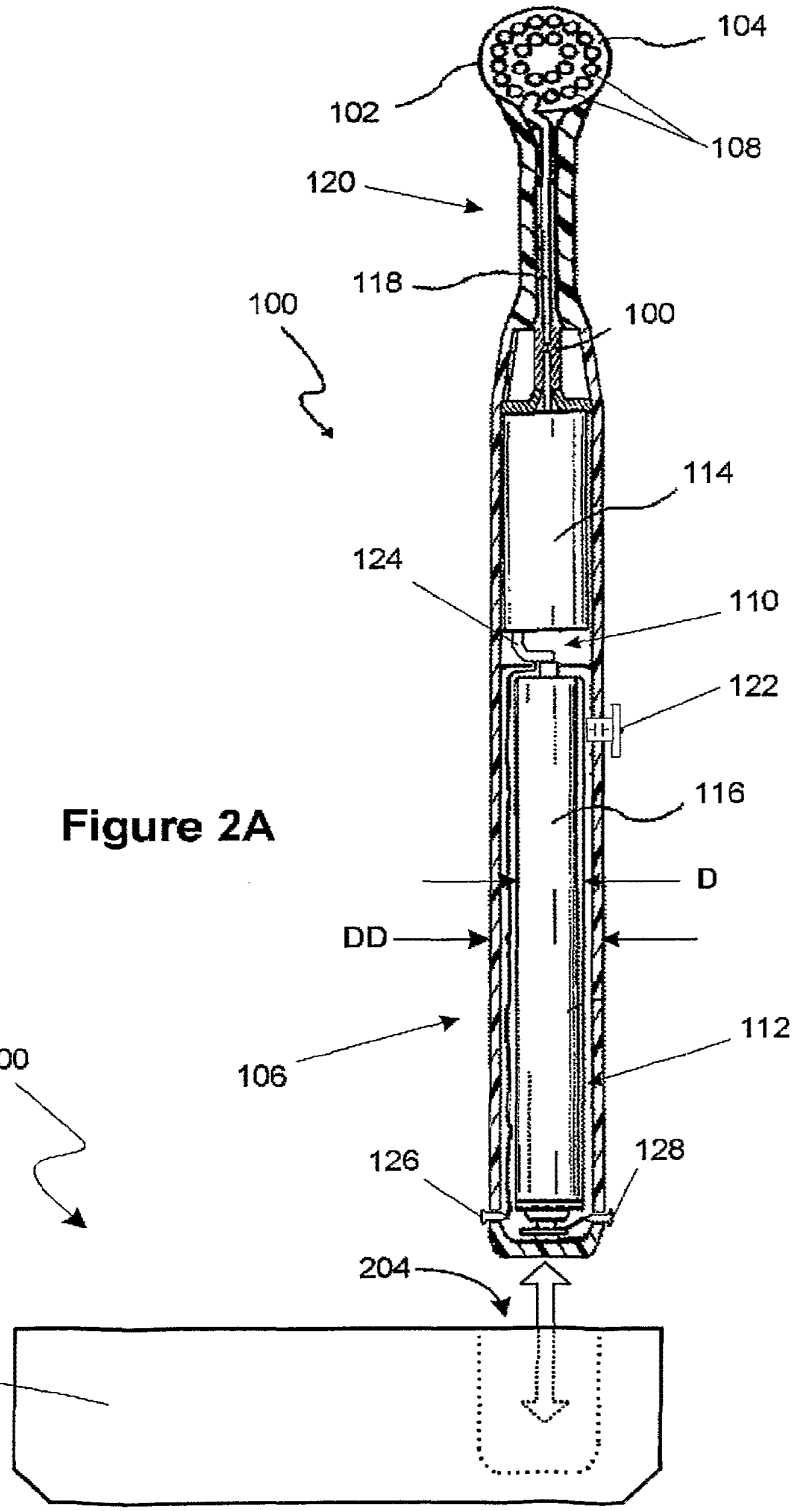


Figure 2A

Figure 2B

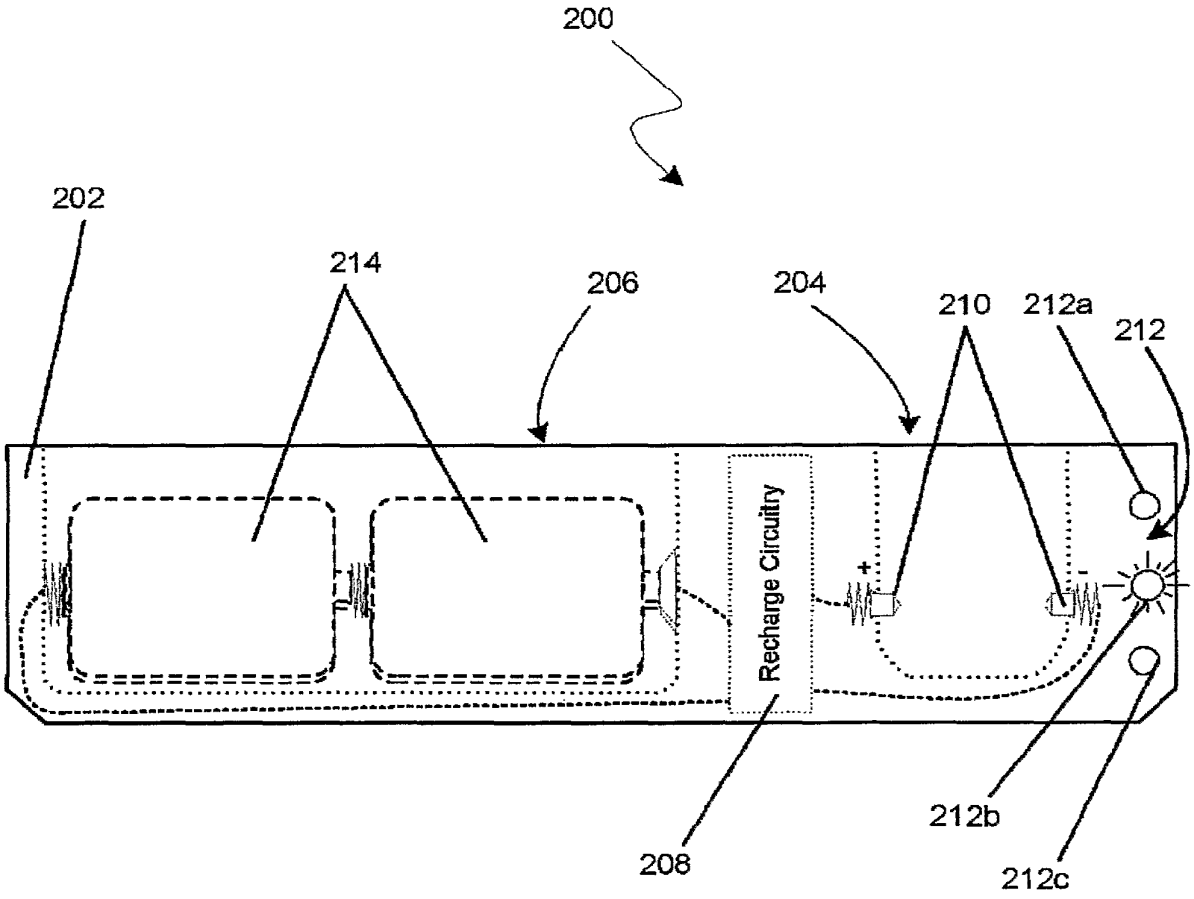

200
202
214
206
204
210
212a
212
Recharge Circuitry
208
212b
212c

Figure 2C

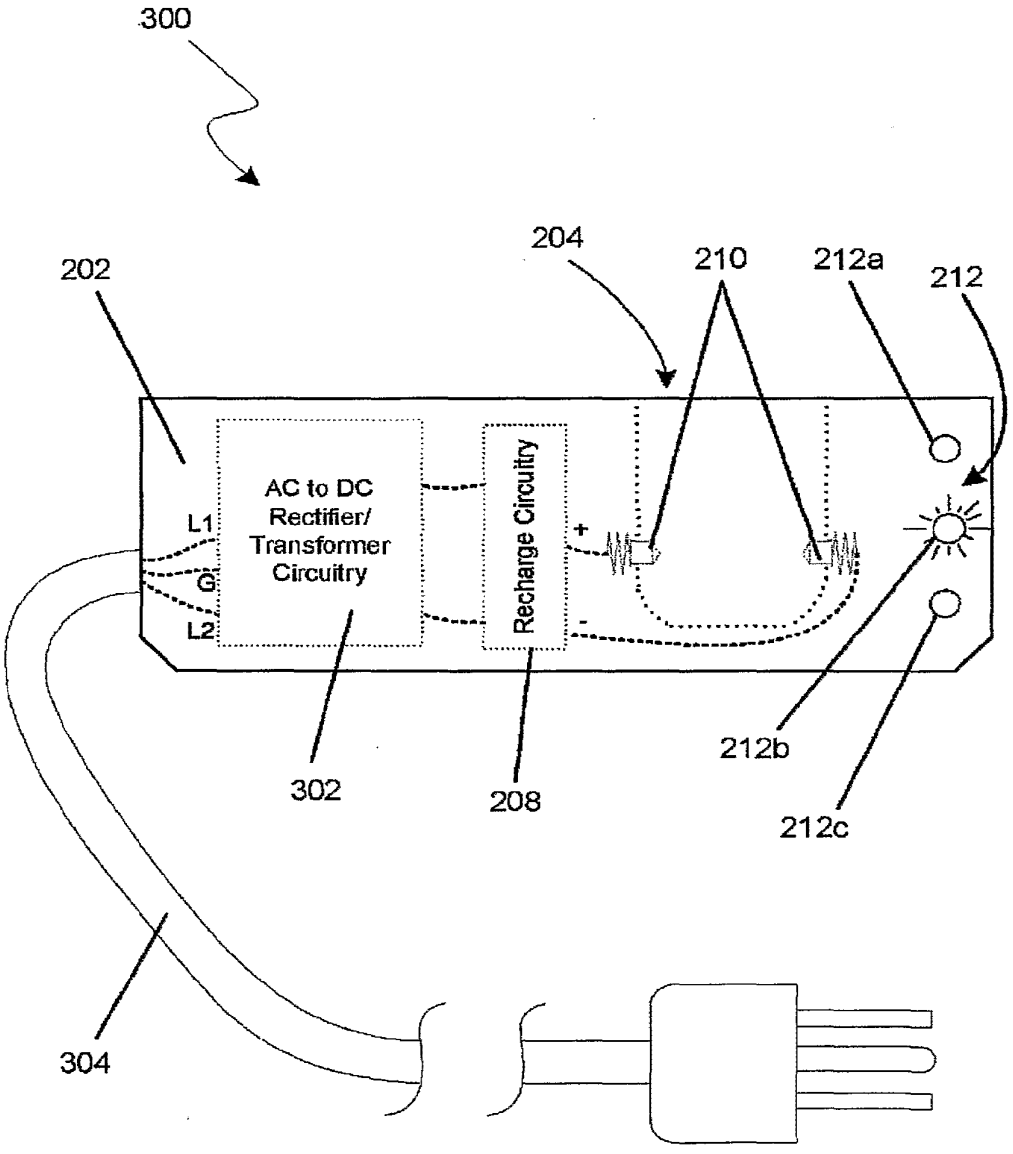

300
202
204
210
212a
212
AC to DC
Rectifier/
Transformer
Circuitry
Recharge Circuitry
L1
G
L2
+
-
302
208
212b
212c
304

Figure 3

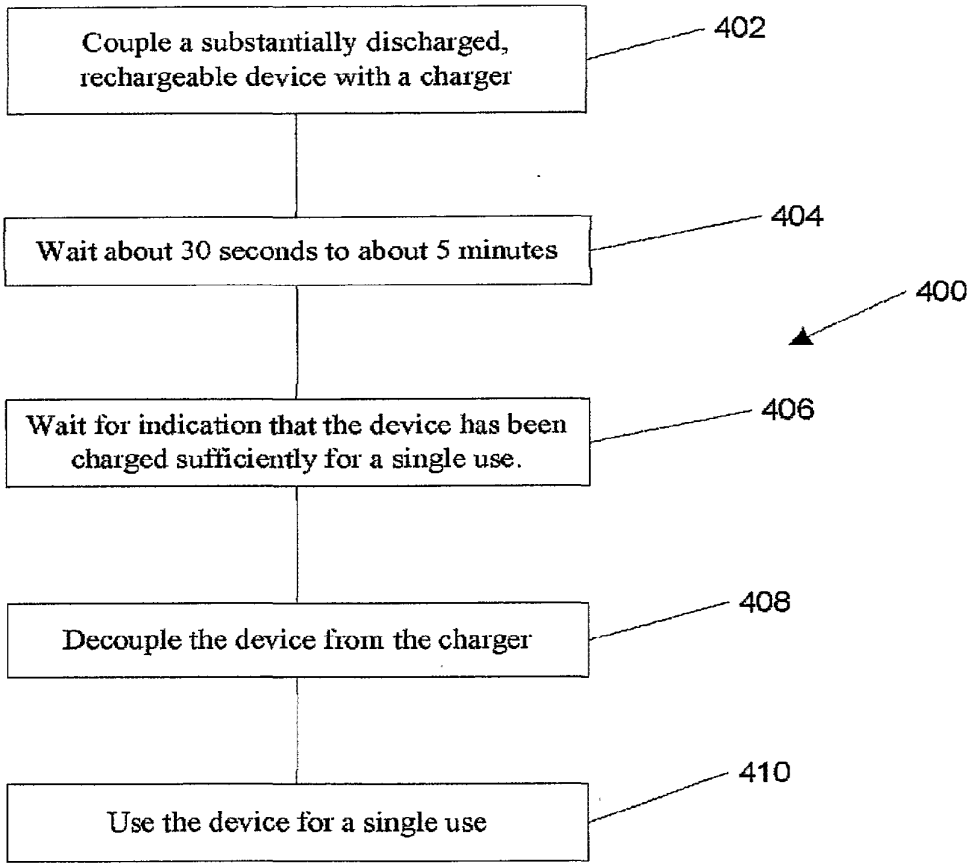

Couple a substantially discharged, rechargeable device with a charger
402
Wait about 30 seconds to about 5 minutes
404
400
Wait for indication that the device has been charged sufficiently for a single use.
406
Decouple the device from the charger
408
Use the device for a single use
410

Figure 4

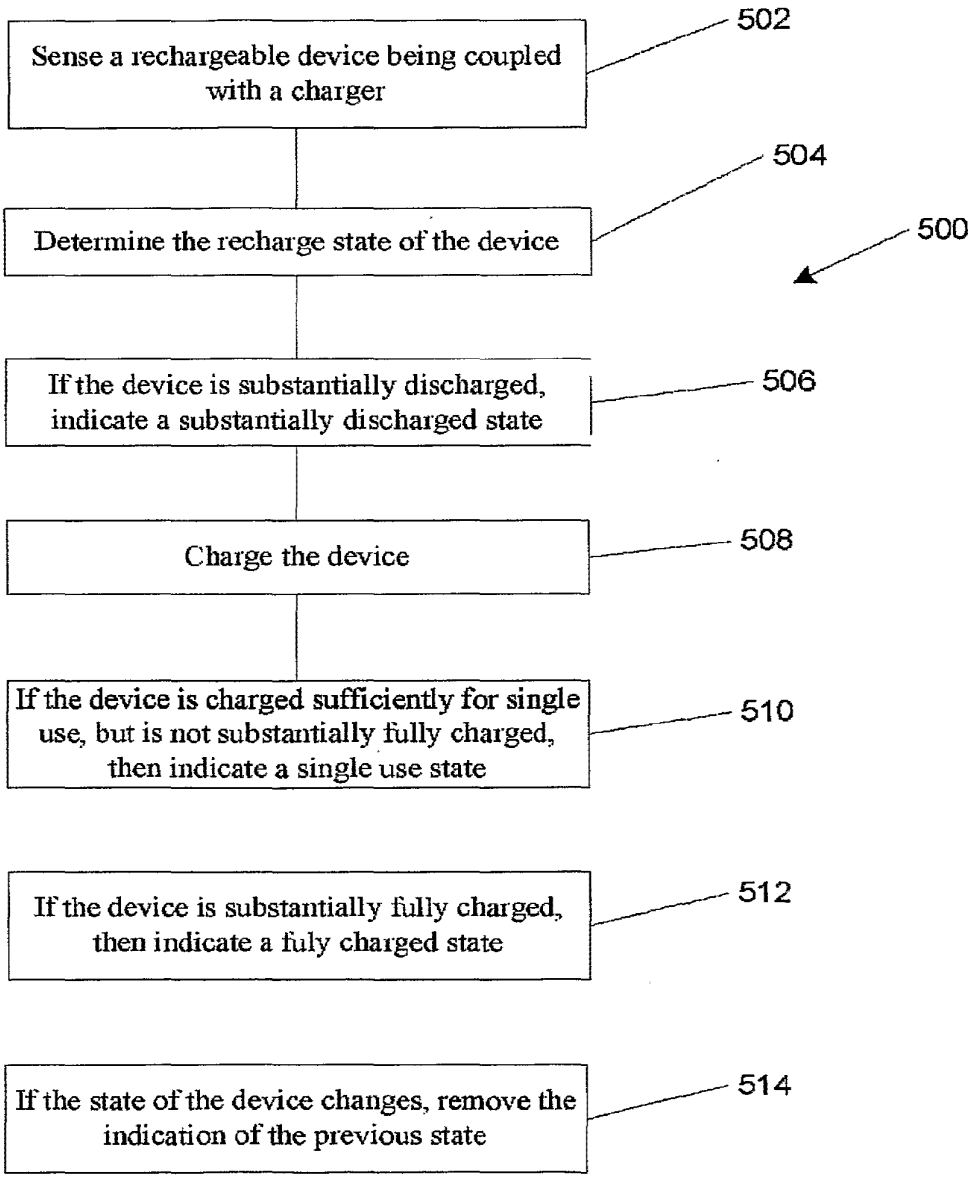

Sense a rechargeable device being coupled with a charger
502
Determine the recharge state of the device
504
500
If the device is substantially discharged, indicate a substantially discharged state
506
Charge the device
508
If the device is charged sufficiently for single use, but is not substantially fully charged, then indicate a single use state
510
If the device is substantially fully charged, then indicate a fuly charged state
512
If the state of the device changes, remove the indication of the previous state
514

Figure 5

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(71) Applicant *(for all designated States except US)*: **VARIBEL B.V.** [NL/NL]; Zuideinde 110, NL-7641 GL Meppel (NL).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **VAN DER ZWAN, Jacob** [NL/NL]; Eendrachtsweg 52 A, NL-3012 LD Rotterdam (NL). **SIPKEMA, Marcus, Karel** [NL/NL]; Julianalaan 66, NL-6824 KH Arnhem (NL).

(74) Agent: **VAN WESTENBRUGGE, Andries**; Nederlandsch Octrooibureau, Postbus 29720, NL-2502 LS Den Haag (NL).

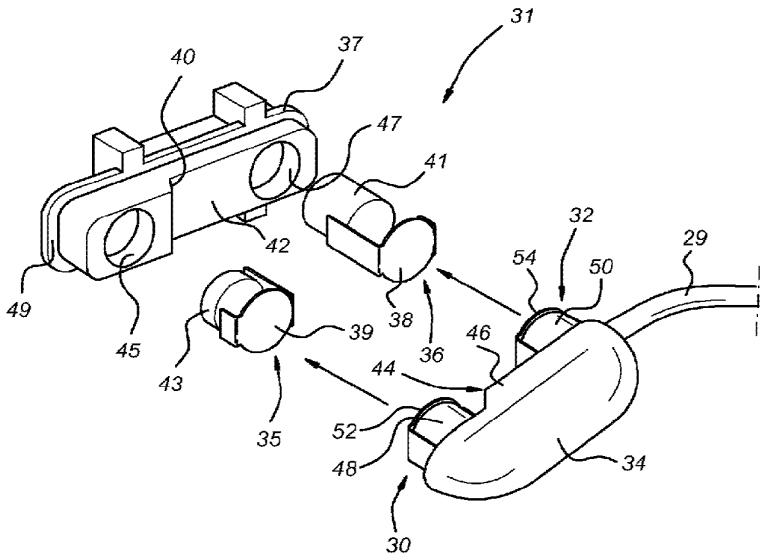
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(54) **Title:** CONNECTOR ASSEMBLY FOR CONNECTING AN EARPIECE OF A HEARING AID TO A GLASSES TEMPLE



(57) **Abstract:** Connector assembly for connecting an earpiece (27) of a hearing aid to a glasses temple (13). The glasses temple (13) has hearing aid components. The connector assembly 5 (31) has a first connector housing (34) and a second connector housing (37). The first connector housing (34) is designed to be attached to the earpiece (27) via an intermediate unit (29) whereas the second connector housing (37) is designed to be attached to the glasses temple (13). The first and second connector housings (34, 37) are designed to engage one another by means of a disconnectable connection (10).

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Connector assembly for connecting an earpiece of a hearing aid to a glasses temple.

Field of the invention

The present invention relates to a connector assembly for connecting an earpiece of a hearing aid to a glasses temple.

Prior art

Several types of hearing aid glasses have been proposed in the past, see e.g. EP-A-1025744, WO2004/028203, and prior art referred to in files relating to these documents. However, constructive design details as to how to manufacture one or more practical embodiments of such hearing aid glasses are not known from these prior art documents.

Summary of the invention

The present invention is directed to several constructive details of hearing aid glasses and supporting equipment therefore. Several aspects of the invention have wider application than just hearing aid glasses as will become evident from the detailed description hereinafter.

In a first aspect, the invention relates to a connector assembly used to attach hearing aid glasses to an earpiece. The hearing aid glasses comprise electronics for the hearing aid. Sound, either as an acoustic or as an electrical signal, has to be directed from the glasses to a human ear through the use of an intermediate unit, e.g. a tube or cable attached to the earpiece. Existing hearing aid glasses have the disadvantage that the earpieces are difficult to put into the ear, as a turning movement of the earpieces is required during insertion, while the earpieces are tightly attached to the glasses. The same problem exists when taking the earpieces out. However in this case an extra risk exists, which is that the user takes off his/her glasses first without thinking about the attached earpieces. In such a case, at best an unpleasant pulling sensation is felt in the ear(s), and at worst the connection between earpiece and glasses breaks.

The objective of this aspect of the invention is to use a connector assembly that provides both a magnetic connection and electrical connection that disconnects when

the user puts off his/her glasses, and is easily connected by the user when he/she puts the glasses on.

To that end the invention provides a connector assembly as claimed in claim 1.

The advantages of this first aspect of the invention are that the insertion and extraction of the earpieces can now be done independently of putting off/on the glasses, as the glasses are not connected during insertion and extraction of the earpieces, and furthermore the risk of breakage of an intermediate unit in case of inadvertently putting off the glasses does not exist anymore.

In an embodiment at least one of the electrical contacts is designed to cover at least a portion of the magnetic component. Then, less space is required than in situations where the electrical contact is located remote from the magnetic component. Furthermore, since that electrical contact is contacting the magnetic component they are as close to one another as they can be, thus, improving the contact force required for the electrical contact.

In a second aspect, the invention is directed to a cradle set for charging a battery in a temple of glasses where the temples comprise electronic components that need power supply. Such glasses may be hearing aid glasses.

To that end, in its second aspect, the invention provides a cradle set comprising a transformer arranged to receive electrical power from a mains and transform said electrical power to battery charging power to charge a first chargeable battery and a cradle housing comprising at least a first opening, the first opening comprising a first electrical contact and a second electrical contact, the first opening being shaped to receive a rear side portion of a first glasses temple and the first and second electrical contacts being designed to contact electrical contacts on said rear side portion of said first glasses temple in order to provide said battery charging power to said first glasses temple.

Thus, a user of the hearing aid glasses can put off his/her glasses and insert the rear side portion of the glasses temple in the first opening and the battery in the glasses temple will be charged. This can be done overnight when the user is not wearing his/her glasses anyway.

Using rechargeable batteries in glasses with electronics has the advantage for the user of not needing to exchange batteries, which is the case when disposable batteries

are used. Exchanging disposable batteries results in a substantial cost for the user, especially in the case of daily use. Moreover, exchanging small batteries is a difficult task, taking into account that the user is not wearing his/her glasses while exchanging. This is especially so in case the user is elderly, and has decreased motorial control (e.g., trembling fingers).

Rechargeable batteries however also have a disadvantage over disposable batteries in that they are substantial larger for the same power storage. The larger battery size could result in decreased attractiveness of the glasses. This aspect of the invention solves this issue in 2 ways:

1. In glasses with electronics with disposable batteries, for example hearing aid glasses, the power lifetime of a battery is between several days and several weeks. A battery power lifetime of less than several days is not deemed acceptable by users. As the glasses in this invention can be charged every night, the power lifetime of one charge operation of the battery only needs to be one day. This decreases the required size of the rechargeable battery to approximately the same size as a disposable battery in a comparable product.
2. The battery, being the largest electronics component in the glasses, is in this invention being placed at the rear end of the temple. On the head of a user this is the position behind the ear, which is the least visible place.

A further objective of the second aspect of this invention is that the cradle set can accommodate a wide range of glasses. Glasses measures (front widths, front heights, temple lengths, temple shapes) vary widely, because measures of people's heads vary and because glasses designs vary. Furthermore, temples also get bent around the ear and towards the head when the optician fits the glasses to the user's head, resulting in even more variations. And finally, glasses get deformed during use; temples and hinges are bent or deformed. Accommodating such a wide range of glasses variations with one cradle set is achieved in this aspect of the invention by using contact points at the rear ends of the temples. These can be seen as two points which can move substantially independently from each other when the temples are partially extended, because they can move up and down relative to each other (by turning the glasses around the main axis parallel to the extended temples), and towards and away from each other (by

closing or fully extending the temples). Therefore these rear ends with contacts can always be positioned in the opening(s) of the cradle.

In a third aspect the invention relates to constructive details of a glasses temple comprising electronic components. Here, the objective is to better protect the electronic components from being damaged due to external influences, like bending of the glasses temple.

To that end, in the third aspect, the invention provides a glasses temple comprising a printed circuit board with electrical components, a temple housing and a metal plate, the temple housing accommodating both said printed circuit board and said metal plate, said metal plate being arranged to protect said printed circuit board with electrical components.

In a fourth aspect the invention relates to updating hearing aid programs of a processor arrangement in a hearing aid. Here, the objective is to provide a method, and means for performing such a method, to spread available updates of such hearing aid programs in an easy way, without requiring the hearing dispenser to actively take care of latest updates being available on his computer.

To that end, in the fourth aspect, the invention provides a method of updating a hearing aid, comprising:

a) providing a computer with a computer processor arranged to communicate with other telecommunication devices and storing a computer version of a hearing aid application program;
b) providing hearing aid glasses with a hearing aid processor arranged to communicate with other telecommunication devices and storing a hearing aid glasses version of said hearing aid application program;
c) setting up a communication between said computer processor and said hearing aid processor;
d) checking whether said hearing aid glasses version is a more recent version than said computer version of said hearing aid application program;
e) if said hearing aid glasses version is more recent than said computer version, transferring said hearing aid glasses version to said computer and to store said

transferred hearing aid glasses version in said computer as an updated computer version;

f) if said computer version is more recent than said hearing aid glasses version, transferring said computer version to said hearing aid processor and to store said computer version in said hearing aid processor as updated hearing aid glasses version.

Brief description of the drawings

The present invention will be explained in detail with reference to some drawings, which are only intended for illustrative purposes and not to limit the scope of the invention. The scope is defined by the annexed claims and its equivalents.

Figure 1 shows a charging cradle;

Figures 2a, 2b show a battery housing at a glasses temple;

Figures 2c, 2d, 2e show an alternative battery housing at a glass temple;

Figures 3a, 3b show a cross sectional view of a glasses temple placed in the charging cradle along line III-III in figure 1;

Figure 3c shows a cross sectional view through the charging cradle along line IIIc-IIIc in figure 1;

Figure 3d shows a cross section view of an alternative charging cradle;

Figure 4a-4f show different embodiments of a connector assembly for connecting an earpiece of a hearing aid to a glasses temple;

Figure 5 shows different parts arranged in a glasses temple;

Figure 6a shows some details of an embodiment of the connector assembly;

Figure 6b shows a cross sectional view of an alternative embodiment of the connector assembly;

Figure 6c shows a schematic view of magnets connected to electrically conductive wires;

Figure 6d shows a 3D view of the first housing of the connector assembly of figure 6b;

Figure 7 shows an operation button within a glasses temple;

Figure 8 shows a computer arrangement to be used in an aspect of the invention.

Figure 9a shows a perspective view of an alternative charging unit to be used to charge a chargeable battery in the hearing aid;

Figure 9b shows the alternative charging unit of figure 9a in side view;

Figure 9c shows the alternative charging unit of figure 9a in top view;

Figure 9d shows an electronic circuit that can be used in the arrangement of the unit shown in figures 9a-9c;

Figure 9e shows an alternative electronic circuit that can be used in the arrangement of the unit shown in figures 9a-9c;

Figures 9f and 9g show a further alternative charging unit.

Figure 10 shows an electronic circuit that can be used to restart and/or reset a hearing aid.

Description of the preferred embodiment

The present invention comprises several aspects. They will be explained in detail below.

Charging cradle / battery housing.

Figure 1 shows a charging cradle 1. The charging cradle 1 comprises a housing 11 preferably made of a suitable synthetic material. The charging cradle 1 comprises two openings 6, 8 each shaped to receive a rear side portion of a wide variety of glasses temples, as will be explained further below. Each of the openings 6, 8 comprises two distinct electrical contacts 3, 5, 7, 9. The electrical contacts 3, 5, 7, 9 are accommodated in pairs in two resilient clamps 20, 22. Each opening 6, 8 comprises one such resilient clamp 20, 22. The resilient clamps 20, 22 may be made of a suitable synthetic, electrically insulating material, as will become apparent from figures 3a, 3b.

The housing 11 accommodates a transformer 10 to transform electrical power received from the mains to electrical power to charge a battery accommodated in glasses temples (cf. figures 2 and 3). Such a battery is arranged to provide electrical power to electrical equipment in such glasses temples or in other parts of glasses associated with such glasses temples. The housing 11 is connected to one side of a cable 2 that is, at its other side, connected to a plug 4 designed to be connected to the mains. In an alternative embodiment, the transformer 10 is located outside the housing 11 and connected to the electrical contacts 3, 5, 7, 9 by suitable wiring.

The cradle 1 may comprise a processor 16 connected to the transformer 10 to receive electrical power and arranged to communicate, either wirelessly or via a cable, with external devices. It's possible use will be explained in more detail in the section "updating hearing aid software". To that end, the cradle 1 may, in addition to or instead of the processor 16, also comprise a transceiver 18 for communication with external devices, e.g., by means of Bluetooth. The transceiver 18 is also connected to the transformer 10 for receiving electrical power.

In an embodiment, the housing 11 comprise lights 12, 14 in, or close to, the openings 6, 8. They may be electrically connected to processor 16 such that processor 16 controls them to provide light when no temple of glasses is positioned in the opening 6, 8. Locating the lights 12, 14 in, or close to, the openings 6, 8 facilitates finding the openings 6, 8. This facilitates inserting the temples for a user, as he/she does not wear his/her glasses while inserting, and as it might be dark (the recharging may take place at night). Moreover, these lights 12, 14 may be controlled by the processor 16 to indicate other operation states like at least one of charging, charging complete and no-connection between temple contacts and electrical contacts 3, 5, 7, 9. The lights 12, 14 are preferably made of light emitting diodes (LED´s). Different colors or different lighting patterns may be used to indicate different operation states.

Figures 2a, 2b show an embodiment of a back portion of a glasses temple 13. Figure 2 a shows the back portion in its assembled state whereas figure 2b shows the back portion with taken away cover member. As shown in figure 2a, the glasses temple 13 has a rear side portion 17 that is connected to a cover member 15. The cover member 15 can be removed from the rear side portion 17. The rear side portion 17 is provided with two electrical contacts 19, 21. Between the cover member 15 and the rear side portion 17, there is a hollow space for accommodating a battery 70 (see figure 2b) for providing electrical power to electrical components in the glasses temple 13 (or in other portions of the glasses). The electrical components may be part of a hearing aid. The electrical contacts 19, 21 are connected to respective contact pads 26, 28 within rear side portion 17, which are arranged to contact different electrical poles of battery 70. Two other contacts (not shown) connect the electrical poles of the battery to the electrical components. Preferably, the cover member 15 is located at an inside of the glasses temple 13, i.e. the side of the glasses temple 13 intended to face a head of a user of the glasses. This way, the cover members 15 are less visible when the user

wears the glasses. Moreover, this is ergonomically better because a human head contour bends inwardly behind the ear and the glasses temple-inside thus follows the shape of the head. During fitting, at the optician, glasses are normally bent behind the ears towards the head, which with this design is not or less needed. The electrical contacts 19, 21 are preferably located at a rear side of the rear side portion 17. They may be provided on cover member 15 instead. Figure 2a shows a screw (or bolt) 72 used to attach the cover member 15 to the rear side portion 17.

Figure 2b shows the rear side portion 17 without the cover member 15. This figure shows that the rear side portion 17 has a space to accommodate a battery 70. It also shows the contact pads 26, 28. Moreover, it shows a hole 74 for receiving the screw 72.

Preferably, the rear sides of the cover 15 and the rear side portion 17 are circularly shaped such that the charging cradle 1 can accommodate a wide range of different glasses models. A circular shape facilitates electrical contact between respective electrical contacts 19, 21 and 3, 5 (7, 9). This is further explained with reference to figures 3a, 3b.

Figures 2c 2d, 2e show an alternative battery housing structure. The same components as in figures 2a, 2b are indicated with the same reference numbers. Alternative components are indicated with a prime. So, the rear side portion 17 now comprises alternatively shaped contact pads 26', 28'. Contact pad 26' comprises a flat plate for contacting a flat side of battery 70, whereas contact pad 28'comprises an arc shaped portion to contact a circumference portion of battery 70.

Contact pad 26' is connected to an electrical contact 19' that is shaped as a bolt that connects to the contact pad 26' via a through hole through rear side portion 17.

Likewise, contact pad 28' is connected to an electrical contact 21' that is also shaped as a bolt that connects to the contact pad 28' via a through hole through rear side portion 17. The bolts can be positioned anywhere on the radius of the battery housing. By positioning them farther apart, the risk of short circuiting the contacts is diminished.

The bolt shaped electrical contacts 19', 21' need not have a slit or the like for a screw driver but may be designed to have any attractive appearance.

Figure 2c shows the alternative embodiment with taken away cover member 15. Figure 2d shows the alternative embodiment having a battery arranged within the

battery housing. Figure 2e shows the alternative embodiment with cover member 15 attached to the rear side portion 17.

Figures 3a, 3b show two different examples of a glasses temple 13 placed in opening 6 of charging cradle 1. Same reference numbers refer to same components as in earlier figures. Figures 3a, 3b show the charging cradle 1 in cross section along a line III-III in figure 1. The clamp 20 (as well as the clamp 22) within opening 6 of charging cradle 1 is, preferably, shaped to receive and clamp a back portion of a glasses temple 13. In that clamping condition, the electrical contacts 3, 5 contact electrical contacts 19, 21, respectively. To that end, clamp 20 may be semi-circularly shaped and resilient, as shown. However, other mechanical designs may be used instead.

By making the electrical contacts 19, 21 rather long, these electrical contacts 19, 21 will contact the electrical contacts 3, 5 on the clamp 20 when the back portion of the glasses temple 13 is inserted into the clamp 20 under a wide variety of angles α. By designing clamp 20 and opening 6 in such a way, the charging cradle 1 is able to receive rear side portions 17 with cover members 15 under a wide range of angles α, as is shown in figures 3a, 3b. The clamp 22 with its electrical contacts 7 and 9, respectively, is preferably similarly shaped as clamp 20 with its electrical contacts 3 and 5, respectively.

Preferably, cover members 15 and rear side portions 17 of a left and right glasses temple 13 are shaped in a mirror symmetry such that the cover members 15 only fit to one of rear side portions 17.

Preferably, the opening 6, 8 of the charging cradle 1 have a width that becomes smaller the closer to the clamp 20, 22. Figure 3c, which is a cross sectional view along line IIIc-IIIc in Figure 1, shows this for opening 6. Such a tapered width supports easy insertion of temple 13 into opening 6.

Figure 3d shows a cross section view of an alternative charging cradle 1'. This alternative charging cradle is designed to cooperate with the alternative battery housing shown in figures 2c, 2d, 2e. The same components as in figures 3a-3c are indicated with the same reference numbers. Alternative components are indicated with a prime.

Since the electrical contacts 19', 21' of the alternative battery housing are shaped as heads of bolts their contact surface is rather small. Therefore, in the embodiment of figure 3d, there are provided alternative electrical contacts 3', 5' within the cradle 1' with a rather large contact surface to be sure that electrical contact is established when

the rear side portion 17 of the temple 13 is moved into the cradle 1' taking into consideration that the angle under which the rear side portion 17 enters the cradle 1' varies from user to user, based on how far the rear side portion was bent to fit the person's head. The electrical contact 5' is shown to be a fixed member, whereas, electrical contact 3' is shown to be designed as a flexible member, e.g., as a portion of a flat spring.

Moreover, the cradle 1' comprises a clamp 20' designed to clamp the rear side portion 17.

The present invention also relates to an alternative cradle. This alternative cradle will be explained in detail after the sections relating to the "connector assembly" and the "temple" since it uses the connector as explained in these sections.

Connector assembly.

In the case that the glasses with electronics comprise a hearing aid, sound, either as an acoustic or as an electrical signal, has to be directed from the glasses to a human ear through the use of an intermediate unit, e.g., a tube or cable attached to an earpiece. Existing hearing aid glasses have the disadvantage that the earpieces are difficult to put into the ear, as a turning movement of the earpieces is required during insertion, while the earpieces are tightly attached to the glasses. The same problem exists when taking the earpieces out. However in this case an extra risk exists, which is that the user takes off his glasses first without thinking about the attached earpieces. In such case, at best an unpleasant pulling sensation is felt in the ear(s), and at worst the connection between earpiece and glasses breaks.

The objective of this aspect of the invention is to use a connector assembly that disconnects when the user puts off his/her glasses, and is easily connected by the user when he/she puts the glasses on. The advantages of the invention are that the insertion and extraction of the earpieces now can be done independently of putting off/on the glasses, as the glasses are not connected during insertion and extraction of the earpieces, and furthermore the risk of breakage of the intermediate unit in case of inadvertently putting off the glasses does not exist anymore. This will be explained in detail below.

Figures 4a-4f show different embodiments of a connector assembly 31 used to connect an earpiece 27 of a hearing aid to temple 13 of glasses 23. The connector assembly 31 comprises first and second housings 34, 37. The first housing 34 is attached to the earpiece 27 and is shown in all figures 4a-4f. Second housing 37 is shown in figures 5 and 6a. Second housing 37 does not need to be a separate component, but can be part of the temple 13, in which case the shape of the second housing 37 is for example milled into temple housing 73, or formed during the injection molding of temple housing 73.

The earpiece 27 comprises a speaker (not shown) to transmit sound to an ear of the user. To that end, the earpiece 27 receives suitable input signals from hearing aid components located in the temple 13 (or in other parts of glasses 23). Those input signals are transmitted via wires in a suitable cable 29 that is attached, at one end, to the first housing 34 and, at an opposing end, to the earpiece 27. The first housing 34 can be connected to and disconnected from the second housing 37 in the temple 13 as will be explained hereinafter.

In an alternative embodiment, the earpiece 27 does not comprise a speaker but comprises a hollow channel to lead sound received from a hollow tube, or any other hollow intermediate unit, to the ear. In that embodiment, such a hollow tube substitutes the cable 29. Then, the speaker is e.g. present in the first housing 34 or, alternatively, in the second housing 37 in temple 13. The sound produced by that speaker is then transmitted to the ear via the hollow tube. Figure 4b shows such a speaker 33 in first housing 34 in a very schematic way.

In a further alternative embodiment, the speaker is present in the temple and is transmitting sound via such a hollow tube that is attached to the temple 13. Then, first housing 34 is located at the end of the hollow tube and is pushed into the earpiece to connect.

Figures 4a-4c show an embodiment in which the first housing 34 is to be connected to an outside of the temple 13 that, in use, faces away from the head of the user. Figure 4d shows an embodiment in which the first housing 34 is connected to a bottom side of temple 13 that, in use, faces downwards (i.e. to the ground). Figures 4e, 4f show an embodiment in which the first housing 34 is also connected to the bottom side of temple 13 that, in use, faces downwards, however, at a position that, in use, is behind the user's ear. In this latter embodiment, the cable 29 (or hollow tube) remains

clamped behind the user's ear even when the user has disconnected the temple 13 from the first housing 34. This is more convenient than in the embodiments of figures 4a-4d where the cable 29 (or hollow tube) is dangling in the air when it is disconnected from the temple 13.

In all embodiments of figures 4a-4f, the connector assembly 31 is designed such that the cable 29 (or hollow tube) by means of the first housing 34 can be easily connected to and disconnected from the temple 13, e.g., such that the first housing 34 connects with only a little help of the user and disconnects substantially automatically when the user uses a little force when putting of his/her glasses.

The first and second housings 34, 37 may comprise magnets as shown in figures 5 and 6a in more detail. However, other arrangements of housings that can be easily connected and disconnected are envisaged, like housings with a mechanical snapping connection.

Figure 5 shows connector assembly 31 with first housing 34 and second housing 37. The second housing 37 is to be accommodated by the temple 13 as will be explained further below. The second housing 37 is preferably made of a synthetic material. As shown in more detail in figure 6a, the second housing 37 has a connecting face 40 to be directed to the first housing 34 in order to engage the first housing 34. The connecting face 40 has a recess 42 and first and second openings 45, 47. Moreover, the second housing has an edge 49 the purpose of which will be explained below.

The first opening 45 is designed to accommodate a first contact member 35 whereas the second opening 47 is designed to accommodate a second contact member 36. The first contact member 35 comprises a first magnet 43 covered by a first metal contact plate 39. The second contact member 36 comprises a second magnet 41 covered by a second metal contact plate 38. In its assembled state, the contact plates 38, 39 are connected to suitable conductors (not shown) within the temple 13. These conductors are connected to other hearing aid components in the temple 13 for transporting suitable electrical sound and control signals etc.

It is observed that the term "contact members" is used to refer to members that are designed to connect the two housings 34, 37 to one another such that they are in contact. The term does not necessarily refer to electrical contact.

The first housing 34 has a connecting face 44 to be directed to and engage the second housing 37. The connecting face 44 has an extending portion 46 that is designed

to fit into recess 42 of second housing 37 when first and second housings 34 and 37 are engaging one another. The first housing has a third contact member 30 and a fourth contact member 32. The third contact member 30 comprises a third magnet 48 and a third electrical contact 52. The fourth contact member 32 comprises a fourth magnet 50 and a fourth electrical contact 54. The third and fourth magnets 48, 50 are made of a suitable magnetic metal that is attracted by the first magnet 43 and second magnet 41, respectively. In the embodiment where the earpiece 27 has a speaker, the third and fourth electrical contacts are connected to suitable conductors within cable 29 that are connected to such a speaker.

If the first housing 34 comprises such a speaker (cf. figure 4b, where a speaker 33 is shown in connector assembly 31 and is attached to a hollow tube) the third and fourth electrical contacts provide electrical sound and control signals to such a speaker. The speaker, then, produces sound that is transported via the tube to the earpiece 27.

If the second housing 37 or the temple 13 comprises a speaker no electrical signals need be transported to the first housing and the electrical contacts 38, 39, 52, 54 can be omitted. The third and fourth contact members 30, 32 need only engage the opposing first and second contact members 35, 36, respectively. Of course, the first and second housings 34, 37 must, then, be designed to allow sound to pass from such a speaker via the tube to the earpiece 27.

In an alternative embodiment, only one of the contact members 35, 36 is provided with a magnet, e.g., only first contact member 35 has first magnet 43 and second contact member 36 has an electrical contact 38 wrapped around a magnetically sensitive but non magnetic material, such as iron. This prevents the second housing 37 from attracting metal parts like chains and iron filings that, when engaged by both first and second magnets 43, 41 cause an electrical short circuit. Another solution would be to provide both the first and second housing 34, 37 with one magnet only.

Magnets can be provided such that first and second magnets 43, 41 are facing outward to first housing 34 with different magnetic poles, whereas third and fourth magnets 48, 50 can also be provided with different poles such that first contact member 35 is attracted by third contact member 30 and second contact member 36 by fourth contact member 32. Then, automatically a correct orientation of the first and second housings 34, 37 relative to each other is guaranteed.

By providing this connector assembly 31 with at least one magnet 41, 43, 48, 50 the first and second housings 34, 37 can be easily connected and disconnected while applying only a small force. This can be further facilitated by providing a rather stiff and only slightly flexible cable 29 (hollow tube). Such a cable 29 (hollow tube) can be made of a synthetic material that can be custom formed, i.e., is made of a material that can be shaped by a customer and keeps a new shape after being deformed by a customer. Then, when the user disconnects the first housing 34 from the second housing 37 by putting off his/her glasses the first housing 34 will remain substantially in its place, thus, facilitating connecting first and second housings 34, 37 when the user puts on his/her glasses again because they will be very close to one another. Using opposing magnet pole combinations further facilitates reconnection since the first and second housings 34, 37 will then attract one another automatically in the proper orientation and direction.

Figure 6b shows a cross section of an alternative connector assembly. The same components as in figure 6a are indicated with the same reference numbers. Alternative components are indicated with a prime.

Figure 6b shows mating alternative first and second housings 34', 37'. The first alternative housing 34' accommodates alternative third and fourth contact members 30', 32'. The second alternative housing 37' accommodates alternative first and second contact members 35', 36'.

Whereas figure 6a shows an embodiment of the first, second, third and fourth contact members 35, 36, 30, and 32 where they each comprise a magnet covered with a corresponding contact plate and the contact plates contact one another one-by-one via mating surfaces in use, the alternative first, second, third and fourth contact members 35', 36', 30', and 32' of figure 6b differ in the following way.

Figure 6b shows that the first and second magnets 43, 41 are accommodated by respective first and second electrical contacts in the form of metal boxes 39', 38'. Likewise, the third and fourth magnets 48, 50 are accommodated by respective third and fourth electrical contacts in the form of metal boxes 52', 54'. These metal boxes are arranged such that, in use, magnet 41 faces magnet 50, and magnet 43 faces magnet 48, without there being any metal plate between them. The metal box 38'contacts the metal box 54' and the metal box 39'contacts the metal box 52'. Magnet 41 may be a distance away from magnet 50, and the magnet 43 may be a distance away from

magnet 48. The mutual distances between magnets 41 and 50, and between magnets 43 and 48, as well as the strength of the magnets determines the magnetic force between the alternative first and second housings 34', 37'. These metal boxes 39', 38', 52', 54' improve the magnetic contacting force between the connector assembly portions. Moreover, these metal boxes 39', 38', 52', 54' are connected to electrical wires via soldering.

Alternatively, the magnets 42, 43, 48, 50 can be gold coated. In this case, the magnets 41, 43, 48, 50 can be directly connected to electrical wires via soldering. As a result one or more of the metal boxes 39', 38', 52', 54' can be left out. Instead of using gold, any other suitable metal coating can be used provided the metal used is magnetic, can be easily coated on the magnets and can be easily connected to electrical wiring. That wiring may be (a portion of) wiring on a printed circuit board as will be explained below.

As a further alternative, magnets 41, 50, 43, 48 may be used that are directly connected to a wire. This is schematically shown in figure 6c. Figure 6c shows magnet 41 contacting magnet 50. Magnet 41 is connected to an electrically conductive wire 78, whereas magnet 50 is connected to an electrically conductive wire 80. These wires 78, 80 may be connected to the magnets 41, 50 by any suitable technique. The magnets 43, 48 may be designed to be connected to suitable electrically conductive wires in a similar or same way.

In general, in the embodiments shown in figures 6a-6d, contact members 30, 31, 35, 36, or 30', 31', 35', 36' are used that are both, at least in part, magnetic such that two contact members exert a magnetic force to contact one another, and are, at least in part, electrically conductive to allow electrical currents to flow from one contact member to the other contact member.

As shown in figures 6b and 6d, in an embodiment, the first alternative connector housing 34' accommodates a speaker 33 receiving suitable signals via wires 64, 66. If the first alternative connector housing 34' comprises such an internal speaker 33, the metal boxes 39', 38', 52', 54' have another advantage. By using metal boxes 39', 38', 52', 54' that have a closed metal surface towards the interior of the first alternative housing 34', the metal boxes 39', 38', 52', 54' function as magnetic shielding and the magnetic field lines are not directed towards the internal speaker 33 which is situated in the interior of the first alternative connector housing 34'. As a result, the internal

speaker 33, which consists of metal itself, is pulled less strongly towards the magnets 48, 50 and can vibrate freely in the housing, thus diminishing the known hearing aid problem of mechanical feedback or howling.

A second measure to ensure that the internal speaker 33 can vibrate freely is by the use of flexible sleeves 68, 82 that are attached to the internal speaker 33 and connect the internal speaker sound outlet flexibly to the sound outlet of a hearing aid. This latter feature is used in many hearing aids. New is the invention to use sleeves 68, 82 at two sides of the internal speaker 33 to connect the internal speaker 33 to the remainder of the housing 34'. This way, the internal speaker 33 lies in a type of "hammock" construction. The advantage is that as there are two connection points, both sleeves 68, 82 can be much more flexible than in the case of just one sleeve connection to the housing of the hearing aid. In the case that magnets 48, 50 are positioned towards the internal speaker 33 in the housing the hammock construction has as extra advantage in that the whole hammock construction is pulled somewhat to the magnets 48, 50, but the internal speaker 33 can still vibrate freely.

The contacts 39', 38' of the second housing 37' lie deeper than the surface of the temple 13 in a hole in the temple 13, as shown in figure 6b. First housing 34's contacts 52', 54' extend from its housing, into the hole in temple 13 to contact deeper situated contacts 39', 38'of second housing 37'. As a result, in regular use, the possibility of hairs coming between the contacts after connecting the first and second housings 34', 37' is diminished strongly. This is important as occasional contact loss because of hairs is a nuisance to users.

The first housing 34' is fixed to a printed circuit board (pcb) 56. Conductor paths are provided on the pcb 56, of which one conductor path 58 connected to metal box 54' is shown. The use of the pcb 56 as base plate simplifies the production as parts of the production can be performed by automated smd machines, and thus lowers production costs. In addition, the metal boxes of contacts 54', 52' are soldered to the pcb 56 and are thus robustly fixed to the housing, in contrast to gluing them to a plastic housing which results in a much less robust fixation.

Temple.

In a further aspect, the invention relates to a glasses temple arranged to accommodate electronic equipment. In an example, such electronic equipment is part of

a glasses hearing aid. However, this aspect is not restricted to such an application. This aspect can also be applied to electronic equipment for other applications, like a headset for a mobile device such as a mobile telephone or personal digital assistant (pda). Below, by way of example only, this aspect will be explained in more detail with reference to its application in a glasses hearing aid.

Glasses temples of high quality can be fitted by the optician to the user's head. To this end, usually, the temples are made of metal, or of plastic with a metal pin inside the plastic. The metal part is required to make sure the plastic after bending does not return to its original form.

Glasses temples that contain electronics require protection that prevent a cavity with electronic equipment being bent, as bending of the electronic equipment harms the electronic equipment.

The objective of this aspect of the invention is to solve this apparent paradox of required bending for fitting and prohibited bending for electronic equipment protection. To this end, a metal plate is attached as protection to a plastic temple enclosing electronic equipment. Only behind the ear, the metal plate decreases in height and becomes a metal pin that can be bent during fitting behind the ear. This will be explained with reference to figure 5.

Figure 5 shows several constructive details of a temple 13. Some of these details have already been explained above and will not be repeated here.

Figure 5 shows a printed circuit board (pcb) 59. The pcb 59 comprises several microphones 61. Four microphones 61 are shown on the pcb 59. However, this number may differ. The microphones 61 have an extension 63 in use facing downward. However, these extensions 63 may face another direction. The extensions 63 are provided with an opening for receiving sound to enable the microphones 61 to receive the sound and convert the received sound into a suitable electric sound signal. These electric sound signals are supplied to a processor arrangement 60 also connected to the pcb 59. The pcb 59 is also connected to one or more switches 65 to be operated by the user or an operator. In order to allow somebody to operate the switch 65, the switch 65 is provided with a button 83. Moreover, the pcb 59 may be connected to a socket 67 arranged to be connected to a mating plug of a cable (not shown) that can, e.g., be connected to a communication device like a computer. The switch and the socket are connected to the processor arrangement 60. All connections between the electrical

components on the pcb 59 are provided via suitable electrically conductive tracks as is known to persons skilled in the art.

The processor arrangement 60 comprises suitable memory, like EEPROM, ROM, RAM, etc. For the sake of simplicity this has not been shown in figure 5.

The temple 13 has a metal plate 51. In one embodiment, the metal plate 51 is provided with an opening 53 for receiving the second housing 37. The size of opening 53 may be selected such that, in assembled form, it abuts the edge 49 (cf. figure 6a). At its rear side, the metal plate has a narrowed portion 55, e.g., pin-shaped, that can be bent easily. At its terminating portion 57 the metal plate 51 may widen again. At its rear side, the metal plate 51 comprises a hole 76 for receiving the screw 72. The screw 72 is shown in figure 2a. In the embodiment shown, the screw 72 attaches the metal plate 51 to the cover member 15 and clamps the rear side portion 17 of the glasses temple 13 in between.

The temple 13 comprises a temple housing 73. The temple housing can be made of injection molded plastic. Alternatively, the material can be a millable material such as plastic or metal. The temple housing 73 is provided with suitable spaces to accommodate both the pcb 59 and the metal plate 51. The pcb 59 is preferably located in a space defined by the temple housing 73 and the metal 51 such that it is covered against external influences. Moreover, the space accommodating the pcb 59 is preferably designed large enough such that the temple 13 may bend slightly under external forces without bending the pcb, thus reducing risk of damaging the pcb 59 as much as possible. This risk is further reduced by the metal plate 51 since it has a relatively large height at the location of the pcb 59 which counteracts any tendency to bend. In this embodiment, metal plate 51 forms an outside wall of the temple 13. The metal plate 51 can be clamped by suitable rims of the first temple housing 73 Alternatively, the first temple housing 73 can be screwed to the metal plate 51, using suitable screws and screw sockets. Moreover, the metal plate 51 can be fixed to the temple housing 73 by a suitable glue.

In another embodiment, a metal strip is attached to the inside of the metal plate 51, thus forming a T profile to even further prevent bending of the metal plate 51 and thus of the temple 13.

In another embodiment, the temple 13 is injection molded, and exists of a single part comprising two sides of the temple housing with a fold line in the middle. During

manufacturing, the single part is arranged around the pcb 59 with the electronic equipment and folded together. Then, it is closed with for example glue or lasering, or heat to exactly enclose the electronics and form the temple. In this case, a metal pin may be included in the cavity between the two plastic sides for extra electronics protection.

The narrowed portion 55 of the metal plate 51 fits into a narrowed portion 75 of the temple housing 73. Together with the narrowed portion 75 of temple housing 73, the narrowed portion 55 of the metal plate 51 can be bent easily in order to fit the temple 13 to a human head, behind the ear, (cf. figures 4a-4f) and ensures that after bending the (plastic) temple housing 73 does not return to its original form.

In an embodiment, the narrowed portion 55 of the metal plate 51 and the narrowed portion 75 of the temple housing 73 both have a bent shape, so that little bending has to be done in production and by the optician during fitting of the glasses. This protects electronic equipment.

At its rear side, the temple housing 73 comprises first and second battery contacts 26, 28. The battery contacts 26 and 28, respectively, are connected to electrical contacts 19 and 21, respectively (cf. figure 2). The battery contacts 26, 28 are designed to contact a battery (not shown). Two other contacts connected to the poles of the battery are connected to the electrical components on the pcb 59 by suitable conductors (not shown).

The temple housing 73 is provided with suitable holes 69 at its bottom side to receive microphone extensions 63. Moreover, the temple housing 73 comprises suitable holes 71 for receiving switch 65 and socket 67 such that the switch 65 extend through the housing wall and can be operated from outside. Preferably, the temple housing 73 and its holes 69 are designed such that the extensions 63 of the microphones 61on the pcb 59 can be placed into these holes 69 by a tilting movement, thus limiting the height of the space required for the pcb 59 and thus the height of the temple 13, improving the visual attractiveness of the glasses. During manufacturing, first the socket 67 and the switch 65 may be connected to the pcb 59 by means of relatively long wires. Then, the socket 67 and the switch 65 may be inserted in respective holes 71 and pushed outward. After the pcb 59 has been placed by means of the tilting movement, the socket 67 and

the switch 65 may be shifted back into the holes 71 after which they will be fixed, e.g., by gluing.

Figure 5 shows a mobile telephone 85 and a personal digital assistant (pda) 87. In an embodiment, the processor arrangement 60 on the pcb 59 is arranged to communicate with such a mobile telephone 85 or pda 87 (or another communication device), eg., by Bluetooth or other wireless communication protocols.

Figure 7 shows a detail of pcb 59 on an enlarged scale. The same reference numbers are used for the same components as in figure 5. One microphone 61 is shown with its extension 63 inserted into an opening 69 in temple housing 73. The switch 65 and button 83 are rather large. In order to minimize the depth of the space for the electronics and thus of the temple 13, improving the visual attractiveness of the glasses, the switch 65 extends into a notch 81 in pcb 59. The switch 65 is shown to have contact leads 79 connected to the pcb 59 where they contact conducting tracks, as will be apparent to persons skilled in the art. Those tracks are connected to processor arrangement 60.The switch 65 has a button 83 protruding from the temple housing 73 and arranged to be operated by a user or operator.

The socket 67 that is not shown in figure 7 and may also have a substantial size, may, like switch 65, also be accommodated in a notch, like notch 81, in pcb 59.

Alternative cradle.

With reference to figures 1, 2a-2e, 3a-3d, cradle 1 for charging battery 70 located in the hearing aid arranged in glasses through contacts 19, 21; 19', 21'at the rear side of temple 13 has been explained. Now, an alternative cradle 137 will be explained with reference to figures 9a-9g.

Figure 9a shows glasses 23 located upside-down in the alternative cradle 137. The cradle 137 comprises a support block 134. A guiding mechanism 136 is provided on the support block 134, that is arranged to receive and keep a nose bridge 135 located between the lenses of glasses 23 when it is in its upside-down position. The guiding mechanism 136 is slidably mounted on support block 134. The guiding mechanism 136 can slide across a sliding mechanism 138 that has a corrugated structure such that the guiding mechanism can take a predetermined number of fixed positions relative to the support block 134. Of course, other sliding mechanisms can be provided, e.g., a rail

along which the guiding mechanism 136 can be moved together with a fixing mechanism, e.g., comprising a screw or a bolt and a nut.

Support block 134 accommodates transformer 10 (not shown in figure 9a) connected to power supply cable 2.

Two arms 130, 132 are connected to the support block 134, preferably via respective hinges 131, 133 attached to one end of the arms 130, 132. Each other end of the arms 130, 132 is fixed to a connector 142, 148, as well as possibly to a magnet 144, 150. At the end where the arms 130, 132 are connected to the connectors 142, 148 they may be made of a flexible material, e.g. rubber. Each connector 142, 148 has two charging contact members. The charging contact members of connector 148 are shown with reference signs 152, 154. The charging contact members of connector 142 are not shown in figure 9a. However, they are shown in figure 9b and 9c and indicated with reference signs 156, 158.

Each temple 13 of the glasses 23 may comprise a magnetic switch 140, 146, the purpose of which will be explained below. The magnetic switch may be a Reed switch. Figure 9a also shows the first and second contact members 35, 36 in temple 13 (the other temple 13 has similar contact members, but they are not shown).

Figure 9b shows the arrangement of figure 9a in side view, whereas figure 9c shows the arrangement of figure 9a in top view.

Figure 9d shows an electronic circuit in the temple 13 that can be used to charge chargeable battery 70. The battery 70 is connected to the processor 60 in temple 13 to supply the processor 60 with a suitable voltage. In the embodiments explained with reference to the preceding figures the first and second contact members 35, 36 are used to provide signals from processor 60 to a loudspeaker that is e.g. located in connector housing 34 (cf. figure 6a). However, in accordance with the embodiment shown in figures 9a-9e, the first and second contact members 35, 36 are also used to receive electrical power from the transformer 10 to charge battery 70.

To that end, in use, charging contact member 158 is contacting second contact member 36 and charging contact member 156 is contacting first contact member 35. It is assumed that charging contact member 158 provides a positive voltage whereas charging contact member 156 provides a negative (or earth) voltage. Second contact member 36 is connected to the positive terminal of battery 70 via a diode 172 to prevent said positive terminal from keeping the second contact member 36 on the

positive battery voltage when the transformer 10 is not connected anymore. Similarly, the first contact member 35 is connected to the negative terminal of battery 70 via a diode 170 to prevent said negative terminal from keeping the first contact member 35 on the negative battery voltage when the transformer 10 is not connected anymore. Diode 170 can be left out if all negative terminals have the same voltage, e.g., earth voltage.

Moreover, a diode 168 is arranged between second contact member 36 and the processor 60 in order to prevent the positive charging voltage of transformer 10 from reaching, and possibly destroying, the output of processor 60.

Figure 9e shows an alternative electronic circuit that can provide the same function as the one shown in figure 9d. In the circuit of figure 9e, two switches 141, 143 are provided. A first switch 141 is connected to first contact member 35 and is arranged to connect first contact member 35 to either the positive terminal of battery 70 or to the (positive) output of processor 60. A second switch 143 is connected to second contact member 36 and is arranged to connect second contact member 36 to either the negative terminal of battery 70 or to the (negative) output of processor 60. Switch 141 can be left out if all negative terminals have the same voltage, e.g., earth voltage.

The switches 141, 143 are, in an embodiment, Reed switches that are operated by a magnetic force that is exerted by magnets 144, 150 located on arms 130, 132 when the arms 130, 132 are positioned such that the first and second contact members 35, 36 can contact charging contact members 156, 158. In that case, the switches 141, 143 connect the contact members 35, 36 to the associated terminals of the battery 70. Otherwise, when the switches 141, 143 are not operated by the magnets 144, 150 the switches 141, 143 connect the contact members 35, 36 to the associated outputs of processor 60.

Thus, this embodiment uses the first and second contact members 35, 36 on the temple 13 of the connection assembly as described earlier also for charging the battery 70. This is possible since connecting an earpiece to the hearing glasses in use, takes place at exclusively different moments from the moments that the battery 70 needs charging. Charging takes place when the hearing glasses are not in use by the user. Therefore it is possible to use the first and second contact members 35, 36 for both the connection of the earpiece and the charging of the battery 70 in the hearing glasses.

Like in the embodiments of the earlier figures, the contact members 35, 36 of housing 37 are connected to contact members 156, 158 of connector housing 142 by magnetic force, whereas they establish electrical contact at the same time.

As described earlier for the charging cradle shown in figures 1 and 3a-3d, an obstacle to overcome by a charger of rechargeable batteries in pairs of glasses is that the position of temples varies widely for different pairs of glasses. This is not only due to varying temple lengths and front widths of the glasses, but also because temples are bent by an optician when fitting to a user's head.

The alternative charging apparatus of figures 9a-9c deals with this obstacle in the following ways:

1. The magnetic force ensures the first and second contact members 35, 36 are attracted to the charging contact members 156, 158. By attaching the charging contact members 156, 158 to a flexible, e.g. rubber, end at the arm 130, the contacts seek each other despite positioning differences caused by bending.

2. The position of the guiding mechanism 136 is adjustable relative to the support block 134, and thus relative to the arms 130, 132. Thus adjustments can be made to cope with differences in temple lengths.

After having set the guiding mechanism 136 relative to the support block 134 for a specific pair of glasses , the user, wishing to charge the battery of the glasses, simply puts the nose bridge 135 of the glasses in the guiding mechanism 136 and opens the temples 13 of the glasses until the respective contacts contact one another by the magnetic forces, as explained above.

In another embodiment, shown in figures 9f and 9g, the charger makes use of a small notch 162 located at the rear side of the temple 13. In this embodiment, the charging unit comprises a support base 160 comprising a ridge 164, against which the notch 162 should be located in order to align the first and second contact member 35, 36 with the charging contact members 156, 158. Instead of a ridge 164, any other technical equivalent alignment unit may be used, like a slit or hole in the support base 160 designed to accommodate notch 162 such that the first and second contact member 35, 36 are aligned with the charging contact members 156, 158.

Instead of the support base 160 extending underneath the glasses as shown in figure 9f, the support base 160 can alternatively be positioned next to the glasses. In this case, the ridge 164 is one side of the support base 160, and the glasses are lying

upside down next to the support base 160, on a table for example, contacting the ridge 164 of the support base 160 with notch 162.

By laying the glasses upside-down as shown in figures 9f and 9g, the notch 162 at the rear side – instead of the nose bridge 135 – can be used to position the glasses with stretched temples 13 against the ridge 164. Again, magnetic force is used to provide the contact force. Connector 142 with the charging contact members 156, 158 may, again be attached to a flexible, e.g. rubber, end of an arm, by which the contacts seek each other despite positioning differences caused by bending. But in this case no adjustment of the charger is required for different temple lengths, because the notch 162 at the rear side of the temples 13 is positioned at the same position in relation to the connector 142, irrespective of the temple length.

Yet in another embodiment the charger uses the magnetic force of the connector housing within the temple 13, but not the contact members themselves. In this case separate charging contacts are mounted in the temple connector housing. The charger connects to the temple through magnetic force in the same way as described in the embodiments above. However the charging current flows through the separate charging contacts in the connector housing. The advantage is that no diode or switch is required to ensure the current flows to the battery and not to the processor. These charging contacts are supported by and located on the pcb 59 and, preferably, also extend through opening 53 in metal plate 51 to allow contacting the charging contacts of the charger.

It is observed that the charger explained with reference to figures 9a-9g has as an additional advantage that the rear sides of the temples 13 do not comprise any electrical contacts 19, 21; 19', 21' anymore, which is aesthetically more attractive. Moreover, the charger is smaller than the one shown in figures 1, 3a-3d.

User interface.

The user interface comprises the switch 65. Preferably, the switch 65 is intended to be operated by the wearer of the glasses and located at the front side of the temple 13 where "front side" is defined as the side where the temple is connected to the portion of

the glasses 23 designed to accommodate the lenses. This is where the wearer normally puts his/her fingers to put on or to put off his/her glasses. So, this is a convenient location for the wearer to operate the button 83 of the switch 65. The switch 67 is intended to be operated by a hearing aid dispenser and can be located more to the rear side of the temple 13, i.e., the side to be put on the human ear.

Both temples of the glasses 23 can be provided with two (or more) such switches 65. However, in an embodiment, each temple may have just one switch, one to be operated by a wearer and one to be operated by the hearing aid dispenser. This is a feasible option if the glasses comprise a single processor arrangement 60 common to both temples, or if both temples are wirelessly connected. Then, manufacturer, i.e. default, settings of this single processor arrangement 60 can be adjusted by the hearing aid dispenser via a single switch on one of the temples where the other switch is used by the wearer to adjust user settings of the hearing aid like gain, directivity or beam forming for both ears.

The processor arrangement 60 that is connected to the switch 65 is arranged to receive a signal from these switch 65, indicating how long the button 83 is pushed by the user/operator. In an embodiment, three different operating modes can be distinguished:

1. short push
2. long push
3. very long push

The short push may take e.g. between 0 and 0.5 sec., the long push may e.g. take between 0.5 and 2 sec. whereas the very long push may e.g. take longer than 2 sec. Of course, other examples are possible. By operating the button 83 in the short push mode, the user/operator instructs the processor arrangement 60 to jump through consecutive programs like directivity, beam forming, volume, and telecoil. By operating the button 83 in the long push mode, the user/operator may instruct the processor arrangement 60 to search a certain setting within the selected program, or it may just select a specific program. By operating the button 83 in the very long push mode, the processor arrangement 60 is, e.g., instructed to reset all settings back to the manufacturer default settings, or to reboot, or to shut down.

The program "directivity" determines the main hearing direction or directions of the hearing aid. The hearing aid can, e.g., be programmed to have a single main hearing

direction for both temples, extending substantially parallel to the temples in use, i.e., when the glasses are worn by the user and the temples are supported by the human ears. Alternatively, the hearing aid may have two different main hearing directions, i.e., one main direction per temple and per ear. These two different main directions may form opposing angles to the direction in which the temples extend. Such a plurality of different main directions of hearing aid glasses is explained in detail in European patent application EP-A-1 025 744 which is incorporated herein by means of reference.

Setting a suitable gain volume can in one embodiment be done by the long push mode. The gain is adapted by a predetermined amount after each long push. The volume may, e.g., be adjustable in 3 steps. Each time the user pushes long, the volume makes one increasing step. When the volume has reached a maximum level the steps will be reversed, i.e., the volume will be decreased in steps. When the volume has reached a minimum level, the steps are reversed again, etc.

The telecoil program relates to functionality of the hearing aid to receive radio waves from a transmitter in, e.g., a theater or concert hall, that include the sound produced at that moment in the theater / concert hall such that the user of the hearing aid can better listen to, e.g., a theater play. In one embodiment the telecoil program can be selected or deselected by applying the long push mode.

Adapting settings of the programs to be executed by the processor by the hearing aid dispenser can be performed in the same way.

Updating hearing aid software.

In an embodiment, the invention relates to updating hearing aid software. Now, a description of updating hearing aid software will be given. The hearing aid may comprise functional modules as explained in detail in WO2004/028203. However, other types of hearing aids may be used instead.

The functionality of a hearing aid is preferably implemented by software. Once a hearing aid has been bought and time passes by, this software will become outdated. The present invention, in an embodiment, provides for a suitable way of keeping the software as up to date as possible. Basically, this can be done by means of a computer arrangement as shown in figure 8.

In figure 8, an overview is given of a computer arrangement that can be used to carry out the method according to the invention. The arrangement comprises a processor 101 for carrying out arithmetic operations.

The processor 101 is connected to a plurality of memory components, including a hard disk 105, Read Only Memory (ROM) 107, Electrically Erasable Programmable Read Only Memory (EEPROM) 109, and Random Access Memory (RAM) 111. Not all of these memory types need necessarily be provided. Moreover, these memory components need not be located physically close to the processor 101 but may be located remote from the processor 101.

The processor 101 is also connected to means for inputting instructions, data etc. by a user, like a keyboard 113, and a mouse 115. Other input means, such as a touch screen, a track ball and/or a voice converter, known to persons skilled in the art may be provided too.

A reading unit 117 connected to the processor 101 is provided. The reading unit 117 is arranged to read data from and possibly write data on a data carrier like a floppy disk 119 or a CDROM 121. Other data carriers may be tapes, DVD, memory sticks etc,. as is known to persons skilled in the art.

The processor 101 is also connected to a printer 123 for printing output data on paper, as well as to a display 103, for instance, a monitor or LCD (Liquid Crystal Display) screen, or any other type of display known to persons skilled in the art.

The processor 101 may be connected to a communication network 127, for instance, the Public Switched Telephone Network (PSTN), a Local Area Network (LAN), a Wide Area Network (WAN), the Internet, etc. by means of an I/O device 125. The processor 101 may be arranged to communicate with other communication arrangements through the network 127.

The processor 101 may be implemented as stand alone system, or as a plurality of parallel operating processors each arranged to carry out subtasks of a larger computer program, or as one or more main processors with several subprocessors. Parts of the functionality of the invention may even be carried out by remote processors communicating with processor 101 through the network 127.

The processor is arranged to communicate with the processor arrangement 60 accommodated in temple 13, e.g. wireless or through a cable connected to the socket 67 in the temple 13.

The computer arrangement shown in figure 8 may be located at the premises of a wearer of the hearing aid glasses. Alternatively, it may be located at the premises of a hearing aid dispenser who sells such hearing aid glasses to end-users. The computer arrangement may be used to update the programs to be executed by processor arrangement 60 in different ways.

The computer arrangement shown in figure 8 may be arranged, as controlled by suitable software instructions and data stored in memory 105-111, to download updates of software programs (or version parameters) from a server that stores latest software / parameters from a manufacturer of hearing aids, that can be executed by the hearing aid glasses processor arrangement 60. Moreover, processor 101, as controlled by other suitable software instructions and data stored in memory 105-111, is then arranged to communicate such updated software programs or parameters to the processor arrangement 60 once a communication link is established between the processor 101 and the processor arrangement 60. This setup can be used both in a home environment of an end-user or at the premises of a hearing aid dispenser who sells hearing aid glasses. The updated software and/or parameters can be downloaded by computer arrangements from a website that is controlled by, e.g., a manufacturer of hearing aid glasses. The updated software and/or parameters can be distributed automatically to such computer arrangements upon any new release, e.g., on a subscription basis at any time that the computer arrangement is connected to the Internet.

In a very advantageous embodiment, the hearing aid dispenser does not need to download updated versions of the software and/or parameters. In such an embodiment, the processor 101, as controlled by suitable instructions and data stored in memory 105-111, is arranged to communicate with processor arrangement 60 of hearing aid glasses and to check the version number of the software running on the processor arrangement 60, or of the parameters used by the software running on the processor arrangement 60. Moreover, the computer arrangement as shown in figure 8 stores software and parameters with a certain version number itself in memory 105-111. The processor 101 checks whether the version number of the software / parameters on the processor arrangement 60 is more recent than the version number of the software / parameters stored in memory 105-111. If the version number of the software / parameters stored in memory 105-111 is more recent than the version number of the software / parameters stored in processor arrangement 60, then, this stored software /

parameters is / are transmitted to the processor arrangement 60 and used by the processor arrangement 60 to update its own software / parameters. In case the version number of the software / parameters stored in memory 105-111 is older than the version number of the software / parameters stored in processor arrangement 60, then, this software /parameters of the processor arrangement 60 are transmitted to the processor 101 and stored by the processor 101 in its own memory 105-111. The processor 101 can then later use the updated software / parameters to update other hearing aid glasses when they are arranged to communicate with the processor 101 to find out whether it has more recent software / parameters. This setup is especially advantageous for hearing aid dispensers. They can, thus, keep their software / parameters for the hearing aid glasses reasonably up to date. In practise, they will be visited by hearing aid glasses wearers regularly for different consultant purposes and, in this way, they can use the hearing aid glasses of those wearers to update their software and/or parameters. Secondly it is advantageous for the glasses manufacturer. The manufacturer does not have to wait with the introduction of an improvement in newly produced glasses until all dispensers have updated their fitting software. Instead the manufacturer can immediately introduce software and/or parameter improvements in newly produced glasses, which will spread automatically to the software of the hearing aid dispenser. The fast introduction of improvements of course benefits the user as well.

In an alternative embodiment, the processor 101 does not communicate with processor arrangement 60 directly but with the cradle processor 16 (cf. figure 1). This cradle processor 16 is also arranged to communicate with the processor arrangement 60, e.g., via Bluetooth or through contacts in the temple 13 that connect to contacts in the cradle 1 when positioned in the cradle 1.

In an alternative embodiment, the processor arrangement 60 is connected to the transceiver 18 when the temple 13 is put into cradle 1 by suitable connecting members. Then, the processor arrangement 60 uses the transceiver 18 to communicate with external devices like processor 101, e.g. for updating it's software / parameters. The advantage is that the electrical power to communicate with external devices does not need to be derived from the battery within the temple 13 but can be derived from transformer 10 within cradle 1.

In a further alternative, another communication device like pda 87 or mobile telephone 85 is used for the updating process. They already have the equipment to communicate with other devices like processor 101, so, they can easily be programmed to download latest software / parameters from processor 101 and transmit this further to processor arrangement 60, either directly or via processor 16 / transceiver 18 in the cradle 1. Here, the hearing aid glasses can be a headset of such a communication device like pda 87, mobile telephone 85, as, e.g., explained in more detail in WO2004/028203.

Resetting processor of hearing glasses to default program.

Hearing aids need to be restarted and reset to a default program from time to time. Restarting, also called rebooting, is required to ensure the software keeps running properly. Resetting the hearing aid to default settings, for example a default user-program, ensures that the user has the hearing aids for left and right ear in the same setting. This is crucial for binaural listening.

Regular hearing aids that run on replaceable batteries get a restart and a reset when the batteries are replaced, or when the user pulls out the battery to stop the hearing aid functioning. This is not possible with rechargeable batteries.

One solution for a rechargeable hearing aid is to include an on/off switch on the hearing aid. But this has the disadvantage of an extra button, which takes space and increases costs.

This embodiment of the invention does not require an extra button. In this embodiment, the processor 16 of the charge cradle controls the transformer 10 to generate such a charging voltage that it contains commands that can be recognized as restart/reset commands by processor 60. The processor 60 (possibly together with a separate controller) may have a function that continuously examines the voltage or current that the battery 70 provides in order to shut down when the battery is low. This function can be used to recognize the commands from the charger. That can, e.g., be done by shaping the charging voltage as generated by transformer 10 such that it contains charging pulses for battery 70 in a pattern that the processor 60 in the hearing aid receives as current or voltage increases/ decreases and recognizes as such commands. Alternatively, the charging voltage can be a DC voltage having an AC voltage superimposed on it which AC voltage can be recognized as such commands.

Figure 10 provides an implementation of this embodiment. The implementation shown in figure 10 comprises all the components shown in figure 9d. Additionally, the implementation comprises a controller 166 that is connected to and receives input signals from first and second contact members 35, 36 when they are connected to the charging contact members 156, 158. The controller 166 is designed to derive the command signals as present in the charging voltage and to provide such command signals to the processor 60, which, upon receiving the command signals, restarts/resets the hearing aid. The controller 166 may be part of the processor 60, as a person skilled in the art will understand.

Of course, instead of using the setup of figure 9d, the setup of figure 9e can be used as a starting point for an alternative implementation.

Moreover, the concept of this embodiment can be used in any arbitrary hearing aid with a chargeable battery where the hearing aid needs to be restarted of reset.

Selling hearing aid glasses.

In a last aspect, the invention relates to a method of selling hearing aid glasses to clients. This method includes the following actions:

a) selecting by a client a selected hearing aid glasses frame from a set of hearing aid glasses frames;
b) providing said selected hearing aid glasses frame with lenses in accordance with a prescription relating to client's eyes deviations;
c) paying by the client of a fee that is substantially less than a total sales price of said hearing aid glasses;
d) after a trial period, checking whether the client is satisfied with the hearing aid glasses as bought, and:
    I. if so, debiting the total sales price less the fee to said client;
    II. if not, allowing the client to keep the glasses and disabling the hearing functionality of said hearing aid glasses or exchanging the temples that contain the electronics for normal temples, without returning said fee.

By using this method, potential clients are helped in deciding to try hearing aid glasses, which may cost a substantial amount of money. Clients only have to pay a fee during the trial period and are sure that they need not pay more should they be not

satisfied with the hearing aid glasses due to whatever reason. They will only have to pay the full amount of the sales price of the hearing aid glasses when they decide to keep the functionality of the hearing aid.

The fee may be below 20% of the total sales price.

The advantage for the user is that, through the payment of the fee, he/she will at least receive a pair of nice looking glasses with lenses in accordance with his/her eyes' prescriptions.

The advantage for the manufacturer is that by receiving the fee the costs for producing prescription glasses for a user's trial period are covered.

Claims

1. Connector assembly for connecting an earpiece (27) of a hearing aid to a glasses temple (13), the glasses temple (13) comprising hearing aid components, the connector assembly (31) comprising a first connector housing (34; 34') and a second connector housing (37; 37'), the first connector housing (34; 34') being designed to be attached to said earpiece (27) via an intermediate unit (29), the second connector housing (37; 37') being designed either to be attached to, or to be part of said glasses temple (13), the first and second connector housings (34, 37; 34', 37') being designed to engage one another by means of a disconnectable connection, wherein said second connector housing (37; 37') comprises a first contact member (35; 35') and a second contact member (36; 36'), said first connector housing (34; 34') comprises a third contact member (30; 30') and a fourth contact member (32; 32'), said first contact member (35; 35') and said third contact member (30; 30') being arranged to contact one another by magnetic force and to allow an electrical current to flow between said first and third contact member, said second contact member (36; 36') and said fourth contact member (32; 32') being arranged to contact one another by magnetic force and to allow an electrical current to flow between said second and fourth contact member.

2. Connector assembly according to claim 1, wherein at least one of said first and third contact member comprises a first magnetic component to provide a first magnetic contact force and a first metal component covering at least a portion of said first magnetic component.

3. Connector assembly according to claim 2, wherein at least one of said second and fourth contact member comprises a second magnetic component to provide a second magnetic contact force and a second metal component covering at least a portion of said second magnetic component.

4. Connector assembly according to claim 3, wherein said first contact member (35; 35') comprises a first metal member (39; 39'), said second contact member (36; 36') comprises a second metal member (38; 38'), said third contact member (30; 30') comprises a third metal member (52; 52'), said fourth contact member (32; 32')

comprises a fourth metal member (54; 54'), said first magnetic component being a permanent magnet (43; 48) forming part of at least one of said first and third contact member.

5. Connector assembly according to claim 2, wherein said first contact member (35; 35') comprises a first metal member (39; 39'), said second contact member (36; 36') comprises a second metal member (38; 38'), said third contact member (30; 30') comprises a third metal member (52; 52'), said fourth contact member (32; 32') comprises a fourth metal member (54; 54'), said first magnetic component being a permanent magnet (43; 48) forming part of at least one of said first and third contact member, and said second magnetic component being a further permanent magnet (41; 50) forming part of at least one of said second and fourth contact member.

6. Connector assembly according to claim 4 or 5, wherein said first metal member is a first metal plate (39), said second metal member is a second metal plate (38), said third metal member is a third metal plate (52), and said fourth metal member is a fourth metal plate (54), said first metal plate (39) having a first contact surface to contact a third contact surface of said third metal plate (52), said second metal plate (38) having a second contact surface to contact a fourth contact surface of said fourth metal plate (54).

7. Connector assembly according to claim 5, wherein said first metal member is a first metal box (39') accommodating a first permanent magnet (43), said second metal member is a second metal box (38') accommodating a second permanent magnet (41), said third metal member is a third metal box (52') accommodating a third permanent magnet (48), and said fourth metal member is a fourth metal box (54') accommodating a fourth permanent magnet (50).

8. Connector assembly according to claim 7, wherein said first metal box (39') has a first cavity accommodating said first permanent magnet (43), said second metal box (38') has a second cavity accommodating said second permanent magnet (41), said third metal box (52') has a third cavity accommodating said third permanent magnet (48), said fourth metal box (54') has a fourth cavity accommodating said fourth

permanent magnet (50), said first metal box (39') being arranged to cover said first permanent magnet (43) completely apart from one side in use facing said third permanent magnet (48), said second metal box (38') being arranged to cover said second permanent magnet (41) completely apart from one side in use facing said fourth permanent magnet (50), said third metal box (52') being arranged to cover said third permanent magnet (48) completely apart from one side in use facing said first permanent magnet (43), said fourth metal box (54') being arranged to cover said fourth permanent magnet (50) completely apart from one side in use facing said second permanent magnet (41).

9. Connector assembly according to claim 5, wherein said permanent magnet (43; 48) comprises a metal coating forming a metal member, and said further permanent magnet (41; 50) comprises a further metal coating forming a further metal member.

10. Connector according to claim 9, wherein said metal coating comprises gold, and said further metal coating comprises gold.

11. Connector according to claim 1, wherein said first contact member (35; 35') and said third contact member (30; 30') are arranged to comprise at least one permanent magnet with an electrically conductive wire connected to it, and said second contact member (36; 36') and said fourth contact member (32; 32') are arranged to comprise at least one further permanent magnet with a further electrically conductive wire connected to it.

12. Connector assembly according to any of the claims 1-11, wherein said third and fourth contact members (30, 32; 30', 32') are attached to wires (64, 66) extending in said intermediate unit (29) for transporting input signals to a speaker in said earpiece (27).

13. Connector assembly according to any of the claim 1-11, wherein said third and fourth contact members (30, 32; 30', 32') are connected to a speaker (33) within said first connector housing (34; 34'), said speaker (33) being arranged to produce sound to be transported to said earpiece via said intermediate unit (29).

14. Connector assembly according to claim 13, wherein said speaker (33) is resiliently connected to said first connector housing (34') by means of two resilient sleeves (68, 82) at opposite sides of said speaker (33).

15. Connector assembly according to any of the claims 1-14, wherein said third and fourth contact members (30, 32; 30', 32') within said first connector housing (34') are connected to a printed circuit board (56).

16. Connector assembly according to any of the claims 1-15, wherein said intermediate unit (29) is made of a material that can be custom formed.

17. Hearing aid arrangement comprising a first connector housing (34; 34') that can be engaged via a disconnectable connection with a second connector housing (37; 37') which is arranged on a glasses temple (13), the hearing aid arrangement also comprising an intermediate unit (29) having one end attached to the first connector housing (34; 34') and an earpiece (27) that is connected to an other end of the intermediate unit (29), wherein the first connector housing (34; 34') comprises a third contact member (30; 30') designed to contact a first contact member (35; 35') in the second connector housing (37; 37') by magnetic force and to allow an electrical current to flow between said first and third contact member, and the first connector housing (34; 34') comprises a fourth contact member (32; 32') designed to contact a second contact member (36; 36') in the second connector housing (37; 37') by magnetic force and to allow an electrical current to flow between said second and fourth contact member.

18. Glasses temple of a pair of glasses, comprising hearing aid components, the glasses temple comprising a second connector housing (37; 37') arranged to be attached to a first connector housing (34; 34') of a hearing aid arrangement according to claim 17, wherein the second connector housing (37; 37') comprises a first contact member (35; 35') designed to contact a third contact member (30; 30') in the first connector housing (34; 34') by magnetic force and to allow an electrical current to flow between said first and third contact member, and the second connector housing (37;

37') comprises a second contact member (36; 36') designed to contact a fourth contact member (32; 32') in the first connector housing (34; 34') by magnetic force and to allow an electrical current to flow between said second and fourth contact member.

19. Glasses temple according to claim 18, wherein said temple is arranged to accommodate a rechargeable battery (70), comprises contact pads (26, 28; 26', 28') arranged to contact said rechargeable battery (70) to supply said rechargeable battery (70) with recharge power, and separate recharge contacts accommodated in said second connector housing (37; 37') connected to said contact pads (26, 28; 26', 28') and arranged to receive said recharge power from an external recharger.

20. Glasses temple according to claim 18 or 19, wherein said glasses temple (13) comprises a hole accommodating said second connector housing such that said second connector housing (37') lies below a surface of said glasses temple (13).

21. Hearing aid glasses with a glasses temple according to claim 20.

22. Hearing aid assembly comprising a hearing aid arrangement according to claim 17 and hearing aid glasses according to claim 21.

23. A connector housing (34') designed to be attached to an earpiece (27) via an intermediate unit (29) and to engage a further connector housing (37'), the connector housing (34') accommodating a speaker (33) that is arranged to produce sound to be transported to said earpiece (27) via said intermediate unit (29), wherein said speaker (33) is resiliently connected to said first connector housing (34') by means of two resilient sleeves (68, 82) at opposite sides of said speaker (33).

24. A cradle set comprising a transformer (10) arranged to receive electrical power from a mains and transform said electrical power to battery charging power to charge a first chargeable battery and a cradle housing (11) comprising at least a first opening (6), the first opening (6) comprising a first electrical contact (3) and a second electrical contact (5), the first opening (6) being shaped to receive a rear side portion of a first

glasses temple (13) and the first and second electrical contacts (3, 5) being designed to contact electrical contacts on said rear side portion of said first glasses temple (13) in order to provide said battery charging power to said first glasses temple (13).

25. The cradle set according to claim 24, wherein said first opening (6) comprises a clamp (20) designed to resiliently clamp said rear side portion of said first glasses temple (13).

26. The cradle set according to claim 25, wherein said clamp (20) is shaped like a circle arc portion and first and second electrical contacts (3, 5) are located on said clamp (20).

27. The cradle set according to claim 25, wherein said clamp (20) is separate from said first and second electrical contacts (3, 5), and at least one of said first and second electrical contacts (3, 5) is resilient.

28. The cradle set according to any of the claims 25, 26, wherein said clamp (20) is arranged to receive said rear side portion of said first glasses temple (13) under different angles.

29. The cradle set according to any of the claims 24-28, wherein the cradle housing (11) comprises a cradle processor (16) arranged to communicate with other communication devices.

30. The cradle set according to any of the claims 24-29, wherein the cradle housing (11) comprises a transceiver (18) arranged to receive and transmit data.

31. The cradle set according to any of the claims 24-30, wherein the cradle set comprises at least one light (12, 14) in or near to the first opening (6).

32. The cradle set according to claim 31, wherein the at least one light (12, 14) comprises one or more light emitting diodes.

33. The cradle set according to claim 31 or 32, wherein the at least one light (12, 14) is connected to a processor arrangement (16) that is arranged to indicate different operation states of the cradle set via said at least one light, e.g., by different light colors or by different light patterns.

34. The cradle set according to any of the claims 24-33, wherein said cradle housing (11) comprises a second opening (8) comprising a third electrical contact (7) and a fourth electrical contact (9), the second opening (8) being shaped to receive a rear side portion of a second glasses temple and the third and fourth electrical contacts (7, 9) being designed to contact electrical contacts on said rear side portion of said second glasses temple in order to provide battery charging power to a second chargeable battery in said second glasses temple.

35. An hearing aid arrangement comprising a cradle set and hearing aid glasses, the hearing aid glasses being arranged to accommodate at least one rechargeable battery and electrical contacts allowing to receive battery charging power in order to recharge said rechargeable battery, the cradle set being designed to contact said electrical contacts and to provide battery charging power.

36. An hearing aid arrangement according to claim 35, comprising a cradle set according to any of the claims 24-34, the hearing aid glasses comprising at least one glasses temple (13) comprising a rear side portion with electrical contacts for receiving said battery charging power from said cradle set.

37. An hearing aid arrangement comprising a glasses temple (13) comprising hearing aid components, the hearing aid arrangement being designed to accommodate a rechargeable battery (70) to provide said hearing aid components with a supply voltage, said hearing aid components comprising a processor (60), the hearing aid arrangement further comprising contact pads (26, 28) to provide a charging voltage to said rechargeable battery (70) and contact members (35, 36), said contact members (35, 36) being both connectable to an output of said processor (60) and to said contact pads (26, 28), such that said contact members (35, 36) allow both said processor (60) to send

output signals for a loudspeaker via said contact members (35, 36) and allow an external charging unit to supply a charging voltage to said chargeable battery (70) via said contact members (35, 36).

38. An hearing aid arrangement according to claim 37, wherein at least one first diode (168) is located between said output of said processor (60) and said contact members (35, 36) to prevent said charging voltage from reaching said output of said processor (60).

39. An hearing aid arrangement according to claim 37 or 38, wherein at least one second diode (172; 170) is located between said contact pads (26, 28) and said contact members (35, 36), the at least one second diode (172; 170) being arranged to prevent said supply voltage of said battery (70) from reaching said contact members (35, 37) when said processor (60) sends said output signals for said loudspeaker via said contact members (35, 36).

40. An hearing aid according to claim 37, wherein the hearing aid arrangement comprises at least one switch (141; 143) arranged to connect said contact members (35, 36) either to said output of said processor (60) or to said contact pads (26, 28).

41. An hearing aid arrangement according to any of the claims 37 to 40, wherein the hearing aid arrangement comprises a pair of glasses comprising said temple (13).

42. An hearing aid arrangement according to any of the claims 37 to 41, comprising said external charging unit too.

43. An hearing aid arrangement according to claim 42, said external charging unit comprising at least one arm (130; 132) provided with a connector (142; 148) with charging contact members (156, 158; 152, 154) arranged to contact said contact members (35, 36).

44. An hearing aid arrangement according to claim 43, said external charging unit comprising a support block (134) and a guiding mechanism (136) arranged to receive a glasses nose bridge (135) and being movably arranged on said support block (134).

45. An hearing aid arrangement according to claim 43 or 44, wherein said at least one arm (130; 132) is at least partly made of a flexible material.

46. An hearing aid arrangement according to claim 42, wherein said temple comprises a notch (162), said external charging unit comprising a connector (142; 148) with charging contact members (156, 158; 152, 154) arranged to contact said contact members (35, 36), a support base (160) provided with an alignment unit (164) arranged to align said charging contact members (156, 158; 152, 154) with said contact members (35, 36) in co-operation with said notch (162).

47. An hearing aid arrangement according to claim 40, said at least one switch (141, 143) being magnetically operable, the hearing aid arrangement comprising said external charging unit that comprises a magnet (144; 150) to operate said at least one switch (141, 143).

48. A glasses temple (13) comprising a printed circuit board (59) with electrical components (60; 61; 65; 67), a temple housing (73) and a metal plate (51), the temple housing (73) accommodating both said printed circuit board (59) and said metal plate (51), said metal plate (51) being arranged to protect said printed circuit board (59) with electrical components (60; 61; 65; 67).

49. The glasses temple according to claim 48, wherein said metal plate (51) comprises a narrowed portion (55) at a rear side of said glasses temple (13) that can be bent behind an ear of a user.

50. The glasses temple according to claim 48, wherein said electrical components (60; 61; 65; 67) are hearing aid components.

51. The glasses temple according to claim 50, wherein said temple housing (73) comprises a first hole (69) and said hearing aid components comprise at least one microphone (61) with an extension (63) with an opening to receive sound, said temple housing (73) and printed circuit board (59) being designed such that said extension (63) can be put into said first hole (69) by a tilting movement.

52. The glasses temple according to any of the claims 48-51, wherein said temple housing (73) comprises a hole (69) and said electrical components comprise at least one switch (65) with a button (83) to be operated by a user, wherein said printed circuit board (59) comprises a first notch (81) to provide space within said temple housing (73) to accommodate said at least one switch (65).

53. The glasses temple according to any of the claims 48-52, wherein said printed circuit board (59) comprises a processor arrangement (60).

54. The glasses temple according to claim 53, wherein said printed circuit board (59) is provided with a socket (67) connected to said processor arrangement (60).

55. The glasses temple according to claim 54, wherein said printed circuit board (59) comprises a second notch (81) to provide space within said temple housing (73) to accommodate said at least one socket (67).

56. The glasses temple according to any of the claims 48-55, wherein said glasses temple (13) comprises a connector housing (37) to be connected by means of a magnetic force to a further connector housing (34) that is connected to a hearing aid earpiece (27).

57. The glasses temple according to claim 56, wherein said metal plate (51) comprises a hole (53) to accommodate said connector housing (37).

59. The glasses temple according to any of the claims 48-57, wherein said temple housing (73) comprises a space for accommodating a battery which space can be

covered by a cover (15) with the cover positioned at a side of the temple facing a head of a user in use.

59. The glasses temple according to any of the claims 48-58, wherein said temple housing (73) has a circularly shaped rear side portion with two electrical contacts (19, 21) to receive electrical power to charge a battery for the electrical components.

60. Glasses comprising at least one glasses temple according to any of the claims 48-59.

61. Method of updating a hearing aid, comprising:

a) providing a computer with a computer processor (101) arranged to communicate with other telecommunication devices and storing a computer version of a hearing aid application program;

b) providing hearing aid glasses with a hearing aid processor (60) arranged to communicate with other telecommunication devices and storing a hearing aid glasses version of said hearing aid application program;

c) setting up a communication between said computer processor (101) and said hearing aid processor (60);

d) checking whether said hearing aid glasses version is a more recent version than said computer version of said hearing aid application program;

e) if said hearing aid glasses version is more recent than said computer version, transferring said hearing aid glasses version to said computer and to store said transferred hearing aid glasses version in said computer as an updated computer version;

f) if said computer version is more recent than said hearing aid glasses version, transferring said computer version to said hearing aid processor (60) and to store said computer version in said hearing aid processor (60) as updated hearing aid glasses version.

62. Method according to claim 61, wherein said action c) comprises setting up said communication between said computer processor (101) and said hearing aid processor (60) via an intermediate processor.

63. Method according to claim 62, wherein said intermediate processor is part of one of a mobile telephone (85), a personal digital assistant (87), and a cradle (1) arranged to charge a battery of said hearing aid.

64. Method according to any of the claims 61-63, wherein said computer is arranged to download said computer version via a telecommunication network (127).

65. A communication assembly comprising a computer and hearing aid glasses, arranged to perform together the method as claimed in any of the claims 59-62.

66. Method of giving a command signal to a hearing aid arrangement comprising a rechargeable battery (70), the method comprising:

- providing a charging voltage to said rechargeable battery (70);
- deriving from said charging voltage a command signal;

67. Method according to claim 66, wherein said command signal is at least one of a restart and reset command, and said method comprises:

- using said command signal to perform at least one of restarting and resetting said hearing aid arrangement.

68. Method according to any of the claims 66 and 67, wherein the charging voltage consists of at least one pattern of different voltages in time, each pattern signifying a different command.

69. Hearing aid arrangement comprising a processor (60) and arranged to accommodate a rechargeable battery (70) for providing a supply voltage to said processor (60), the hearing aid arrangement also comprising contact pads (26, 28) arranged to contact said rechargeable battery (70) and to receive a charging voltage for said rechargeable battery (70), said hearing aid arrangement comprising a controller

(166) arranged to receive said charging voltage and derive a command signal from said charging voltage and to supply said command signal to said processor (60).

70. Hearing aid arrangement according to claim 69, said processor (60) being arranged to at least one of restart and reset upon receipt of said command signal.

71. Hearing aid arrangement according to claim 69 or 70, wherein the charging voltage consists of at least one pattern of different voltages in time, each pattern signifying a different command.

72. Method of selling hearing aid glasses to clients, comprising:

a) selecting by a client a hearing aid glasses frame from a set of hearing aid glasses frames;

b) providing said hearing aid glasses frame with lenses in accordance with a prescription relating to client's eyes deviations;

c) paying by the client of a fee that is substantially less than a total sales price of said hearing aid glasses;

d) after a trial period, checking whether the client is satisfied with the hearing aid glasses as bought, and:

- if so, debiting the total sales price less the fee from said client;
- if not, allowing the client to keep the glasses and disabling hearing functionality of said hearing aid glasses or exchanging electronics containing temples of said glasses for normal temples, without returning said fee.

73. The method according to claim 72, wherein said fee is below 20% of said total sales price.

*****

Fig 1

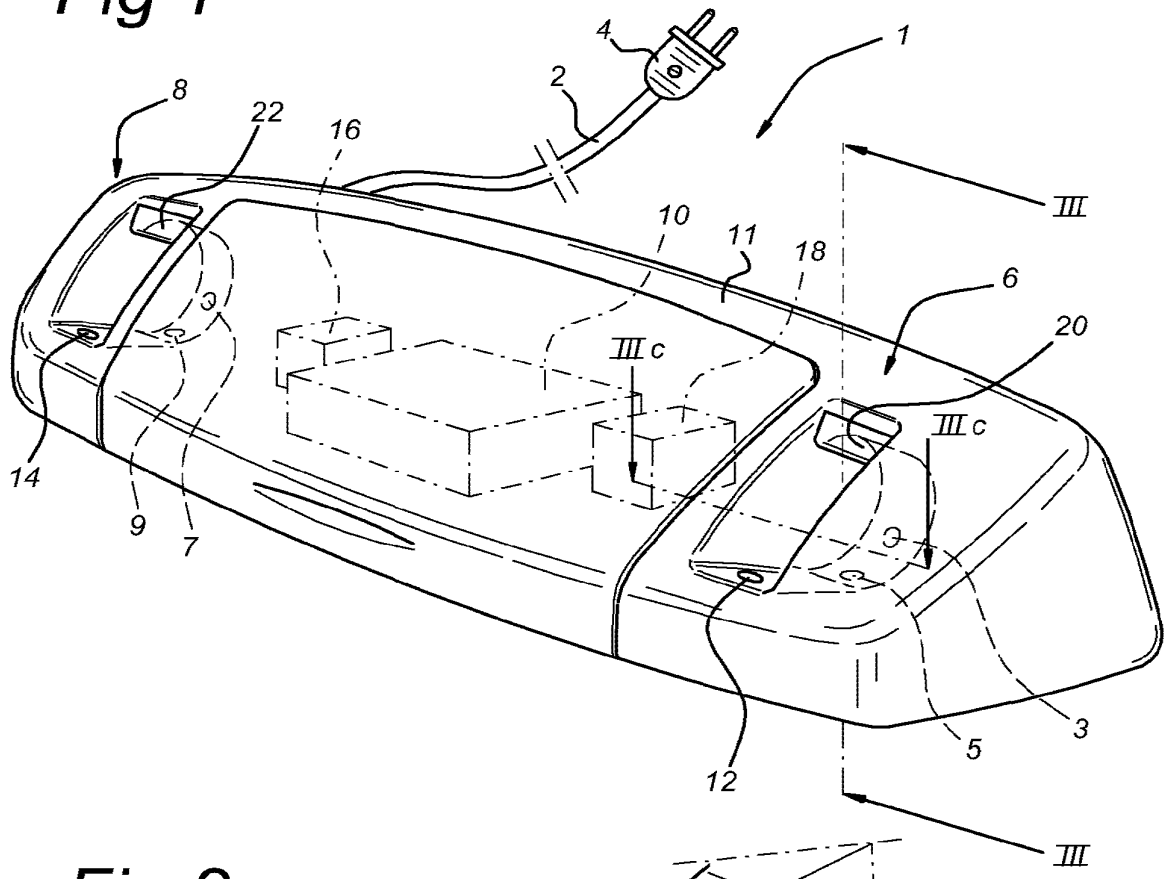


Fig 2a

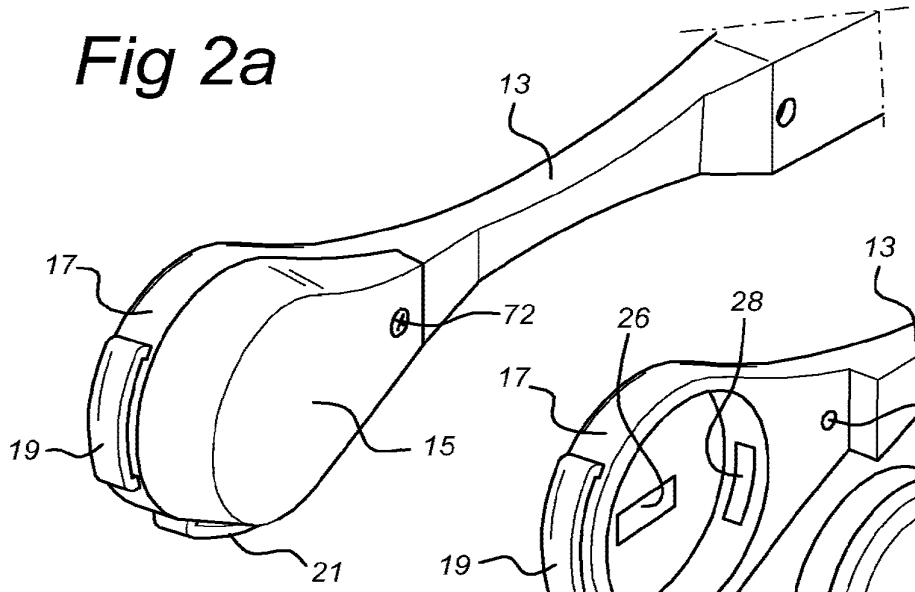


Fig 2b

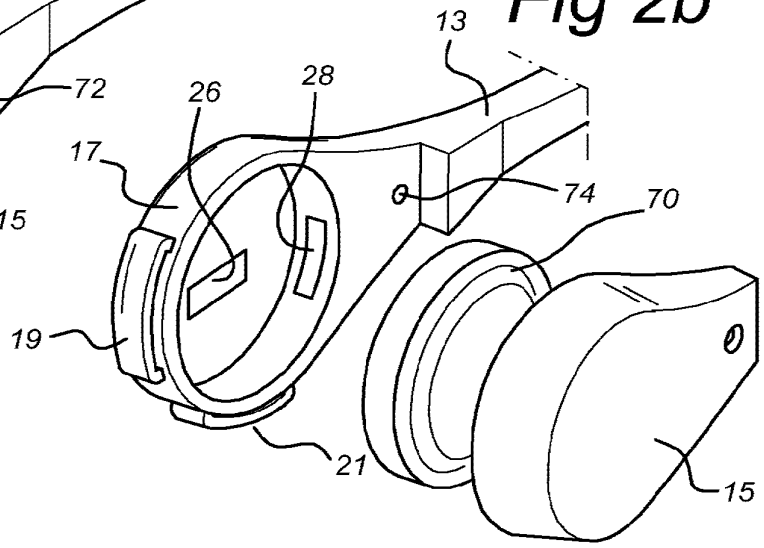


Fig 2c

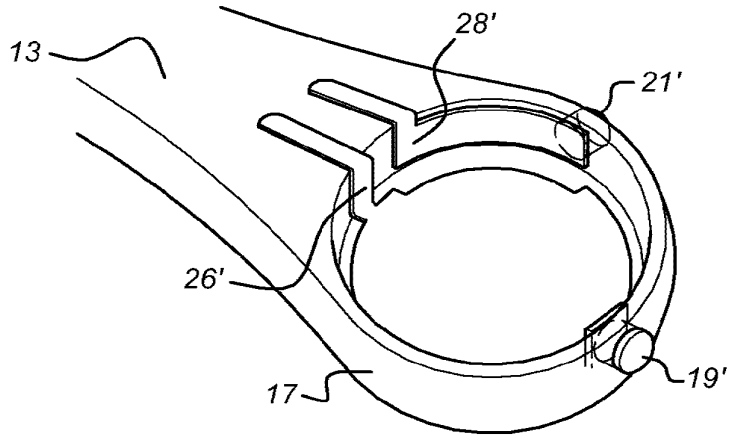


Fig 2d

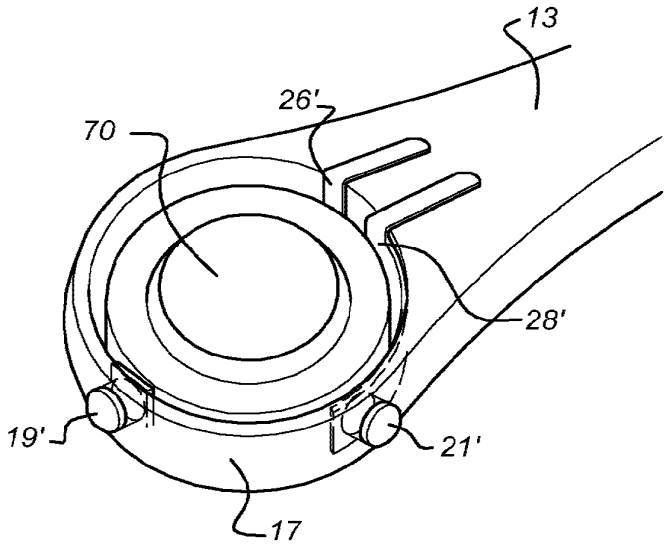


Fig 2e

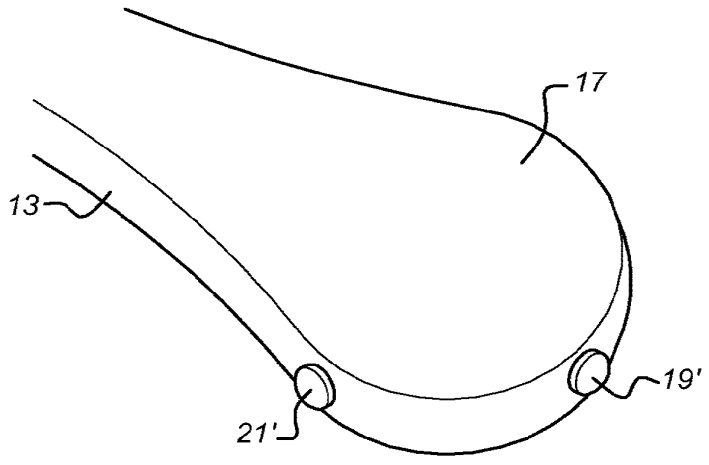


Fig 3a

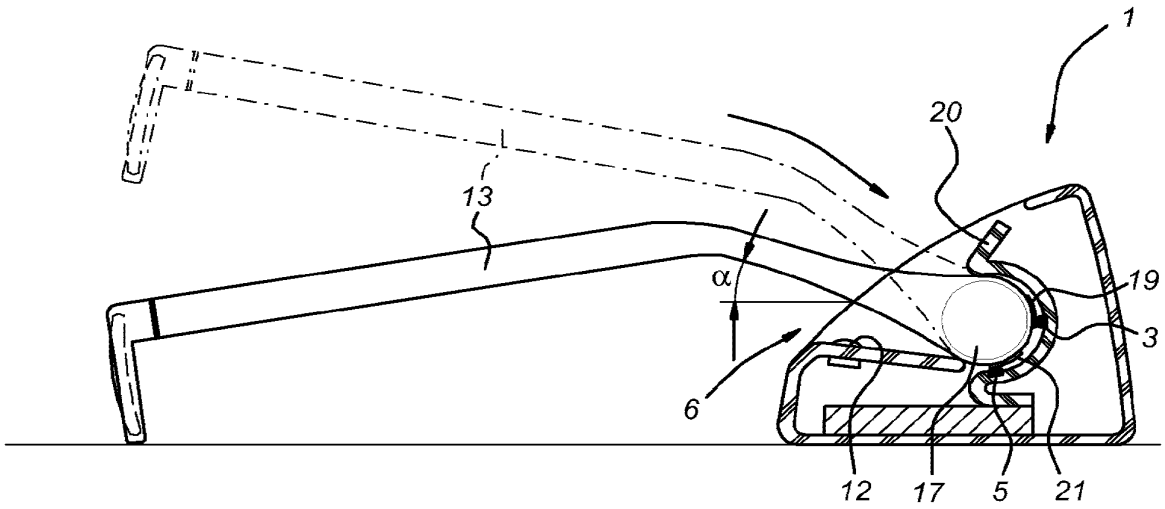


Fig 3b

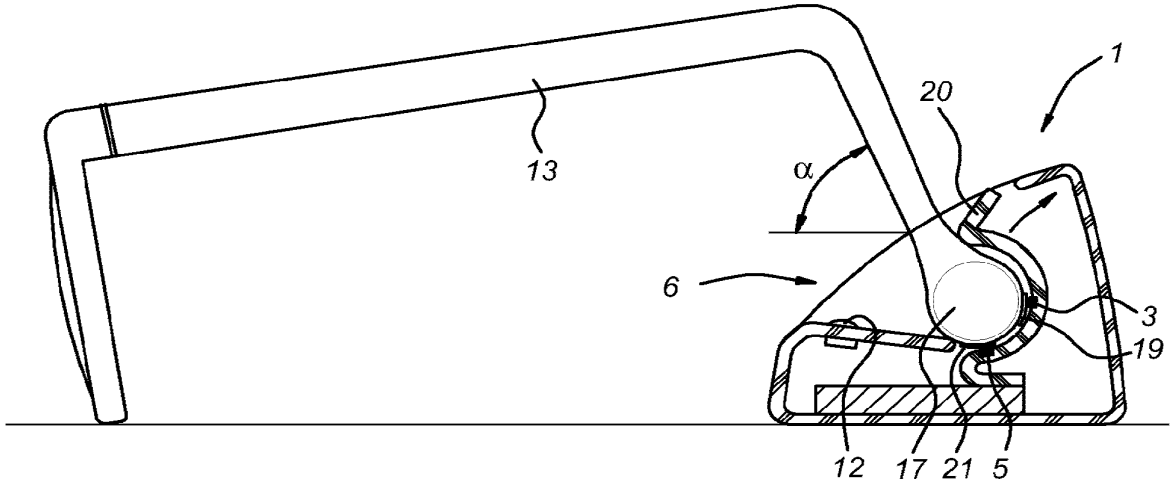


Fig 3c

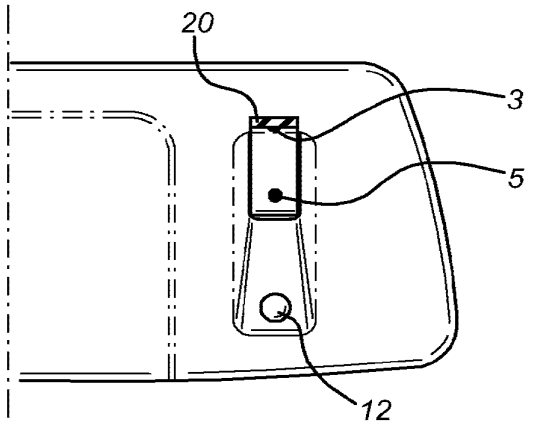


Fig 3d

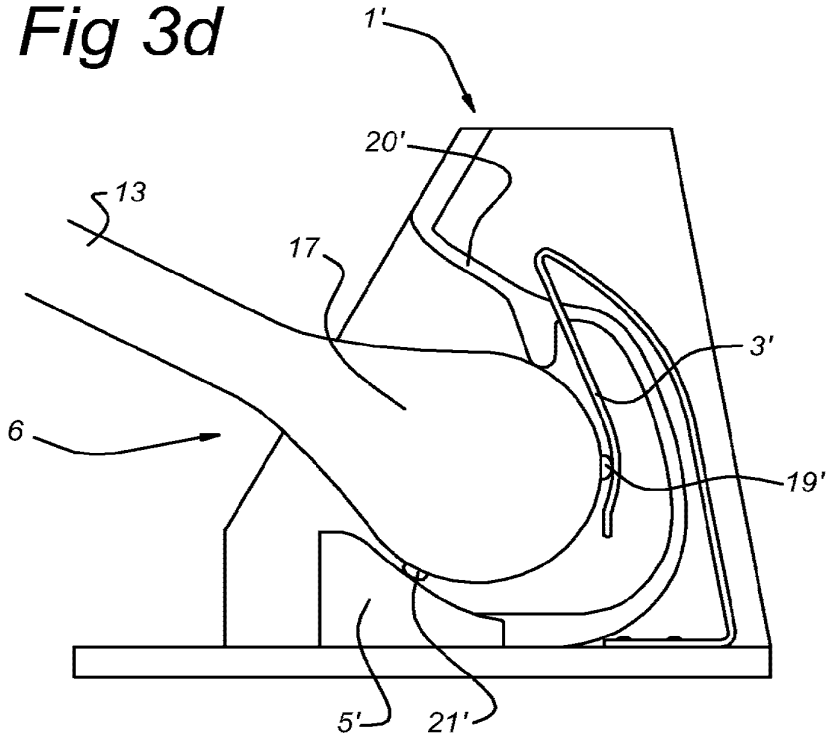


Fig 4a

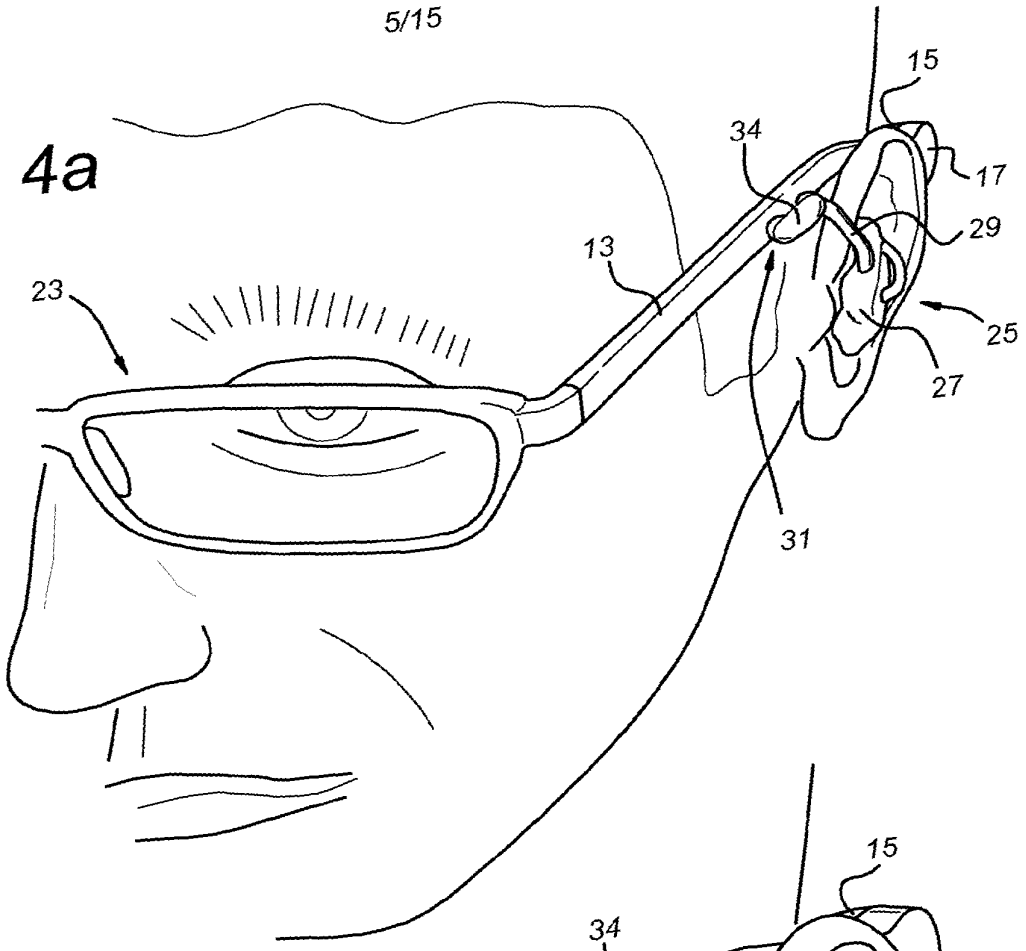


Fig 4b

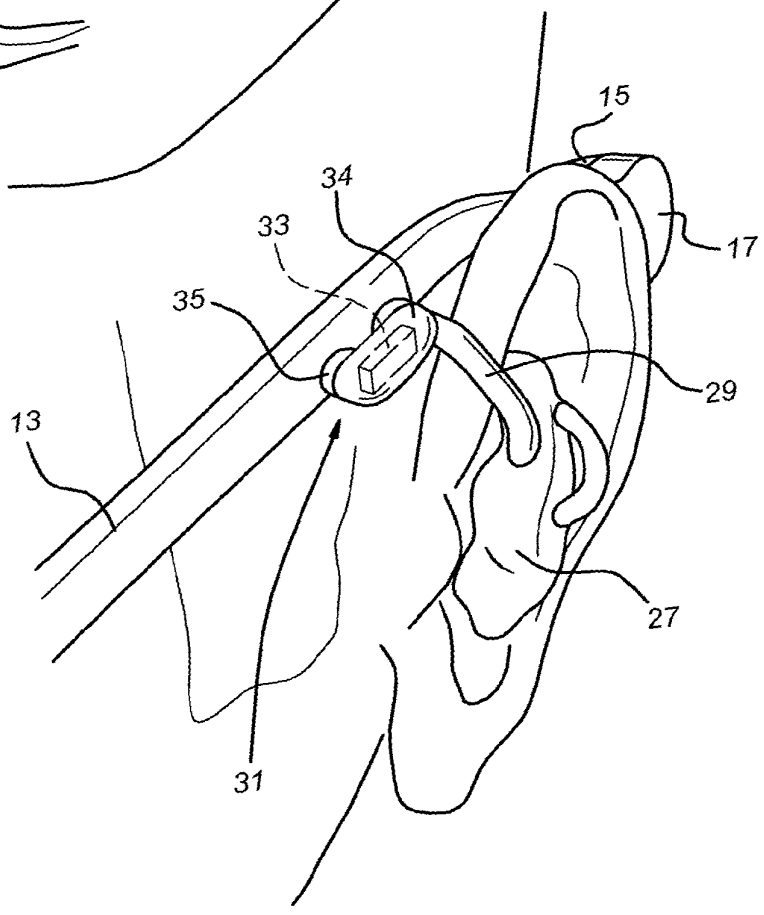


Fig 4c

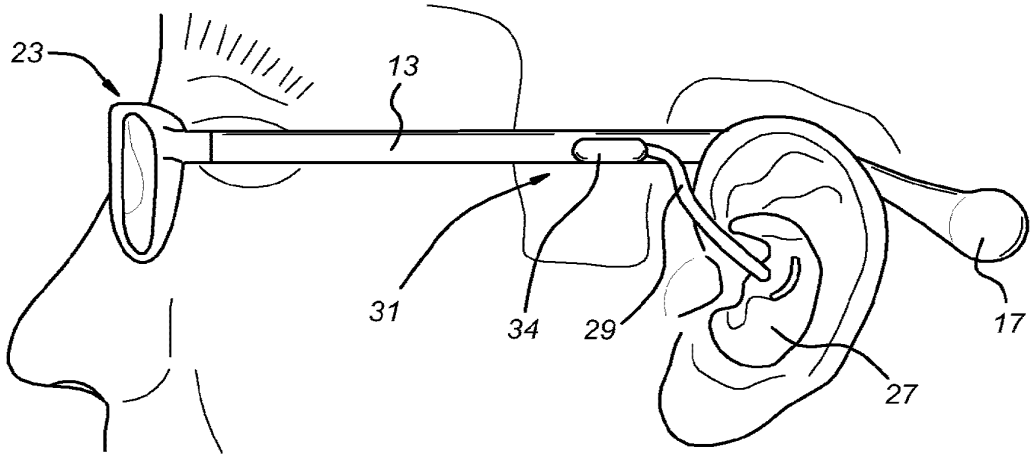


Fig 4d

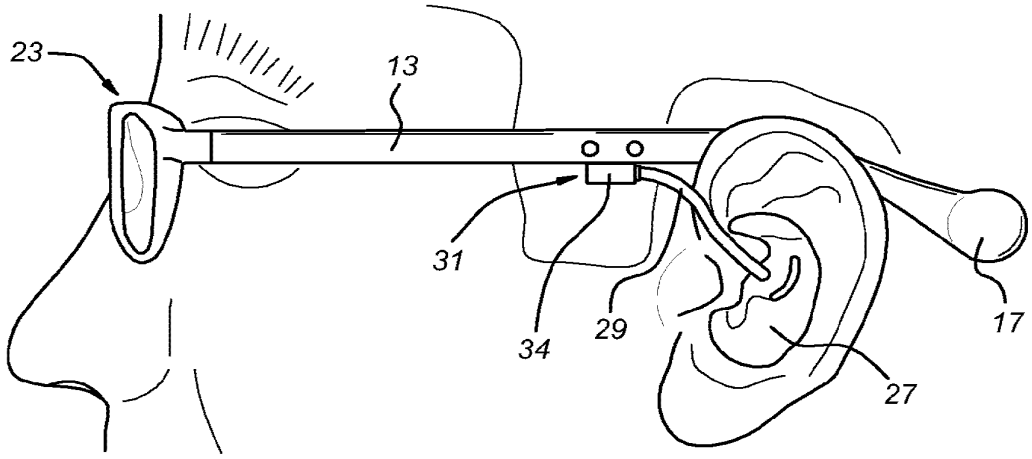


Fig 4e

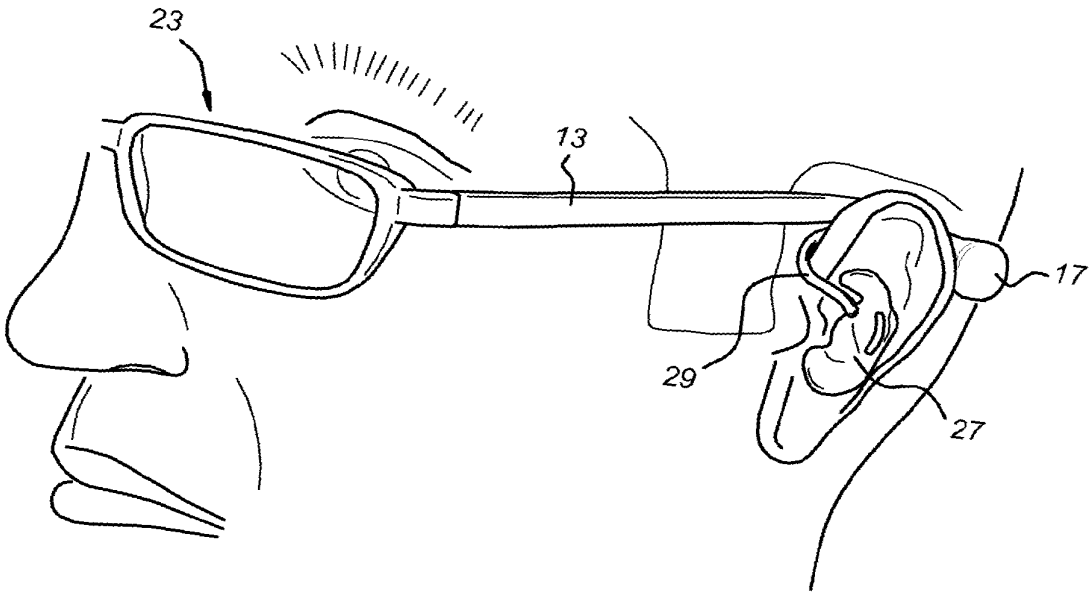


Fig 4f

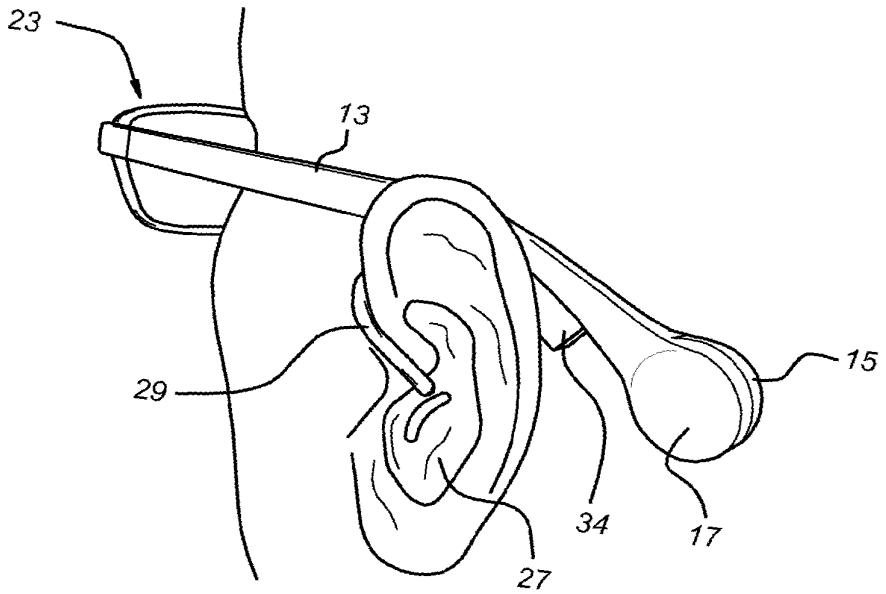


Fig 5

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Fig 6a

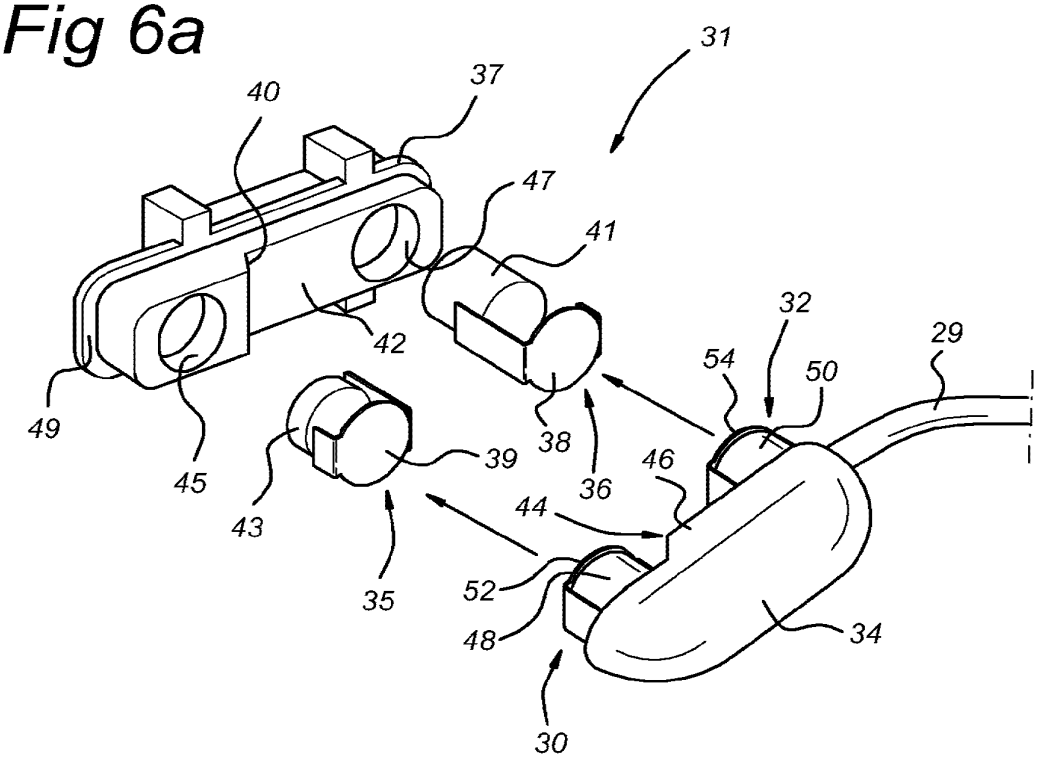

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Fig 6b

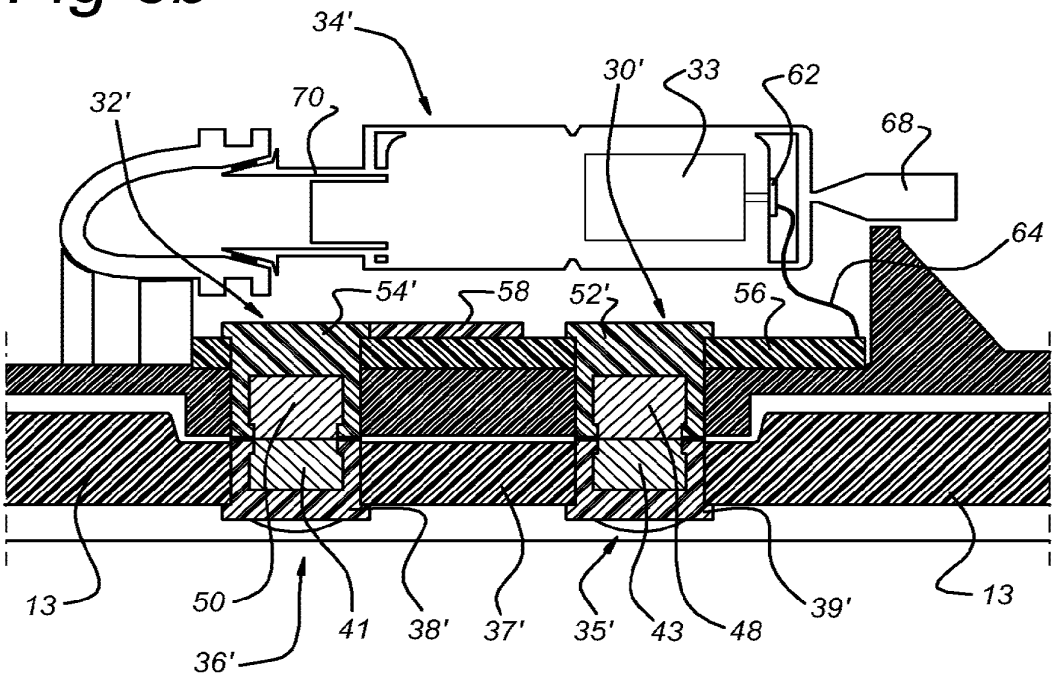

34'
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32'
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Fig 6c

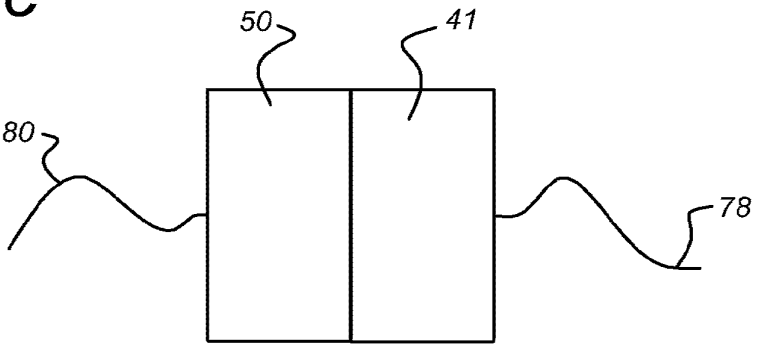


Fig 6d

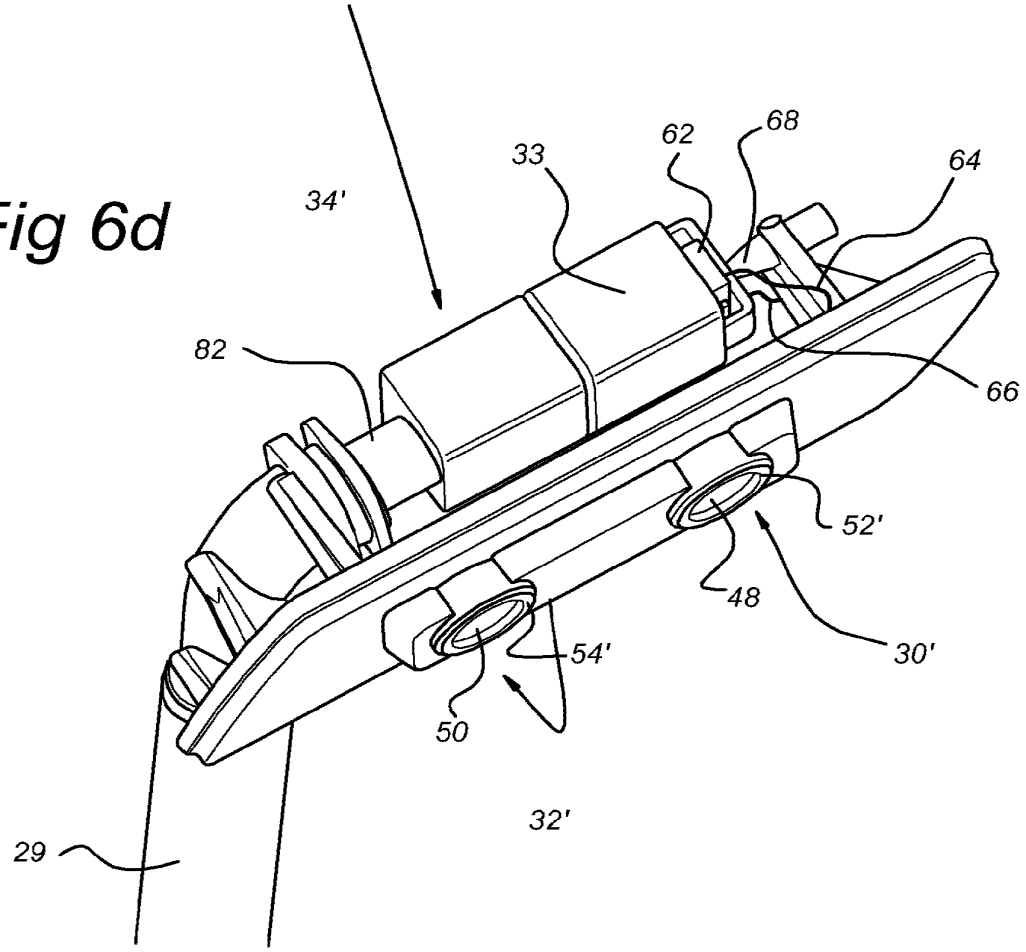


Fig 7

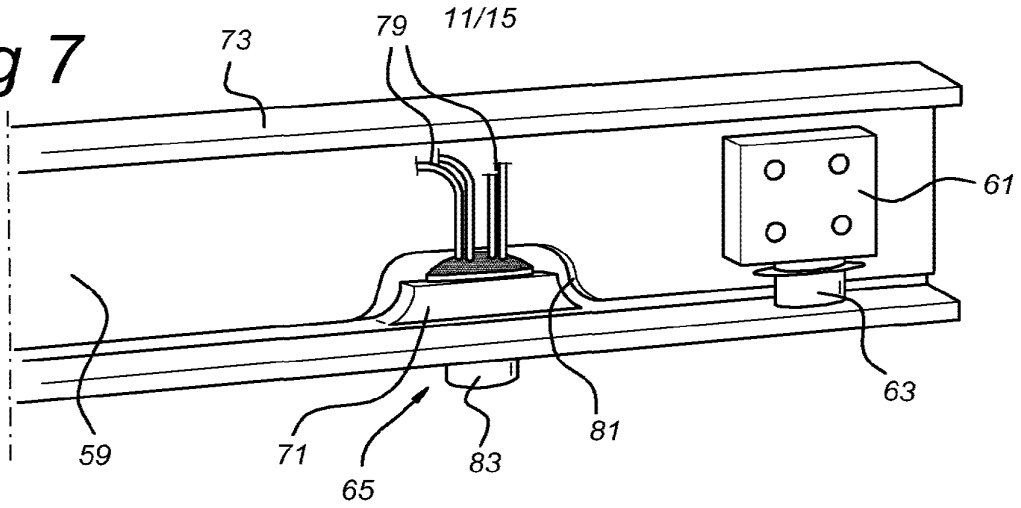

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11/15
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Fig 8

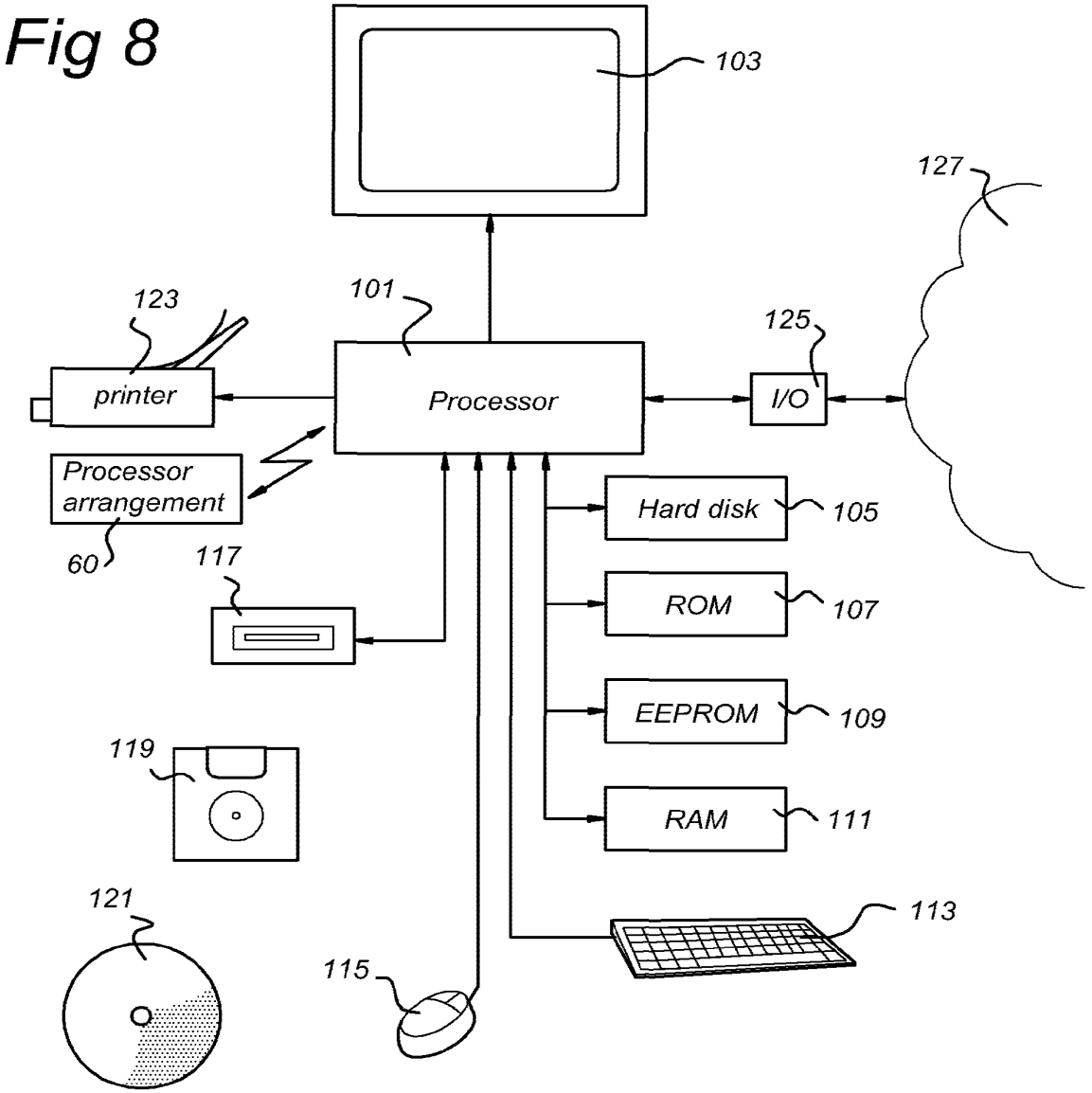

103
127
123
101
125
printer
Processor
I/O
Processor arrangement
60
117
Hard disk
105
ROM
107
EEPROM
109
RAM
111
119
121
113
115

Fig 9a

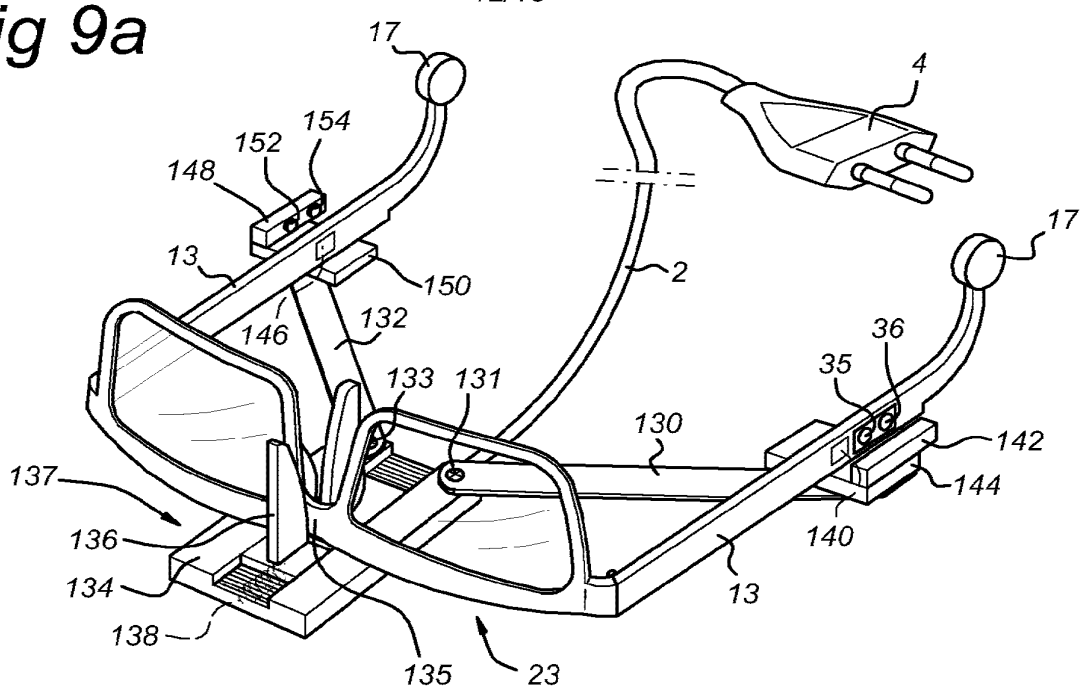


Fig 9b

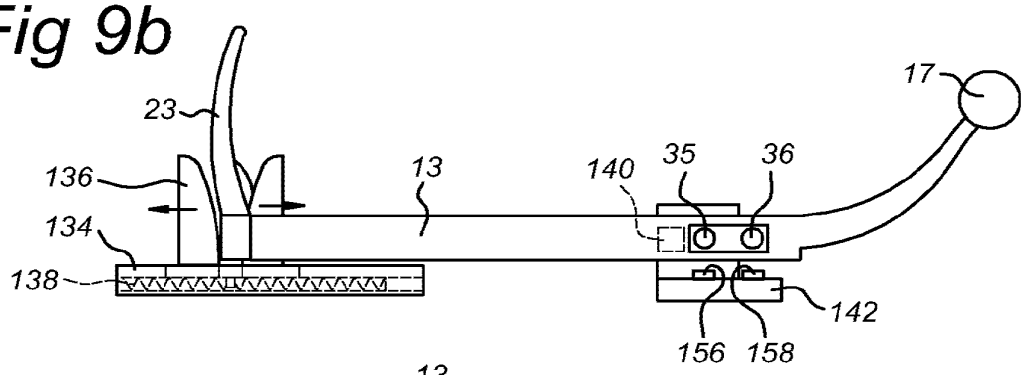


Fig 9c

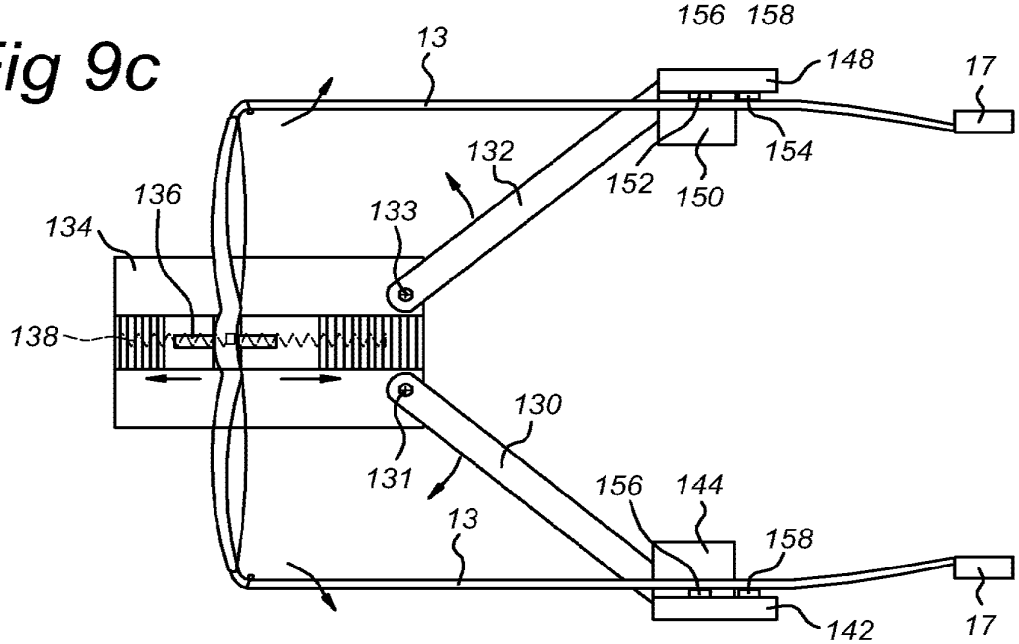


Fig 9d

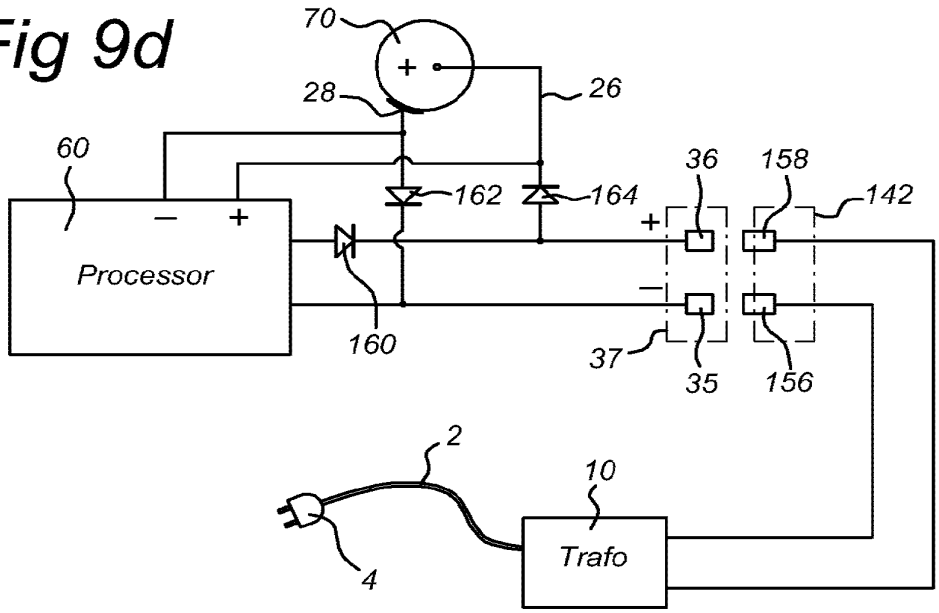

70
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Processor
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Trafo
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Fig 9e

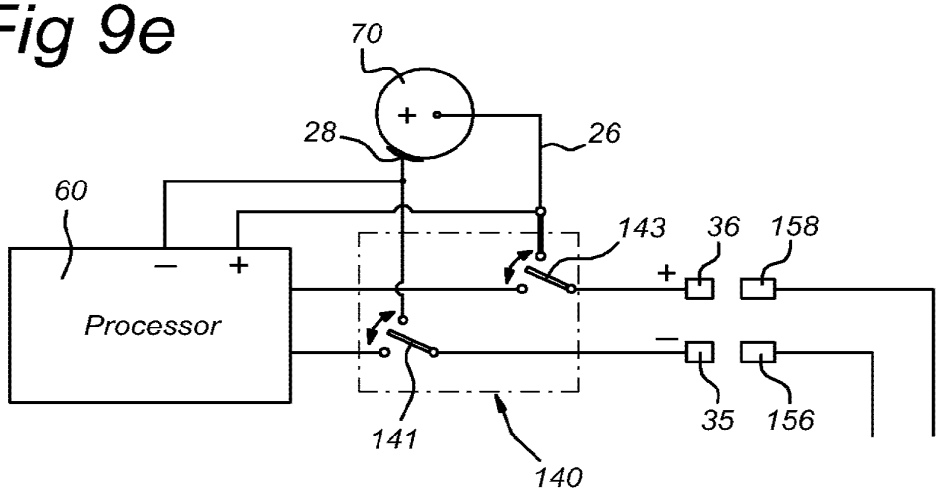

70
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Processor
141
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Fig 9f

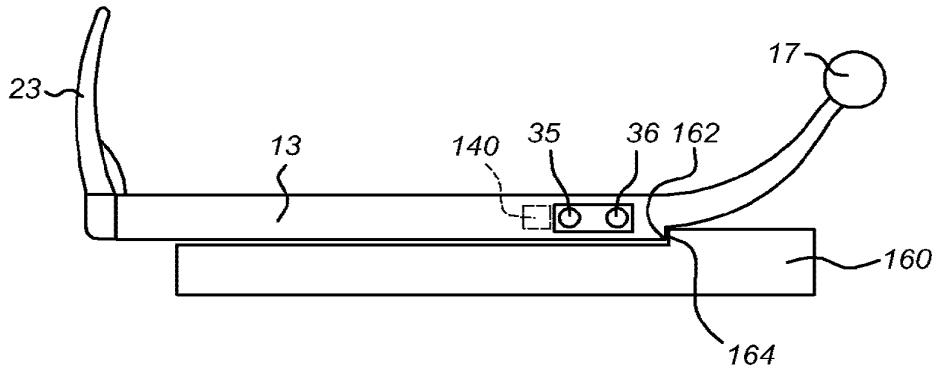

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140
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164

Fig 9g

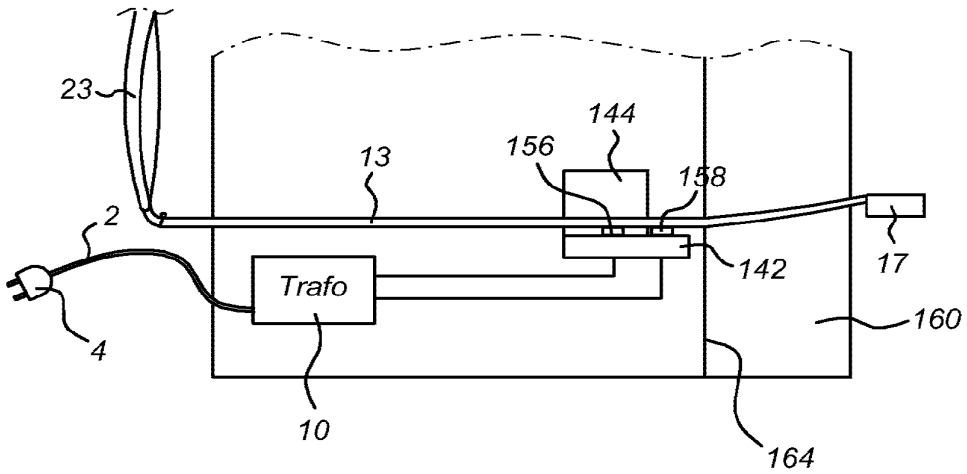
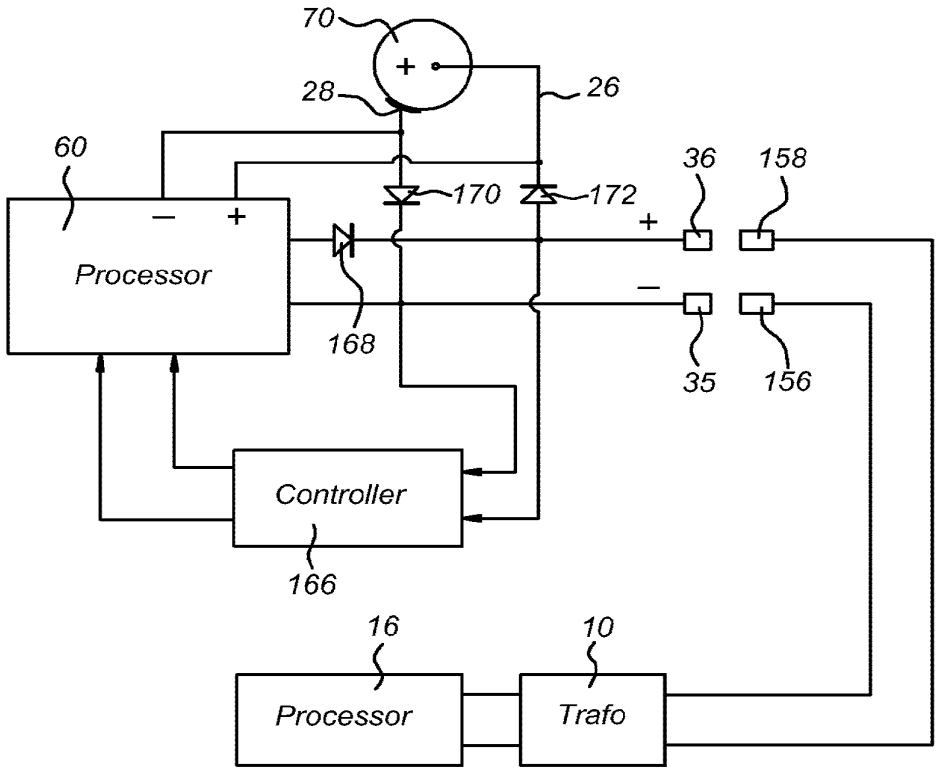

23
13
144
156
158
2
142
17
Trafo
160
4
10
164

Fig 10


70
+
28
26
60
36
158
170
172
+
–
+
Processor
168
–
35
156
Controller
166
16
10
Processor
Trafo

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(71) Applicant *(for all designated States except US)*: **PIXELOPTICS, INC.** [US/US]; 2840 Hershberger Road, Suite B, Roanoke, VA 24017 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **KOKONASKI, William** [US/US]; 1807 44th Street Court, NW, Gig Harbor, WA 98335 (US). **BOCHNOWSKI, James, J.** [US/US]; 28 Camino Por Los Arboles, Atherton, CA 94027 (US). **BLUM, Ronald, D.** [US/US]; 5320 Silver Fox Road, Roanoke, VA 24018 (US). **HADDOCK, Joshua, N.** [US/US]; 17 Church Avenue SW, Apt 202, Roanoke, VA 24011 (US).

(74) Agent: **SCHAFFER, Robert, D.**; Pearl Cohen Zedek Latzer, LLP, 1500 Broadway, 12th Floor, New York, NY 10036 (US).

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(54) Title: LOW BATTERY INDICATOR FOR ELECTRO-ACTIVE SPECTACLES

(57) Abstract: A low power indicator for electro-active spectacle lenses is presented in which the low power indicator is a part of a controller for the electro-active spectacle lenses or is operably connected to the controller. The low power indicator may generate a signal when the power of the power source for the electro-active spectacle lenses is low. The signal may be used by the controller or other circuitry to activate an indication to a user of the lenses that the power is low. Such an indication may be periodically activating and deactivating one of an optical power of the electro-active lenses, a vibration source, a visible light source, or an audible sound source.

Low Battery Indicator for Electro-Active Spectacles

Inventors: William Kokonaski, Jim Bochnowski, Ronald D. Blum, and Joshua N. Haddock

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims priority from and incorporates by reference in its entirety provisional application U.S. Serial No. 60/853,470 filed on 23 October 2006 and entitled "Low Battery Indicator for Electro-Active Spectacles".

BACKGROUND OF THE INVENTION

Field of the Invention

[002] The present invention relates to indicating to a user a low power condition of a power source. More specifically, the present invention relates to indicating to a user a low power condition of a power source which powers the user's electro-active spectacles so that the user may have advance notice that the power source needs to be recharged or replaced if the user is to continue enjoying the benefits of the electro-active spectacle lenses.

Description of the Related Art

[003] Many patents have been granted relating to a variety of electro-active spectacle lenses which are powered by a power source. However, these patents are absent any teaching of a device or method which may be used to alert the user of the electro-active spectacle lenses that the power source is in a low power condition. For example in United States Patent Number 7,009,757 Nishioka, et al., discusses a variety of features of electro-active spectacles for correcting vision, but does not discuss the need for a low power indicator. In United States Patent Number 5,359,444 Piosenka, et al., discusses a pair of electro-active spectacles controlled by a rangefinder but fails to discuss the need for a low power indicator. Various other patents published before these cited references also fail to discuss the need for an indicator that will allow a user to know that the power source of the user's electro-active spectacles is in a low power state.

[004] One application of electro-active lenses for spectacle wearers includes the correction of presbyopia. In such applications, the electro-active lenses typically provide the wearer's required near distance vision power, while the wearer's required far distance vision correction is

provided by a conventional, non-electro-active optical correction. In such applications it is advantageous for the wearer to have advanced notice that the power source of the electro-active spectacles is running low, so as to avoid a situation where the wearer is suddenly no longer able to read or view objects up close when the power source is no longer able to power the lenses.

[005] Therefore, there is a need for a variety of techniques for alerting the user of electro-active spectacle lenses that the power source powering the electro-active spectacle lenses is reaching a point where either the power source need to be recharged or replaced.

SUMMARY OF THE INVENTION

[006] In an embodiment of the invention, spectacles housing an electro-active lens may include a power source. The spectacles may further include a low power indicator for producing a signal indicating a low power condition of the power source. The spectacles may further include a controller for receiving the signal from the low power indicator and for periodically activating and deactivating an optical power of the electro-active lens based on the signal.

[007] In an embodiment of the invention, spectacles housing an electro-active lens may include a power source. The spectacles may further include a low power indicator for producing a signal indicating a low power condition of the power source. The spectacles may further include a vibration source for receiving the signal from the low power indicator and for periodically vibrating based on the signal.

[008] In an embodiment of the invention, spectacles housing an electro-active lens may include a power source. The spectacles may further include a low power indicator for producing a signal indicating a low power condition of the power source. The spectacles may further include a light source for receiving the signal from the low power indicator and for periodically illuminating and extinguishing a light from the light source based on the signal.

[009] In an embodiment of the invention, spectacles housing an electro-active lens may include a power source. The spectacles may further include a low power indicator for producing a signal indicating a low power condition of the power source. The spectacles may further include a sound source for receiving the signal from the low power indicator and for periodically producing an audible sound from the sound source based on the signal.

[0010] In an embodiment of the invention, a charging station for electro-active spectacles having a power source may include a charging device for coupling the charging station with the

power source of the electro-active spectacles and for charging the power source while coupled. The charging station may further include a low power indicator for producing a signal indicating a low power condition of the power source. The charging station may further include an output device for receiving the signal from the low power indicator and indicating to a user whether the low power condition exists within the power source.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] A specific embodiment of the present invention will be described with reference to the following drawings, wherein:

[0012] Figure 1 illustrates an embodiment of a low power indicator circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] A low power indicator refers to circuitry which monitors a low power condition of a power source which powers electro-active lenses housed in a pair of spectacles. The power source may be a battery, a fuel cell, a solar power cell, or other devices capable of producing electrical power. The power source may be located within the spectacle frame or may be embedded within the electro-active lens. A "low power condition" may mean that a voltage of the power source is below a threshold. A "low power condition" may mean that a current of the power source is below a threshold. A "low power condition" may mean that a power of the power source is below a threshold. A "low power condition" may mean that an impedance of the power source is above a threshold. A "low power condition" may mean that the power source may not be able to provide for operation of the electro-active spectacle lenses for more than a predetermined amount of time.

[0014] The low power indication circuitry may be associated with the frame of the electro-active spectacle lenses. For example, the low power indication circuitry may be located in the frame, on the frame, attached to the frame, or remotely connected to the frame. The low power indication circuitry may be associated with the electro-active lenses. For example, the low power indication circuitry may be located in the lens, on the lens, attached to the lens, or remotely connected to the lens.

[0015] The low power indicator circuitry may be part of a controller which controls the optical power of the electro-active spectacle lenses. A controller may be a CPLD, an FPGA, a

processor, a microprocessor, a microcontroller, a DSP, or any device capable of controlling the optical power of the electro-active spectacle lenses. Alternatively, the low power indication circuitry may be separate from the controller or the processor. The low power indicator may output a signal to indicate a low power condition. Alternately, the low power indicator may output a signal to indicate that there is no low power condition. The low power indicator may be operably connected to the controller or the processor. The low power indicator may be operably connected to other circuitry such as a visible light source, an audible sound source, or a vibration source.

[0016] Because the power of the power source may vary, in some embodiments of the present invention when a low power condition is detected by the low power indicator, it may latch this condition. In such an embodiment, once a low power condition is detected the indicator will continue to indicate a low power condition until reset. Thus, the user will not be bothered by an indicator that turns on and off due to the natural fluctuations of the power source above and below a threshold. The low power indicator may be reset by charging the electro-active spectacle lenses or by resetting the indicator.

[0017] In a first embodiment of the present invention, a low power indicator is part of or is operably connected to a controller which controls the optical power of a user's electro-active spectacle lenses. The low power indicator may generate a signal when a low power condition exists in the power source which powers the electro-active spectacle lenses. The signal may cause the controller to periodically activate and deactivate the optical power of the electro-active spectacle lenses such that the optical power of the lenses turns on and off in a periodic manner.

[0018] In a second embodiment of the present invention, a low power indicator is part of or is operably connected to a vibration source. The vibration source may be located in the temple portion of the frame of a user's electro-active spectacle lenses. The vibration source may be capable of generating a low amplitude vibration. The low power indicator may generate a signal when a low power condition exists in the power source which powers the electro-active spectacle lenses. The signal may cause the vibration source to periodically generate a low amplitude vibration to the user's head. The vibration may be noticeable by the user but not overly annoying as to be uncomfortable or overly disconcerting to the user.

[0019] In a third embodiment of the present invention, a low power indicator is part of or is operably connected to a visible light source. The light source may be located such that a user of electro-active spectacle lenses can see the light source when it is illuminated. The low power

indicator may generate a signal when a low power condition exists in the power source which powers the electro-active spectacle lenses. The signal may cause the light source to periodically illuminate and extinguish. The amplitude, frequency of visible light, and periodicity of illuminating and extinguishing of the flashing light may be optimized so as to be an adequate indicator which is easily noticed by the user, but not overly intrusive so as to be disconcerting to the user.

[0020] In a fourth embodiment of the present invention, a low power indicator is part of or is operably connected to an audible sound source. The sound source may be located such that a user of electro-active spectacle lenses can hear the sound source when it is producing sound. The low power indicator may generate a signal when a low power condition exists in the power source which powers the electro-active spectacle lenses. The signal may cause the sound source to periodically produce an audible sound. The amplitude, frequency of audible sound, and periodicity of the sound may be optimized so as to be an adequate indicator which is easily noticed by the user, but not overly intrusive so as to be disconcerting to the user.

[0021] In a fifth embodiment of the present invention, the electro-active spectacles may be placed in a charging station that has a low power indicator that can sense the power of the spectacle's power source. The charging station may have a charging device which, when coupled to the power source of the electro-active spectacles, is capable of charging the power source. The charging device may couple to the power source through a connector or wirelessly such as through inductive charging. The low power indicator may provide an output signal to an output device which can be utilized to indicate whether a lower power condition exists in the power source of the electro-active spectacles. The output signal may be an indication of an amount of power remaining in the power source. Alternately, this indication may be a voltage, a current, a power, or a time remaining during which there is enough power to operate the lenses. The output device may be a visual display device, one or more Light Emitting Diodes (LEDs), a Liquid Crystal Display (LCD) screen, an electro-chromatic device, a sound source, or any other device capable of informing a user that a low power condition exists in the power source of the spectacles.

[0022] In still other embodiments of the present invention, small LEDs may be placed on the frame of the electro-active spectacles. The LEDs may be placed on a side of the drive circuit. The LEDs may indicate the amount of power remaining by either the color of the diode that is lit or the number of diodes that are lit, thereby forming a simple power level scale. Alternatively, a single diode may be lit to indicate simply that power is low.

[0023] Figure 1 illustrates an embodiment of a low power indicator circuit as described in a publication of EDN, dated 2 January, 1997, designed by David Johnson and Associates. Such a design is typical of low power indicators used in low voltage battery powered devices, and are well know to those of ordinary skill in the art.

[0024] Such a circuit may be ideal for the embodiment described above having a visible light source. The circuit design shown in Figure 1 draws only 1 microampere in the off state and only 20 microamperes while flashing an LED.

[0025] While the circuit in Figure 1 illustrates a flashing LED as an indicator, the driver chip MN13811-G could also be used to drive other indicators described above. For example the output could be sent to the controller of the electro-active lenses. When the controller senses the output signal of the MN13811-G indicating a low power condition, it may change the drive voltage(s) applied to the electro-active lenses. Such a change in drive voltage(s) may periodically toggle the optical power of the electro-active lenses between substantially zero optical power and a substantially non-zero optical power, thereby alerting the wearer of the lenses of a low power condition.

[0026] Alternately, the output signal of the MN13811-G may be used to drive a vibration source such as, by way of example only, a thin piezoelectric strip. The piezoelectric strip may be located in one or both of the frame temples. The piezoelectric strip may be capable of generating a low amplitude vibration to the side of the wearer's head indicating that a low power condition exists in the power source used to power the electro-active spectacles.

[0027] It should be pointed out that other low power indication circuits exist and are well known in the art. Such low power indication circuits are considered within the scope of the present invention. Furthermore, the lower power indicator circuit shown in Figure 1 is only provided as an illustrative example and is in no way meant to limit the scope of the present invention to only this embodiment.

THE CLAIMS

What is claimed is:

1. Spectacles housing an electro-active lens, comprising:

a power source;

a low power indicator for producing a signal indicating a low power condition of said power source; and

a controller for receiving said signal from said low power indicator and for periodically activating and deactivating an optical power of the electro-active lens based on said signal.

2. The spectacles of Claim 1, wherein said low power indicator is associated with a frame of the spectacles.

3. The spectacles of Claim 1, wherein said low power indicator is associated with the electro-active lens.

4. The spectacles of Claim 1, wherein said low power condition is selected from the group consisting of: a voltage of said power source below a voltage threshold, a current of said power source below a current threshold, a power of said power source below a power threshold, an impedance of said power source above an impedance threshold, and a time said power source is able to provide for operation of the electro-active lens less than a predetermined amount of time.

5. The spectacles of Claim 1, wherein said low power condition is latched by said low power indicator.

6. Spectacles housing an electro-active lens, comprising:

a power source;

a low power indicator for producing a signal indicating a low power condition of said power source; and

a vibration source for receiving said signal from said low power indicator and for periodically vibrating based on said signal.

7. The spectacles of Claim 6, wherein said low power indicator is associated with a frame of the spectacles.

8. The spectacles of Claim 6, wherein said low power indicator is associated with the electro-active lens.

9. The spectacles of Claim 6, wherein said low power condition is selected from the group consisting of: a voltage of said power source below a voltage threshold, a current of said power source below a current threshold, a power of said power source below a power threshold, an impedance of said power source above an impedance threshold, and a time said power source is able to provide for operation of the electro-active lens less than a predetermined amount of time.

10. The spectacles of Claim 6, wherein said low power condition is latched by said low power indicator.

11. The spectacles of Claim 6, wherein said vibration source is a piezoelectric strip.

12. Spectacles housing an electro-active lens, comprising:

a power source;

a low power indicator for producing a signal indicating a low power condition of said power source; and

a light source for receiving said signal from said low power indicator and for periodically illuminating and extinguishing a light from said light source based on said signal.

13. The spectacles of Claim 12, wherein said low power indicator is associated with a frame of the spectacles.

14. The spectacles of Claim 12, wherein said low power indicator is associated with the electro-active lens.

15. The spectacles of Claim 10, wherein said low power condition is selected from the group consisting of: a voltage of said power source below a voltage threshold, a current of said power source below a current threshold, a power of said power source below a power threshold, an impedance of said power source above an impedance threshold, and a time said power source is able to provide for operation of the electro-active lens less than a predetermined amount of time.

16. The spectacles of Claim 10, wherein said low power condition is latched by said low power indicator.

17. The spectacles of Claim 10, wherein said light source is at least one light emitting diode.

18. Spectacles housing an electro-active lens, comprising:
a power source;
a low power indicator for producing a signal indicating a low power condition of said power source; and
a sound source for receiving said signal from said low power indicator and for periodically producing an audible sound from said sound source based on said signal.

19. The spectacles of Claim 18, wherein said low power indicator is associated with a frame of said spectacles.

20. The spectacles of Claim 18, wherein said low power indicator is associated with the electro-active lens.

21. The spectacles of Claim 18, wherein said low power condition is selected from the group consisting of: a voltage of said power source below a voltage threshold, a current of said power source below a current threshold, a power of said power source below a power threshold, an impedance of said power source above an impedance threshold, and a time said power source is able to provide for operation of the electro-active lens less than a predetermined amount of time.

22. The spectacles of Claim 18, wherein said low power condition is latched by said low power indicator.

23. A charging station for electro-active spectacles having a power source, comprising:
a charging device for coupling the charging station with the power source of the electro-active spectacles and for charging the power source while coupled;
a low power indicator for producing a signal indicating a low power condition of the power source; and
an output device for receiving said signal from said low power indicator and indicating to a user whether said low power condition exists within the power source.

24. The charging station of Claim 23, wherein said low power condition is selected from the group consisting of: a voltage of said power source below a voltage threshold, a current of said power source below a current threshold, a power of said power source below a power threshold, an impedance of said power source above an impedance threshold, and a time said power source is able to provide for operation of the electro-active lens less than a predetermined amount of time.

25. The charging station of Claim 23, wherein said output means is selected from the group consisting of: a visual display device, one or more light emitting diodes, a liquid crystal display, an electro-chromatic device, and a sound source.

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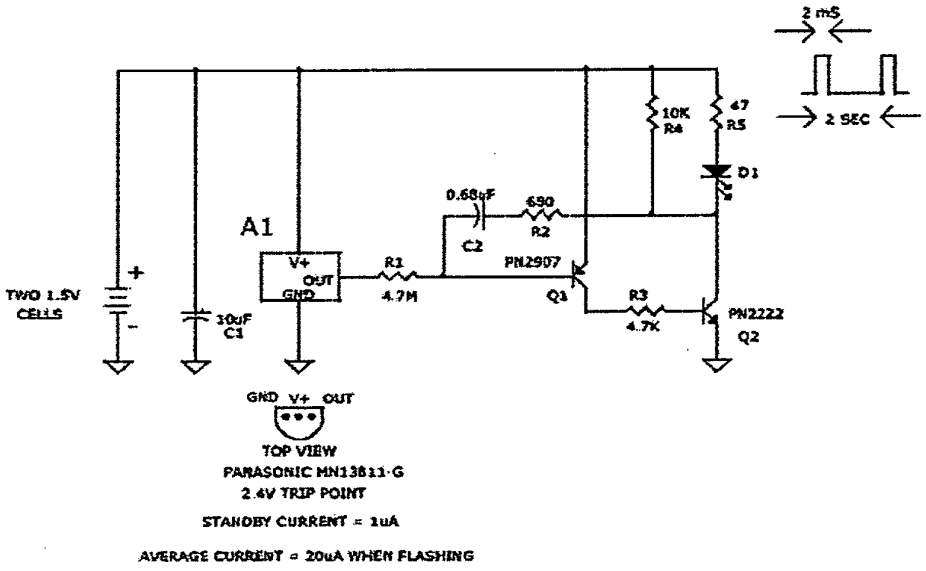

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Q1
R3
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PN2222
Q2
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TOP VIEW
PANASONIC MN13811-G
2.4V TRIP POINT
STANDBY CURRENT = 1uA
AVERAGE CURRENT = 20uA WHEN FLASHING

Figure 1

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 91904-813941	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2011/042883	International filing date *(day/month/year)* 01 July 2011 (01.07.2011)	Priority date *(day/month/year)* 02 July 2010 (02.07.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 January 2013 (08.01.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt03.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/042883	01.07.2011	02.07.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02C11/06 G02C7/10 G02C1/06 G02C5/22

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☑ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☑ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☑ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	de Lajarte, Gilles Telephone No. +49 89 2399 2697

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☑ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 6-11, 22-27

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 6-11, 22-27

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b).

☐ See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. ☑ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-5, 12-21, 28-33

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-5, 12-21, 28-33
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-5, 12-21, 28-33
Industrial applicability (IA)	Yes:	Claims	1-5, 12-21, 28-33
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item IV

Lack of unity of invention

1 Non unity

It is considered that there are 2 inventions covered by the claims indicated as follows:

- Group 1 (claims 1-5, 12-21, 28-33): conductive spring hinge with a leaf spring.

- Group 2 (claims 6-11, 22-27): conductive spring hinge with a pogo pin (or sliding piston).

The reasons for which the inventions are not so linked as to form a single general inventive concept, are as follows:

- The subject-matter of independent claim 1 (and the concept of conductive spring hinge, see [0069-0073] of the description) is already known from D1 (see argumentation below).

- The special technical features of each group are:

  - Group 1 : use the leaf spring to provide electrical connection (Claim 5; Fig 2(b); [0091]),

  - Group 2 : use the first conductor (or piston) to provide the electrical connection (Claims 6-8; Fig 2(a); [0090]).

- The problem solved by these special technical features can therefore be construed as:

  - Group 1: how to achieve mecanical, elastic and electrical connection with the temple fixed to a hinge component,

  - Group 2: how to achieve mecanical, elastic and electrical connection with the temple sliding away from at least one hinge component,

The requisite unity of invention no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features does not exist between the subject-matter of the 2 groups of claims.

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 2 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Since the applicant chosen not to pay for the additional search fees, the following written opinion is given on group 1.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 US 2 930 857 A (ELEANOR HOLLINGSWORTH) 29 March 1960 (1960-03-29)

D2 US 2007/121061 A1 (KIM YOUNG H [KR]) 31 May 2007 (2007-05-31)

D3 WO 2009/081542 A1 (PANASONIC CORP [JP]; MATSUI MASATOMO) 2 July 2009 (2009-07-02); & EP 2 233 964 A1 (PANASONIC CORP [JP]) 29 September 2010 (2010-09-29)

D4 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

2 Independent claim 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claim 1 is not novel.

D1 discloses a first device, comprising:

a frame (Fig 16; Col 11, L 71-73) further comprising:

a lens housing adapted to support a first lens and a second lens (Fig 16, (79-81); Col 1, L 57-64);

a first temple movably coupled to the lens housing (Fig 16, (B'); Col 12, L 39-44), and

a second temple movably coupled to the lens housing (Fig 16, (B'); Col 12, L 39-44);

a first spring mechanism coupled to the first temple and the lens housing (Fig 18, (x, y); Col 12, L 16-26) and

a first conductive path provided from the first temple to the lens housing for at least one position of the first temple relative to the frame (Fig 18, (x, y); Col 12, L 39-44).

Thus, the electro-active spectacles of D1 discloses the subject matter of claim 1, which is therefore not novel.

2.1 Dependent claims 2-5, 12-21, 28-33

Dependent claims 2-5, 12-21, 28-33 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2, 3) PCT), the reasons being as follows:

- claim 2: electronic component coupled to the frame (D1, Col 6, L 9-36; Fig 16),

- claim 3: conductive path electrically connected to the electronic component for one position of temple (D1, Fig 18, (x, y); Col 12, L 39-44),

- claim 4: conductive path with spring mechanism (please note that the adjective "first" has not limiting meaning here, since no second path nor mechanism are defined; D1, Fig 18, (x, y); Col 12, L 39-44),

- claim 5: conductive path provided by spring (D1, Fig 18, (x, y); Col 12, L 39-44),

- claim 12: spring hinge. The elastic function of the leaf spring in D1 (Fig 18, (x)) in overextension may be regarded as small due to the stop abutement for the bows (Col 12, L 55-59), but is however present (Col 12, L 23). Moreover, to remove the abutements and provide a stronger leaf spring would be

regarded by the person skilled in the art as a minor improvement for providing a more gradual pressure onto the temples, for example for hearing aids with air-conduction (D1, Col 12, L 74-75) or for providing electrical contact to electro-active lenses instead of hearing aids. He would do so based on his general knowledge, or in the light of D2 (Fig 6).

- claim 13: conductive path connected to electronics module (D1, Col 6, L 9-36; Fig 16, 31),

- claims 14-16, 19, 20, 28-33: electrical connection with opened temple, no electrical connection with closed temple (D1, Col 12, L 40-47),

- claim 17: full rim or semi-rimmed lenses (D1, Fig 16),

- claim 18: spring mechanism coupled to the first lens (mechanical coupling is shown in D1, Fig 16); assuming that an electrical connection to an electro-active lens was meant (see also [0158] of the description), the difference between D1 and the subject matter fo claim 17 is that the lens does not require an electro-optical component. Faced with the problem of having an electro-optical lens instead of an hearing aid, the person skilled in the art would change these components withthout requiring an inventive activity and would end up with the spring mechanism (leaf spring) electronically connected to the electro-active lens. He would do so based on his general knowledge, or for example on D3 (Fig 15, 18).

- claim 21: rimless spectacles (technical equivalent to the full rim spectacle frame of D1; alternatively, see the argumentation for claim 18, whereby to provide an electrical connection via the lens or via the rim does not provide any unexpected effect; see also D4, [0090]).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 91904-12910P	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2011/061485	International filing date *(day/month/year)* 18 November 2011 (18.11.2011)	Priority date *(day/month/year)* 19 November 2010 (19.11.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 21 May 2013 (21.05.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Philippe Bécamel e-mail: pt01.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/061495	18.11.2011	19.11.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02C11/06 G02C7/08

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☑ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	de Lajarte, Gilles Telephone No. +49 89 2399 2697

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☑ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	12-14
	No:	Claims	1-11, 15-22
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-22
Industrial applicability (IA)	Yes:	Claims	1-22
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item VIII

Certain observations on the international application

1 Clarity

Claim 1 is not clear for the following reasons:

It is not clear what is the limitation of the term "lens housing" in the case of a rimless spectacles. It is not clear which limitation is meant by the term "supported" other than "in contact with". It is not clear whether the façade is only a decorative component or whether it is a necessary part of the frame (e.g. whether the façade is required to fulfil the function of the bridge, holding both lenses together).

It appears at first sight (see also [0289] in the description of the application) that the term "façade" means a decorative element placed in the front part of an existing structure (rim, semi-rimless or rimless structure). This, however, **contradicts** the one example (Fig 28, 29) given in the application, whereby the façade has a structural function of holding the two lenses together ("bridge" function).

Claim 1 lacks the essential features "the façade is a separate component that can attach to a lens housing or the temples" and "the façade is detachable and re-attachable"such that "the user can change the appearance of the electronic frame without changing or damaging the the underlying frames or components therein" ([0291]; claim 19).

Furthermore, claim 1 lacks the essential feature that the façade hides or conceals electrical portions of the conductive path to electro-active lenses ([0297]).

It is assumed here that the claims are related only to paragraphs [0288-0314] and to Fig 28, 29.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 WO 2010/080999 A1 (PIXELOPTICS INC [US]; KOKONASKI WILLIAM [US]; WANG YONGPING [US]; BLUM) 15 July 2010 (2010-07-15)

D2 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

D3 US 5 463 428 A (LIPTON LENNY [US] ET AL) 31 October 1995 (1995-10-31)

D4 US 2008/316420 A1 (AGAZAROVA MAZAL [US]) 25 December 2008 (2008-12-25)

D5 EP 1 647 854 A1 (SUNSHINE OPTICAL COMPANY LTD [CN]) 19 April 2006 (2006-04-19)

D6 US 5 764 338 A (MACK CAROL ANNE [US]) 9 June 1998 (1998-06-09)

2 Independent claim 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claim 1 is not novel.

D1 discloses a first device comprising eyeglasses ([0071-0073]), the eyeglasses further comprising:

a lens housing (Fig 7, (708, 710));

a first temple and a second temple coupled to the lens housing;

a first and a second lens supported by the lens housing (Fig 3, (102, 202));

a facade that covers the lens housing (Fig 7, 8, (702)); and

an electronic component (Fig 7, (202));

wherein at least one conductive path is provided from the electronic component to the first lens having a portion that runs through the lens housing ([0073]).

Thus, the device of D1 has all the features of claim 1, its subject matter being therefore not novel.

Furthermore, the spectacles of D2 (Fig 5B, lens housing (503, 513, 514), façade (502), electronic component (507)), D3 (Fig 1, lens housing (14, 16), façade (10); electronic component (claim 1)) also each anticipates the subject matter of claim 1 (see corresponding passages in the search report).

Alternatively, faced with the problem of hiding the electrical connection to the lenses of electro-active spectacles of D1 or D2, the person skilled in the art would consider adding the façade of D4, Fig 1 or D5, Fig 7A, [0011-0013] or even D6, Fig 8a which covers the lens housing (as in the whole front frame) without requiring an inventive activity. He would do so based on purely aesthetical reasons.

2.1 Dependent claims 2-22

Dependent claims 2-22 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2, 3) PCT), the reasons being as follows:

- claim 2: electronics module (D1, [0048]; D2, [0079]; D3, claim 7),

- claim 3: electronic module coupled to temple (D1, ([0073]; alternative solution for D2; implicit from D3, claim 7 or Fig 3A),

- claim 4: electronic component coupled to lens housing (D1, Fig 11, 12; D2, Fig 5B; D3, Fig 6),

- claim 5: one conductive path from electronic component to second lens (D1-D3, see corresponding figures),

- claim 6: same feature as in claim 1,

- claim 7: façade covers the entire lens housing (D1, Fig 7; D2, Fig 5B; D3, Fig 1),

- claim 8: lens housing comprises rimless or semi-rimless spectacles frame (D1, [0050]; D2, Fig 5B),

- claim 9: lens housing with screws or rim wire (D1, Fig 7; D2, Fig 5B),

- claim 10: conductive path with conductive wire (D1, [0082]); D2, Fig 5B),

- claim 11: façade provides appearance of rimmed spectacles frame (D1, Fig 7; D3, Fig 1),

- claim 12: lens housing rimless spectacles frame and façade with appearance semi-rimless or full rimmed spectacles (not inventive in the light of D1, Fig 9 or D2, Fig 5B combined with any removable façade such as in D4, Fig 1 or D5, Fig 7A, [0011-0013]) or even D6, Fig 8a),

- claim 13: lens housing semi rimless, façade with appearance of full rimmed frame (D1, [0078] or D2, [0067], claim 14) combined with one of D4-D6),

- claim 14: lens housing full rimmed, façade full rimed (D1, [0080] or D2, [0090] combined with one of D4-D6),

- claim 15: the façade masks a portion of conductive path (D1, Fig 7; D2, Fig 5B combined with one of D4-D6),

- claim 16: conductive path with wire, rubber, portion of lens housing (D1, [0045]; D2, Fig 4B, (413, 414); D3, Col 4, L 50),

- claim 17: façade coupled to lens housing with adhesive material (D1, [0090]; D2, [0094]),

- claim 18: façade coupled to lens housing with screw (D2, Fig 5B, (509)),

- claim 19: façade removably coupled to lens housing (D1, Fig 7; D2, Fig 5B; D3, Fig 1),

- claim 20: lens housing can be coupled to different facades (implicit from D1, [0072]; not inventive from D2 or D3, as providing different façades, e.g. different colours for a front frame is standard, and would not require an inventive activity for the person skilled in the art),

- claim 21: façade with metal, lens housing with plastic (D1, [0084], whereby the lens housing is merely the part directly connecting to the lens and providing insulation, e.g. most likely with plastic; implicit from D3),

- claim 22: façade with plastic, lens housing with metal (at least implicit from D1-D3 since metal will most likely be included in any electrical connections to the lens, and the front of a spectacles frame is normally in plastic).

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/020498

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02C7/10 H02J7/00
ADD.

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)
G02C H02J

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, COMPENDEX, INSPEC, WPI Data

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 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06) paragraph [0078] - paragraph [0098]; figures 9C,10,11	1-4,23 5-14
X Y	WO 2008/002388 A2 (PIXELOPTICS INC [US]; BLUM RONALD D [US]; HADDOCK JOSHUA N [US]; DUSTO) 3 January 2008 (2008-01-03) paragraph [0027] - paragraph [0033]	24 5-8, 12-14, 25-34
Y	US 4 991 951 A (MIZUNO MITSUYOSHI [JP] ET AL) 12 February 1991 (1991-02-12) * abstract	9-11

-/--

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* 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 document 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
15 June 2010	25/06/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Girardin, François

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/020498

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2005/016057 A1 (LEWIS GENE LEE CHEYENNE [GB]) 24 February 2005 (2005-02-24) page 4, line 9 - line 14 figure 3	15-22
Y	WO 2006/126881 A2 (VARIBEL B V [NL]; VAN DER ZWAN JACOB [NL]; SIPKEMA MARCUS KAREL [NL]) 30 November 2006 (2006-11-30) figure 9A page 20, line 22 - page 21, line 13 page 23, line 23 - page 24, line 27	15-22
Y	US 5 455 638 A (KALLMAN WILLIAM R [US] ET AL) 3 October 1995 (1995-10-03) * abstract column 9, line 21 - line 40	25-34
A	US 2007/258039 A1 (DUSTON DWIGHT P [US] ET AL) 8 November 2007 (2007-11-08) paragraphs [0036], [0045]	1-14,23
A	WO 2006/086155 A2 (COLGATE PALMOLIVE CO [US]; WAGUESPACK KENNETH [US]) 17 August 2006 (2006-08-17) * abstract	17,18
A	WO 2008/051520 A2 (PIXELOPTICS INC [US]; KOKONASKI WILLIAM [US]; BOCHNOWSKI JAMES J [US];) 2 May 2008 (2008-05-02) the whole document	15-22
A	US 2004/156012 A1 (JANNARD JAMES [US] ET AL) 12 August 2004 (2004-08-12) paragraph [0125]	26-34

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/020498

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:

see additional 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 an 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.:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14, 23

Electro-active frames and spectacles having an inductive charge area in one of the temples.

2. claims: 15-22

An inductive charger for electro-active spectacles having two movable arms and one inductive charging area.

3. claims: 24-34

Frame for electro-active spectacles and method of controlling such spectacles wherein a switch is used to switch the electro-active lenses/spectacles between at least two different states.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2010/020498

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008273166 A1	06-11-2008	AR 066226 A1	05-08-2009
WO 2008002388 A2	03-01-2008	AU 2007265652 A1	03-01-2008
		CA 2656267 A1	03-01-2008
		CN 101479644 A	08-07-2009
		EP 2030073 A2	04-03-2009
		JP 2009541793 T	26-11-2009
		KR 20090019015 A	24-02-2009
		US 2009115961 A1	07-05-2009
		US 2007296918 A1	27-12-2007
US 4991951 A	12-02-1991	IT 1239773 B	15-11-1993
		JP 2266322 A	31-10-1990
		JP 2817178 B2	27-10-1998
WO 2005016057 A1	24-02-2005	AT 441339 T	15-09-2009
		EP 1653825 A1	10-05-2006
		ES 2334233 T3	08-03-2010
		GB 2405049 A	16-02-2005
		US 2007281752 A1	06-12-2007
WO 2006126881 A2	30-11-2006	AT 408975 T	15-10-2008
		AU 2006250153 A1	30-11-2006
		JP 2008542820 T	27-11-2008
		US 2009182688 A1	16-07-2009
US 5455638 A	03-10-1995	NONE	
US 2007258039 A1	08-11-2007	NONE	
WO 2006086155 A2	17-08-2006	AU 2006213044 A1	17-08-2006
		CA 2596779 A1	17-08-2006
		CN 101185220 A	21-05-2008
		EP 1849226 A2	31-10-2007
		KR 20070108228 A	08-11-2007
		RU 2378752 C2	10-01-2010
		US 2006176017 A1	10-08-2006
WO 2008051520 A2	02-05-2008	US 2008106695 A1	08-05-2008
US 2004156012 A1	12-08-2004	US 2006197907 A1	07-09-2006

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 27497-6-41PC	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2010/020488	International filing date *(day/month/year)* 08 January 2010 (08.01.2010)	Priority date *(day/month/year)* 09 January 2009 (09.01.2009)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 12 July 2011 (12.07.2011)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Dorothée Müllhausen e-mail: pt01.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2010/020498	08.01.2010	09.01.2009

International Patent Classification (IPC) or both national classification and IPC
INV. G02C7/10 H02J7/00

Applicant
PixelOptics, Inc.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Girardin, François Telephone No. +49 89 2399-7692

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☑ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☒ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☐ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☒ all parts.

   ☐ the parts relating to claims Nos. 1-34

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3, 5-22, 25-34
	No:	Claims	1, 2, 4, 23, 24
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-34
Industrial applicability (IA)	Yes:	Claims	1-34
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item IV

Unity of the invention

1 This Authority considers that the application does not meet the requirements of unity of invention and that there are 3 inventions covered by the claims indicated as follows:

1.1 claims: 1-14, 23

Electro-active frames and spectacles having an inductive charge area in one of the temples.

1.2 claims: 15-22

An inductive charger for electro-active spectacles having two movable arms and one inductive charging area.

1.3 claims: 24-34

Frame for electro-active spectacles and method of controlling such spectacles wherein a switch is used to switch the electro-active lenses/spectacles between at least two different states.

2 The first and the third groups of claims have in common the fact that they both relate to electro-active spectacles. However, electro-active spectacles are well known in the art and these features can therefore not be considered as forming a single general inventive concept. Furthermore, the second group of claims relates to a charger for electro-active spectacles having an inductive charging area. Electro-active spectacles having a rechargeable battery which can be charged inductively and the corresponding chargers are well known in the art, as disclosed for example in US2007/0258039 in paragraph [0045]: "an eyeglass case may be adapted to be an inductive charger suitable for recharging power source". Using inductive charing in electro-active spectacles and in the corresponding charger does therefore also not constitute a single general inventive concept within the sense of Rule 13.1 PCT.

3 The first group of claims deals with the problem of positioning the driving module within the frame of electro-active spectacles and contacting this module with the lenses. The second group of claims is dedicated to the mechanical construction of the charger for such electro-active lenses. In particular, it requires movable arms for supporting the temples of the spectacles. The third group of claims deals with the problem of switching the spectacles between different (active/inactive) states and the way how this switching is realised. Those features of the three groups of claims which may be considered to form special technical features are therefore no related.

4 The groups of claims listed above are therefore neither linked by a single general inventive concept, nor do they share common special technical features. The requirements of unity expressed in Rule 13.1 and 13.2 PCT are thus not fulfilled.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 The following documents (D) are referred to in this opinion:

D1 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

D2 WO 2008/002388 A2 (PIXELOPTICS INC [US]; BLUM RONALD D [US]; HADDOCK JOSHUA N [US]; DUSTO) 3 January 2008 (2008-01-03)

D3 US 4 991 951 A (MIZUNO MITSUYOSHI [JP] ET AL) 12 February 1991 (1991-02-12)

D4 WO 2005/016057 A1 (LEWIS GENE LEE CHEYENNE [GB]) 24 February 2005 (2005-02-24)

D5 WO 2006/126881 A2 (VARIBEL B V [NL]; VAN DER ZWAN JACOB [NL]; SIPKEMA MARCUS KAREL [NL]) 30 November 2006 (2006-11-30)

D6 US 5 455 638 A (KALLMAN WILLIAM R [US] ET AL) 3 October 1995 (1995-10-03)

2 The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of claims 1, 2, 4 and 23-24 is not new.

2.1 Document D1 discloses electro-active spectacles (figure 9C) comprising two electro-active lenses (996 and 998), a bridge (903) connected to both lenses and two temples (970 and 980). The spectacles further comprises in a temple portion an electronic module (1000 in fig.10 described in [0087]) comprising an inductive charge area (1060 described in [0087]), the electronic module

being adapted to drive one electro-active lens (function of the module described in [0012]). The electronic module is removable for maintenance purposes ([0098]).

D1 discloses all the technical features of independent claim 1 whose subject-matter lacks therefore novelty.

2.2 The disclosed spectacle frame further comprises a frame front having two rims (994 and 995) with a conductive link (1020 and 1030 in figure 10 are connection to the electro-active lens) within the frame front and coupled to the electronic module. The subject-matter of claim 23 lacks therefore also novelty in view of the disclosure of D1.

2.3 Document D1 discloses both systems having only one module to drive both lenses and two modules wherein each module drives one of the two lenses (see in particular [0084]). The subject-matter of claims 2 and 4 lacks therefore novelty.

2.4 Document D2 discloses (figures 2A-2B) a frame for electro-active spectacles having two temples, a frame front, two rims and an electronic module (the electrical adapter) within one temple, a conductive link (between the lenses and the module) within the frame front. The module comprises a capacitive switch (p.4, 3rd line from the bottom) for switching the lenses between two states: on and off.

The subject-matter of claim 24 lacks therefore novelty in view of the disclosure of D2.

3 The present application does not meet the requirements of Article 33(3) PCT, because the subject-matter of claims 3, 5-22 and 25-34 does not involve an inventive step.

3.1 The user would obviously in a first step expect to have the two lenses which are commuted simultaneously. The subject-matter of claim 3 is therefore obvious.

3.2 Document D2 discloses electro-active spectacles having two lenses. Each lens is driven using a module fixed to the corresponding temple ("each lens operates independently from the other" in [0033]). The inventors suggest to use a synchronisation signal from one side to the other between the two electronic modules ("the electrical adapters of the two lenses are connected [by] one or more [...] metal wire"). It is further suggested to use a wire placed between the rims and the lenses ("such signal conduits could be hidden in the gap between the frame eye wire and the lens").

Starting from the embodiment of D1 with two electronic modules, the skilled person would look for documents dealing with the driving of electro-active spectacles. D2 suggests to use a synchronisation signal using one wire between the two controllers. The skilled person would consider using this teaching in the device of D1. This combination renders obvious the subject-matter of claims 5, 6, 7 and 8. Obviously in the case of rimless spectacles also disclosed in D1 (see [0081]), the skilled person would obviously realise the connection using conductive coatings on the lenses or a hidden wire on the side of the lenses. The subject-matter of claims 12, 13 and 14 lacks therefore also an inventive step in view of the combination of D1 with D2.

3.3 When trying to solve the problem mentioned above, the skilled person would also find D3 which discloses (abstract) electro-active spectacles having a conductive frame. Using the teaching of D3, the skilled person would consider connecting the two electronic modules with a conductive frame. The subject-matter of claims 9, 10 and 11 lacks therefore an inventive step in view of the combination of D1 with D3.

3.4 Document D4 discloses a charger (the spectacle case, p.9-14) having an inductive cradle (p.4, l.13) for recharging electro-active lenses. This charger differs from the charger of claim 15 in that it does not have a foldable structure with a base member and two arms. The claimed charger has a reduced size compared to the charger of D4. The skilled person is therefore facing the problem of reducing the size of the charger for electro-active spectacles. He would look for documents dealing with this issue and would find D5.

D5 describes glasses with embedded earing aids. A charger used to recharge the battery of the earing aids is described (figures 9a-9c). This charger comprises and base member (134) and two movable arms (130, 132) supporting both temples (13) of the spectacles. Both arms have connecting regions (144, 150) to establish an electrical contact between the charger and the spectacles. When folded the disclosed charger has a reduced size (p.24, l. 27). When reading this document, the skilled person would consider adapting the disclosed charger to the electro-active spectacles of D4. He would in an obvious manner replace the connection regions by inductive cradles allowing to recharge the batteries of the spectacles of D4. The obtained charger would fall within the scope of claim 15.

The subject-matter of claim 15 lacks therefore an inventive step in view of the combination of D4 with D5.

3.5 The charger of D5 has one connecting region on each arm and obviously comprises a power source (otherwise no charging would be possible). Choosing a rechargeable power source and using a LED as charging status indicator is clearly obvious for the skilled person. Hence, the subject-matter of claims 16-18 and 20 lacks an inventive step.

3.6 The charger disclosed in D5 has an adjustable position of the spectacles on the base member. However it would be a technical equivalent to use a fixed position on the base member and adjustable inductive regions on the arms. Hence, the subject-matter of claim 19 lacks an inventive step.

3.7 The arms of the charger of D5 can be rotated to be adjacent and parallel to the base member for transport. It would be clearly obvious to lock the arms in this position in order to avoid deterioration of the charger when carried for example in a pocket. A release mechanism would be necessary. The subject-matter of claims 21 and 22 lacks therefore an inventive step.

3.8 As mentioned above document D2 discloses electro-active spectacles with a capacitive switch to switch between the on and off operation modes. As disclosed in document D6 (col.9, l.21-40) electro-active glasses exhibiting a stand-by mode are known in the art. Furthermore it is clear that electronic device having an off mode, an on mode and a stand-by mode of operation are well known to the skilled person. When trying to increase the battery lifetime of the spectacles of D2, the skilled person would consider introducing a stand-by mode which allows a reduced power consumption. The spectacles would have three different operation modes. The method of control of such spectacles would fall within the scope of claim 25. The subject-matter of this claim lacks therefore an inventive step.

3.9 Toggling with a single switch between three modes of operation is obvious, the subject-matter of claims 26, 27 and 28 lacks therefore an inventive step. Voice command, button switches, frame status sensors are well known alternatives to the capacitive switch, some of them being disclosed in D2 ([0028], l.5-9). Hence, the subject-matter of claims 29-32 lacks an inventive step in view of the combination of D2 and D6.

D2 also discloses the use of accelerometers which allow to know the position of the spectacles in space. The subject-matter of claims 33 and 34 lacks therefore also an inventive step in view of the combination of D2 and D6.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 91904-8512PC	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2011/061505	International filing date *(day/month/year)* 18 November 2011 (18.11.2011)	Priority date *(day/month/year)* 19 November 2010 (19.11.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 14 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 21 May 2013 (21.05.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Simin Baharlou e-mail: pt09.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/061505	18.11.2011	19.11.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02C11/06 G02C1/06 G02C11/00 G02C5/14 G02C7/08

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☑ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☑ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☑ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	de Lajarte, Gilles Telephone No. +49 89 2399-0

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☑ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 25, 26, 38-40

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 25, 26, 38-40

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b).

☐ See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. ☑ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☒ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☐ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-24, 27-37, 41-47

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-24, 27-37, 41-47
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-24, 27-37, 41-47
Industrial applicability (IA)	Yes:	Claims	1-24, 27-37, 41-47
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

1 Non unity

It is considered that there are 4 inventions covered by the claims indicated as follows:

- Group 1 (claims 1-17, 19, 23, 24, 27-37, 41-47): removable mechanical connections without additional locking component between electronics module, housing module and frame,

- Group 2 (claims 18, 20-22): specificities of the controller,

- Group 3 (claims 25, 26): specificities of the switch,

- Group 4 (claims 38-40): elastic hinge.

The reasons for which the inventions are not so linked as to form a single general inventive concept, are as follows:

- The subject-matter of independent claims 1 and 42 is already known (see the grounds for this objection below).

- The special technical features of each group are:

  - Group 1 : embedding of electrical components such that they are easily interchangeable,

  - Group 2 : specific driving of the electro-active lens,

  - Group 3: specific user input to the controller,

  - Group 4: good pressure of the temples on the user's head.

- The problem solved by these special technical features can therefore be construed as:

  - Group 1: how to remove easily electronic components from a spectacles,

  - Group 2: how to save electrical power,

  - Group 3: how to enable the user to communicate with the controller,

  - Group 4: how to combine electrical and elastic hinge connectivity.

The requisite unity of invention no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features does not exist between the subject-matter of the 4 groups of claims.

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 4 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Since the applicant chose to pay for one additional search (Group 2), the following opinion is given for groups 1 and 2.

Re Item VIII

Certain observations on the international application

2 Clarity

Claims 1, 42 are not clear for the following reasons:

It is not clear which structural feature is meant by the term "electronics module". It appears to be a sum of electronic components which may or may not be connected with one another and may or may not be close to one another.

It is not clear what is meant by the term "structural member", whether that structural member is even part of the frame, or how it could be connected with part of the frame.

It is not clear which function the controller has, an which function the first device has.

It is not clear which limiting feature is meant by the use of the adjective "first" (device).

Claim 1 lacks the essential feature that the electronics module is connected with an electro-active lens.

In claim 42, is it not clear which structural feature defines the housing module and its connection / relationship with the frame.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 WO 2010/080999 A1 (PIXELOPTICS INC [US]; KOKONASKI WILLIAM [US]; WANG YONGPING [US]; BLUM) 15 July 2010 (2010-07-15)

D2 WO 2009/098719 A1 (COZZANI LAURA MARIA [IT]) 13 August 2009 (2009-08-13)

D3 WO 2008/002388 A2 (PIXELOPTICS INC [US]; BLUM RONALD D [US]; HADDOCK JOSHUA N [US]; DUSTO) 3 January 2008 (2008-01-03)

D4 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

D5 US 6 115 177 A (VOSSLER STEPHEN P [US]) 5 September 2000 (2000-09-05)

D6 WO 2009/126946 A1 (PIXELOPTICS INC [US]; HADDOCK JOSHUA N [US]; KOKONASKI WILLIAM [GB]; C) 15 October 2009 (2009-10-15)

3 Group 1

3.1 Independent claims 1, 42

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claims 1, 42 is not novel.

D1 discloses a first device, comprising:

a frame (Fig 2) comprising a first temple (Fig 2, (102); [0050]) and a second temple (Fig 1), wherein the frame comprises a housing module (Fig 2, (202)) coupled to a structural member (Fig 2, (102));

a first lens and a second lens (Fig 2, (104); [0049]) coupled to the frame; and

an electronics module ([0048]; Fig 5, (202)), wherein the electronics module is located within the housing module ([0048]; Fig 5, (502)); and wherein the electronics module comprises at least any two of:

a power source ([0048]);

a controller (or processor, see [0048]); and

a sensing mechanism ([0056]).

Thus, the device of D1 has all the features of claim 1, its subject matter being therefore not novel.

Furthermore, D2 (Claim 1; Fig 2, 8); D3 (Fig 3B, [0030 D2 ([Fig 1A-1C; [0073, 0074]), D3 (Fig 5; [0092]), D4 (Fig 5, 8) also each anticipates the subject matter of claim 1.

Similarly, each mounting method for the spectacles of D1-D4 anticipates the method according to claim 42, whereby an electronics module is inserted into a cavity within a housing module.

3.2 Dependent claims 2-17, 19, 23, 24, 27-37, 41, 43-47

The dependent claims do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33 (2, 3) PCT), the reasons being as follows:

- claim 2: insulating layer between electronic components and frame (D1, implicit otherwise there would be short circuits; the wires can have insulating materials, see [0087]),

- claim 3: housing module with insulating layer (D1, implicit from Fig 5, 9; in particular, in Fig 5, either the box is insulating or it is insulated against the electronic components, which would otherwise not work),

- claim 4: electronics module with conductive material (D1, Fig 5, (506)),

- claim 5: housing with conductive material (D1, (504)), insulating layer between housing module and electronics module (e.g. between the electrical contacts Fig 5, (506)),

- claim 6: insulating layer comprises a portion of the electronics module (e.g. between the electrical contacts Fig 5, (506), of the insulated wires between the electronics components),

- claim 7: housing module with conductive material (D1, Fig 5, (504)),

- claim 8: electronics module removably coupled to the housing module (implicit from D1, [0048, 0069], whereby the electronic components are normally exchangeable; alternatively, see D2, Fig 5, 8)

- claim 9: electronics module removed and recoupled to the housing module (D2, Fig 5, 8),

- claim 10: electronics module inserted into the opening of housing module (D2, Fig 2),

- claim 11: electronics module pressure fitted (D2, Fig 2),

- claim 12: electronics module located within body of housing module (D1, Fig 9, (202); D2, Fig 8),

- claim 13: housing with nylon or carbon fiber (standard material),

- claim 14: structural member with cavity in first temple (D1, Fig 9; D2, Fig 8),

- claim 15: housing module coupled with temple via screw (D3, [0031]) or tape (typical alternative, see D1, [0090]),

- claim 16: housing module selectively removable (D1, Fig 9; D2, Fig 8),

- claim 17: housing module pressure fitted in cavity of temple (D1, Fig 9; D2, Fig 8),

- claim 19: battery (D1, [0034]),

- claim 23: housing module with aperture on its outer side (D1, Fig 9; D2, Fig 8),

- claim 24: aperture between 1 cm^2 and 5 cm^2 (implicit from D1, Fig 9; D2, Fig 8).

- claim 27: structural member is a temple (D1, Fig 9; D2, Fig 8),

- claim 28: housing module closer to lens (D1, Fig 9),

- claim 29: housing module comprises first portion of temple (D1, Fig 9; D2, Fig 8),

- claims 30-35: housing module with conductive and non-conductive, plastic or nylon, acetate material (D1, [0082, 0089, 0091]; also standard materials for spectacles with electric / electronic functions which are at least implicitly disclosed in the prior art),

- claims 36, 37: temple with metal (D1, [0041]), electrically isolate from housing module (see objection for claims 30-35 above),

- claim 41: housing module with thickness <= 0.7 mm (implicit from D1, Fig 11, or at least not inventive, the person skilled in the art makes thin temples for aesthetic reasons),

- claims 43-45: changing electronics module are to be expected with any document within D1-D4, e.g. when one module is not working properly,

- claim 46: electronics module inserted in housing module, itself inserted in temple (D1, Fig 9, (202); D2, Fig 2, 8; D3, Fig 3B),

- claim 47: two electrical connection separated by a barrier layer (D1, [0098]).

4 Group 2

4.1 Independent claim 18

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claim 18 is not novel.

D5 discloses a first device (Fig 1; Col 3, L 60-Col 4, L 16), comprising:

a frame comprising a first temple and a second temple (Fig 1, (22, 23)), wherein the frame comprises a housing module coupled to a structural member;

a first lens and a second lens coupled to the frame (Fig 1, (16)); and

an electronics module, wherein the electronics module is located within the housing module (Fig 1, (17)); and wherein the electronics module comprises at least any two of:

a power source (Fig 1, 2, (19, 20););

a controller (Fig 1, (17)); and

a sensing mechanism (Fig 1, (18); Col 4, L 2) ,

wherein the controller is configured to provide alternative current to the first lens (Col 5, L 31-32; Fig 1, (19)).

Per default, alternative current is either zero DC biased square or zero DC biased sine wave, therefore D5 is interpreted as implicitly anticipating all the features of claim 18, the subject matter of which is not novel.

Alternatively, to provide such as signal is regarded as a routine implementation with an AC part which the person skilled in the art would do without requiring an inventive activity.

D6 discloses an electro active lens (Fig 1) with an electronics module, a power source and a controller on the frame (P 34, L 8-10), the controller being configured to provide a zero DC bias square wave (P 37, L 19). D6 implicitly discloses a sensing mechanism as defined in the application, since the on/off situation for the electro active lens is necessarily given by some sort of switch.

Faced with the problem of choosing where to locate the electronics modules on the frame, the person skilled in the art would place them on a housing module based on his general knowledge, without requiring an inventive activity. An example of this general knowledge can be seen in D1, Fig 2, 5.

4.2 Dependent claims 20-22

The dependent claims 20-22 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2, 3) PCT), the reasons being as follows:

- Claim 20: controller comprises firmware (implicit from D5 or D6; alternatively, see D1, [0053, 0054]),

- Claim 21: controller with voltage multiplier (trivial feature; faced with the problem of adapting the voltage output between 10 and 30 V to fit the voltage required by the electro-active lens of D6 (P 37, L 20-21), the person skilled in the art would implement the required voltage multiplier without requiring an inventive activity),

- Claim 22: providing the signal to the first lens (directly implicit from D5, "LCD lenses" or D6, "electro-active lens").

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 91904-814220	**FOR FURTHER ACTION**	See Item 4 below
International application No. PCT/US2011/043581	International filing date *(day/month/year)* 11 July 2011 (11.07.2011)	Priority date *(day/month/year)* 09 July 2010 (09.07.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 10 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 15 January 2013 (15.01.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Philippe Bécamel e-mail: pt01.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/043591	11.07.2011	09.07.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02C11/06 G02C7/10 G02C1/06

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☑ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☑ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☑ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	de Lajarte, Gilles Telephone No. +49 89 2399 2697

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☑ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a)).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 8-12, 18, 30-36

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 8-12, 18, 30-36

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b).

☐ See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. ☑ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-7, 13-17, 19-29

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	5, 13, 28
	No:	Claims	1-4, 6, 7, 14-17, 19-27, 29
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-7, 13-17, 19-29
Industrial applicability (IA)	Yes:	Claims	1-7, 13-17, 19-29
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item IV

Lack of unity of invention

1 Non unity

It is considered that there are 3 inventions covered by the claims indicated as follows:

- Group 1 (claims 1-7, 13-17, 19-20-29): shape of the connection element.

- Group 2 (claims 8-12, 18): interaction between the conductor and the frame.

- Group 3 (claims 30-36): hardness of the connection element and its conductivity.

The reasons for which the inventions are not so linked as to form a single general inventive concept, are as follows:

- The subject-matter of independent claim 1 is already known from D1:

D1 discloses a first device (Fig 18, 19), comprising:

a lens comprising at least a first electrical contact (Fig 4, 5; [0045, 0046] or Fig 19, (1); [0070]);

a lens housing holding the lens, wherein the lens housing comprises at least a second electrical contact (Fig 4, (8b); Fig 18, 19, (306a, 306b)); and

a compliant conductive element (Fig 4, (7); [0045] or Fig 18, 19, (308); [0070]) disposed between the first and the second electrical contact, wherein the compliant conductive element electrically connects the first and second electrical contacts.

- The special technical features of each group are:

- Group 1 : specific shapes & dimensions of the conductive element and / or of the groove into which it is located.

- Group 2 : location of the conductor within the frame and material of the frame.

- Group 3: hardness and conductivity values of the conductive element

- The problem solved by these special technical features can therefore be construed as:

  - Group 1: how to achieve a mecanical connection which is stable, small and provides enough contact surface between the conductive element and its corresponding groove

  - Group 2: how to achieve a good connection between the electronic module and the part recieving the conductive element

  - Group 3: how to choose the material properties of the elastomer to obtain the desired properties of deformation, holding strength and conductivity

The requisite unity of invention no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features does not exist between the subject-matter of the 3 groups of claims.

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 3 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Since the applicant chosen not to pay for the additional search fees, the following written opinion is given on group 1.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

2 Independent claim 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claim 1 is not novel.

D1 discloses a first device (Fig 18, 19), comprising:

a lens comprising at least a first electrical contact (Fig 4, 5; [0045, 0046] or Fig 19, (1); [0070]);

a lens housing holding the lens, wherein the lens housing comprises at least a second electrical contact (Fig 4, (8b); Fig 18, 19, (306a, 306b)); and

a compliant conductive element (Fig 4, (7); [0045] or Fig 18, 19, (308); [0070]) disposed between the first and the second electrical contact, wherein the compliant conductive element electrically connects the first and second electrical contacts.

Thus, the electro-active spectacles of D1 discloses the subject matter of claim 1, which is therefore not novel.

Furthermore, D2 (Fig 26A, 26B, 28, (106); P 31, L 23-28) also anticipates the subject matter of claim 1.

2.1 Dependent claims 2-36

Dependent claims 2-36 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2, 3) PCT), the reasons being as follows:

- claim 2: conductive rubber (D1, [0045] or [0070]; D2, P 31, L 27),

- claim 3: conductive element between lens housing and lens (D1, Fig 4, (7) or Fig 18, 19, (308); D2, P 31, L 23-28),

- claim 4: conductive element with some undefined shape (any shape can be made with a combination of rectangles and ovals), e.g. rectangle (D1, Fig 4, (7) or Fig 18, 19, (308); D2, P 31, L 23-28),

- claim 5: conductive element **thinner** in the center (not inventive when starting from D1 or D2, as this described one of the standard shape for rubber used to hold eyeglasses in the frame, see for example D3, Fig 1,2 or D4, Fig 1, 2),

- claim 6: conductive element extruded (see clarity objection in paragraph 1 above; implicit or well-known production method for the rubber of D1 (Fig 4, (7) or Fig 18, 19, (308) or D2, P 31, L 27),

- claim 7: conductive element surfaces conform to a surface from lens and from a surface from housing (D1, Fig 4, (7) or Fig 18, 19, (308); implicit from D2, P 31, L 23-28),

- claim 13: semi-rimless (not inventive from D1 combined with D4 (Fig 1) or with general knowledge),

- claims 14, 26: conductive element within lens **groove**, and lens housing **cavity** (D1, Fig 4, (1b)),

- claim 15: conductive element with a bridge connecting two portions (a rectangle could be arbitrarily divided in three, the part in the middle called "bridge"),

- claim 16: shapes of ends of conductive element are either square (D1) or a circle (D4) or circle and rectangle (D3) (the term "comprises" also leaves the possible interpretation open that the shape is a combination with a rectangle and another shape),

- claim 17: conductive element in contact with lens groove (D1, Fig 4, (7) or Fig 18, 19, (308)),

- claim 19: width / depth of first groove between 0.4 and 1 mm (implicit from D1, Fig 4 and D2, or at least within the scope of routine implementation of the person skilled in the art, depending for example on the width of the spectacle lens for a particular user),

- claim 20: width 0.7 mm, depth 0.6 mm (see argumentation for claim 19),

- claim 21: conductive element in contact with lens housing cavity (D1, Fig 4, (7) or Fig 18, 19, (308)),

- claims 22, 24: conductive element compressed between lens groove and housing cavity (D1, Fig 3, [0038, 0040]),

- claim 23: height of conductive element at least 0.75 mm (implicit from D1 or D2 or at least within the scope of routine choices of the person skilled in the art),

- claim 25: full rim (D1, Fig 5, (b); implicit from D2, Fig 20B),

- claim 27: lens with beveled edge (D1, Fig 2-4),

- claim 28: uncompressed width of conductive element smaller than width of cavity (not inventive from D1 in the light of D3 (Fig 2), as to solve the problem of better holding the rubber within the cavity, the person skilled in the art would think about making it thicker and that the rubber would remain in place due to friction,

- claim 29: a portion of the lens extends into the cavity of the rim (D1, Fig 4).

Electronic Acknowledgement Receipt

EFS ID:	16853007
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	115626
Filer:	John P. McGroarty/Stacy Jen
Filer Authorized By:	John P. McGroarty
Attorney Docket Number:	3373.0570001
Receipt Date:	13-SEP-2013
Filing Date:	17-NOV-2011
Time Stamp:	18:34:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		33730570001_5SIDS.pdf	1246427 11afbbf39768f73db0cb75120bb4de7a1ef75589	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Transmittal Letter	2	8
	Information Disclosure Statement (IDS) Form (SB08)	9	10

Warnings:					
Information:					
2	Foreign Reference	FP1_WO2005016057A1.pdf	605124 73de061fb4100920339003b9be6d9e7fbc8e2815	no	17
Warnings:					
Information:					
3	Foreign Reference	FP2_WO2006086155A2.pdf	1038096 c18e2520a6a3fb274f28eeddb06cbd7f6e122ed2	no	28
Warnings:					
Information:					
4	Foreign Reference	FP3_WO2006126881A2.pdf	2685190 08144dc69a9a21086a81850b09f48116e29364a9	no	61
Warnings:					
Information:					
5	Foreign Reference	FP4_WO2008051520A2.pdf	491862 aea856f0c98f0e957afb23f05b368cc20cbf3d3d	no	12
Warnings:					
Information:					
6	Non Patent Literature	NPL1_IPRP_Written_Opinion_PCTUS2011042883.pdf	1368925 1dd667c70b532ccfbf07525e59032e64fce3a7e8	no	9
Warnings:					
Information:					
7	Non Patent Literature	NPL2_IPRP_Written_Opinion_PCTUS2011061495.pdf	1213927 1e9762ebe3a04fadca56aa9390d289db5837a313	no	8
Warnings:					
Information:					
8	Non Patent Literature	NPL3_ISR_PCTUS2010020498.pdf	738588 c7d792aea5aea38c220c7bf78fef03c4d6ecdd2d	no	5
Warnings:					

Information:					
9	Non Patent Literature	NPL4_IPRP_Written_Opinion_PCTUS2010020498.pdf	1698999 8e8e2175aaeb17b2125e00b53ba6b2cbb0d84b0c	no	9
Warnings:					
Information:					
10	Non Patent Literature	NPL5_IPRP_Written_Opinion_PCTUS2011061505.pdf	1971973 c43d318a98c89234f76e75cc966f355d3450d612	no	14
Warnings:					
Information:					
11	Non Patent Literature	NPL6_IPRP_Written_Opinion_PCTUS2011043591.pdf	1452893 2631568a70efdfa41b7758ac980814e667877551	no	10
Warnings:					
Information:					
			Total Files Size (in bytes):	14512004	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

JOHN P. MCGROARTY
DIRECTOR
(202) 772-8882
JMCGROARTY@SKGF.COM

Sterne Kessler Goldstein Fox
ATTORNEYS AT LAW

September 13, 2013

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 1095
Art Unit 2872
Attn: Mail Stop Amendment

Re: U.S. Utility Patent Application
Application No. 13/298,992; Filing Date: November 17, 2011
For: **ELECTRONIC SPECTACLE FRAMES**
Inventors: BLUM *et al.*
Our Ref: 3373.0570001

Commissioner:

Transmitted herewith for appropriate action are the following documents:

1. Fifth Supplemental Information Disclosure Statement;
2. Form PTO/SB/08a (1 sheet) listing 15 documents (**US1-US11** and **FP1-FP4**);
3. Form PTO/SB/08b (1 sheet) listing 7 documents (**NPL1-NPL7**); and
4. Copies of cited documents (**FP1-FP4** and **NPL1-NPL6**).

The above-listed documents are filed electronically through EFS-Web.

In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

John P. McGroarty
Attorney for Applicants
Registration No. 41,186

JPM/JAF/ssj
Enclosures

1742644_1.DOCX

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No.: 1095
BLUM *et al.*	Art Unit: 2872
Appl. No.: 13/298,992	Examiner: DANG, Hung Xuan
Filed: November 17, 2011	Atty. Docket: 3373.0570001
For: ELECTRONIC SPECTACLE FRAMES	

Fifth Supplemental Information Disclosure Statement

Mail Stop Amendment

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a equivalent and/or PTO/SB/08b equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicants have listed publication dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered.

This statement should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Applicants have checked the appropriate boxes below.

☐ 1. Statement under 37 C.F.R. 1.704(d). Each item of information contained in this Information Disclosure Statement: (i) was first cited in any communication from a patent office in a counterpart[1] foreign or international application or from the Office; and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of this information disclosure statement; OR (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

☒ 2. Filing under 37 C.F.R. § 1.97(b). This Information Disclosure Statement is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international

[1] The term counterpart foreign patent application means that a claim for priority has been made in either the U.S. application or a foreign application based on the other, or that the disclosures of the U.S. and foreign patent applications are substantively identical (e.g., an application filed in the European Patent Office claiming the same U.K. priority as claimed in the U.S. application).

application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

☐ 3. Filing under 37 C.F.R. § 1.97(c). This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ c. The required fee is provided through online credit card payment authorization in the amount of $180.00 in payment of the fee under 37 C.F.R. § 1.17(p).

☐ 4. Filing under 37 C.F.R. § 1.97(d) This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or Notice of Allowance, but on or before payment of the Issue Fee. The required fee is provided through online credit card payment authorization in the amount of $180.00 in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ 5. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. 1138 OG 37, 38 and MPEP 609.04(a)(III).

☐ 6. A concise explanation of the relevance of the non-English language document(s) appears below in accordance with 37 C.F.R. § 1.98(a)(3).

☒ 7. Copies of documents **FP1-FP4** and **NPL1-NPL6** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2), no copies of U.S. patents and patent application publications cited as documents **US1-US11** on the attached IDS Forms are submitted.

Additionally, a copy of document **NPL7**, cited on the attached IDS Form, is not provided in accordance with the U.S. Patent and Trademark Office Official Gazette notice of October 19, 2004, which states: "the requirement in 37 C.F.R. § 1.98(a)(2)(iii) for a legible copy of the specification, including the claims, and drawings of each cited pending U.S. patent application (or portion of the application which caused it to be listed) is *sua sponte* waived where the cited pending application is stored in the USPTO's IFW system."

☐ 8. Copies of the _____ documents were cited by or submitted to the Office in an IDS that complies with 37 C.F.R. § 1.98(a)-(c) in Application No._____, filed _____, which is relied upon for an earlier filing

date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

☒ 9. It is expected that the examiner will review the prosecution and cited art in the parent application nos. 13/175,633, filed July 1, 2011; 13/175,634, filed July 1, 2011; and 13/179,219, filed July 8, 2011, in accordance with MPEP 2001.06(b), and it is requested that the examiner review the prosecution and cited art in the co-pending application nos. 13/298,997, filed November 17, 2011, and 13/890,809, filed May 9, 2013, and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

☐ 10. In accordance with the Federal Circuit decision in *Dayco Prods., Inc. v. Total Containment, Inc.* 329 F.3d 1358 (Fed. Cir. 2003), Applicants submit herewith Office Actions from the co-pending U.S. Patent Application No. _____, filed _____, as documents _____ to _____.

The identification of these Office Actions is not to be construed as a waiver of secrecy as to those applications now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited applications and the art cited therein during examination.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

John P. McGroarty
Attorney for Applicants
Registration No. 41,186

Date: 9/13/13

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

1742641_1.DOCX

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/298,992	11/17/2011	Ronald D. Blum	91904-817521

CONFIRMATION NO. 1095

115626
Sterne, Kessler, Goldstein & Fox P.L.L.C.
1100 New York Avenue NW
Washington, DC 20005

POA ACCEPTANCE LETTER

OC000000062763904

Date Mailed: 07/29/2013

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/18/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/ctuazon/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/298,992	11/17/2011	Ronald D. Blum	91904-817521

CONFIRMATION NO. 1095

POWER OF ATTORNEY NOTICE

72162
KILPATRICK TOWNSEND & STOCKTON, LLP
Two Embarcadero Center
Eighth Floor
San Francisco, CA 94111-3834

OC000000062763860

Date Mailed: 07/29/2013

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/18/2013.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/ctuazon/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

[X] Practitioners associated with the Customer Number: 115626

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

[X] The address associated with Customer Number: 115626

OR

[ ] Firm or Individual Name

Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

PixelOptics Inc.
5241 Valleypark Drive
Roanoke, VA 24019
U.S.A.

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	6/10/13
Name	Ashley Wren	Telephone	(540) 685-2103
Title	General Counsel		

The collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing the burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Atty. Docket No. 3373.0570001

Applicant/Patent Owner: BLUM et al.

Application No./Patent No.: 13/298,992 Filed/Issue Date: November 17, 2011

Titled: ELECTRONIC SPECTACLE FRAMES

PixelOptics Inc., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 027663, Frame 0561, or for which a copy therefore is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/John P. McGroarty/ 7/05/12

Signature Date

John P. McGroarty, Reg. No. 41,186 Attorney for Applicants

Printed or Typed Name Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	16325943
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	72162
Filer:	John P. McGroarty/Kim McCabe
Filer Authorized By:	John P. McGroarty
Attorney Docket Number:	91904-817521
Receipt Date:	18-JUL-2013
Filing Date:	17-NOV-2011
Time Stamp:	16:42:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		3373_0570001.pdf	353712 bd1a0934686d991fa01fddffb5aa1192bf7e2fdb	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	1
	Assignee showing of ownership per 37 CFR 3.73.	2	2
Warnings:			
Information:			
	Total Files Size (in bytes):	353712	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
				Cozzani, Laura Maria	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
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(71) Applicant: E-VISION, L.L.C. [US/US]; Suite B, 3904 Franklin Road, Roanoke, VA 24014 (US).

(72) Inventors: BLUM, Ronald, D.; 5320 Silver Fox Road, Roanoke, VA 24014 (US). DUSTON, Dwight, P.; 59 Fairlane, Laguna Niguel, CA 92677 (US).

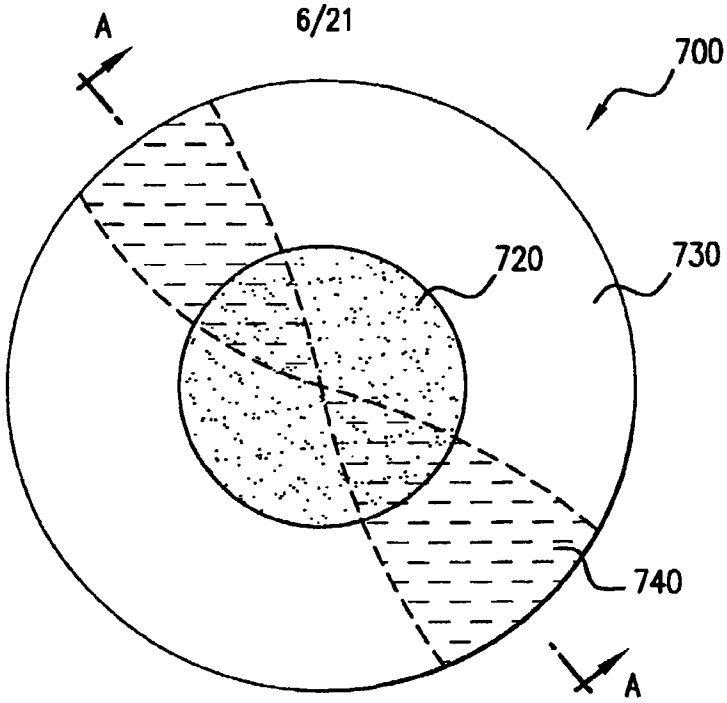
(74) Agents: WELLS, William, K. et al.; Kenyon & Kenyon, Suite 700, 1500 K Street, N.W., Washington, DC 20005 (US).

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(54) Title: SYSTEM, APPARATUS, AND METHOD FOR CORRECTING VISION USING AN ELECTRO-ACTIVE LENS



(57) Abstract: An electro-active spectale lens (700) is disclosed. The disclosed lens includes a first lens optic. The disclosed lens also includes a first electro-active zone (720) positioned in a cooperative relationship with the first lens optic. In certain embodiments, the electro-active lens includes a range finder positioned in a cooperative relationship with the electro-active lens.

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System, Apparatus, and Method for Correcting Vision Using an Electro-Active Lens

Field of the Invention

The present invention relates to the field of vision correction, and, more particularly, to a system, apparatus, and method for correcting vision using an electro-active lens.

Brief Description of the Drawings

The invention will be more readily understood through the following detailed description, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of an embodiment of an electro-active phoropter/refractor system 100;

FIG. 2 is a diagrammatic view of an embodiment of another electro-active phoropter/refractor system 200;

FIG. 3 is a flow diagram of a conventional dispensing practice sequence 300;

FIG. 4 is a flow diagram of an embodiment of dispensing method 400;

FIG. 5 is a perspective view of an embodiment of electro-active eyewear 500;

FIG. 6 is a flow diagram of an embodiment of prescription method 600;

FIG. 7 is a front view of an embodiment of a hybrid electro-active spectacle lens 700;

FIG. 8 is a section view of an embodiment of hybrid electro-active spectacle lens 700 taken along section line A-A of Fig. 7;

FIG. 9 is a section view of an embodiment of an electro-active lens 900, taken along section line Z-Z of Fig. 5;

FIG. 10 is a perspective view of an embodiment of an electro-active lens system 1000;

FIG. 11 is a section view of an embodiment of a diffractive electro-active lens 1100 taken along section line Z-Z of Fig. 5;

FIG. 12 is a front view of an embodiment of an electro-active lens 1200;

FIG. 13 is a section view of an embodiment of the electro-active lens 1200 of Fig. 12 taken along section line Q-Q;

FIG. 14 is a perspective view of an embodiment of a tracking system 1400;

FIG. 15 is a perspective view of an embodiment of an electro-active lens system 1500;

FIG. 16 is a perspective view of an embodiment of an electro-active lens system 1600;

FIG. 17 is a perspective view of an embodiment of an electro-active lens 1700;

FIG. 18 is a perspective view of an embodiment of an electro-active lens 1800;

FIG. 19 is a perspective view of an embodiment of an electro-active layer 1900;

FIG. 20 is a perspective view of an embodiment of an electro-active lens 2000;

FIG. 21 is a perspective view of an embodiment of electro-active eyewear 2100;

FIG. 22 is a front view of an embodiment of an electro-active lens 2200;

FIG. 23 is a front view of an embodiment of an electro-active lens 2300;

FIG. 24 is a front view of an embodiment of an electro-active lens 2400;

FIG. 25 is a section view of an embodiment of an electro-active lens 2500 taken along section line Z-Z of Fig. 5;

FIG. 26 is a section view of an embodiment of an electro-active lens 2600 taken along section line Z-Z of Fig. 5;

FIG. 27 is a flow diagram of an embodiment of dispensing method 2700; and

FIG. 28 is a perspective view of an embodiment of an electro-active lens 2800.

Detailed Description

In 1998, there were approximately 92 million eye examinations performed in the United States alone. The vast majority of these examinations involved a thorough check for eye pathology both internal and external, analysis of muscle balance and binocularity, measurement of the cornea and, in many cases, the pupil, and finally a refractive examination, which was both objective and subjective.

Refractive examinations are performed to understand / diagnose the magnitude and type of the refractive error of one's eye. The types of refractive error that are currently able to be diagnosed & measured, are myopia, hyperopia, astigmatism, and presbyopia. Current refractors (phoropters) attempt to correct one's vision to 20/20 distance and near and, in some cases, 20/15 distance vision can be achieved; however, this is by far the exception.

It should be pointed out that the theoretical limit to which the retina of one's eye can process and define vision is approximately 20/10. This is far better than the level of vision which is currently obtained by way of both today's refractors (phoropters) and conventional spectacle lenses. What is missing from these conventional devices is the ability to detect, quantify and correct for non-conventional refractive error, such as aberrations, irregular astigmatism, or ocular layer irregularities. These aberrations, irregular astigmatism, and/or ocular layer irregularities may be as a result of one's visual system or as a result of aberrations caused by conventional eyeglasses, or a combination of both.

Therefore, it would be extremely beneficial to have a means for detecting, quantifying, and correcting one's vision as close to 20/10 or better as possible.

Furthermore, it would be beneficial to do this in a very efficient and user friendly manner.

The present invention utilizes a novel approach in detecting, quantifying and correcting one's vision. The approach involves several innovative embodiments utilizing an electro-active lens. Furthermore, the invention utilizes a novel approach towards the selection, dispensing, activating, and programming of electro-active eyewear.

For example, in one inventive embodiment, a novel electro-active phoropter/refractor is utilized. This electro-active phoropter/refractor utilizes far fewer lens components than today's phoropters and is a fraction of the overall size and/or weight of today's phoropters. In fact, this exemplary inventive embodiment consists of only a pair of electro-active lenses housed in a frame mounting that provides, either through its own structural design and/or by way of a network of conductive wires, electrical power needed to enable the electro-active lenses to function properly.

To assist with understanding certain embodiments of the invention, explanations of various terms are now provided. In some situations, these explanations are not necessarily intended to be limiting, but, should be read in light of the examples, descriptions, and claims provided herein.

An "electro-active zone" can include or be included in an electro-active structure, layer, and/or region. An "electro-active region" can be a portion and/or the entirety of an electro-active layer. An electro-active region can be adjacent to another electro-active region. An electro-active region can be attached to another electro-active region, either directly, or indirectly with, for example, an insulator between each electro-active region. An electro-active layer can be attached to another electro-active layer, either directly, or indirectly with, for example, an insulator between each electro-active layer. "Attaching" can include bonding, depositing, adhering, and other well-known attachment methods. A "controller" can include or be included in a processor, a microprocessor, an integrated circuit, an IC,

a computer chip, and/or a chip. A "refractor" can include a controller. An "auto-refractor" can include a wave front analyzer. "Near distance refractive error" can include presbyopia and any other refractive error needed to be corrected for one to see clearly at near distance. "Intermediate distance refractive error" can include the degree of presbyopia needed to be corrected an intermediate distance and any other refractive error needed to be corrected for one to see clearly at intermediate distance. "Far distance refractive error" can include any refractive error needed to be corrected for one to see clearly at far distance. "Near distance" can be from about 6 inches to about 24 inches, and more preferably from about 14 inches to about 18 inches. "Intermediate distance" can be from about 24 inches to about 5 feet. "Far distance" can be any distance between about 5 feet and infinity, and more preferably, infinity. "Conventional refractive error" can include myopia, hyperopia, astigmatism, and/or presbyopia. "Non-conventional refractive error" can include irregular astigmatism, aberrations of the ocular system, and any other refractive error not included in conventional refractive error. "Optical refractive error" can include any aberrations associated with a lens optic.

In certain embodiments, a "spectacle" can include one lens. In other embodiments, a "spectacle" can include more than one lens. A "multi-focal" lens can include bifocal, trifocal, quadrafocal, and/or progressive addition lens. A "finished" lens blank can include a lens blank that has finished optical surface on both sides. A "semi-finished" lens blank can include a lens blank that has, on one side only, a finished optical surface, and on the other side, a non-optically finished surface, the lens needing further modifications, such as, for example, grinding and/or polishing, to make it into a useable lens. "Surfacing" can include grinding and/or polishing off excess material to finish a non-finished surface of a semi-finished lens blank.

FIG. 1 is a perspective view of an embodiment of electro-active phoropter/refractor system 100. Frames 110 contain electro-active lens 120, which

are connected via a network of conductive wires 130 to an electro-active lens controller 140 and to an electrical power source 150.

In certain embodiments, the temples (not shown in Fig. 1) of frames 110 contain batteries or power sources such as, for example, a micro-fuel cell. In other inventive embodiments, the temple or temples of frame 110 possess the needed electrical components so that a power cord is plugged directly into an electrical outlet and/or the electro-active refractor's controller/programmer 160.

Still in other inventive embodiments, the electro-active lenses 120 are mounted in a housing assembly which is suspended so one could simply position one's face properly in order to look through the electro-active lenses while being refracted.

While the first inventive embodiment utilizes only a pair of electro-active lenses, in certain other inventive embodiments, multiple electro-active lenses are used. Still in other inventive embodiments, a combination of conventional lenses and electro-active lenses are utilized.

FIG. 2 is a diagrammatic view of an exemplary embodiment of an electro-active refractor system 200 that includes housing assembly 210 that contains at least one electro-active lens 220 and several conventional lenses, specifically, diffractive lens 230, prismatic lens 240, astigmatic lens 250, and spherical lens 260. A network of conductive wires 270 connects the electro-active lens 220 to a power source 275 and to a controller 280, that provides a prescription display 290.

In each inventive embodiment where multiple electro-active lenses and/or a combination of conventional and electro-active lenses are utilized, the lenses can be used to test one's vision in a random and/or non-random one-at-a-time sequence. In other inventive embodiments, two or more lenses are added together giving a total corrective power in front of each eye as needed.

The electro-active lenses, which are utilized in both the electro-active phoropter and the electro-active eyewear, are comprised of either a hybrid and/or non-hybrid construction. In a hybrid construction, a conventional lens optic is

combined with an electro-active zone. In a non-hybrid construction, no conventional lens optic is used.

As discussed above, the invention differs from today's conventional dispensing practice sequence 300, which is shown as a flow diagram in **FIG. 3**. As shown at steps 310 and 320, traditionally an eye examination involving a conventional refractor is followed by obtaining one's prescription and taking that prescription to a dispenser. Then, as shown at steps 330 and 340, at the dispenser one's frames and lens are selected. As shown at step 350 and 360, the lenses are fabricated, edged, and assembled into the frames. Finally, at step 370, the new prescription eyeglasses are dispensed and received.

As shown in the flow diagram of **FIG. 4**, in an exemplary embodiment of one inventive dispensing method 400, at step 410 the electro-active eyewear is selected by or for the wearer. At step 420, the frames are fitted to the wearer. With the wearer wearing the electro-active eyewear, at step 430, the electronics are controlled by the electro-active phoropter/refractor control system which in most cases is operated by an eyecare professional and/or technician. However, in certain inventive embodiments, the patient or wearer can actually operate the control system and thus, control the prescription of their own electro-active lenses. In other inventive embodiments, both the patient/wearer and the eyecare professional and/or technician work with the controller together.

At step 440, the control system, whether operated by the eyecare professional, technician, and/or the patient/wearer, is utilized to select both objectively or subjectively the best correcting prescription for the patient/wearer. Upon selecting the proper prescription to correct the patient/wearer's vision to it's optimal correction, the eyecare professional or technician then programs the patient's/wearer's electro-active eyewear.

In one inventive embodiment, the selected prescription is programmed into an electro-active eyewear controller, and/or one or more controller components, prior to the selected electro-active eyewear being disconnected from the electro-

active phoropter/refractor's controller. In other inventive embodiments the prescription is programmed into the selected electro-active eyewear at a later time.

In either case the electro-active eyewear is selected, fitted, programmed, and dispensed at step 450 in a totally different sequence than conventional eyeglasses are today. This sequence allows for improved manufacturing, refracting and dispensing efficiencies.

Via this inventive method, the patient/wearer literally can select their eyewear, wear them while the testing of their vision is taking place, and then have them programmed for the correct prescription. In most cases, but not all, this is done before the patient/wearer leaves the examination chair, thus, ensuring the total fabrication and programming accuracy of the patient's final prescription, as well as the accuracy of the eye refraction itself. Finally, in this inventive embodiment the patient can literally wear their electro-active eyeglasses when they get up out of the examination chair and proceed out of the eyecare professional's office.

It should be pointed out that other inventive embodiments allow for the electro-active phoropter/refractor to simply display or print out the patient or wearer's best corrected prescription which is then filled in much the same manner as in the past. Currently the process involves taking a written prescription to a dispensing location where electro-active eyewear (frames and lenses) are sold and dispensed.

Still in other inventive embodiments the prescription is sent electronically, for example, via the Internet, to a dispensing location where electro-active eyewear (frames and lenses) are sold.

In the case where the prescription is not filled at the point where the eye refraction is performed, in certain inventive embodiments an electro-active eyewear controller, and/or one or more controller components, is either programmed and installed into the electro-active eyewear, or directly programmed while installed in the electro-active eyewear, following the refraction. In the case where nothing is added to the electro-active eyewear, the electro-active eyewear controller, and/or one

or more controller components, is an intricate built-in part of the electro-active eyewear and does not need to be added at a later time.

FIG. 27 is a flow diagram of an embodiment of another inventive dispensing method 2700. At step 2710, the vision of the patient is refracted using any method. At step 2720, the prescription for the patient is obtained. At step 2730, the electro-active eyewear is selected. At step 2740, the electro-active eyewear is programmed with the wearer's prescription. At step 2750, the electro-active eyewear is dispensed.

FIG. 5 is a perspective view of another inventive embodiment of the electro-active eyewear 500. In this illustrative example, frames 510 contain generic electro-active lenses 520 and 522 that are electrically coupled by connecting wires 530 to electro-active eyewear controller 540 and power source 550. Section line Z-Z divides generic electro-active lens 520.

Controller 540 acts as the "brains" of the electro-active eyewear 500, and can contain at least one processor component, at least one memory component for storing instructions and/or data for a specific prescription, and at least one input/output component, such as a port. Controller 540 can perform computational tasks such as reading from and writing into memory, calculating voltages to be applied to individual grid elements based on desired refractive indices, and/or acting as a local interface between the patient/user's eyewear and the associated refractor/phoropter equipment.

In one inventive embodiment, controller 540 is pre-programmed by the eyecare specialist or technician to meet the patient's convergence and accommodative needs. In this embodiment, this pre-programming is done on controller 540 while controller 540 is outside the patient's eyewear, and controller 540 is then inserted into the eyewear after the examination. In one inventive embodiment, controller 540 is a "read-only" type, supplying the voltage to grid elements to obtain the necessary array of refractive indices to correct the vision for a specific distance. As the patient's prescription changes, a new controller 540 must

be programmed and inserted into the eyewear by the specialist. This controller would be of a class of ASIC's, or application specific integrated circuits, and its memory and processing commands permanently imprinted.

In another inventive embodiment, the electro-active eyewear controller may be originally programmed by the eyecare specialist or technician when first dispensed, and later the same controller, or a component thereof, can be reprogrammed to provide a different correction, as the patient's needs change. This electro-active eyewear controller may be extracted from the eyewear, placed in the refractor's controller/programmer (shown in Figs. 1 and 2) and reprogrammed during the examination, or reprogrammed, in situ, by the refractor without removal from the electro-active eyewear. The electro-active eyewear controller in this case could, for example, be of a class of FPGA's, or field programmable gate array architecture. In this inventive embodiment the electro-active eyewear controller may be permanently built into the eyewear and require only an interface link to the refractor which issues the reprogramming commands to the FPGA. Part of this link would include external AC power to the electro-active eyewear controller provided by an AC adapter embedded in the refractor/phoropter or in its controller/ programmer unit.

In another inventive embodiment, the electro-active eyewear acts as the refractor, and the external equipment operated by the eyecare specialist or technician consists of merely a digital and/or analog interface to the electro-active eyewear's controller. Thus, the electro-active eyewear controller can also serve as the controller for the refractor/phoropter. In this embodiment, the necessary processing electronics are available to alter the array of grid voltages to the electro-active eyewear and reprogram the electro-active eyewear controller with this data after the optimal correction for the user is empirically determined. In this case, the patient reviews the eye charts through his/her own electro-active eyewear during the examination and may be unaware that as he/she is selecting the best corrective

prescription, the controller in their electro-active eyewear is simultaneously being reprogrammed electronically.

Another innovative embodiment utilizes an electronic auto-refractor that can be used as a first step and/or in combination with the electro-active refractors (shown in Figs. 1 and 2) such as by way of example, but not limited to Humphrey's Auto-refractor & Nikon's Auto-refractor which have been developed or modified to provide feed back which is compatible and programmed for use with the invention's electro-active lenses. This innovative embodiment is used to measure one's refractive error, while the patient or wearer is wearing his or her electro-active spectacles. This feedback is fed automatically or manually into a controller and/or programmer, which then calibrates, programs or reprograms the controller of the user/wearer's electro-active spectacles. In this innovative embodiment, one's electro-active spectacles can be re-calibrated as needed without requiring full eye examination or eye refraction.

In certain other inventive embodiments, one's vision correction is corrected, by way of one's electro-active lenses, to 20/20. This is obtained in most cases by correcting one's conventional refractive error (myopia, hyperopia, astigmatism, and / or presbyopia). In certain other inventive embodiments, non-conventional refractive error such as aberrations, irregular astigmatism, and/or ocular layer irregularities of the eye are measured and corrected, as well as conventional refractive error (myopia, hyperopia, astigmatism and / or presbyopia). In the inventive embodiments whereby aberrations, irregular astigmatism, and/or ocular layer irregularities of the eye are corrected in addition to conventional refractive error, one's vision can be corrected in many cases to better than 20/20, such as to 20/15, to better than 20/15, to 20/10, and/or to better than 20/10.

This advantageous error correction is accomplished by utilizing the electro-active lenses in the eyewear effectively as an adaptive optic. Adaptive optics have been demonstrated and in use for many years to correct for atmospheric distortion in ground-based astronomical telescopes, as well as for laser transmission through the

atmosphere for communications and military applications. In these cases, segmented or "rubber" mirrors are usually employed to make small corrections to the wave front of the image or laser lightwave. These mirrors are manipulated by mechanical actuators in most cases.

Adaptive optics, as applied to vision, is based on active probing of the ocular system with a light beam, such as an eye-safe laser, and measures the wavefront distortion of either the retinal reflection or the image created on the retina. This form of wavefront analysis assumes a plane or spherical probe wave and measures the distortion imparted on this wavefront by the ocular system. By comparing the initial wavefront with the distorted one, a skilled examiner can determine what abnormalities exist in the ocular system and prescribe an appropriate corrective prescription. There are several competing designs for wavefront analyzers, however, the adaption of the electro-active lenses described here for use as either a transmissive or reflective spatial light modulator to perform such wavefront analysis is included within the invention. Examples of wavefront analyzers are provided in U.S. Patent Nos. 5,777,719 (Williams) and 5,949,521 (Williams), each of which is herein incorporated by reference in its entirety.

In certain embodiments of the present invention, however, small corrections or adjustments are made to the electro-active lenses so that an image lightwave is imparted by a grid array of electrically driven pixels whose index of refraction can be altered, accelerating or slowing down the light passing through them by the alterable index. In this way, the electro-active lens becomes an adaptive optic, which can compensate for the inherent spatial imperfection in the optics of the eye itself in order to obtain a nearly aberration-free image on the retina.

In certain inventive embodiments, because the electro-active lens is fully two-dimensional, fixed spatial aberrations caused by the eye's optical system can be compensated for by incorporating the small index of refraction corrections on top of the gross vision correction prescription needs of the patient/user. In this way, vision can be corrected to a level of better than what could be achieved with common

convergence and accommodation corrections, and, in many cases, could result in vision better than 20/20.

In order to achieve this better than 20/20 correction, the patient's ocular aberrations can be measured by, for example, a modified auto refractor utilizing a wavefront sensor or analyzer designed specifically for eye aberration measurements. Once the ocular aberrations and other types of non-conventional refractive error have been determined in both magnitude and spatially, the controller in the eyewear can be programmed to incorporate the 2-D spatially-dependent index of refraction changes to compensate for these aberrations and other types of non-conventional refractive error in addition to the overall myopia, hyperopia, presbyopia, and/or astigmatism correction. Thus, embodiments of the electro-active lens of the present invention can electro-actively correct for aberrations of the patient's ocular system or created by the lens optic.

Thus, for example, a certain power correction of -3.50 diopters may be required in a certain electro-active divergent lens to correct a wearer's myopia. In this case, an array of different voltages, $V_1...V_N$, is applied to the M elements in the grid array to generate an array of different indices of refraction, $N_1...N_M$, which give the electro-active lens a power of -3.50 diopters. However, certain elements in the grid array may require up to plus or minus 0.50 units change in their index $N_1...N_M$ to correct for ocular aberrations and/or non-conventional refractive error. The small voltage deviations corresponding to these changes is applied to the appropriate grid element, in addition to the base myopia-correcting voltages.

In order to detect, quantify, and/or correct as much as possible for non-conventional refractive error such as irregular astigmatism, ocular refractive irregularities, such as for example, the tear layer on the front of the cornea, the front, or back of the cornea, aqueous irregularities, the front or back of the lenticular lens, vitreous irregularities, or for other aberrations caused by the ocular refractive system

itself, the electro-active refractor/phoropter is used according to an embodiment of the inventive prescription method 600 of **FIG. 6**.

At step 610, either a conventional refractor, an electro-active refractor having both conventional and electro-active lenses, or an electro-active refractor having only electro-active lenses, or an auto-refractor, is utilized to measure one's refractive error using conventional lens powers such as minus power (for myopes), plus power (for hyperopes), cylindrical power and axis (for astigmatism) and prism power when needed. Utilizing this approach, one will get what is known today as the patient's BVA (best visual acuity) by way of conventional corrective refractive error. However, certain embodiments of the invention allow for improving one's vision beyond what today's conventional refractor/phoropters will achieve.

Therefore, step 610 provides for further refinement of one's prescription in a non-conventional inventive way. In step 610, the prescription, which accomplishes this end point, is programmed into the electro-active refractor. The patient is properly positioned to look through the electro-active lenses having a multi-grid electro-active structure into a modified and compatible autorefractor or a wavefront analyzer, which automatically measures precisely the refractive error. This refractive error measurement detects and quantifies as much non-conventional refractive errors as possible. This measurement is taken through a small, approximately 4.29 mm, targeted area of each electro-active lens, while automatically computing the necessary prescription to achieve the best focus on the fovea along the line-of-sight while the patient is looking through the targeted area of the electro-active lens. Once this measurement is made this non-conventional correction is either stored in the controller/programmer memory for future use or it is then programmed into the controller that controls the electro-active lenses. This, of course, is repeated for both eyes.

At step 620, the patient or wearer now may at their option elect to use a control unit which will allow them to further refine the conventional refractive error correction, the non-conventional refractive error correction, or a combination of

both, and thus the final prescription, to their liking. Alternatively, or in addition, the eyecare professional may refine it, until in some cases no further refinement is performed. At this point, an improved BVA for the patient, better than any available via conventional techniques, will be achieved.

At step 630, any further refined prescription is then programmed into the controller, which controls the electro-active lenses' prescription. At step 640, the programmed electro-active spectacles are dispensed.

While the preceding steps 610 through 640 present an embodiment of one inventive method, depending upon the eyecare professional's judgement or approach, numerous different but similar approaches could be used to detect, quantify, and/or correct one's vision using solely electro-active refractors/phoropters or in combination with wavefront analyzers. Any method, no matter in what sequence, that utilizes an electro-active refractor/phoropter to detect, quantify, and/or correct one's vision, whether in conjunction with a wavefront analyzer or not, is considered part of the invention. For example, in certain inventive embodiments, steps 610 through 640 may be performed in either a modified way or even a different sequence. Furthermore, in embodiments of certain other inventive methods, the targeted area of the lens referred to in step 610 is within the range of about 3.0 millimeters in diameter to about 8.0 millimeters in diameter. Still in other inventive embodiments, the targeted area can be anywhere from about 2.0 millimeters in diameter up to the area of the entire lens.

Although this discussion has thus far concentrated on refraction using various forms of electro-active lenses alone or in combination with wavefront analyzers to perform the eye examination of the future, there is another possibility that new emerging technology may allow simply for objective measurements, thus potentially eliminating the need for a patient's communicated response or interaction. Many of the inventive embodiments described and/or claimed herein are intended to work with any type of measuring system, whether objective, subjective, or a combination of both.

Turning now to the electro-active lens itself, as discussed above, an embodiment of the present invention concerns an electro-active refractor/phoropter that has a novel electro-active lens, that can either be of a hybrid or of a non-hybrid construction. By hybrid construction it is meant a combination of a conventional single vision or a multifocal lens optic, with at least one electro-active zone located on the front surface, back surface, and/or in between the front and back surfaces, the zone consisting of an electro-active material having the necessary electro-active means to change focus electrically. In certain embodiments of the invention, the electro-active zone is specifically placed either inside the lens or on the back concave surface of the lens to protect it from scratches and other normal wear. In the embodiment where the electro-active zone is included as part of the front convex surface, in most cases a scratch resistant coating is applied. The combination of the conventional single vision lens or a conventional multifocal lens and the electro-active zone gives the total lens power of the hybrid lens design. By non-hybrid it is meant a lens which is electro-active whereby mostly 100% of its refractive power is generated solely by its electro-active nature.

FIG. 7 is a front view, and **FIG. 8** is a section view taken along line A-A, of an embodiment of an exemplary hybrid electro-active spectacle lens 700. In this illustrative example, lens 700 includes a lens optic 710. Attached to lens optic 710 is an electro-active layer 720, that can have one or more electro-active regions that occupy all or a portion of electro-active layer 720. Also attached to lens optic 710 and at least partially surrounding electro-active layer 720 is framing layer 730. Lens optic 710 includes an astigmatic power correction region 740 having an astigmatic axis A-A rotated, in this specific example only, approximately 45 degrees clockwise from horizontal. Covering electro-active layer 720 and framing layer 730 is an optional cover layer 750.

As will be discussed further, electro-active layer 720 can include a liquid crystal and/or a polymer gel. Electro-active layer 720 can also include an alignment layer, a metallic layer, a conducting layer, and/or an insulating layer.

In an alternative embodiment, astigmatic correction region 740 is eliminated so that lens optic 710 corrects for sphere power only. In another alternative embodiment, lens optic 710 can correct for either far distance, near distance, and/or both, and any sort of conventional refractive error, including spheric, cylindric, prismatic, and/or aspheric errors. Electro-active layer 720 can also correct for near distance, and/or for non-conventional refractive error such as aberrations. In other embodiments, electro-active layer 720 can correct any sort of conventional or non-conventional refractive error and lens optic 710 can correct for conventional refractive error.

It has been discovered that an electro-active lens having a hybrid construction approach has certain distinct advantages over that of a non-hybrid lens. These advantages are lower electrical power needs, smaller battery size, longer battery life expectancy, less complex electrical circuitry, fewer conductors, fewer insulators, lower manufacturing costs, increased optical transparency, and increased structural integrity. However, it must be noted that non-hybrid electro-active lenses have their own set of advantages, including reduced thickness and mass manufacturing.

It also has been discovered that both the non-hybrid, and in some embodiments, the full field hybrid and partial field hybrid approach, will allow for mass manufacturing of a very limited number of SKUs (Stock Keeping Units) when, for example, the electro-active structural design utilized is that of a multi-grid electro-active structure. In this case, it would only be necessary when mass manufacturing to focus primarily on a limited number of differentiated features such as curvature and size for the wearer's anatomical compatibility.

To understand the significance of this improvement, one must understand the number of traditional lens blanks needed to address most prescriptions. About 95% of corrective prescriptions include a sphere power correction within a range of -6.00 diopters to +6.00 diopters, in 0.25 diopter increments. Based on this range, there are about 49 commonly prescribed sphere powers. Of those prescriptions that include

an astigmatism correction, about 95% fall within the range of -4.00 diopters to + 4.00 diopters, in 0.25 diopter increments. Based on this range, there are about 33 commonly prescribed astigmatic (or cylinder) powers. Because astigmatism has an axis component, however, there are about 360 degrees of astigmatic axis orientations, which are typically prescribed in 1 degree increments. Thus, there are 360 different astigmatic axis prescriptions.

Moreover, many prescriptions include a bifocal component to correct for presbyopia. Of those prescriptions that have a presbyopic correction, about 95% fall within the range of +1.00 to +3.00 diopters, in 0.25 diopter increments, thereby resulting in about 9 commonly prescribed presbyopic powers.

Because some embodiments of the invention can provide for spherical, cylindrical, axis, and presbyopic corrections, one non-hybrid electro-active lens can serve the 5,239,080 (= 49 x 33 x 360 x 9) different prescriptions. Thus, one non-hybrid electro-active lens can eliminate the need to mass manufacture and/or stock numerous lens blank SKUs, and of possibly greater importance, can eliminate the need to grind and polish each lens blank to a particular patient's prescription.

To account for the various lens curvatures that may be needed to accommodate anatomical issues such as face shape, eyelash length, etc., somewhat more than one non-hybrid electro-active lens SKU could be mass manufactured and/or stocked. Nevertheless, the number of SKU's could be reduced from millions to about five or less.

In the case of the hybrid electro-active lens, it has been discovered that by correcting for conventional refractive error with the lens optic and utilizing a mostly centered electro-active layer, it is possible to also reduce the number of SKU's needed. Referring to FIG. 7, lens 700 can be rotated as needed to place astigmatic axis A-A in the needed position. Thus, the number of hybrid lens blanks needed can be reduced by a factor of 360. Moreover, the electro-active zone of the hybrid lens can provide the presbyopic correction, thereby reducing by a factor of 9 the number of lens blanks needed. Thus, a hybrid electro-active lens embodiment can reduce

from more than 5 million to 1619 (= 49 x 33) the number of lens blanks needed. Because it may be reasonably possible to mass manufacture and/or stock this number of hybrid lens blank SKUs, the need for grinding and polishing may be eliminated.

Nevertheless, grinding and polishing semi-finished hybrid lens blanks into finished lens blanks remains a possibility. **FIG. 28** is a perspective view of an embodiment of a semi-finished lens blank 2800. In this embodiment, semi-finished lens blank 2800 has a lens optic 2810 with a finished surface 2820, an unfinished surface 2830, and a partial field electro-active layer 2840. In another embodiment, semi-finished lens blank 2800 can have a full field electro-active layer. Moreover, the electro-active structure of semi-finished lens blank 2800 can be multi-grid or single interconnect. Further, semi-finished lens blank 2800 can have refractive and/or diffractive characteristics.

In either the hybrid or the non-hybrid embodiment of the electro-active lens, a significant number of needed correcting prescriptions can be created and customized by the electro-active lens which can be adjusted and controlled by a controller that has been customized and/or programmed for the patient's specific prescription needs. Thus, the millions of prescriptions and numerous lens styles, single vision lens blanks, as well as the numerous multifocal semi-finished lens blanks may be no longer needed. In fact, most lens and frame manufacturing and distribution, as we know it may be revolutionized.

It should be noted that the invention includes both non-hybrid electro-active lenses, as well as full and partial field specific hybrid electro-active lenses that are either pre-manufactured electronic eyewear (frame and/or lenses) or customized electronic eyewear at the time of delivery to the patient or customer. In the case of the eyewear being pre-fabricated and assembled, both the frames and the lenses are pre-made with the lenses already edged and put into the eyeglass frames. Also considered to be part of the invention is the programmable and re-programmable controller as well as the mass production of frames and lenses having the necessary

electric components which can be prefabricated and sent to the eyecare professional's site or some other site for either the installation of, for example, a programmed controller, and/or one or more controller components, for the patient's prescription.

In certain cases the controller, and/or one or more controller components, can be part of the pre-manufactured frame and electro-active lens assembly and then programmed at either the eyecare professional's site or some other site. The controller, and/or one or more controller components, can be in the form, for example, of a chip or a thin film and can be housed in the frame, on the frame, in the lens, or on the lens of the eyeglasses. The controller, and/or one or more controller components, can be re-programmable or not re-programmable based upon the business strategy to be implemented. In the case where the controller, and/or one or more controller components, is re-programmable, this will allow for the repeated updating of one's prescriptions as long as the patient or customer is happy with his or her eyeglass frames as well as the cosmetic appearance and functionality of the electro-active lenses.

In the case of the latter, the non-hybrid and hybrid electro-active lens embodiments just discussed, the lenses must be structurally sound enough in order to protect the eye from injury from a foreign object. In the United States, most eyewear lenses must pass a FDA required impact test. In order to meet these requirements, it is important that a support structure is built into or on the lens. In the case of the hybrid type, this is accomplished, for example, utilizing either a prescription or non-prescription single vision or multifocal lens optic as a structural base. For example, the structural base for the hybrid type can be made out of polycarbonate. In the case of the non-hybrid lens, in certain embodiments, the electro-active material selected and thickness accounts for this needed structure. In other embodiments, the non-prescription carrier base or substrate onto which the electro-active material is positioned accounts for this needed protection.

When utilizing electro-active zones in spectacle lenses in certain hybrid designs, it can be essential to maintain proper distance correction when a power interruption to the lenses occurs. In the case of a battery or wiring failure, in some situations it could be disastrous if the wearer was driving an automobile or piloting an airplane and their distance correction was lost. To prevent such occurrences, the inventive design of the electro-active spectacle lenses can provide for the distance correction to be maintained when the electro-active zones is in the OFF position (the inactivated or unpowered state). In an embodiment of this invention, this can be accomplished by providing the distance correction with a conventional fixed focal length optic, whether it be a refractive or a diffractive hybrid type. Any additional add power, therefore, is provided by the electro-active zone(s). Thus, a fail-safe electro-active system occurs, because the conventional lens optic will preserve the wearer's distance correction.

FIG. 9 is a side view of an exemplary embodiment of another electro-active lens 900 having a lens optic 910 that is index matched to an electro-active layer 920. In this illustrative example, the diverging lens optic 910, having an index of refraction, n_1, provides distance correction. Attached to lens optic 910 is the electro-active layer 920, which can have an unactivated state, and a number of activated states. When electro-active layer 920 is in its unactivated state, it has an index of refraction n_2, which approximately matches the index of refraction, n_1, of lens optic 910. More accurately, when unactivated, n_2 is within 0.05 refractive units of n_1. Surrounding electro-active layer 920 is framing layer 930, which has an index of refraction, n_3, that also approximately matches the index of refraction, n_1, of lens optic 910 within 0.05 refractive units of n_1.

FIG. 10 is a perspective view of an exemplary embodiment of another electro-active lens system 1000. In this illustrative example, electro-active lens 1010 includes a lens optic 1040 and an electro-active layer 1050. A rangefinder transmitter 1020 is positioned on electro-active layer 1050. Also, a rangefinder detector/receiver 1030 is positioned on electro-active layer 1050. In an alternative

embodiment, either transmitter 1020 or receiver 1030 can be positioned in electro-active layer 1050. In other alternative embodiments, either transmitter 1020 or receiver 1030 can be positioned in or on lens optic 1040. In other embodiments either transmitter 1020 or receive 1030 can be positioned on outer covering layer 1060. Further, in other embodiments, 1020 and 1030 can be positioned on any combination of the preceding.

FIG. 11 is a side view of an exemplary embodiment of a diffractive electro-active lens 1100. In this illustrative example, lens optic 1110 provides distance correction. Etched on one surface of lens optic 1110 is diffractive pattern 1120, having an index of refraction, n_1. Attached to lens optic 1110 and covering diffractive pattern 1120 is electro-active layer 1130, which has an index of refraction, n_2, that approximates n_1, when electro-active layer 1130 is in its unactivated state. Also attached to lens optic 1110 is framing layer 1140, which is constructed of material mostly identical to lens optic 1110, and which at least partially surrounds electro-active layer 1120. A covering 1150 is attached over electro-active layer 1130 and framing layer 1140. The framing layer 1140 can also be an extension of lens optic 1110, in which can no actual layer is added, however, lens optic 1110 is fabricated so as to frame or circumscribe electro-active layer 1130.

FIG. 12 is a front view, and **FIG. 13** a side view, of an exemplary embodiment of an electro-active lens 1200 having a multi-focal optic 1210 attached to an electro-active framing layer 1220. In this illustrative example, multi-focal optic 1210 is of a progressive addition lens design. Moreover, in this illustrative example, multi-focal optic 1210 includes a first optical refraction focus zone 1212 and a second progressive addition optical refraction focus zone 1214. Attached to multi-focal optic 1210 is electro-active framing layer 1220 having an electro-active region 1222 that is positioned over second optical refraction focus zone 1214. A cover layer 1230 is attached to electro-active framing layer 1220. It should be noted that the framing layer can be either electro-active or non-electro-active. When the framing layer is electro-active, insulating material is utilized to insulate the activated

region from the non-activated region.

In most inventive cases, but not all, in order to program the electro-active eyewear to correct one's vision to its optimum, thus, correcting for non-conventional refractive error it is necessary to track the line-of-sight of each eye by way of tracking the eye movements of the patient or wearer.

FIG. 14 is a perspective view of an exemplary embodiment of a tracking system 1400. Frames 1410 contain electro-active lens 1420. Attached to the backside of electro-active lens 1420 (that side closest to the wearer's eyes, also referred to as the proximal side), are a tracking signal sources 1430, such as light emitting diodes. Also attached to the backside of electro-active lens 1420 are tracking signal receivers 1440, such as light reflection sensors. Receivers 1440, and possibly sources 1430, are connected to a controller (not shown) that includes in its memory instructions to enable tracking. Utilizing this approach it is possible to locate very precisely the eye movements up, down, right, left and any variation thereof. This is needed as certain types, but not all, of non-conventional refractive error needs to be corrected and isolated within one's line-of-sight (for example, in the case of a specific corneal irregularity or bump that moves as the eye moves).

In various alternative embodiments, sources 1430 and/or receivers 1440 can be attached to the backside of frames 1410, embedded in the backside of frames 1410, and/or embedded in the backside of lenses 1420.

An important portion of any spectacle lens, including the electro-active spectacle lens, is the portion used to produce the sharpest image quality within the user's field of view. While a healthy person can see approximately 90 degrees to either side, the sharpest visual acuity is located within a smaller field of view, corresponding to the portion of the retina with the best visual acuity. This region of the retina is known as the fovea, and is approximately a circular region measuring 0.40mm in diameter on the retina. Additionally, the eye images the scene through the entire pupil diameter, so the pupil diameter will also affect the size of the most critical portion of the spectacle lens. The resulting critical region of the spectacle

lens is simply the sum of the diameter of the eye's pupil diameter added to the projection of the fovea's field of view onto the spectacle lens.

The typical range for the eye's pupil diameter is from 3.0 to 5.5 mm, with a most common value of 4.0 mm. The average fovea diameter is approximately 0.4 mm.

The typical range for the size of the fovea's projected dimension onto the spectacle lens is affected by such parameters as the length of the eye, the distance from the eye to the spectacle lens, etc.

The tracking system of this specific inventive embodiment then locates the regions of the electro-active lens that correlate to the eye movements relative to the fovial region of the patient's retina. This is important as the invention's software is programmed to always correct for the non-conventional refractive error that is correctable as the eye moves. Thus, it is necessary in most, but not all, inventive embodiments that correct for non-conventional refractive error to electro-actively alter the area of the lens that the line-of-sight is passing through as the eyes fixate their target or gaze. In other words, in this specific inventive embodiment the vast majority of the electro-active lens corrects for conventional refractive error and as the eye moves the targeted electro-active area focus moves as well by way of the tracking system and software to correct for the non-conventional refractive error taking into account the angle in which the line-of-sight intersects different sections of the lens and factoring this into the final prescription for that specific area.

In most, but not all, inventive embodiments, the tracking system and enabling software is utilized to correct one's vision to its maximum, while looking or gazing at distant objects. When looking at near points the tracking system, if used, is utilized to both calculate the range of near point focus in order to correct for one's accommodative and convergence near or intermediate range focusing needs. This of course is programmed into the electro-active eyewear controller, and/or one or more controller components, as part of the patient or wearers' prescription. In still other inventive embodiments a range finder and/or tracking system is

incorporated either into the lenses and/or frames.

It should be pointed out that in other inventive embodiments such as those that correct for certain types of non-conventional refractive error, such as, for example, irregular astigmatism, in most but not all cases, the electro-active lenses do not need to track the patient or wearer's eye. In this case the overall electro-active lens is programmed to correct for this, as well as the other conventional refractive error of the patient.

Also, since aberrations are directly related to the viewing distance, it has been discovered that they can be corrected in relation to the viewing distance. That is, once the aberration or aberrations have been measured, it is possible to correct for these aberrations in the electro-active layer by way of segregating the electro-active regions so as to electro-actively correct for aberrations for specific distances such as distance vision, intermediate vision, and/or near vision. For example, the electro-active lens can be segregated into a far vision, intermediate vision, and near vision corrective zones, each the software controlling each zone causing the zone to correct for those aberrations that impact the corresponding viewing distance. Therefore in this specific inventive embodiment, where the electro-active layer is segregated for different distances whereby each segregated region corrects for specific aberrations of a specific distance, it is possible to correct for non-refractive error without a tracking mechanism.

Finally, it should be pointed out that in another inventive embodiment, it is possible to accomplish the correction of the non-conventional refractive error, such as that caused by aberrations, without physically separating the electro-active regions and without tracking. In this embodiment, using the viewing distance as an input, the software adjusts the focus of a given electro-active area to account for the correction needed for an aberration that would otherwise impact the vision at the given viewing distance.

Furthermore, it has been discovered that either a hybrid or non-hybrid electro-active lens can be designed to have a full field or a partial field effect. By

full field effect it is meant that the electro-active layer or layers cover the vast majority of the lens region within an eyeglass frame. In the case of a full field, the entire electro-active area can be adjusted to the desired power. Also, a full field electro-active lens can be adjusted to provide a partial field. However, a partial field electro-active specific lens design can not be adjusted to a full field due to the circuitry needed to make it partial field specific. In the case of a full field lens adjusted to become a partial field lens, a partial section of the electro-active lens can be adjusted to the desired power.

FIG. 15 is a perspective view of an exemplary embodiment of another electro-active lens system 1500. Frames 1510 contain electro-active lenses 1520, which have a partial field 1530.

For purposes of comparison, **FIG. 16** is a perspective view of an exemplary embodiment of yet another electro-active lens system 1600. In this illustrative example, frames 1610 contain electro-active lenses 1620, which have a full field 1630.

In certain inventive embodiments the multifocal electro-active optic is pre-manufactured and in some cases, due to the significantly reduced number of SKU's required, even inventoried at the dispensing location as a finished multifocal electro-active lens blank. This inventive embodiment allows for the dispensing site to simply fit and edge the inventoried multifocal electro-active lens blanks into the electronic enabling frames. While in most cases this invention could be of a partial field specific type electro-active lens, it should be understood this would work for full field electro-active lenses, as well.

In one hybrid embodiment of the invention, a conventional single vision lens optic being of aspheric design or non-aspheric design having a toric surface for correction of astigmatism and a spherical surface is utilized to provide the distance power needs. If astigmatic correction is needed the appropriate power single vision lens optic would be selected and rotated to the proper astigmatic axis location. Once this is done the single vision lens optic could be edged for the eye wire frame style

and size. The electro-active layer could then be applied on the single vision lens optic or the electro-active layer can be applied prior to edging and the total lens unit can be edged later. It should be pointed out that, for edging whereby the electro-active layer is affixed to a lens optic, either a single vision or multifocal electro-active optic, prior to edging, an electro-active material such as a polymer gel may be advantageous over a liquid crystal material.

The electro-active layer can be applied to compatible lens optics by way of different technologies known in the art. Compatible lens optics are optics whose curves and surfaces will accept the electro-active layer properly from the stand point of bonding, aesthetics, and/or proper final lens power. For example, adhesives can be utilized applying the adhesive directly to the lens optic and then laying down the electro-active layer. Also, the electro-active layer can be manufactured so it is attached to a release film in which case it can be removed and reattached adhesively to the lens optic. Also, it can be attached to two-way film carrier of which the carrier itself is attached adhesively to the lens optic. Furthermore, it can be applied utilizing a SurfaceCasting technique in which case the electro-active layer is created in-situ.

In previously mentioned hybrid embodiment, **FIG. 12**, a combination of a static and non-static approach is used to satisfy one's mid and near point vision needs, a multifocal progressive lens 1210 having the proper needed distance correction and having, for example, approximately +1.00 diopter of full near add power is utilized in lieu of the single vision lens optic. In utilizing this embodiment the electro-active layer 1220 can be placed on either side of the multifocal progressive lens optic, as well as buried inside the lens optic. This electro-active layer is utilized to provide for additional add power.

When utilizing a lower add power in the lens optic than required by the overall multifocal lens, the final add power is the total additive power of the low multifocal add and the additional required near power generated by way of the electro-active layer. For example only; if a multifocal progressive addition lens

optic had an add power of +1.00 and the electro-active layer created a near power of +1.00 the total near power for the hybrid electro-active lens would be +2.00D. Utilizing this approach, it is possible to significantly reduce unwanted perceived distortions from multi-focal lenses, specifically progressive addition lenses.

In certain hybrid electro-active embodiments whereby a multifocal progressive addition lens optic is utilized, the electro-active layer is utilized to subtract out unwanted astigmatism. This is accomplished by neutralizing or substantially reducing the unwanted astigmatism through an electro-actively created neutralizing power compensation solely in the areas of the lens where the unwanted astigmatism exists.

In certain inventive embodiments decentration of the partial field is needed. When applying a decentered partial field electro-active layer it is necessary to align the electro-active layer in such a way to accommodate the proper astigmatic axis location of the single vision lens optic so as to allow for correcting one's astigmatism, should it exist, as well as locating the electronic variable power field in the proper location for one's eyes. Also, it is necessary with the partial field design to align the partial field location to allow for proper decentration placement with regards to the patient's pupillary needs. It has been further discovered that unlike conventional lenses where the static bifocal, multifocal or progressive regions are always placed to always be below one's distance-viewing gaze, the use of an electro-active lens allows for certain manufacturing freedom not available to conventional multifocal lenses. Therefore, some embodiments of the invention, the electro-active region is located where one would typically find the distance, intermediate, and near vision regions of a conventional non-electro-active multi-focal lens. For example, the electro-active region can be placed above the 180 meridian of the lens optic, thereby allowing the multifocal near vision zone to be occasionally provided above the 180 meridian of the lens optic. Providing the near vision zone above the 180 meridian of the lens optic can be especially useful for those spectacle wearers working at close distances to an object directly in front or overhead of the wearer,

such as working with a computer monitor, or nailing picture frames overhead.

In the case of a non-hybrid electro-active lens or both the hybrid full field lens and for example, a 35mm diameter hybrid partial field lens, the electro-active layer, as stated before, can be applied directly to either the single vision lens optic, or pre-manufactured with a lens optic creating electro-active finished multifocal lens blanks, or the multifocal progressive lens optic, prior to edging the lens for the shape of the frame's lens mounting. This allows for pre-assembly of electro-active lens blanks, as well as being able to inventory stock finished, but not edged electro-active lens blanks, thus allowing for just in time eyeglass fabrication at any channel of distribution, including the doctor or optician's offices. This will allow all optical dispensaries to be able to offer fast service with minimal needs for expensive fabrication equipment. This benefits manufacturers, retailers, and their patients, the consumers.

Considering the size of the partial field, it has been shown, for example, in one inventive embodiment that the partial field specific region could be a 35mm diameter centered or decentered round design. It should be pointed out that the diameter size can vary depending upon the needs. In certain inventive embodiments 22mm, 28mm, 30mm, & 36mm round diameters are utilized.

The size of the partial field can depend on the structure of the electro-active layer and/or the electro-active field. At least two such structures are contemplated as within the scope of the present invention, namely, a single-interconnect electro-active structure and a multi-grid electro-active structure.

FIG. 17 is a perspective view of an embodiment of an electro-active lens 1700 having a single interconnect structure. Lens 1700 includes a lens optic 1710 and an electro-active layer 1720. Within electro-active layer 1720, an insulator 1730 separates an activated partial field 1740 from a framed non-activated field (or region) 1750. A single wire interconnect 1760 connects the activated field to a power supply and/or controller. Note that in most, if not all, embodiments, a single-interconnect structure has a single pair of electrical conductors coupling it to a

power source.

FIG. 18 is a perspective view of an embodiment of an electro-active lens 1800 having a multi-grid structure. Lens 1800 includes a lens optic 1810 and an electro-active layer 1820. Within electro-active layer 1820, an insulator 1830 separates an activated partial field 1840 from a framed non-activated field (or region) 1850. A plurality of wire interconnects 1860 connect the activated field to a power supply and/or controller.

When utilizing the smaller diameters for the partial field, it has been discovered that the electro-active thickness differential from edge to center of the partial field specific region when utilizing a single interconnect electro-active structure can be minimized. This has a very positive role in minimizing the electrical power needs, as well as number of electro-active layers required, especially for the single interconnect structure. This is not always the case for the partial field specific region whereby it utilizes a multi-grid electro-active structure. When utilizing a single interconnect electro-active structure, in many inventive embodiments, but not all, multiple single interconnect electro-active structures are layered within or on the lens so as to allow for multiple electro-active layers creating for example, a total combined electro-active power of +2.50D. In this inventive example only, five +0.50D single interconnect layers could be placed one on top of each other separated only in most cases, by insulating layers. In this way, the proper electrical power can create the necessary refractive index change for each layer by way of minimizing the electrical needs of one thick single interconnect layer which in some cases would be impractical to energize properly.

It should be further pointed out in the invention, certain embodiments having multiple single interconnect electro-active layers can be energized in a preprogrammed sequence to allow one to have the ability to focus over a range of distances. For example, two +0.50D single interconnect electro-active layers could be energized, creating a +1.00 intermediate focus to allow for a +2.00D presbyope to see at finger tip distance and then two additional +0.50D single interconnect electro-

active layers could be energized to give the +2.00D presbyope the ability to read as close as 16 inches. It should be understood that the exact number of electro-active layers, as well as the power of each layer, can vary depending upon the optical design, as well as the total power needed to cover a specific range of near and intermediate vision distances for a specific presbyope.

Furthermore, in certain other inventive embodiments, a combination of either one or more single interconnect electro-active layers are present in the lens in combination with a multi-grid electro-active structural layer. Once again, this gives one the ability of focusing for a range of intermediate and near distances assuming the proper programming. Finally, in other inventive embodiments, only a multi-grid electro-active structure is utilized either in a hybrid or non-hybrid lens. Either way, the multi-grid electro-active structure in combination with a properly programmed electro-active eyewear controller, and/or one or more controller components, would allow for the ability to focus over a broad range of intermediate and near distances.

Also, semi-finished electro-active lens blanks that would allow for surfacing are also within the scope of the invention. In this case, either a decentered, centered, partial field electro-active layer incorporated with the blank, or a full field electro-active layer is incorporated with the blank and then surfaced to the correct prescription needed.

In certain embodiments the variable power electro-active field is located over the entire lens and adjusts as a constant spherical power change over the entire surface of the lens to accommodate one's working near vision focusing needs. In other embodiments the variable power field adjusts over the entire lens as a constant spherical power change while at the same time creating an aspherical peripheral power effect in order to reduce distortion and aberrations. In some of the embodiments mentioned above, the distance power is corrected by way of either the single vision, multifocal finished lens blanks, or the multifocal progressive lens optic. The electro-active optical layer corrects mainly for the working distance focusing needs. It should be noted this is not always the case. It is possible, in some

cases, to utilize either a single vision, multifocal finished lens optic, or multifocal progressive lens optic for distance spherical power only and correct near vision working power and astigmatism through the electro-active layer or utilize either the single vision or multifocal lens optic to correct astigmatism only and correct the sphere power and near vision working power through the electro-active layer. Also, it is possible to utilize a plano, single vision, multifocal finished lens optic, or progressive multifocal lens optic and correct the distance sphere and astigmatism needs by way of the electro-active layer.

It should be pointed out that with the invention, the power correction needed, whether prismatic, spherical or aspheric power as well as total distance power needs, mid range power needs and near point power needs, can be accomplished by way of any number of additive power components. These include the utilization of a single vision or finished multifocal lens optic providing all the distance spherical power needs, some of the distance spherical power needs, all of the astigmatic power needs, some of the astigmatic power needs, all of the prismatic power needs, some of the prismatic power needs, or any combination of the above when combined with the electro-active layer, will provide for one's total focusing needs.

It has been discovered that the electro-active layer allows for the utilization of adaptive optic correction-like techniques to maximize one's vision through his or her electro-active lenses either prior or after final fabrication. This can be accomplished by way of allowing the patient or intended wearer to look through the electro-active lens or lenses and adjusting them manually, or by way of a special designed automatic refractor that almost instantly will measure conventional and/or non-conventional refractive error and will correct any remaining refractive error be it spherical, astigmatic, aberrations, etc. This technique will allow for the wearer to achieve 20/10 or better vision in many cases.

Furthermore, it should be pointed out that in certain embodiments a Fresnell power lens layer is utilized along with the single vision or multifocal or multifocal lens blank or optic as well as the electro-active layer. For example: the Fresnell

layer is utilized to provide spherical power and thereby reduce lens thickness, the single vision lens optic to correct astigmatism, and the electro-active layer to correct for mid and near distance focusing needs.

As discussed above, in another embodiment a diffractive optic is utilized along with the single vision lens optic and the electro-active layer. In this approach the diffractive optic, which provides for additional focusing correction, further reduces the need for the electric power, circuitry, and thickness of the electro-active layer. Once again, the combination of any two or more of the following can be utilized in an additive manner to provide the total additive power needed for one's spectacle correction power needs. These being a Fresnell layer, conventional or non-conventional single vision or multifocal lens optic, diffractive optic layer, and electro-active layer or layers. Furthermore it is possible through an etching process to impart a shape and or effect of a diffractive or Fresnel layer into the electro-active material so as to create a non-hybrid or hybrid electro-active optic having a diffractive or Fresnel component. Also, it is possible using the electro-active lens to create not only conventional lens power, but also prismatic power.

It has also been discovered that utilizing either an approximate 22mm or a 35mm diameter round centered hybrid partial field specific electro-active lens design or an adjustable decentered hybrid electro-active partial field specific design being approximately 30mm in diameter it is possible to minimize the electrical power circuitry needs, battery life, and battery size, reducing manufacturing costs and improving optical transparency of the final electro-active spectacle lens.

In one inventive embodiment, the decentered partial field specific electro-active lens is located so that the optical center of this field is located approximately 5mm below the optical center of the single vision lens, while at the same time having the near working distance electro-active partial field being decentered nasally or temporally to satisfy the patient's correct near to intermediate working range pupillary distance. It should be noted that such a design approach is not limited to a circular design but could be virtually any shape that allowed the proper electro-

active visual field area needed for one's vision needs. For example, the design could be oval, rectangular, square shaped, octagonal, partially curved, etc. What is important is the proper placement of the viewing area for either the hybrid partial field specific designs or hybrid full field designs that have the ability to achieve partial fields as well as non-hybrid full field designs that also have the ability to achieve partial fields.

Further it has been discovered that the electro-active layer in many cases (but not all) is utilized having an uneven thickness. That is, the metallic and conductive surrounding layers are not parallel and the gel polymer thickness varies to create a convergent or divergent lens shape. It is possible to employ such a non-uniform thickness electro-active layer in a non-hybrid embodiment or in a hybrid mode with a single vision or multifocal lens optic. This presents a wide variety of adjustable lens powers through various combinations of these fixed and electrically adjustable lenses. In some inventive embodiments, the single interconnect electro-active layer utilizes non-parallel sides creating a non-uniform thickness of the electro-active structure. However, in most inventive embodiments, but not all, the multi-grid electro-active structure utilizes a parallel structure, which creates a uniform thickness of the electro-active structure.

To illustrate some of the possibilities, a convergent single vision lens optic may be bonded to a convergent electro-active lens to create a hybrid lens assembly. Depending upon the electro-active lens material used, the electrical voltage may either increase or reduce the refractive index. Adjusting the voltage up to reduce the index of refraction would change the final lens assembly power to give less plus power, as shown in the first row of Table 1 for different combinations of fixed and electro-active lens power. If adjusting the applied voltage up increases the index of refraction of the electro-active lens optic, the final hybrid lens assembly power changes as shown in Table 2 for different combinations of fixed and electro-active lens power. It should be noted that, in this embodiment of the invention, only a single applied voltage difference is required across the electro-active layer.

S.V. or M.F. Lens Optic (Distance Vision)	Electro-Active Lens Power	Voltage Change	Index of Refractive Change	Final Hybrid Lens Assembly Power
+	+	-	=	Less Plus
+	-	-	=	More Plus
-	+	-	=	More Minus
-	-	-	=	Less Minus

Table 1

S.V. or M.F. Lens Optic (Distance Vision)	Electro-Active Lens Power	Voltage Change	Index of Refractive Change	Final Hybrid Lens Assembly Power
+	+	-	-	More Plus
+	-	-	-	Less Plus
-	+	-	-	Less Minus
-	-	-	-	More Minus

Table 2

A possible manufacturing process for such a hybrid assembly follows. In one example, the electro-active polymer gel layer can be injection-molded, cast, stamped, machined, diamond turned, and/or polished into a net lens optic shape. The thin metallic layer is deposited onto both sides of the injection molded or cast polymer gel layer by, for example, sputtering or vacuum deposition. In another exemplary embodiment, the deposited thin metallic layer is placed on both the lens optic and the other side of the injection-molded or cast electro-active material layer. A conductive layer may not be necessary, but if it is, it may also be vacuum deposited or sputtered onto the metallic layer.

Unlike conventional bifocal, multifocal or progressive lenses where the near vision power segments need to be positioned differently for different multifocal designs the invention can always be placed in one common location. For unlike different static power zones utilized by the conventional approach, where the eye

moves and the head tilts to utilize such zone or zones, the present invention allows one to either look straight ahead or slightly up or down, and the entire electro-active partial or full field adjusts to correct for the necessary near working distance. This reduces eye fatigue and head and eye movements. Furthermore, when one needs to look to the distance the adjustable electro-active layer adjusts to the correct power needed to clearly see the distant object. In most cases, this would cause the electro-active adjustable near working distance field to become of plano power, thus converting or adjusting the hybrid electro-active lens back to a distance vision correction lens or low power multifocal progressive lens correcting distance power. However, this is not always the case.

In some cases it may be advantageous to reduce the thickness of the single vision lens optic. For example, the central thickness of a plus lens, or the edge thickness of a minus lens, can be reduced by way of some appropriate distance power compensation in the electro-active adjustable layer. This would apply to a full field or mostly full field hybrid electro-active spectacle lens or in all cases of a non-hybrid electro-active spectacle lens.

Once again, it should be pointed out that the adjustable electro-active layer does not have to be located in a limited area but could cover the entire single vision or multifocal lens optic, whatever size area or shape is required of either one. The exact overall size, shape, and location of the electro-active layer is constrained only due to performance and aesthetics.

It has also been discovered and is part of the invention that by utilizing the proper front convex and back concave curves of the single vision or multifocal lens blank or optic it is possible to further reduce the complexity of electronics needed for the invention. By way of properly selecting the front convex base curves of the single vision or multifocal lens blank or optic it is possible to minimize the number of connecting electrodes needed to activate the electro-active layer. In some embodiments, only two electrodes are required as the entire electro-active field area is adjusted by a set amount of electrical power.

This occurs due to the change of refractive index of the electro-active material, which creates, depending upon the placement of the electro-active layer, a different power front, back, or middle electro-active layer. Thus the appropriate curvature relationship of the front and back curves of each layer influences the needed power adjustment of the electro-active hybrid or non-hybrid lens. In most, but not all, hybrid designs especially those not utilizing a diffractive or Fresnel component it is important that the electro-active layer does not have its front & back curves parallel to that of the single vision or multifocal semifinished blank or single vision or multifocal finished lens blank it is attached to. One exception to this is a hybrid design utilizing a multi-grid structure.

It should be pointed out that one embodiment is of a hybrid electro-active lens utilizing less than a full field approach and a minimum of two electrodes. Other embodiments utilize a multi-grid electro-active layer approach to create the electro-active layer in which case multiple electrodes and electrical circuitry will be required. When utilizing a multi-grid electro-active structure, it has been discovered that for the boundaries of the grids that have been electrically activated to be cosmetically acceptable (mostly invisible), it may be necessary to produce a refractive index differential between adjacent grids of zero to .02 units of refractive index difference. Depending upon cosmetic demands, the range of refractive index differential could be from 0.01 to 0.05 units of refractive index differential but in most inventive embodiments the difference is limited, by way of a controller to a maximum of 0.02 or 0.03 units of refractive index difference between adjacent areas.

It is also possible to utilize one or more electro-active layers having different electro-active structures such as a single-interconnect structure and/or a multi-grid structure, which can react as needed once energized to create the desired additive end focusing power. For example only, one could correct for distance power of a full field by way of the anterior (electro-active layer, distal with respect to the wearer's eyes) and utilize the posterior (i.e. proximal) electro-active layer to focus for near vision range utilizing a partial field specific approach generated by the

posterior layer. It should become readily apparent that utilizing this multi electro-active layer approach will allow for increased flexibility while keeping the layers extremely thin and reducing the complexity of each individual layer. Furthermore, this approach allows for sequencing the individual layers in as much as one can energize them all at one time, to generate a simultaneous variable additive focusing power effect. This variable focusing effect can be produced in a time lapsed sequence, so as to correct for mid-range focusing needs and near vision range focusing needs as one looks from far to near and then create the reverse effect as one looks from near to far.

The multi electro-active layer approach also allows for faster electro-active focusing power response time. This happens due to a combination of factors, one being the reduced electro-active material thickness needed for each layer of multi electro-active layered lens. Also, because a multi electro-active layer lens allows for breaking up the complexity of a master electro-active layer into two or more less complex individual layers which are asked to do less individually than the master electro-active layer.

The following describes the materials and construction of the electro-active lens, its electrical wiring circuitry, the electrical power source, the electrical switching technique, software required for focal length adjustment, and object distance ranging.

FIG. 19 is a perspective view of an exemplary embodiment of an electro-active layer 1900. Attached to both sides of an electro-active material 1910 are metallic layers 1920. Attached to the opposite side of each metallic layer 1920 are conductive layers 1930.

The electro-active layer discussed above is a multilayer construction consisting of either a polymer gel or liquid crystal as the electro-active material. However, in certain inventive cases both a polymer gel electro-active layer and a liquid crystal electro-active layer are utilized within the same lens. For example: the liquid crystal layer may be utilized to create an electronic tint or sunglass effect and

the polymer gel layer may be utilized to add or subtract power. Both the polymer gel and liquid crystal has the property that its optical index of refraction can be changed by an applied electric voltage. The electro-active material is covered by two nearly transparent metallic layers on either side, and a conductive layer is deposited on each metallic layer to provide good electrical connection to these layers. When a voltage is applied across the two conductive layers, an electric field is created between them and through the electro-active material, changing the refractive index. In most cases, the liquid crystal and in some cases the gels are housed in a sealed encapsulating envelope of a material selected from silicones, polymethacrylate, styrene, proline, ceramic, glass, nylon, mylar and others.

FIG. 20 is a perspective view of an embodiment of an electro-active lens 2000 having a multi-grid structure. Lens 2000 includes an electro-active material 2010 that can, in some embodiments, define a plurality of pixels, each of which can be separated by a material having electrical insulating properties. Thus, electro-active material 2010 can define a number of adjacent zones, each zone containing one or more pixels.

Attached to one side of electro-active material 2010 is a metallic layer 2020, which has a grid array of metallic electrodes 2030 separated by a material (not shown) having electrical insulating properties. Attached to the opposite side (not shown) of electro-active material 2010 is a symmetrically identical metallic layer 2020. Thus, each electro-active pixel is matched to a pair of electrodes 2030 to define a grid element pair.

Attached to metallic layer 2020 is a conductive layer 2040 having a plurality of interconnect vias 2050 each separated by a material (not shown) having electrical insulating properties. Each interconnect via 2050 electrically couples one grid element pair to a power supply and/or controller. In an alternative embodiment, some and/or all of interconnect vias 2050 can connect more than one grid element pair to a power supply and/or controller.

It should be noted that in some embodiments, metallic layer 2020 is eliminated. In other embodiments, metallic layer 2020 is replaced by an alignment layer.

In certain inventive embodiments the front (distal) surface, intermediate surface, and/or back surface can be made of a material comprising a conventional photochromatic component. This photochromatic component may or may not be utilized with an electronic produced tint feature associated as part of the electro-active lens. In the event that it is utilized it would provide an additive tint in a complimentary manner. It should be pointed out, however, in many inventive embodiments the photochromatic material is used solely with the electro-active lens without an electronic tint component. The photochromatic material can be included in an electro-active lens layer by way of the layer composition or added later to the electro-active layer or added as part of an outer layer either on the front or the back of the lens. Furthermore, the electro-active lenses of the invention can be hard-coated front, back, or both can be coated with an anti-reflection coating as desired.

This construction is referred to as a sub-assembly and it can be electrically controlled to create either a prismatic power, sphere power, astigmatic power correction, aspheric correction, or aberration correction of the wearer. Furthermore, the subassembly can be controlled to mimic that of a Fresnell or diffractive surface. In one embodiment, if more than one type of correction is needed, two or more sub-assemblies can be juxtaposed, separated by an electrically insulating layer. The insulating layer may be comprised of silicone oxide. In another embodiment, the same subassembly is utilized to create multiple power corrections. Either of the two sub-assembly embodiments just discussed can be made of two different structures. This first structural embodiment allows that each of the layers, the electro-active layer, conductor, and metal, are contiguous, that is, continuous layers of material, thus forming a single-interconnect structure. The second structural embodiment (as shown in Figure 20) utilizes metallic layers in the form of a grid or array, with each sub-array area electrically insulated from its neighbors. In this embodiment showing

a multi-grid electro-active structure, the conductive layers are etched to provide separate electrical contacts or electrodes to each sub-array or grid element. In this manner, separate and distinct voltages may be applied across each grid element pair in the layer, creating regions of different index of refraction in the electro-active material layer. The details of design, including layer thickness, index of refraction, voltages, candidate electro-active materials, layer structure, number of layers or components, arrangement of layers or components, curvature of each layer and/or components is left for the optical designer to decide.

It should be noted that either the multi-grid electro-active structure or the single interconnect electro-active structures can be utilized as either a partial lens field or a full lens field. However, when a partial field specific electro-active layer is utilized, in most cases, an electro-active material having a closely matching refractive index as that of the partial field specific electro-active non-activated layer (the framing layer) is utilized laterally adjacent to and separated from the partial field specific electro-active region by an insulator. This is done to enhance the cosmetic nature of the electro-active lens by way of keeping the appearance of the entire electro-active layer appearing as one, in the unactivated state. Also, it should be pointed out that in certain embodiments, the framing layer is of a non-electro-active material.

The polymer material can be of a wide variety of polymers where the electro-active constituent is at least 30% by weight of the formulation. Such electro-active polymer materials are well known and commercially available. Examples of this material include liquid crystal polymers such as polyester, polyether, polyamide, (PCB) penta cyano biphenyl and others. Polymer gels may also contain a thermoset matrix material to enhance the processability of the gel, improve its adhesion to the encapsulating conductive layers, and improve the optical clarity of the gel. By way of examples only this matrix may be a cross-linked acrylate, methacrylate, polyurethane, a vinyl polymer cross-linked with a difunctional or multifunctional acrylate, methacrylate or vinyl derivative.

The thickness of the gel layer can be, for example, between about 3 microns to about 100 microns, but may be as thick as one millimeter, or as another example, between about 4 microns to about 20 microns. The gel layer can have a modulus of, for example, about 100 pounds per inch to about 800 pounds per inch, or as another example, 200 to 600 pounds per inch. The metallic layer can have a thickness of, for example, about 10^{-4} microns to about 10^{-2} microns, and as another example, from about 0.8×10^{-3} microns to about 1.2×10^{-3} microns. The conductive layer can have a thickness of, for example, on the order of 0.05 microns to about 0.2 microns, and as another example, from about 0.8 microns to about 0.12 microns, and as yet another example, about 0.1 microns.

The metallic layer is used to provide good contact between the conductive layer and the electro-active material. Those skilled in the art will readily recognize the appropriate metal materials that could be used. For example, one could use gold or silver.

In one embodiment, the refractive index of the electro-active material may vary, for example, between about 1.2 units and about 1.9 units, and as another example, between about 1.45 units and about 1.75 units, with the change in index of refraction of at least 0.02 units per volt. The rate of change in the index with voltage, the actual index of refraction of the electro-active material, and its compatibility with the matrix material will determine the percentage composition of the electro-active polymer into the matrix, but should result in a change of index of refraction of the final composition of no less than 0.02 units per volt at a base voltage of about 2.5 volts but no greater than 25 volts.

As previously discussed with the inventive embodiment utilizing a hybrid design, the sections of the electro-active layer assembly are attached to a conventional lens optic with an appropriate adhesive or bonding technique which is transparent to visible light. This bonding assembly can be by way of release paper or film having the electro-active layer pre-assembled and attached ready for bonding to the conventional lens optic. It could be produced and applied to the awaiting lens

optic surface in-situ. Also, it could be applied pre-applied to the surface of a lens wafer, which is then adhesively bonded to the awaiting lens optic. It could be applied to a semi-finished lens blank which is later surfaced or edged for the appropriate size, shape as well as the appropriate total power needs. Finally, it could be casted onto a preformed lens optic utilizing SurfaceCasting techniques. This creates the electrically modifiable power of the invention. The electro-active layer may occupy the entire lens area or only a portion of it.

The index of refraction of the electro-active layers can be correctly altered only for the area needed to focus. For example, in the hybrid partial field design previously discussed, the partial field area would be activated and altered within this area. Therefore, in this embodiment the index of refraction is altered in only a specific partial region of the lens. In another embodiment, that of a hybrid full field design, the index of refraction is altered across the entire surface. Similarly, the index of refraction is altered across the entire area in the non-hybrid design. As discussed earlier, it has been discovered that in order to maintain an acceptable optical cosmetic appearance the refractive index differential between adjacent areas of an electro-active optic should be limited to a maximum of 0.02 units to 0.05 units of refractive index differential, preferably 0.02 units to 0.03 units.

It is envisioned within the invention that in some cases the user would utilize a partial field and then want to switch the electro-active layer to a full field. In this case, the embodiment would be designed structurally for a full field embodiment; however, the controller would be programmed to allow for switching the power needs from a full field to a partial field and back again or vice versa.

In order to create the electric field necessary to stimulate the electro-active lens, voltage is delivered to the optical assemblies. This is provided by bundles of small diameter wires, which are contained in the edges of the frames of the spectacles. The wires run from a power source described below into the an electro-active eyewear controller, and/or one or more controller components, and to the frame edge surrounding each spectacle lens, where state-of-the-art wire bonding

techniques used in semiconductor manufacturing link the wires to each grid element in the optical assembly. In the single wire interconnect structured embodiment, meaning one wire per conductive layer, only one voltage per spectacle lens is required and only two wires would be necessary for each lens. The voltage would be applied to one conductive layer, while its partner on the opposing side of the gel layer is held at ground potential. In another embodiment, an alternating current (AC) voltage is applied across opposing conductive layers. These two connections are easily made at or near the frame edge of each spectacle lens.

If a grid array of voltages is used, each grid sub-area in the array is addressed with a distinct voltage, and conductors connect each wire lead in the frame to a grid element on the lens. An optically transparent conducting material such as indium oxide, tin oxide, or indium tin oxide (ITO) may be used to form the conductive layer of the electro-active assembly which is used to connect the wires in the frame edges to each grid element in the electro-active lens. This method can be used regardless of whether the electro-active area occupies the entire lens region or only a portion of it .

To provide electric power to the optical assemblies, a source of electricity, such as a battery, is included in the design. The voltages to create the electric field are small, hence, the temples of the frames are designed to allow for the insertion and extraction of miniature bulk batteries which provide this power. The batteries are connected to the wire bundles through a multiplexing connection also contained in the frame temples. In another embodiment, conformal thin film batteries are attached to the surface of the frame temples with an adhesive that allows them to be removed and replaced when their charge is dissipated. An alternative would be to provide an AC adapter with an attachment to the frame-mounted batteries to allow in situ charging of either the bulk or conformal thin-film batteries when not in use.

An alternate energy source is also possible whereby a miniature fuel cell could be included in the spectacle frames to provide greater energy storage than

batteries. The fuel cell could be recharged with a small fuel canister that injects fuel into a reservoir in the spectacle frames.

It has been discovered that it is possible to minimize the electrical power needs by way of utilizing an inventive hybrid multi-grid structure approach which comprises in most cases but not all, a partial field specific region. It should be pointed out, while one can utilize a hybrid partial field multi-grid structure, a hybrid full field multi-grid structure can be utilized as well.

In another inventive approach, whereby non-conventional refractive error such as aberrations are corrected, a tracking system is built into the eyewear, such as discussed above, and the proper enabling software and programming of the electro-active eyewear controller, and/or one or more controller components, housed in the electro-active eyewear is provided. This inventive embodiment both tracks one's line of sight, by way of tracking one's eyes, and applies the necessary electrical energy to the specific area of the electro-active lens being looked through. In other words, as the eyes move a targeted electrically energized area would move across the lens corresponding to one's line of sight directed through the electro-active lens. This would be manifested in several different lens designs. For example, the user could have a fixed power lens, an electro-active lens, or a hybrid of both types to correct for conventional (sphere, cylinder, and prism) refractive error. In this example, the non-conventional refractive error would be corrected by way of the electro-active layer being of a multi-grid structure whereby, as the eye moves the corresponding activated region of the electro-active lens would move with the eye. In other words, the eye's line-of-sight corresponding to the eye's movement, as it intersects the lens would move across the lens in relationship to the eye's movements.

In the above inventive example it should be pointed out that the multi-grid electro-active structure, which is incorporated into or on the hybrid electro-active lens can be of a partial field or a full field design.

It should be pointed out utilizing this inventive embodiment one can minimize the electrical needs by way of only electrically energizing the limited area being directly viewed through. Therefore, the smaller area being energized the less electrical power consumed for a given prescription at any one time. The non directly viewed area would, in most cases but not all, not be energized or activated and therefore, would correct for conventional refractive error that would get one to 20/20 vision correcting for example, myopia, hyperopia, astigmatism, and presbyopia. The targeted and tracked area in this inventive embodiment would correct for as much non-conventional refractive error as possible, that being irregular astigmatism, aberrations, and ocular surface or layer irregularities. In other inventive embodiments the targeted and tracked area could correct for also some conventional error, as well. In several of the previous mentioned embodiments, this targeted and tracked area can be automatically located with the assistance of the controller, and/or one or more controller components, by way of either a range finder located in the eyewear tracking the eye movements, with a eye tracking system located in the eyewear or both a tracking system and a range finder system.

Although only a partial electro-active region is utilized in certain designs, the entire surface is covered with the electro-active material to avoid a circular line visible to the user in the lens in the nonactivated state. In some inventive embodiments, a transparent insulator is utilized to keep the electrical activation limited to the central area being activated and the unactivated peripheral electro-active material is utilized to keep the edge of the active region invisible.

In another embodiment, thin film solar cell arrays can be attached to the surface of the frames, and voltage is supplied to the wires and the optical grid by photoelectric effect using sunlight or ambient room lighting. In one inventive embodiment, solar arrays are used for primary power, with the miniature batteries discussed earlier included as back up power. When electrical power is not needed the batteries can be charged from the solar cells during these times in this

embodiment. An alternative allows for an AC adapter and attachment to batteries with this design.

In order to provide a variable focal length to the user, the electro-active lenses are switchable. At least two switch positions are provided, however, more are provided if needed. In the simplest embodiment, the electro-active lenses are either on or off. In the off position, no current flows through the wires, no voltage is applied to the grid assemblies, and only the fixed lens power is utilized. This would be the case in a user requiring a far field distance correction, for example, assuming of course, the hybrid electro-active lens utilizes either a single vision or multifocal lens blank or optic which corrects for distance vision as part of its construction. To provide near vision correction for reading, the switch would be on, providing a predetermined voltage or array of voltages to the lenses, creating a positive add power in the electro-active assemblies. If a mid-field correction is desired, a third switch position can be included. The switch could be microprocessor controlled, or manually user controlled. In fact, there could be several additional positions included. In another embodiment, the switch is analog not digital, and provides continuous variance of the focal length of the lens by adjusting a knob or lever much like a volume control on a radio.

It may be the case that no fixed lens power is part of the design, and all vision correction is accomplished via the electro-active lens. In this embodiment, a voltage or array of voltages is supplied to the lens at all times if both a distance and near vision correction is needed by the user. If only a distance correction or reading accommodation is needed by the user, the electro-active lens would be on when correction is needed and off when no correction is needed. However, this is not always the case. In certain embodiments depending upon the lens design, turning off or down the voltage will automatically increase the power of the distance and or near vision zones.

In one exemplary embodiment, the switch itself is located on the spectacle lens frames and is connected to a controller, for example, an Application Specific

Integrated Circuit, contained in the spectacle frames. This controller responds to different positions of the switch by regulating the voltages supplied from the power source. As such, this controller makes up the multiplexer discussed above, which distributes various voltages to the connecting wires. The controller may also be of an advanced design in the form of a thin film and be mounted like the battery or solar cells conformably along the surface of the frames.

In one exemplary embodiment, this controller, and/or one or more controller components, is fabricated and/or programmed with knowledge of the user's vision correction requirements, and allows the user to easily switch between different arrays of pre-determined voltages tailored for his or her individual vision requirements. This electro-active eyewear controller, and/or one or more controller components, is easily removable and/or programmable by the vision care specialist or technician and replaced and/or reprogrammed with a new "prescription" controller when the user's vision correction requirements change.

One aspect of the controller-based switch is that it can change the voltage applied to an electro-active lens in less than a microsecond. If the electro-active layer is manufactured from a fast-switching material, it is possible that the rapid change in focal length of the lenses may be disruptive to the wearer's vision. A gentler transition from one focal length to another may be desirable. As an additional feature of this invention, a "lag time" can be programmed into the controller that would slow the transition. Conversely, a "lead time" could be programmed into the controller that would speed the transition. Similarly, the transition could be anticipated by a predictive algorithm.

In any event, the time constant of the transition can be set so that it is proportional and/or responsive to the refractive change needed to accommodate the wearer's vision. For example, small changes in focusing power could be switched rapidly; while a large change in focusing power, such as a wearer quickly moving his gaze from a distant object to read printed material, could be set to occur over a

longer time period, say 10-100 milliseconds. This time constant could be adjustable, according to the comfort of the wearer.

In any event, it is not necessary for the switch to be on the spectacles themselves. In another exemplary embodiment, the switch is in a separate module, possibly in a pocket in the user's clothing, and is activated manually. This switch could be connected to the spectacles with a thin wire or optical fiber. Another version of the switch contains a small microwave or radio-frequency short-range transmitter which sends a signal regarding switch position to a tiny receiver antenna mounted conformably on the spectacle frames. In both of these switch configurations, the user has direct but discreet control over the focal length variation of his or her spectacles.

In yet another exemplary embodiment, the switch is automatically controlled by a range finding device located, for example, in the frame, on the frame, in the lens, and/or on the lens of the spectacles, and pointing forward toward the object to be perceived.

FIG. 21 is a perspective view of another inventive embodiment of electro-active eyewear 2100. In this illustrative example, frames 2110 contain electro-active lenses 2120 that are connected by connecting wires 2130 to controller 2140 (integrated circuit) and power source 2150. A range finder transmitter 2160 is attached to an electro-active lens 2120 and a range finder receiver 2170 is attached to the other electro-active lens 2120. In various alternative embodiments, transmitter 2160 and/or receiver 2170 can be attached to any electro-active lens 2120, attached to frame 2110, embedded in lens 2120, and/or embedded in frame 2110. Further, range finder transmitter 2160 and/or receiver 2170 can be controlled by controller 2140 and/or a separate controller (not shown). Similarly, signals received by receiver 2170 can be processed by controller 2140 and/or a separate controller (not shown).

In any event, this range finder is an active seeker and can utilize various sources such as: lasers, light emitting diodes, radio-frequency waves, microwaves, or

ultrasonic impulses to locate the object and determine its distance. In one embodiment, a vertical cavity surface-emitting laser (VCSEL) is used as the light transmitter. The small size and flat profile of these devices make them attractive for this application. In another embodiment, an organic light emitting diode, or OLED, is used as the light source for the rangefinder. The advantage of this device is that OLEDs can often be fabricated in a way that they are mostly transparent. Thus, an OLED might be a preferable rangefinder design if cosmetics is a concern, since it could be incorporated into the lens or frames without being noticeable.

An appropriate sensor to receive the reflected signal off the object is placed in one or more positions on the front of the lens frames and connected to a tiny controller to compute the range. This range is sent via a wire or optical fiber to the switching controller located in the lens frames or a wireless remote carried on oneself and analyzed to determine the correct switch setting for that object distance. In some cases, the ranging controller and switching controller may be integrated together.

In another exemplary embodiment, the switch can be controlled by a small but rapid movement of the user's head. This would be accomplished by including a tiny micro-gyroscope or micro-accelerometer in the temple on the lens frames. A small, rapid shake or twist of the head would trigger the micro-gyro or micro-accelerometer and cause the switch to rotate through its allowed position settings, changing the focus of the electro-active lens to the desired correction.

Yet another exemplary embodiment uses a combination of microgyroscope with a manual switch. In this embodiment, the microgyroscope is utilized for mostly reading and visual functions below the 180 so as to react to one's head tilt. Thus, when one's head tilts, the microgyroscope sends a signal to the controller indicating the degree of head tilt, which is then converted into increased focusing power, depending on the severity of the tilt. The manual switch, which can be remote, is used for overriding the microgyroscope for certain visual functions at or above the 180, such as working on a computer.

In still another exemplary embodiment, a combination of a rangefinder and a microgyroscope is utilized. The microgyroscope is utilized for near vision, and other vision functions below the 180, and the rangefinder is used for viewing distances which are above the 180 and are of a viewing distance of, for example, four feet or less.

As an alternative to the manual switch or range finder design to adjust the focusing power of the electro-active assembly, another exemplary embodiment utilizes an eye-tracker to measure inter-pupillary distance. As the eyes focus on distant or near objects, this distance changes as the pupils converge or diverge. At least two light-emitting diodes and at least two adjacent photo-sensors to detect reflected light from the diodes off the eye are placed on the inside frame near the nose bridge. This system can sense the position of the edge of the pupil of each eye and convert the position to inter-pupillary distance to calculate the distance of the object from the user's eye plane. In certain embodiments three or even four light emitting diodes and photo sensors are used to track eye movements.

In addition to vision correction, the electro-active layer can also be used to give a spectacle lens an electro-chromic tint. By applying an appropriate voltage to an appropriate gel polymer or liquid crystal layer, a tint or sunglass effect can be imparted to the lens, which alternates the light transmission somewhat through the lens. This reduced light intensity gives a "sunglass" effect to the lens for the comfort of the user in bright, outdoor environment. Liquid crystal compositions and gel polymers with high polarizability in response to an applied electric field are most attractive for this application.

In some inventive embodiments, this invention may be used in locations where temperature variations may be sizeable enough to affect the index of refraction of the electro-active layer. Then, a correction factor to all of the supplied voltages to the grid assemblies would have to be applied to compensate for this effect. A miniature thermistor, thermocouple, or other temperature sensor mounted in or on the lens and/or frame and connected to the power source senses changes in

temperature. The controller converts these readings into voltage changes needed to compensate for the change in refractive index of the electro-active material.

However, in certain embodiments electronic circuitry is actually built into or on the lens surface for the purpose of increasing the temperature of the electro-active layer or layers. This is done to further reduce the refractive index of the electro-active layers thus maximizing lens power changes. Increased temperature can be utilized either with or without voltage increases thus giving additional flexibility in being able to control and change the lens power by way of refractive index changes. When temperature is utilized it is desirable to be able to measure, get feed back and control the temperature which has been deliberately applied.

In the case of either a partial or full field grid array of individually addressed electro-active regions, many conductors may be necessary to multiplex specific voltages from the controller to each grid element. For ease of engineering these interconnects, the invention locates the controller in the front section of the spectacle frames, for example, in the nose bridge area. Thus, the power source, which is located in the temples, will be connected to the controller by only two conductors through the temple-front frame hinge. The conductors linking the controller to the lenses can be totally contained within the front section of the frame.

In some embodiments of the invention, the spectacles may have one or both spectacle frame temples, parts of which are easily removable. Each temple will consist of two parts: a short one which remains connected to the hinge and front frame section and a longer one which plugs into this piece. The unpluggable part of the temples each contain an electrical power source (battery, fuel cell, etc.) and can be simply removed and reconnected to the fixed portion of the temples. These removable temples are rechargeable, for example, by placing in a portable A.C. charging unit which charges by direct current flow, by magnetic induction, or by any other common recharging method. In this manner, fully charged replacement temples may be connected to the spectacles to provide continuous, long-term activation of the lenses and ranging system. In fact, several replacement temples

may be carried by the user in pocket or purse for this purpose.

In many cases, the wearer will require spherical correction for distance, near, and/or intermediate vision. This allows a variation of the fully interconnected grid array lens, which takes advantage of the spherical symmetry of the required corrective optic. In this case a special geometrically shaped grid consisting of concentric rings of electro-active regions may comprise either the partial region or full field lens. The rings may be circular or non circular such as, for example, elliptical. This configuration serves to reduce substantially the number of required electro-active regions that must be separately addressed by conductor connections with different voltages, greatly simplifying the interconnect circuitry. This design allows for the correction of astigmatism by employing a hybrid lens design. In this case, the conventional optic may provide cylindrical and/or astigmatic correction, and the concentric ring electro-active layer may provide the spherical distance and/or near vision correction.

This concentric ring, or toroidal zone, embodiment allows for great flexibility in adapting the electro-active focusing to the wearer's needs. Because of the circular zone symmetry, many more thinner zones can be fabricated without increasing the wiring and interconnect complexity. For example, an electro-active lens made from an array of 4000 square pixels will require wiring to address all 4000 zones; a need to cover a circular partial region area of 35 millimeters diameter will yield a pixel pitch of about 0.5 millimeters. On the other hand, an adaptive optic made from a pattern of concentric rings of the same 0.5 millimeter pitch (or ring thickness) will require only 35 toroidal zones, greatly reducing the wiring complexity. Conversely, the pixel pitch (and resolution) can be decreased to only 0.1 millimeters and only increase the number of zones (and interconnects) to 175. The greater resolution of the zones may translate into greater comfort for the wearer, since the radial change in refractive index from zone to zone is smoother and more gradual. Of course, this design restricts one to only vision corrections which are spherical in nature.

It has been further discovered that the concentric ring design can tailor the thickness of the toroidal rings so as to place the greatest resolution at the radius where it is needed. For example, if the design calls for phase-wrapping, i.e., taking advantage of the periodicity of light waves to achieve greater focusing power with materials of limited refractive index variation, one can design an array with narrower rings at the periphery and wider rings at the center of the circular partial region of the electro-active area. This judicious use of each toroidal pixel yields the greatest focusing power obtainable for the number of zones utilized while minimizing the aliasing effect present in low resolution systems that employ phase-wrapping.

In another embodiment of this invention, it may be desired to smooth the sharp transition from the far-field focus region to the near vision focus region in hybrid lenses employing a partial electro-active area. This occurs, of course, at the circular boundary of the electro-active region. In order to accomplish this, the invention would be programmed to have regions of less power for near vision in the periphery of the electro-active region. For example, consider a hybrid concentric ring design with a 35 mm diameter electro-active region, where the fixed focal length lens provides a distance correction, and the electro-active region provides a +2.50 add power presbyopic correction. Instead of maintaining this power all the way out to the periphery of the electro-active region, several toroidal regions or "bands", each containing several addressable electro-active concentric ring zones, would be programmed to have decreasing power at larger diameters. For example, during activation one embodiment might have a central 26 mm diameter circle of +2.50 add power, with a toroidal band extending from 26 to 29 mm diameter with +2.00 add power, another toroidal band extending from 29 to 32 mm diameter with +1.5 add power, surrounded by a toroidal band extending from 32 to 35 mm diameter with +1.0 add power. This design may be useful in providing some users with a more pleasant wearing experience.

When utilizing an ophthalmic spectacle lens one generally utilizes the top approximately one-half of the lens for far distance viewing. Approximately 2 to 3

mm above the mid-line and 6 to 7 mm below the mid-line for intermediate distance viewing and from 7 – 10 mm below the mid-line for near distance viewing.

Aberrations created in the eye appear different for distances from the eye and need to be corrected differently. An object's distance that is being viewed is directly related to the specific aberration correction needed. Therefore, an aberration created from the eye's optical system will need approximately the same correction for all far distances, approximately the same correction for all intermediate distances, and approximately the same correction for all near point distances. Therefore, the invention allows for the electro-active adjustment of the lens to correct certain aberrations of the eye, in three or four sections of the lens (distance section, intermediate section and near section), as opposed to trying to adjust the electro-active lens grid-by-grid as the eye and the eye's line of sight moves across the lens.

FIG. 22 is a front view of an embodiment of an electro-active lens 2200. Within lens 2200 are defined various regions proving different refractive corrections. Below mid-line B-B, several near distance corrective regions 2210 and 2220 each having a different corrective power, are surrounded by a single intermediate distance corrective region 2230. Although only two near distance corrective regions 2210 and 2220 are shown, any number of near distance corrective regions can be provided. Similarly, any number of intermediate distance corrective regions can be provided. Above mid-line B-B, a far distance corrective region 2240 are provided. Regions 2210, 2220, and 2230 can be activated in a programmed sequence manner, to save power for example, or in a static on-off manner similar to a conventional tri-focal. When looking from far to near, or from near to far, lens 2200 can help the wearer's eye focus, by smoothing the transition between the various focal lengths of the various regions. Thereby, the phenomenon of "image jump" is relieved or greatly reduced. This improvement is also provided in the embodiments shown in **FIGS. 23 and 24**, below.

FIG. 23 is a front view of an embodiment of another electro-active lens 2300. Within lens 2300 are defined various regions proving different refractive

corrections. Below mid-line C-C, a single near distance corrective region 2310 is surrounded by a single intermediate distance corrective region 2320. Above mid-line C-C, is located a single far distance corrective region 2330.

FIG. 24 is a front view of an embodiment of an embodiment of another electro-active lens 2400. Within lens 2400 are defined various regions providing different refractive corrections. A single near distance corrective region 2410 is surrounded by a single intermediate distance corrective region 2420, which is surrounded by a single far distance corrective region 2430.

FIG. 25 is a side view of an embodiment of another electro-active lens 2500. Lens 2500 includes a conventional lens optic 2510 to which several full field electro-active regions 2520, 2530, 2540, and 2550 are attached, each separated from the adjacent regions by insulating layers 2525, 2535, and 2545.

FIG. 26 is a side view of an embodiment of another electro-active lens 2600. Lens 2600 includes a conventional lens optic 2610 to which several partial field electro-active regions 2620, 2630, 2640, and 2650 are attached, each separated from the adjacent regions by insulating layers 2625, 2635, and 2645. Framing region 2660 surrounds electro-active regions 2620, 2630, 2640, and 2650.

Returning to the discussion of diffractive electro-active lenses, an electro-active lens for correcting refractive error can be fabricated using an electro-active layer adjacent to a glass, polymer, or plastic substrate lens which is imprinted or etched with a diffractive pattern. The surface of the substrate lens which has the diffractive imprint is directly in contact with the electro-active material. Thus, one surface of the electro-active layer is also a diffractive pattern which is the mirror image of that on the lens substrate surface.

The assembly acts as a hybrid lens, such that the substrate lens always provides a fixed corrective power, typically for distance correction. The index of refraction of the electro-active layer in its unactivated state is nearly identical to that of the substrate lens; this difference should be 0.05 index units or less. Thus, when the electro-active lens is unactivated, the substrate lens and electro-active layer have

the same index, and the diffractive pattern is powerless, and provides no correction (0.00 diopter). In this state, the power of the substrate lens is the only corrective power.

When the electro-active layer is activated, its index changes, and the refractive power of the diffraction pattern becomes additive to the substrate lens. For example, if the substrate lens has a power of −3.50 diopter, and the electro-active diffractive layer has a power when activated of +2.00 diopter, the total power of the electro-active lens assembly is −1.50 diopter. In this way, the electro-active lens allows for near vision or reading. In other embodiments, the electro-active layer in the activated state may be index matched to the lens optic.

Electro-active layers that use liquid crystals are birefringent. That is, they display two different focal lengths in their unactivated state when exposed to unpolarized light. This birefringence gives rise to double or fuzzy images on the retina. There are two approaches to solving this problem. The first requires at least two electro-active layers to be used. One is fabricated with the electro-active molecules aligned longitudinally in the layer, while the other is fabricated with latitudinally oriented molecules in its layer; thus, the molecular alignment in the two layers is orthogonal to each other. In this manner, both polarizations of light are focused equally by both of the layers, and all light is focused at the same focal length.

This can be accomplished by simply stacking the two orthogonally-aligned electro-active layers or by an alternative design in which the center layer of the lens is a double-sided plate, i.e., with identical diffraction patterns etched on both sides. Electro-active material is then placed in a layer on both sides of the center plate, assuring that their alignments are orthogonal. Then a cover superstrate is placed over each electro-active layer to contain it. This provides a simpler design than superimposing two distinct electro-active/diffractive layers on top of each other.

A different alternative requires one to add a cholesteric liquid crystal to the electro-active material to give it a large chiral component. It has been found that a

certain level of chiral concentration eliminates the in-plane polarization sensitivity, and obviates the need for two electro-active layers of purely nematic liquid crystal as a component in the electro-active material.

Turning now to the materials used for the electro-active layer, examples of material classes and specific electro-active materials that can be used for the electro-active layer and lens of the present invention are listed below. Other than the liquid crystal materials listed below in class I, we generally refer to each of these classes of materials as polymer gels.

I) Liquid crystals

This class includes any liquid crystal film that forms nematic, smectic, or cholesteric phases that possess a long-range orientational order that can be controlled with an electric field. Examples of nematic liquid crystals are: pentyl-cyano-biphenyl (5CB), (n-octyloxy)-4-cyanobiphenyl (8OCB). Other examples of liquid crystals are the n = 3, 4, 5, 6, 7, 8, 9, of the compound 4-cyano-4-n-alkylbiphenyls, 4-n-pentyloxy-biphenyl, 4-cyano-4"-n-alkyl-p-terphenyls, and commercial mixtures such as E7, E36, E46, and the ZLI-series made by BDH (British Drug House)- Merck.

II) Electro-optic polymers

This class includes any transparent optical polymeric material such as those disclosed in "Physical Properties of Polymers Handbook" by J. E. Mark, American Institute of Physics, Woodburry, New York, 1996, containing molecules having unsymmetrical polarized conjugated *p* electrons between a donor and an acceptor group (referred to as a chromophore) such as those disclosed in "Organic Nonlinear Optical Materials" by Ch. Bosshard et al., Gordon and Breach Publishers, Amsterdam, 1995. Examples of polymers are as follows: polystyrene, polycarbonate, polymethylmethacrylate, polyvinylcarbazole, polyimide, polysilane. Examples of chromophores are: paranitroaniline (PNA), disperse red 1 (DR 1), 3-

methyl-4-methoxy-4'-nitrostilbene, diethylaminonitrostilbene (DANS), diethyl-thio-barbituric acid.

Electro-optic polymers can be produced by: a) following a guest/host approach, b) by covalent incorporation of the chromophore into the polymer (pendant and main-chain), and/or c) by lattice hardening approaches such as cross-linking.

III) Polymer liquid crystals

This class includes polymer liquid crystals (PLCs), which are also sometimes referred to as liquid crystalline polymers, low molecular mass liquid crystals, self-reinforcing polymers, in situ-composites, and/or molecular composites. PLCs are copolymers that contain simultaneously relatively rigid and flexible sequences such as those disclosed in "Liquid Crystalline Polymers: From Structures to Applications" by W. Brostow, edited by A. A. Collyer, Elsevier, New-York-London, 1992, Chapter 1. Examples of PLCs are: polymethacrylate comprising 4-cyanophenyl benzoate side group and other similar compounds.

IV) Polymer dispersed liquid crystals

This class includes polymer dispersed liquid crystals (PDLCs), which consist of dispersions of liquid crystal droplets in a polymer matrix. These materials can be made in several ways: (i) by nematic curvilinear aligned phases (NCAP), by thermally induced phase separation (TIPS), solvent-induced phase separation (SIPS), and polymerization-induced phase separation (PIPS). Examples of PDLCs are: mixtures of liquid crystal E7 (BDH-Merck) and NOA65 (Norland products, Inc. NJ); mixtures of E44 (BDH-Merck) and polymethylmethacrylate (PMMA); mixtures of E49 (BDH-Merck) and PMMA; mixture of the monomer dipentaerythrol hydroxy penta acrylate, liquid crystal E7, N-vinylpyrrolidone, N-phenylglycine, and the dye Rose Bengal.

V) Polymer stabilized liquid crystals

This class includes polymer-stabilized liquid crystals (PSLCs), which are materials that consist of a liquid crystal in a polymer network in which the polymer constitutes less than 10% by weight of the liquid crystal. A photopolymerizable monomer is mixed together with a liquid crystal and an UV polymerization initiator. After the liquid crystal is aligned, the polymerization of the monomer is initiated typically by UV exposure and the resulting polymer creates a network that stabilizes the liquid crystal. For examples of PSLCs, see, for instance: C. M. Hudson et al. Optical Studies of Anisotropic Networks in Polymer-Stabilized Liquid Crystals, Journal of the Society for Information Display, vol. 5/3, 1-5, (1997), G. P. Wiederrecht et al, Photorefractivity in Polymer-Stabilized Nematic Liquid Crystals, J. of Am. Chem. Soc., 120, 3231-3236 (1998).

VI) Self-assembled nonlinear supramolecular structures

This class includes electro-optic asymmetric organic films, which can be fabricated using the following approaches: Langmuir-Blodgett films, alternating polyelectrolyte deposition (polyanion/polycation) from aqueous solutions, molecular beam epitaxy methods, sequential synthesis by covalent coupling reactions (for example: organotrichlorosilane-based self-assembled multilayer deposition). These techniques usually lead to thin films having a thickness of less than about 1 mm.

Still other advantages and embodiments of the invention will become readily apparent to those skilled in this art from the above-recited detailed description. Accordingly, the drawings, descriptions, and examples provided herein are to be regarded as exemplary and illustrative in nature, and not as restrictive. For example, electro-active eyewear can be provided that has one hybrid lens and one non-hybrid lens. Similarly, electro-active eyewear can be provided that has one full field electro-active lens and one partial field electro-active lens. Likewise, electro-active

eyewear can be provided that has one lens that employs a single interconnect electro-active structure and another that employs a multi-grid electro-active structure.

What Is Claimed Is:

1. An electro-active spectacle lens comprising:
a first lens optic having astigmatic correction;
a first electro-active zone positioned in a cooperative relationship with said first lens optic.

2. The electro-active lens of claim 1, wherein said first electro-active zone is included in an electro-active layer.

3. The electro-active lens of claim 1, wherein said first electro-active zone is included in an electro-active region.

4. The electro-active lens of claim 1, wherein said first electro-active zone is included in an electro-active structure.

5. The electro-active lens of claim 1, wherein said astigmatic correction includes astigmatic power correction.

6. The electro-active lens of claim 1, wherein said astigmatic correction includes astigmatic axis correction.

7. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to about 20/20.

8. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to better than 20/20.

9. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to about 20/15.

10. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to better than 20/15.

11. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to about 20/10.

12. The electro-active lens of claim 1, wherein said electro-active lens is adapted to correct refractive error to better than 20/10.

13. The electro-active lens of claim 1, wherein said first electro-active zone is a single interconnect structure.

14. The electro-active lens of claim 1, wherein said first electro-active zone is a pixelated structure.

15. The electro-active lens of claim 1, wherein said first electro-active zone is a hybrid structure.

16. The electro-active lens of claim 1, wherein said first electro-active zone is a non-hybrid structure.

17. The electro-active lens of claim 1, wherein said first electro-active zone encompasses a portion of a layer.

18. The electro-active lens of claim 1, wherein said first electro-active zone encompasses all of a layer.

19. The electro-active lens of claim 1, wherein said first electro-active zone is

embedded within said first lens optic.

20. The electro-active lens of claim 1, wherein said first electro-active zone is attached to said first lens optic.

21. The electro-active lens of claim 1, wherein said first electro-active zone is bonded to said first lens optic.

22. The electro-active lens of claim 1, wherein said first electro-active zone is attached to a coating attached to said first lens optic.

23. The electro-active lens of claim 1, wherein said first electro-active zone is deposited on said first lens optic.

24. The electro-active lens of claim 1, wherein said first lens optic has a front convex surface, and said first electro-active zone is attached to said front convex surface.

25. The electro-active lens of claim 1, wherein said first lens optic has a concave surface, and said first electro-active zone is attached to said concave surface.

26. The electro-active lens of claim 1, wherein said first lens optic has a surface, said first electro-active zone is attached to said surface, and a scratch resistant coating is attached to said first electro-active zone.

27. The electro-active lens of claim 1, wherein said first electro-active zone is adapted to correct conventional refractive error.

28. The electro-active lens of claim 1, wherein said first electro-active zone is

adapted to correct non-conventional refractive error.

29. The electro-active lens of claim 1, wherein said first electro-active zone is adapted to correct presbyopia.

30. The electro-active lens of claim 1, wherein said first electro-active zone is adapted to correct near vision refractive error.

31. The electro-active lens of claim 1, wherein said first lens optic is a plano lens.

32. The electro-active lens of claim 1, wherein said first lens optic is a single vision corrective optic.

33. The electro-active lens of claim 1, wherein said first lens optic is a multifocal corrective optic.

34. The electro-active lens of claim 1, wherein said first lens optic is a progressive multifocal corrective optic.

35. The electro-active lens of claim 1, wherein said first lens optic provides astigmatic power and axis correction.

36. The electro-active lens of claim 1, wherein said first electro-active zone is centered with respect to said first lens optic.

37. The electro-active lens of claim 1, wherein said first electro-active zone is decentered with respect to said first lens optic.

38. The electro-active lens of claim 1, wherein said first electro-active zone has an optical center that is decentered with respect to an optical center of said first lens optic.

39. The electro-active lens of claim 1, wherein said first electro-active zone has a diameter of about 10 millimeters to about 40 millimeters.

40. The electro-active lens of claim 1, wherein said first electro-active zone has a diameter of about 20 millimeters to about 35 millimeters.

41. The electro-active lens of claim 1, wherein said first electro-active zone has an uneven thickness.

42. The electro-active lens of claim 1, wherein said first electro-active zone has a thickness that varies to create a lens shape.

43. The electro-active lens of claim 1, wherein said first electro-active zone has a thickness that varies to create a convergent lens shape.

44. The electro-active lens of claim 1, wherein said first electro-active zone has a thickness that varies to create a divergent lens shape.

45. The electro-active lens of claim 1, wherein said first electro-active zone includes a polymer gel.

46. The electro-active lens of claim 1, wherein said first electro-active zone includes a metallic layer.

47. The electro-active lens of claim 1, wherein said first electro-active zone

includes a conductive layer.

48. The electro-active lens of claim 1, further comprising a second electro-active zone positioned in a cooperative relationship with said first lens optic.

49. The electro-active lens of claim 1, further comprising a polymer gel second electro-active zone positioned in a cooperative relationship with said first lens optic.

50. The electro-active lens of claim 1, further comprising a liquid crystal second electro-active zone positioned in a cooperative relationship with said first lens optic.

51. The electro-active lens of claim 1, further comprising a tint effect second electro-active zone positioned in a cooperative relationship with said first lens optic.

52. The electro-active lens of claim 1, further comprising a sunglass effect second electro-active zone positioned in a cooperative relationship with said first lens optic.

53. The electro-active lens of claim 1, further comprising a photochromatic second electro-active zone positioned in a cooperative relationship with said first lens optic.

54. The electro-active lens of claim 1, further comprising a anti-reflective second electro-active zone positioned in a cooperative relationship with said first lens optic.

55. The electro-active lens of claim 1, further comprising a protective layer positioned in a cooperative relationship with said first lens optic.

56. The electro-active lens of claim 1, further comprising a second electro-active zone positioned in a cooperative relationship with said first electro-active zone.

57. The electro-active lens of claim 1, further comprising a second electro-active zone positioned in a cooperative relationship with said first electro-active zone and separated from said first electro-active zone by an insulator.

58. The electro-active lens of claim 1, further comprising a second electro-active zone positioned concentrically with said first electro-active zone.

59. The electro-active lens of claim 1, further comprising a second electro-active zone positioned proximally to said first electro-active zone with respect to a wearer's eye.

60. The electro-active lens of claim 1, further comprising a second electro-active zone positioned distally to said first electro-active zone with respect to a wearer's line of eye.

61. The electro-active lens of claim 1, further comprising a second electro-active zone positioned adjacent to said first electro-active zone.

62. The electro-active lens of claim 1, further comprising a second electro-active zone positioned adjacent to said first electro-active zone with respect to a wearer's line of eye.

63. The electro-active lens of claim 1, further comprising a second lens optic positioned in a cooperative relationship with said first lens optic.

64. The electro-active lens of claim 1, further comprising a second lens optic positioned in a cooperative relationship with said first electro-active zone.

65. The electro-active lens of claim 1, further comprising a second lens optic positioned in a cooperative relationship with said first lens optic, said electro-active zone positioned between said second lens optic and said first lens optic.

66. The electro-active lens of claim 1, further comprising a Fresnell layer positioned in a cooperative relationship with said first lens optic.

67. The electro-active lens of claim 1, further comprising an etched Fresnell layer positioned in a cooperative relationship with said first lens optic.

68. The electro-active lens of claim 1, further comprising a diffractive layer positioned in a cooperative relationship with said first lens optic.

69. The electro-active lens of claim 1, further comprising an etched diffractive layer positioned in a cooperative relationship with said first lens optic.

70. The electro-active lens of claim 1, further comprising a diffractive zone etched into said first lens optic.

71. The electro-active lens of claim 1, further comprising a prismatic layer positioned in a cooperative relationship with said first lens optic.

72. The electro-active lens of claim 1, further comprising a prismatic zone within said first lens optic.

73. The electro-active lens of claim 1, further comprising a diffractive second lens optic positioned in a cooperative relationship with said first lens optic.

74. The electro-active lens of claim 1, further comprising an energy source connected to said electro-active zone.

75. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone.

76. The electro-active lens of claim 1, further comprising a removable controller connected to said electro-active zone.

77. The electro-active lens of claim 1, further comprising a controller adapted to be coupled to said electro-active zone.

78. The electro-active lens of claim 1, further comprising a programmable controller connected to said electro-active zone.

79. The electro-active lens of claim 1, further comprising a programmable controller adapted to be coupled to said electro-active zone.

80. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller including a processor.

81. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller including a memory.

82. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller including an input/output mechanism.

83. The electro-active lens of claim 1, further comprising an eye-care-professional-operable controller connected to said electro-active zone.

84. The electro-active lens of claim 1, further comprising an eye-care-professional-adjustable controller connected to said electro-active zone.

85. The electro-active lens of claim 1, further comprising a wearer-operable controller connected to said electro-active zone.

86. The electro-active lens of claim 1, further comprising a wearer-adjustable controller connected to said electro-active zone.

87. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller adapted to change a voltage applied to said electro-active zone.

88. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller adapted to change a voltage applied to said electro-active zone in a variable manner allowing for the focus of vision from far to near and from near to far.

89. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller adjustable to change a voltage applied to said electro-active zone in a variable manner allowing for the

focus of vision from far to near and from near to far

90. The electro-active lens of claim 1, wherein said first electro-active zone includes an plurality of diffractive zones.

91. The electro-active lens of claim 1, wherein said first electro-active zone includes an array of electrically-driven pixels.

92. The electro-active lens of claim 1, wherein said first electro-active zone includes a grid array of electrically-driven pixels.

93. The electro-active lens of claim 1, wherein said first electro-active zone includes an array of electrically-driven pixels, each pixel having an electrically-alterable index of refraction.

94. The electro-active lens of claim 1, wherein said first electro-active zone is configured in a circular shape.

95. The electro-active lens of claim 1, wherein said first electro-active zone is configured in an ellipsoidal shape.

96. The electro-active lens of claim 1, wherein said first electro-active zone is configured in an annular shape.

97. The electro-active lens of claim 1, wherein said electro-active lens is mounted in a spectacle frame.

98. The electro-active lens of claim 1, wherein said electro-active lens is mounted in a phoropter.

99. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller connected to a line-of-sight tracker.

100. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone and to a line-of-sight tracker, wherein said controller is adapted to activate said electro-active zone in response to a line-of-sight of a wearer.

101. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone and to a line-of-sight tracker, wherein said controller is adapted to activate an area of said electro-active zone, said area corresponding to a line-of-sight of a wearer of the electro-active lens.

102. The electro-active lens of claim 1, wherein said first electro-active zone includes an array of electrically-driven pixels adapted to fail-safe if electricity is unavailable to said pixels.

103. The electro-active lens of claim 1, wherein said first electro-active zone includes a diffractive zone adapted to fail-safe if electricity is unavailable to said diffractive zone.

104. The electro-active lens of claim 1, wherein said first electro-active zone includes a diffractive zone adapted to fail-safe if electricity is unviable to said diffractive zone.

105. The electro-active lens of claim 1, further comprising a controller connected to said electro-active zone, said controller connected to a rangefinder.

106. An electro-active spectacle lens comprising:

a first lens optic having astigmatic correction;

a plurality of electro-active zones positioned in a cooperative relationship with said first lens optic.

107. The electro-active lens of claim 106, wherein each of said electro-active zones is separated from an adjacent electro-active zone by an insulator.

108. The electro-active lens of claim 106, wherein each of said electro-active zones includes a grid of pixels.

109. The electro-active lens of claim 106, further comprising a controller connected to said plurality of zones, said controller adapted to change a voltage applied to each of said plurality of zones.

110. The electro-active lens of claim 106, further comprising a controller connected to said plurality of zones, said controller adapted to change a voltage applied to less than all of said plurality of zones.

111. The electro-active lens of claim 106, further comprising a controller connected to said plurality of zones, said controller adapted to energize less than all of said plurality of zones.

112. The electro-active lens of claim 106, further comprising a controller connected to said plurality of zones, said controller adapted to energize each of said plurality of zones.

113. An electro-active lens comprising:

a first lens optic having a first index of refraction;

a first electro-active zone positioned in a cooperative relationship with said first lens optic, said first electro-active zone having a second index of refraction within about 0.00 refractive units to about 0.05 refractive units of said first index of refraction.

114. The electro-active lens of claim 113, wherein said first electro-active zone is included in an electro-active layer.

115. The electro-active lens of claim 113, wherein said first electro-active zone is included in an electro-active region.

116. The electro-active lens of claim 113, wherein said first electro-active zone is included in an electro-active structure.

117. An electro-active lens comprising:

a first lens optic;

a first electro-active zone positioned in a cooperative relationship with said first lens optic, said first electro-active zone having a first index of refraction;

a second electro-active zone positioned in a cooperative relationship with said first lens optic, said second electro-active zone having a second index of refraction within about 0.00 refractive units to about 0.05 refractive units of said first index of refraction.

118. The electro-active lens of claim 117, wherein said first electro-active zone is included in an electro-active layer.

119. The electro-active lens of claim 117, wherein said first electro-active zone is

included in an electro-active region.

120. The electro-active lens of claim 117, wherein said first electro-active zone is included in an electro-active structure.

121. The electro-active lens of claim 117, wherein said second index of refraction corresponds to an electrically inactivated state.

122. The electro-active lens of claim 117, wherein said second index of refraction corresponds to an electrically activated state.

123. The electro-active lens of claim 117, wherein said second index of refraction is within about 0.00 refractive units to about 0.03 refractive units of said first index of refraction.

124. The electro-active lens of claim 117, wherein said second index of refraction is within about 0.02 refractive units to about 0.04 refractive units of said first index of refraction.

125. The electro-active lens of claim 117, wherein said second index of refraction is within about 0.01 refractive units to about 0.03 refractive units of said first index of refraction.

126. The electro-active lens of claim 117, wherein said second index of refraction is within about 0.02 refractive units to about 0.03 refractive units of said first index of refraction.

127. An electro-active lens having a plurality of pixels, each pixel from said plurality of pixels having an adjustable index of refraction, adjustments to

said index of refraction limited to 0.05 refractive units with respect to a neighboring pixel's index of refraction.

128. An electro-active lens comprising:

a lens optic having a distance prescription correction; and

an electro-active zone positioned in a cooperative relationship with said lens optic.

129. An electro-active lens comprising:

a first lens optic;

a first electro-active zone positioned in a cooperative relationship with said first lens optic;

a range finder positioned in a cooperative relationship with said electro-active lens.

130. The electro-active lens of claim 129, wherein at least a part of said range-finder is located in or on said electro-active lens.

131. The electro-active lens of claim 129, wherein at least a part of said range-finder is located in said first lens optic.

132. The electro-active lens of claim 129, wherein at least a part of said range-finder is located on said first lens optic.

133. The electro-active lens of claim 129, wherein at least a part of said range-finder is located in said first electro-active zone.

134. The electro-active lens of claim 129, wherein at least a part of said range-finder is located on said first electro-active zone.

135. The electro-active lens of claim 129, wherein at least a part of said range-finder is located on a frame attached to said first lens optic.

136. The electro-active lens of claim 129, wherein at least a part of said range-finder is located in a frame attached to said first lens optic.

137. The electro-active lens of claim 129, wherein said range-finder includes a light source.

138. The electro-active lens of claim 129, wherein said range-finder includes a substantially transparent light source.

139. The electro-active lens of claim 129, wherein said range-finder includes an organic light-emitting diode light source.

140. The electro-active lens of claim 129, wherein said range-finder includes an inorganic light-emitting diode light source.

141. The electro-active lens of claim 129, wherein said range-finder includes a laser light source.

142. The electro-active lens of claim 129, wherein said range-finder includes a radio frequency transmitter.

143. The electro-active lens of claim 129, wherein said range-finder is coupled to a controller that is coupled to said first electro-active zone.

144. The electro-active lens of claim 129, wherein said range-finder includes a

sensor.

145. The electro-active lens of claim 129, wherein said range-finder includes a sensor adapted to receive a reflected signal originated by said range-finder.

146. An electro-active lens having an electro-actively adjustable focus and a range finder.

147. An electro-active lens comprising:

a first lens optic; and

a first electro-active zone including an electro-active polymer gel, said first zone positioned in a cooperative relationship with said first lens optic.

148. The electro-active lens of claim 147, wherein said polymer gel contains an electro-active constituent comprising at least 30% by weight of said polymer gel.

149. The electro-active lens of claim 147, wherein said polymer gel has a refractive index of about 1.2 units to about 1.9 units.

150. The electro-active lens of claim 147, wherein said polymer gel has a refractive index of about 1.45 units to about 1.75 units.

151. The electro-active lens of claim 147, wherein said polymer gel has a refractive index that changes with respect to voltage by at least 0.02 refractive units per volt.

152. The electro-active lens of claim 147, wherein said polymer gel has a

refractive index that changes with respect to voltage by at least 0.02 refractive units per volt for an applied voltage of about 2.5 volts to about 25 volts.

153. The electro-active lens of claim 147, wherein said polymer gel is an electro-optic polymer.

154. The electro-active lens of claim 147, wherein said polymer gel is a polymer liquid crystal.

155. The electro-active lens of claim 147, wherein said polymer gel is a polymer dispersed liquid crystal.

156. The electro-active lens of claim 147, wherein said polymer gel is a polymer stabilized liquid crystal.

157. The electro-active lens of claim 147, wherein said polymer gel is a self-assembled nonlinear supramolecular structure.

158. The electro-active lens of claim 147, wherein said polymer gel contains a liquid crystal polymer.

159. The electro-active lens of claim 147, wherein said polymer gel contains a thermoset matrix material.

160. The electro-active lens of claim 147, wherein said polymer gel contains a cross-linked acrylate.

161. The electro-active lens of claim 147, wherein said polymer gel contains a

methacrylate.

162. The electro-active lens of claim 147, wherein said polymer gel contains a polyurethane.

163. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a difunctional acrylate.

164. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a multifunctional acrylate.

165. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a difunctional methacrylate.

166. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a multifunctional methacrylate.

167. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a difunctional vinyl derivative.

168. The electro-active lens of claim 147, wherein said polymer gel contains a vinyl polymer cross-linked with a multifunctional vinyl derivative.

169. The electro-active lens of claim 147, wherein said polymer gel is injection-molded onto said first lens optic.

170. The electro-active lens of claim 147, wherein said polymer gel is cast onto said first lens optic.

171. The electro-active lens of claim 147, wherein said polymer gel is bonded onto said first lens optic.

172. The electro-active lens of claim 147, further comprising an alignment layer attached to said polymer gel.

173. The electro-active lens of claim 147, further comprising a metallic layer attached to said polymer gel.

174. The electro-active lens of claim 147, further comprising a transparent metallic layer attached to said polymer gel.

175. The electro-active lens of claim 147, further comprising a metallic layer attached to said polymer gel, said metallic layer transparent to a wearer of said electro-active lens.

176. The electro-active lens of claim 147, further comprising a metallic layer attached to said polymer gel, said metallic layer having a thickness of about 10^{-4} microns to about 10^{-2} microns.

177. The electro-active lens of claim 147, further comprising a metallic layer attached to said polymer gel, said metallic layer having a thickness of about 10^{-3} microns.

178. The electro-active lens of claim 147, further comprising a gridlike metallic layer attached to said polymer gel.

179. The electro-active lens of claim 147, further comprising a metallic layer attached to said polymer gel, said metallic layer having an array of

electrodes.

180. The electro-active lens of claim 147, further comprising a metallic layer adjacent to said polymer gel.

181. The electro-active lens of claim 147, further comprising a metallic layer deposited onto a side of said polymer gel.

182. The electro-active lens of claim 147, further comprising a vacuum deposited metallic layer adjacent to said polymer gel.

183. The electro-active lens of claim 147, further comprising a sputtered metallic layer adjacent to said polymer gel.

184. The electro-active lens of claim 147, further comprising a conductive layer.

185. The electro-active lens of claim 147, further comprising a conductive layer having a thickness of about 0.05 microns to about 0.2 microns.

186. The electro-active lens of claim 147, further comprising a conductive layer having a thickness of about 0.1 microns.

187. The electro-active lens of claim 147, further comprising a conductive layer attached to a metallic layer.

188. The electro-active lens of claim 147, further comprising a transparent conductive layer.

189. The electro-active lens of claim 147, further comprising a transparent

conductive layer attached to a metallic layer.

190. The electro-active lens of claim 147, further comprising a conductive layer attached to a metallic layer, said conductive layer transparent to a wearer of said electro-active lens.

191. The electro-active lens of claim 147, further comprising a conductive layer attached to a metallic layer, said conductive layer having an array of electrical contacts.

192. The electro-active lens of claim 147, further comprising a conductive layer deposited by vacuum deposition onto a metallic layer.

193. The electro-active lens of claim 147, further comprising a conductive layer deposited by sputtering onto a metallic layer.

194. The electro-active lens of claim 147, further comprising an insulating layer attached to a conductive layer.

195. The electro-active lens of claim 147, further comprising a silicone oxide insulating layer attached to a conductive layer.

196. The electro-active lens of claim 147, further comprising a transparent insulating layer.

197. The electro-active lens of claim 147, further comprising a transparent insulating layer attached to a conductive layer.

198. The electro-active lens of claim 147, further comprising an insulating layer

attached to a conductive layer, said insulating layer transparent to a wearer of said electro-active lens.

199. The electro-active lens of claim 147, wherein said polymer gel is housed in a sealed encapsulating envelope.

200. The electro-active lens of claim 147, wherein said polymer gel has a varying thickness.

201. The electro-active lens of claim 147, wherein said polymer gel has a thickness between about 3 microns and about 1 millimeter.

202. The electro-active lens of claim 147, wherein said polymer gel has a thickness between about 3 microns and about 100 microns.

203. The electro-active lens of claim 147, wherein said polymer gel has a thickness between about 4 microns and about 20 microns.

204. The electro-active lens of claim 147, wherein said polymer gel has a modulus of between about 100 pounds per inch and about 800 pounds per inch.

205. The electro-active lens of claim 147, wherein said polymer gel has a modulus of between about 200 pounds per inch and about 600 pounds per inch.

206. An electro-active lens comprising:

a first lens optic;

a first layer positioned in a cooperative relationships with said first lens optic and having a first electro-active region that encompasses a portion of said first layer.

207. The electro-active lens of claim 206, wherein said first electro-active region is activated.

208. The electro-active lens of claim 206, wherein said portion is variable.

209. The electro-active lens of claim 206, wherein said portion is fixed.

210. The electro-active lens of claim 206, wherein said portion is variable in size.

211. The electro-active lens of claim 206, wherein said portion is variable in location.

212. The electro-active lens of claim 206, wherein said portion is time variable.

213. The electro-active lens of claim 206, wherein said first electro-active region has a variable corrective power.

214. The electro-active lens of claim 206, wherein said first electro-active region has an adjustable corrective power.

215. An electro-active lens comprising:

a first lens optic providing multi-focal optical refraction;

a first electro-active zone positioned in a cooperative relationship with said first lens optic.

216. An electro-active lens comprising:

a first lens optic; and

a near vision electro-active zone located intermittently above a 180

meridian of said first lens optic.

217. An optical lens comprising at least two electro-active zones separated by an insulating zone, each electro-active zone adapted to be independently activated.

218. An optical lens comprising at least two electro-active layers separated by an insulating layer, each electro-active layer adapted to be independently activated.

219. An optical lens comprising at least two electro-active regions separated by an insulating region, each electro-active region adapted to be independently activated.

220. An optical lens comprising a plurality of programmably controlled electro-active zones.

221. An optical lens comprising a plurality of programmably controlled electro-active regions.

222. An optical lens comprising a plurality of programmably controlled electro-active layers.

223. An electro-active lens comprising:

a first lens optic having a presbyopic correction region;

a first electro-active zone positioned in a cooperative relationship with said first lens optic and adapted to reduce unwanted astigmatism created by said presbyopic correction region.

224. The electro-active lens of claim 223, adapted to subtract unwanted astigmatism created by said presbyopic correction region.

225. The electro-active lens of claim 223, adapted to offset unwanted astigmatism created by said presbyopic correction region.

226. The electro-active lens of claim 223, adapted to neutralize unwanted astigmatism created by said presbyopic correction region.

227. The electro-active lens of claim 223, adapted to subtract, offset, or neutralize unwanted astigmatism created by said presbyopic correction region.

228. An electro-active lens comprising:

a first lens optic;

a first electro-active zone positioned in a cooperative relationship with said first lens optic and adapted to correct at least one aberration.

229. The electro-active lens of claim 228, wherein said aberration is an ocular aberration.

230. The electro-active lens of claim 228, wherein said aberration is an optical aberration.

231. An electro-active lens comprising:

a first lens optic;

a first electro-active zone positioned in a cooperative relationship with said first lens optic to correct a wearer's vision to better than 20/20.

232. The electro-active lens of claim 231, wherein said first electro-active zone cooperates with said first lens optic to correct a wearer's vision to about 20/15.

233. The electro-active lens of claim 231, wherein said first electro-active zone cooperates with said first lens optic to correct a wearer's vision to better than 20/15.

234. The electro-active lens of claim 231, wherein said first electro-active zone cooperates with said first lens optic to correct a wearer's vision to about 20/10.

235. The electro-active lens of claim 231, wherein said first electro-active zone cooperates with said first lens optic to correct a wearer's vision to better than 20/10.

236. An electro-active lens comprising:

a first lens optic;

a plurality of electro-active zones positioned in a cooperative relationship with said first lens optic;

a tracker adapted to alter a first electro-active zone from said plurality of electro-active zones.

237. The electro-active lens of claim 236, wherein said tracker measures a line-of-sight.

238. The electro-active lens of claim 236, wherein said tracker reacts to changes in a line-of-sight.

239. The electro-active lens of claim 236, wherein said tracker measures inter-pupillary distance.

240. The electro-active lens of claim 236, wherein said tracker reacts to changes in inter-pupillary distance.

241. The electro-active lens of claim 236, wherein said tracker is adapted to alter a second electro-active zone from said plurality of electro-active zones.

242. The electro-active lens of claim 236, wherein said tracker is adapted to alter a second electro-active zone from said plurality of electro-active zones in reaction to a wearer's line-of-sight.

243. The electro-active lens of claim 236, wherein said tracker includes two or more light emitting diodes.

244. The electro-active lens of claim 236, wherein said tracker includes two or more refraction sensors.

245. The electro-active lens of claim 236, wherein said tracker includes two or more refraction sensors located on a back side of a frame attached to said first lens optic.

246. The electro-active lens of claim 236, wherein said tracker includes two or more light emitting diodes and two or more refraction sensors.

247. An electro-active lens comprising:

a semi-finished lens blank; and

an electro-active zone positioned in a cooperative relationship with said semi-finished lens blank.

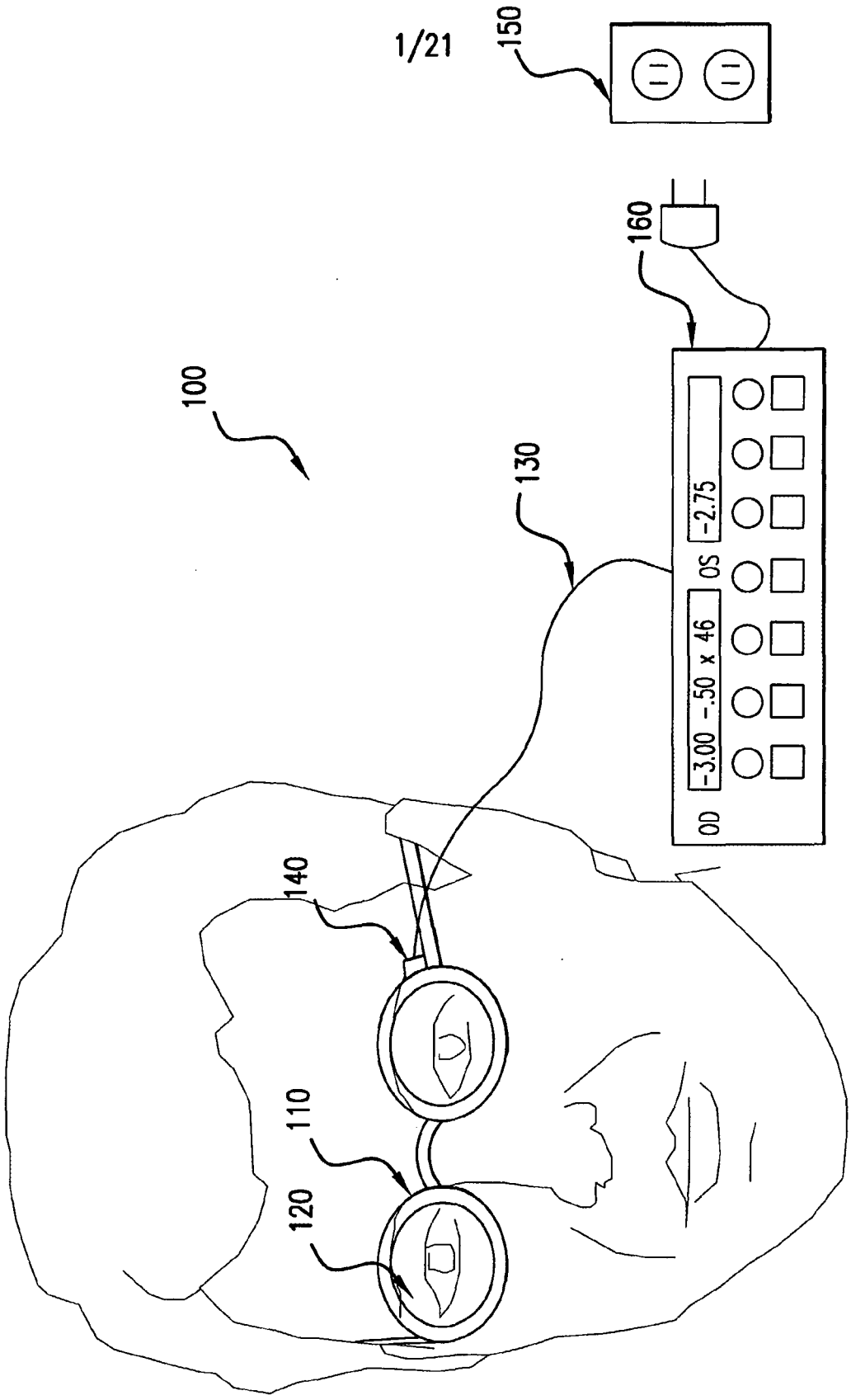


FIG.1

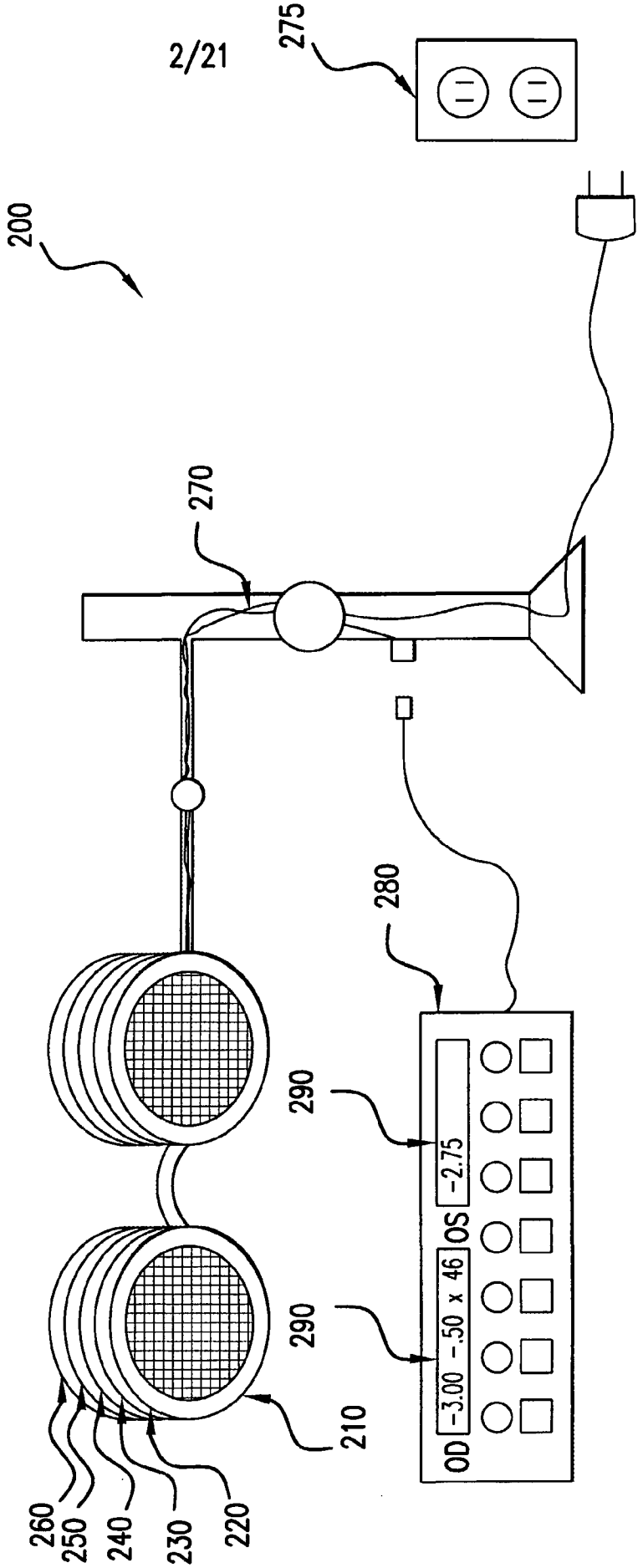

275
200
270
280
290
290
OD -3.00 -.50 x 46
OS -2.75
210
260
250
240
230
220

FIG.2

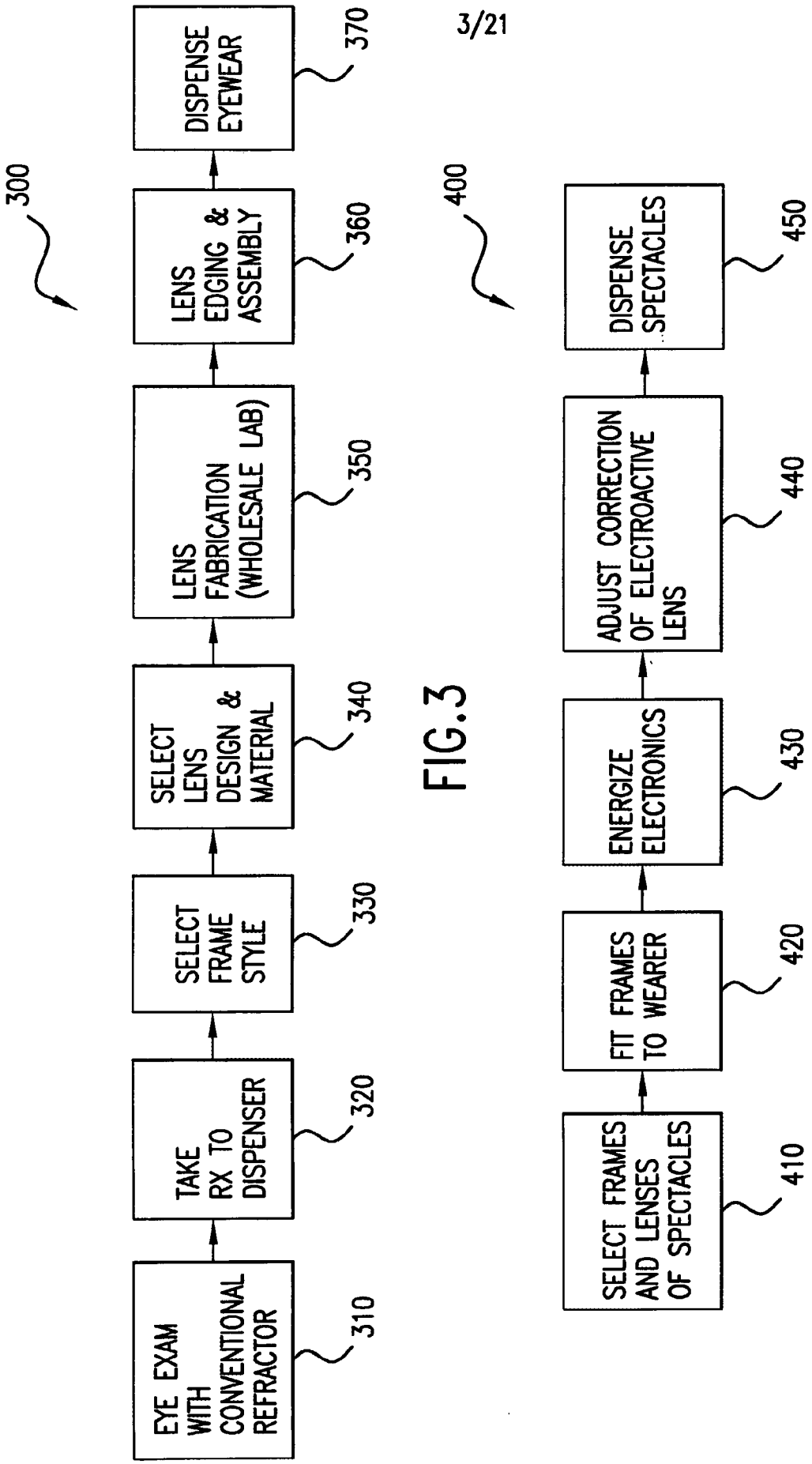

300
EYE EXAM WITH CONVENTIONAL REFRACTOR
310
TAKE RX TO DISPENSER
320
SELECT FRAME STYLE
330
SELECT LENS DESIGN & MATERIAL
340
LENS FABRICATION (WHOLESALE LAB)
350
LENS EDGING & ASSEMBLY
360
DISPENSE EYEWEAR
370
400
SELECT FRAMES AND LENSES OF SPECTACLES
410
FIT FRAMES TO WEARER
420
ENERGIZE ELECTRONICS
430
ADJUST CORRECTION OF ELECTROACTIVE LENS
440
DISPENSE SPECTACLES
450

FIG.3

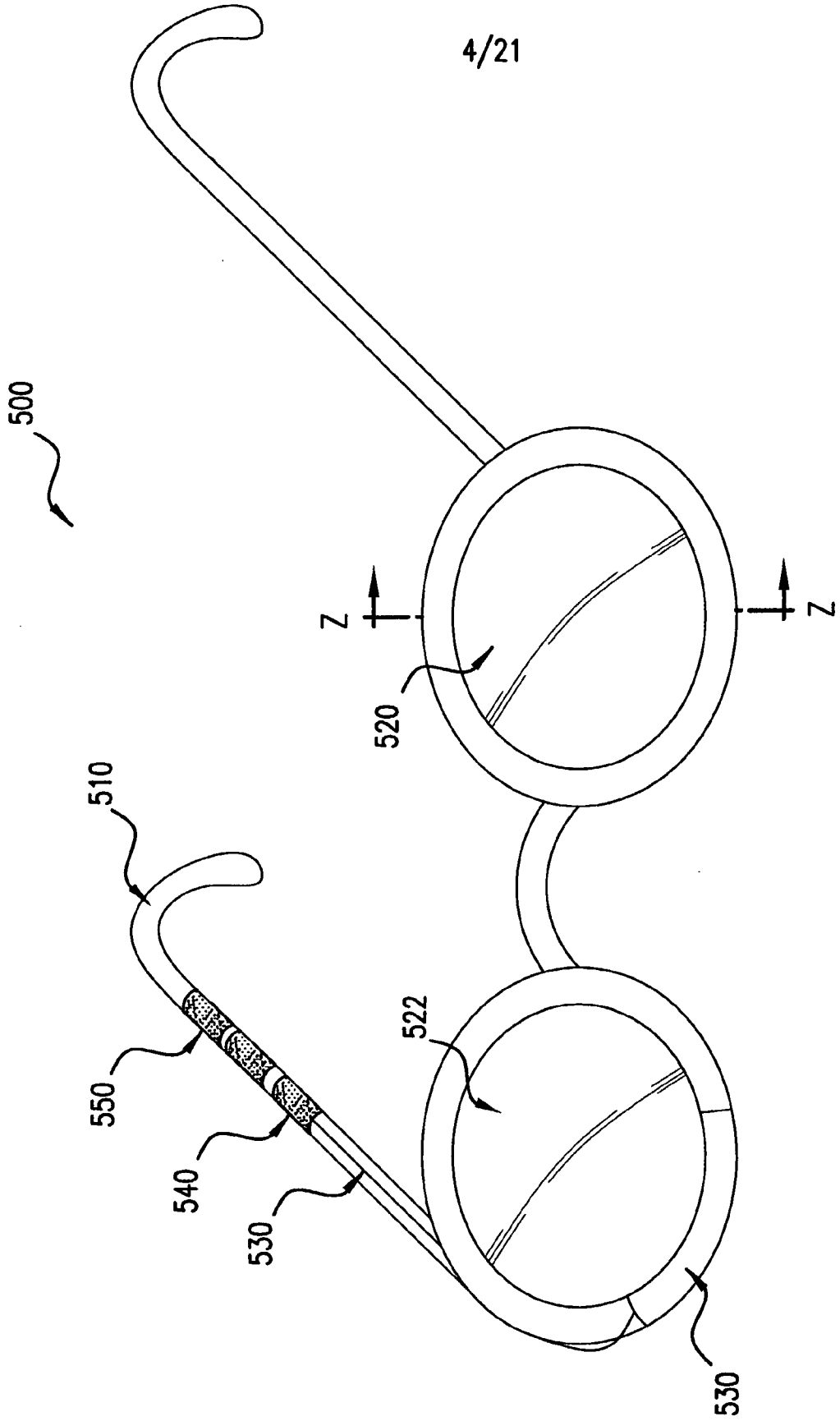


FIG.5

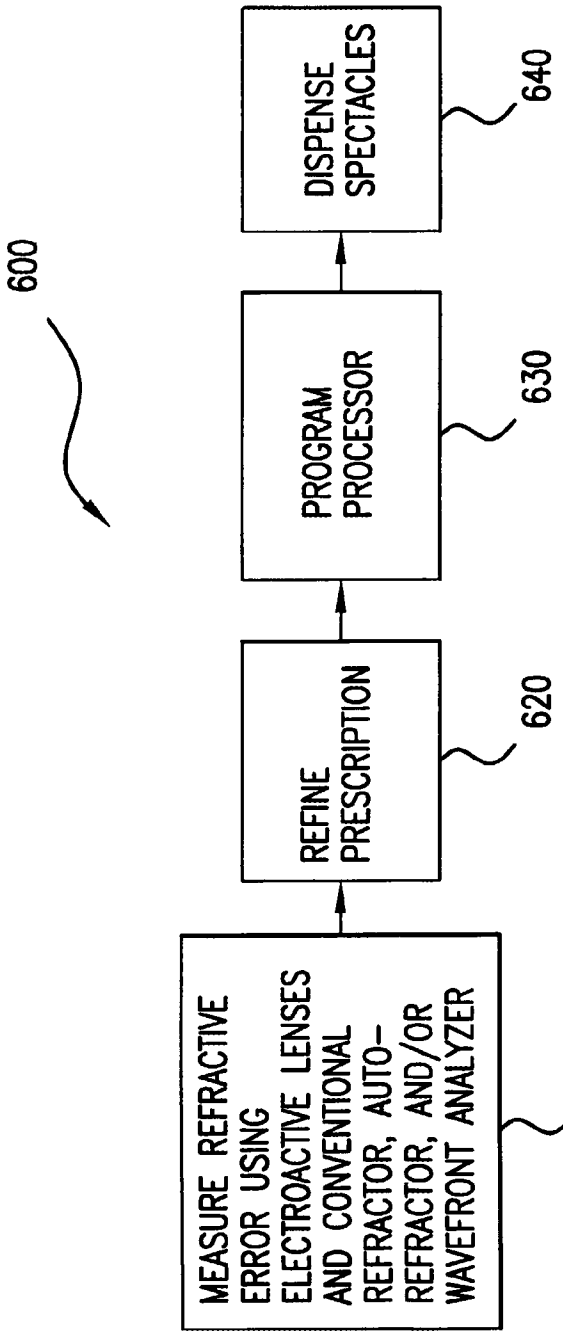

600
MEASURE REFRACTIVE ERROR USING ELECTROACTIVE LENSES AND CONVENTIONAL REFRACTOR, AUTO-REFRACTOR, AND/OR WAVEFRONT ANALYZER
610
REFINE PRESCRIPTION
620
PROGRAM PROCESSOR
630
DISPENSE SPECTACLES
640

FIG.6

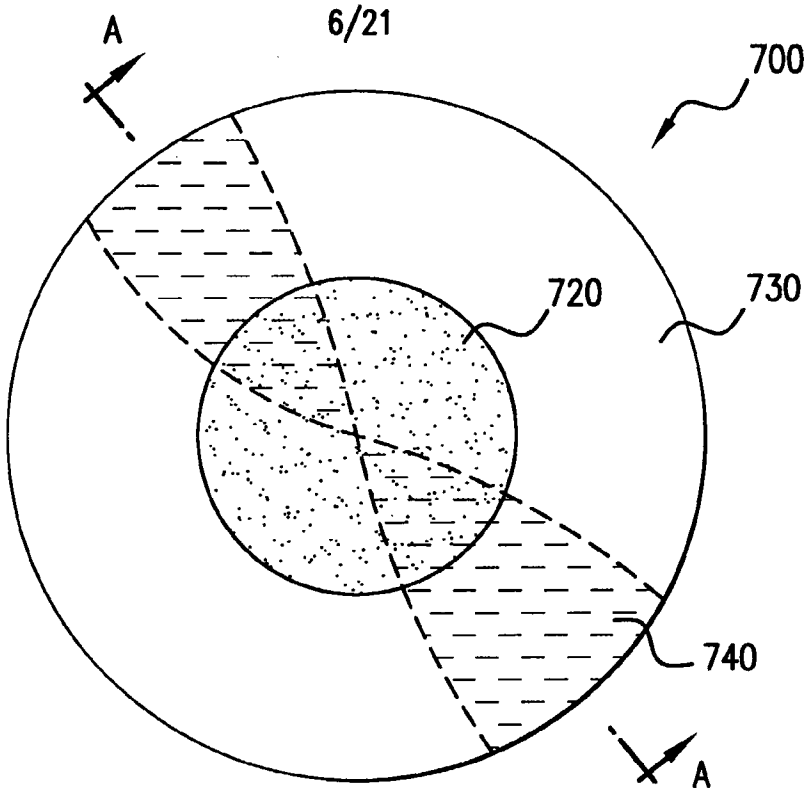


FIG.7

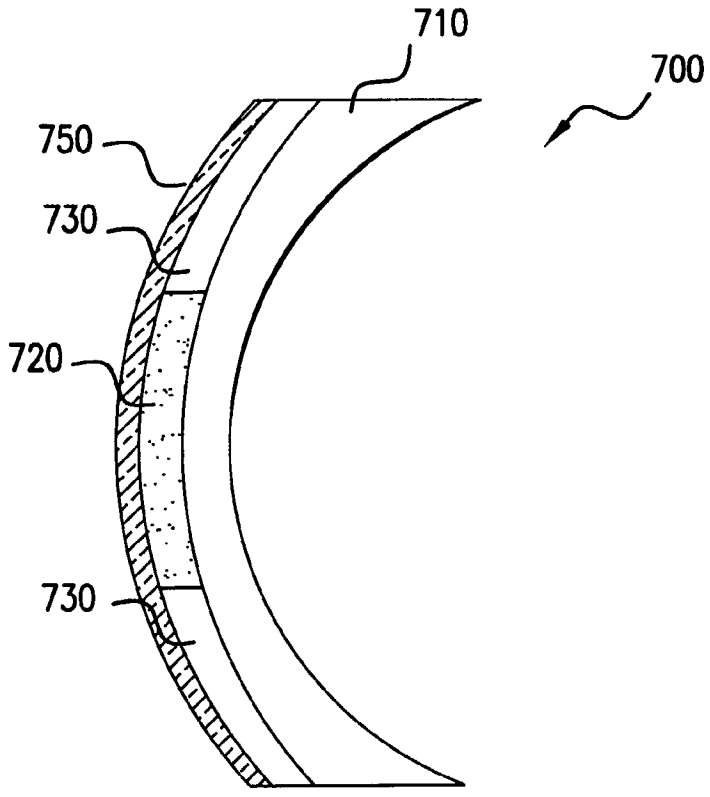


FIG.8

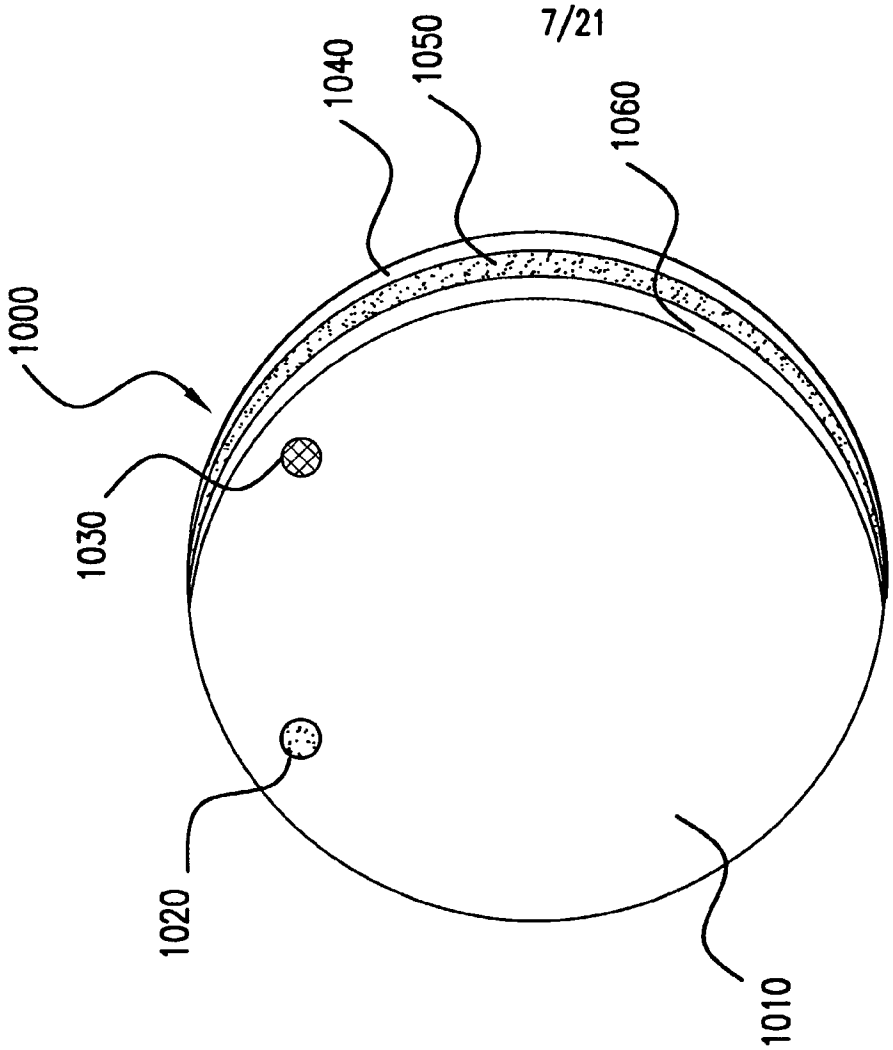


FIG.10

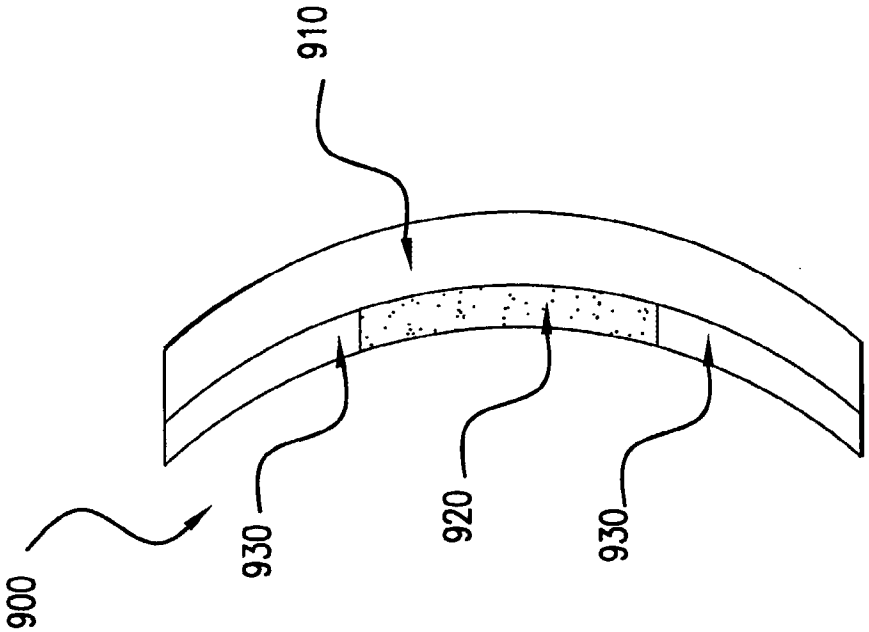


FIG.9

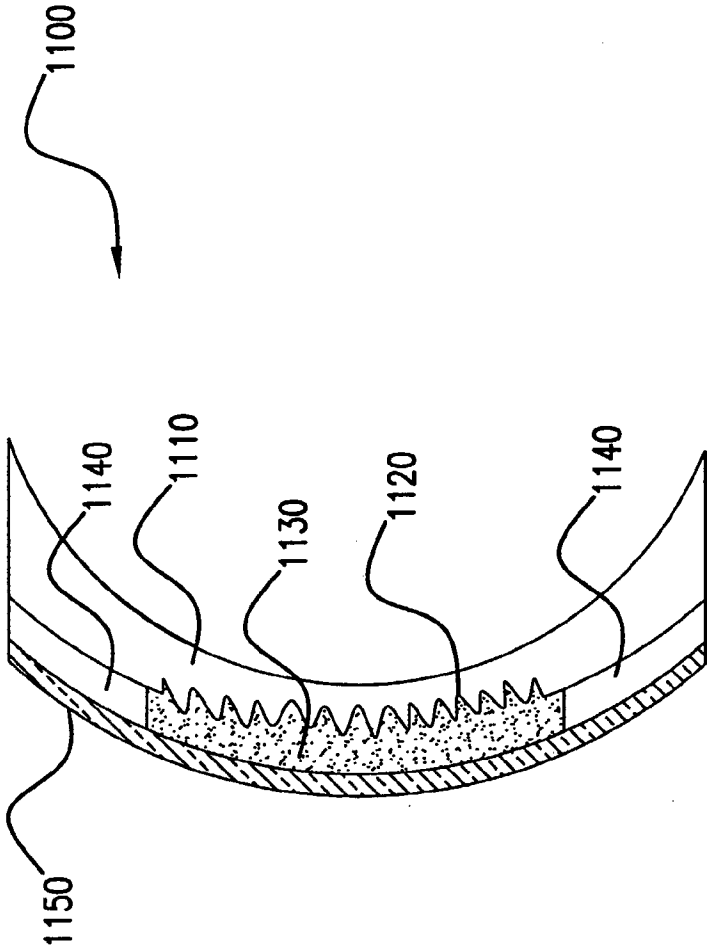


FIG.11

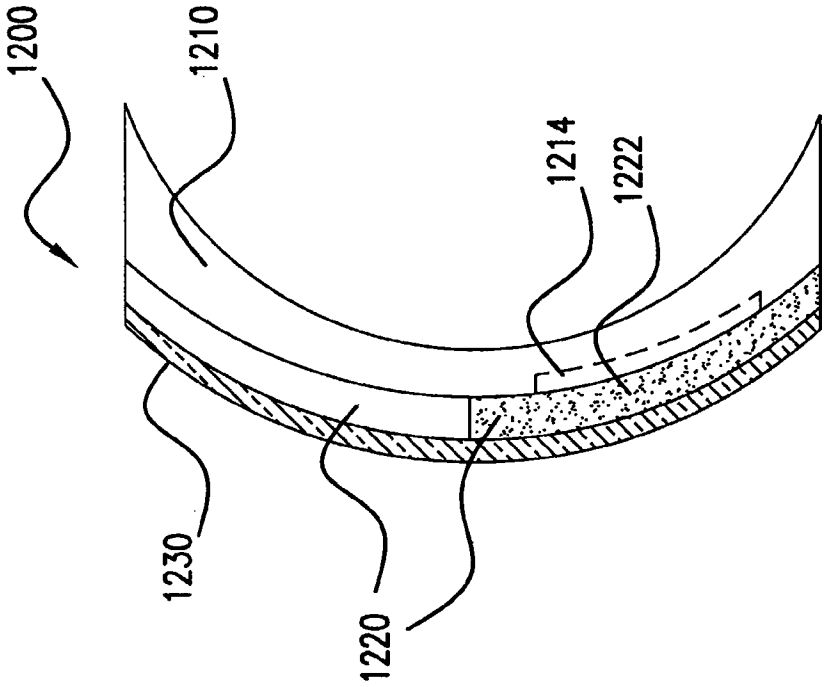

1200
1210
1214
1222
1230
1220

FIG.13

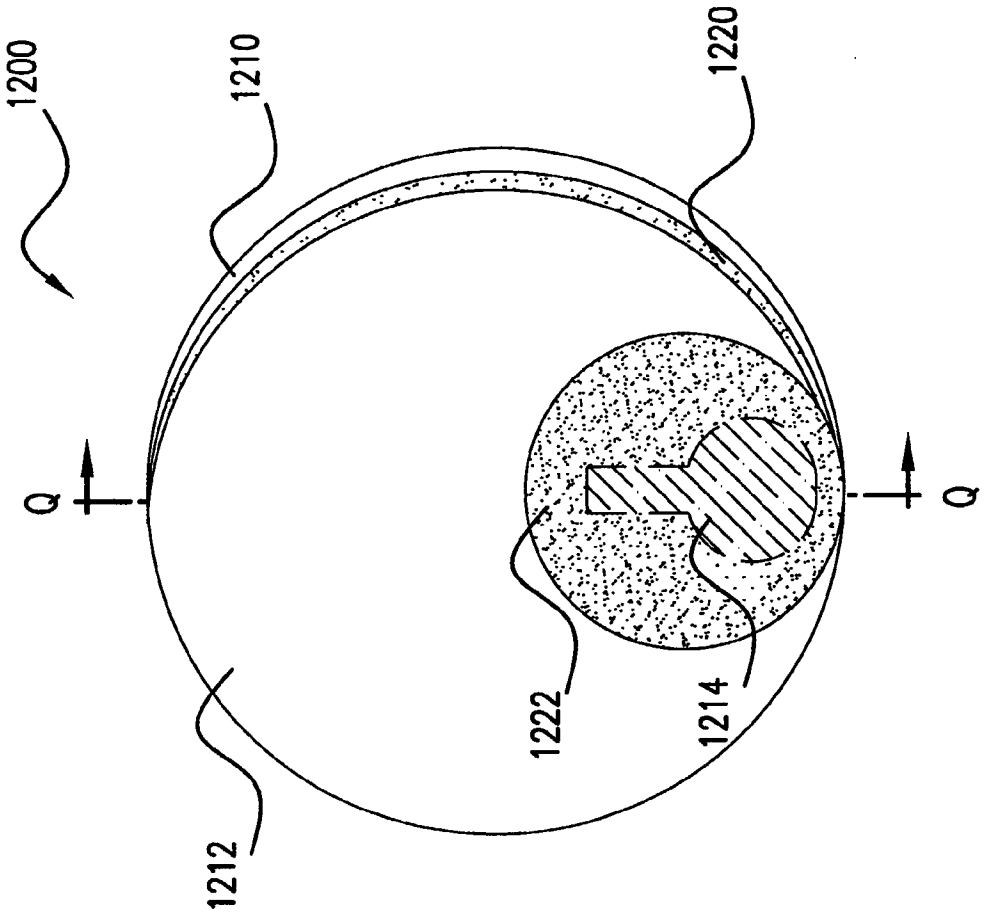

1200
1210
1220
Q
Q
1222
1214
1212

FIG.12

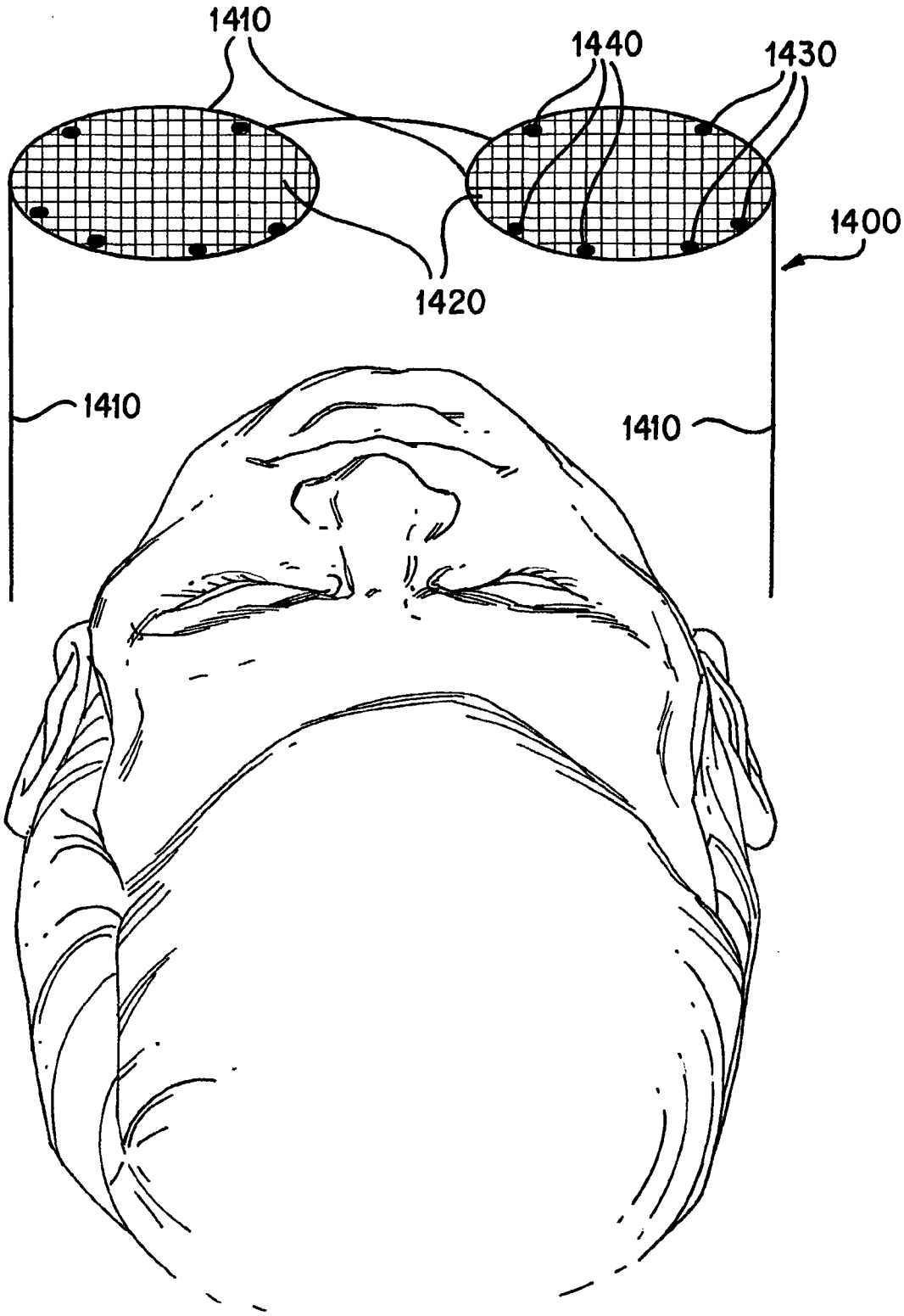


FIG. 14

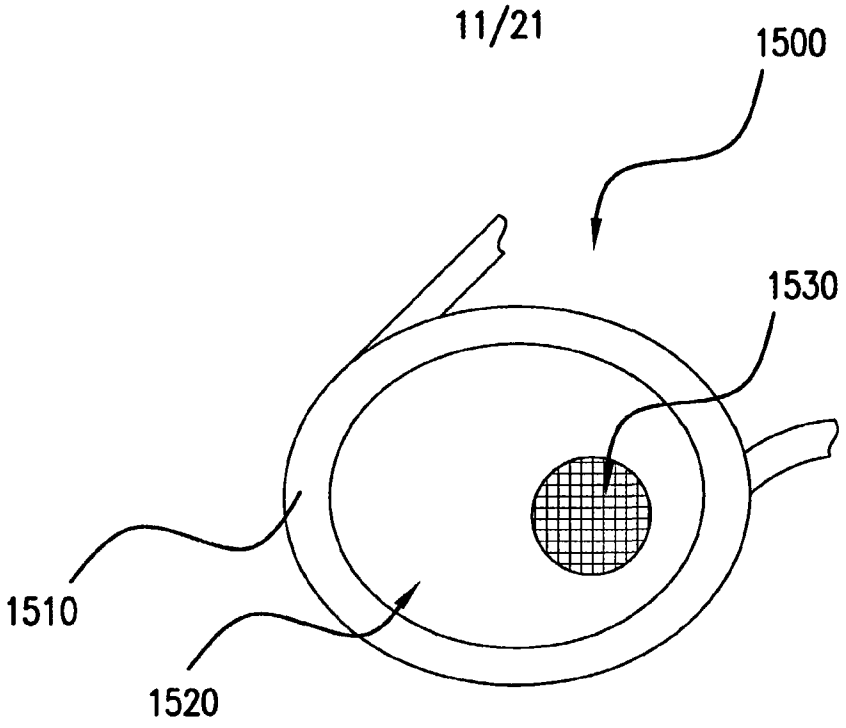


FIG.15

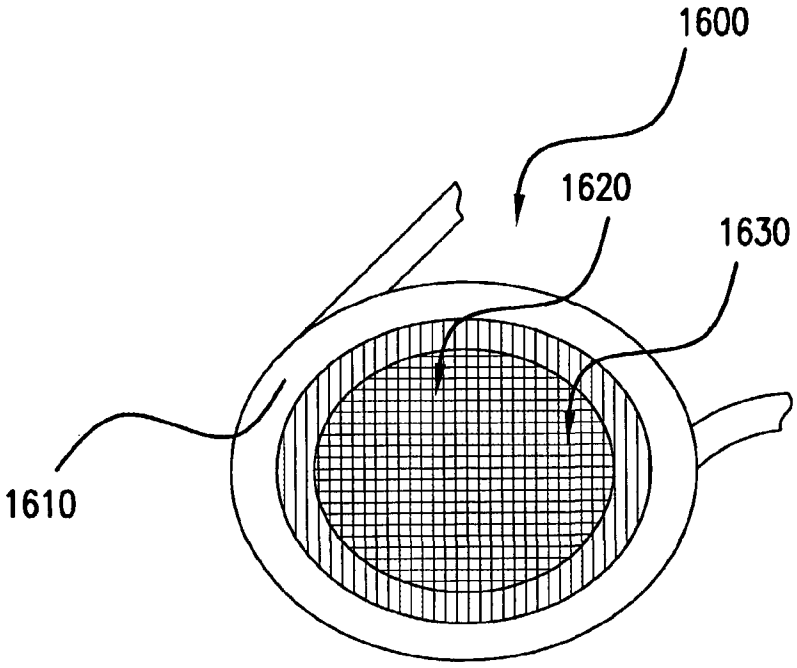


FIG.16

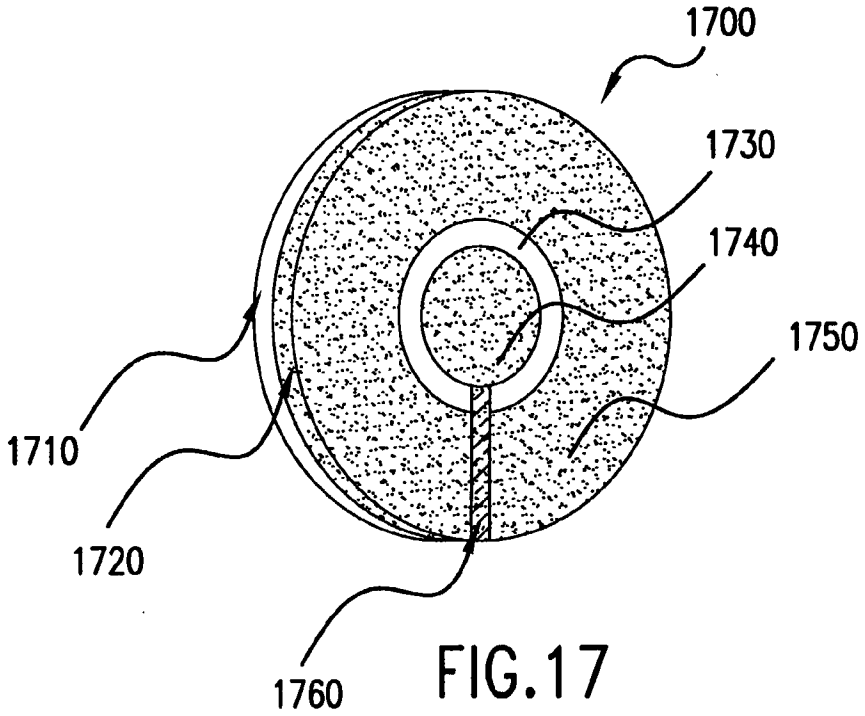

1700
1730
1740
1750
1710
1720
1760

FIG.17

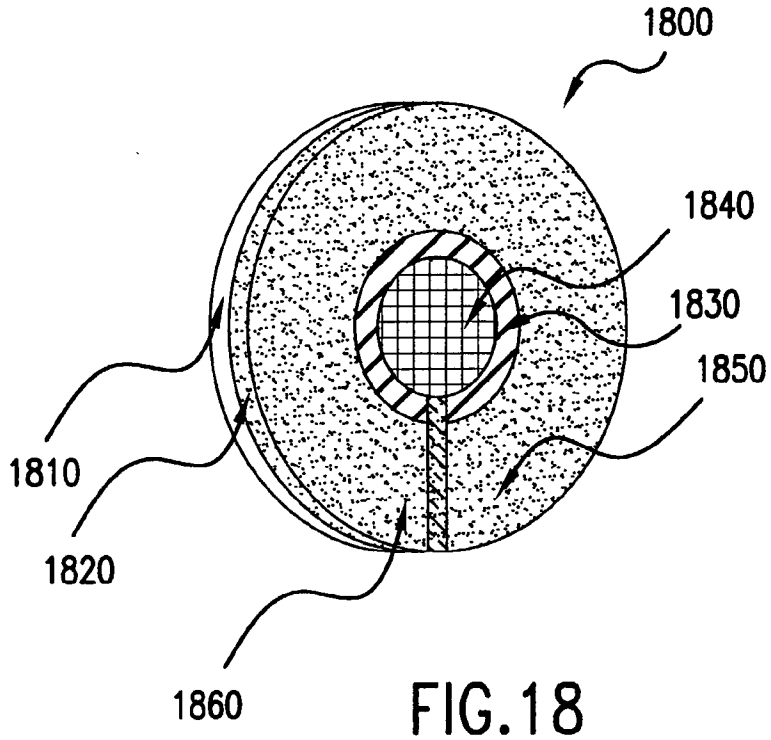

1800
1840
1830
1850
1810
1820
1860

FIG.18

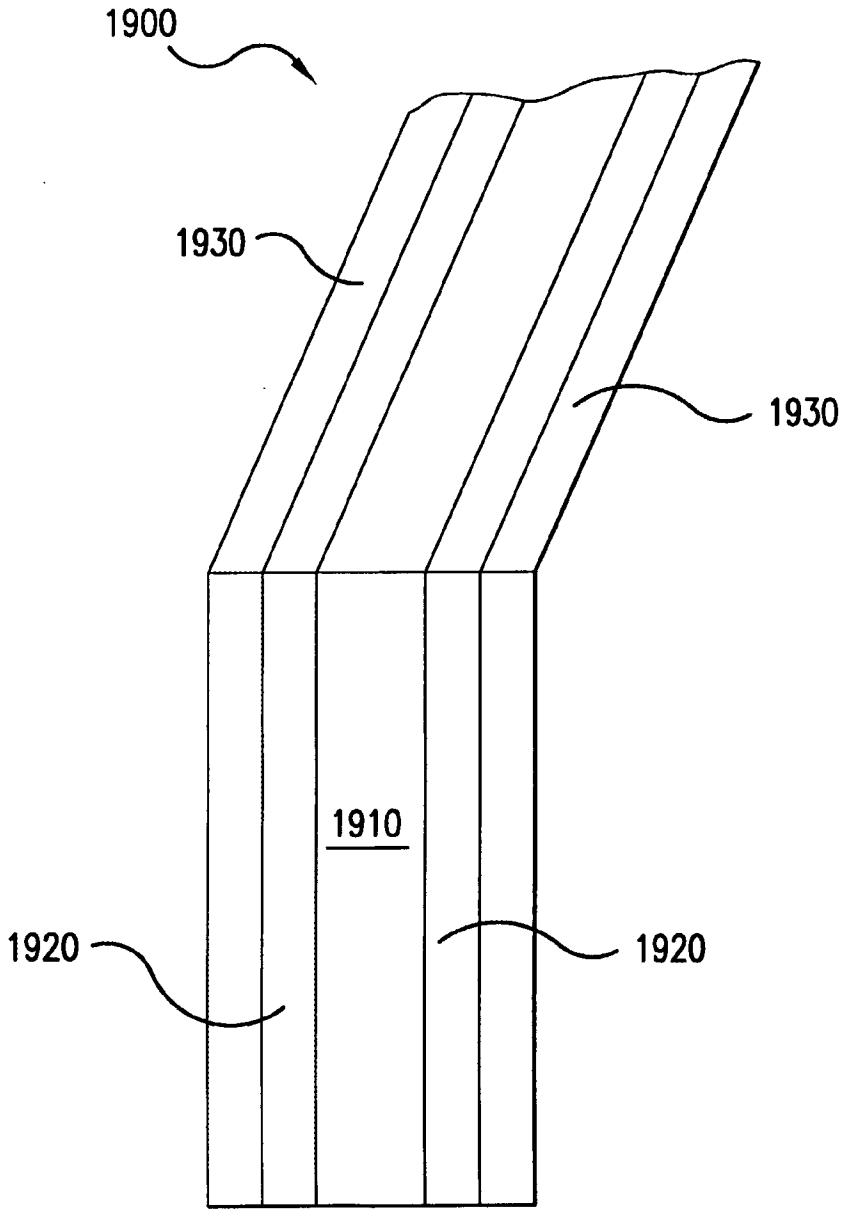


FIG.19

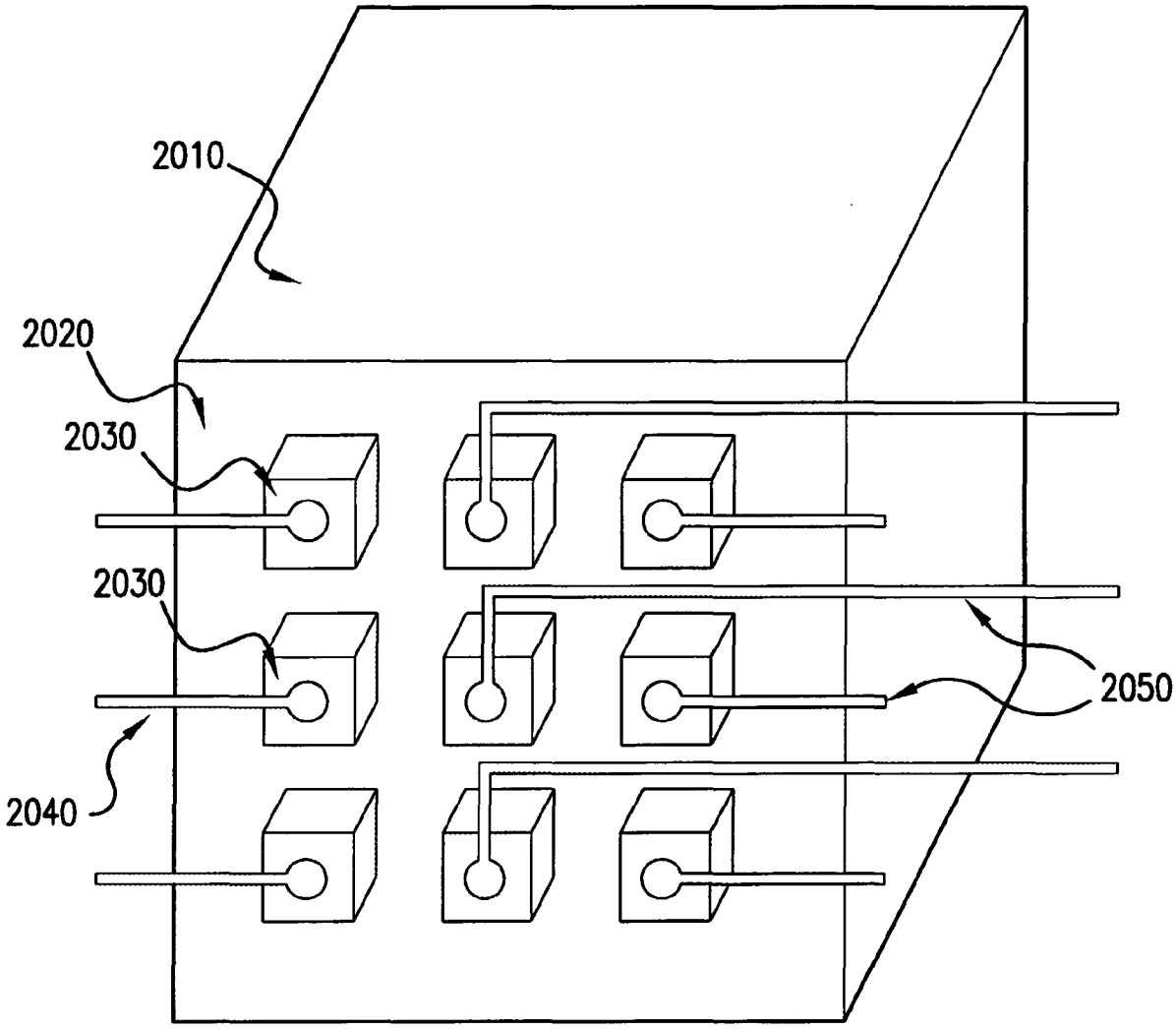


FIG.20

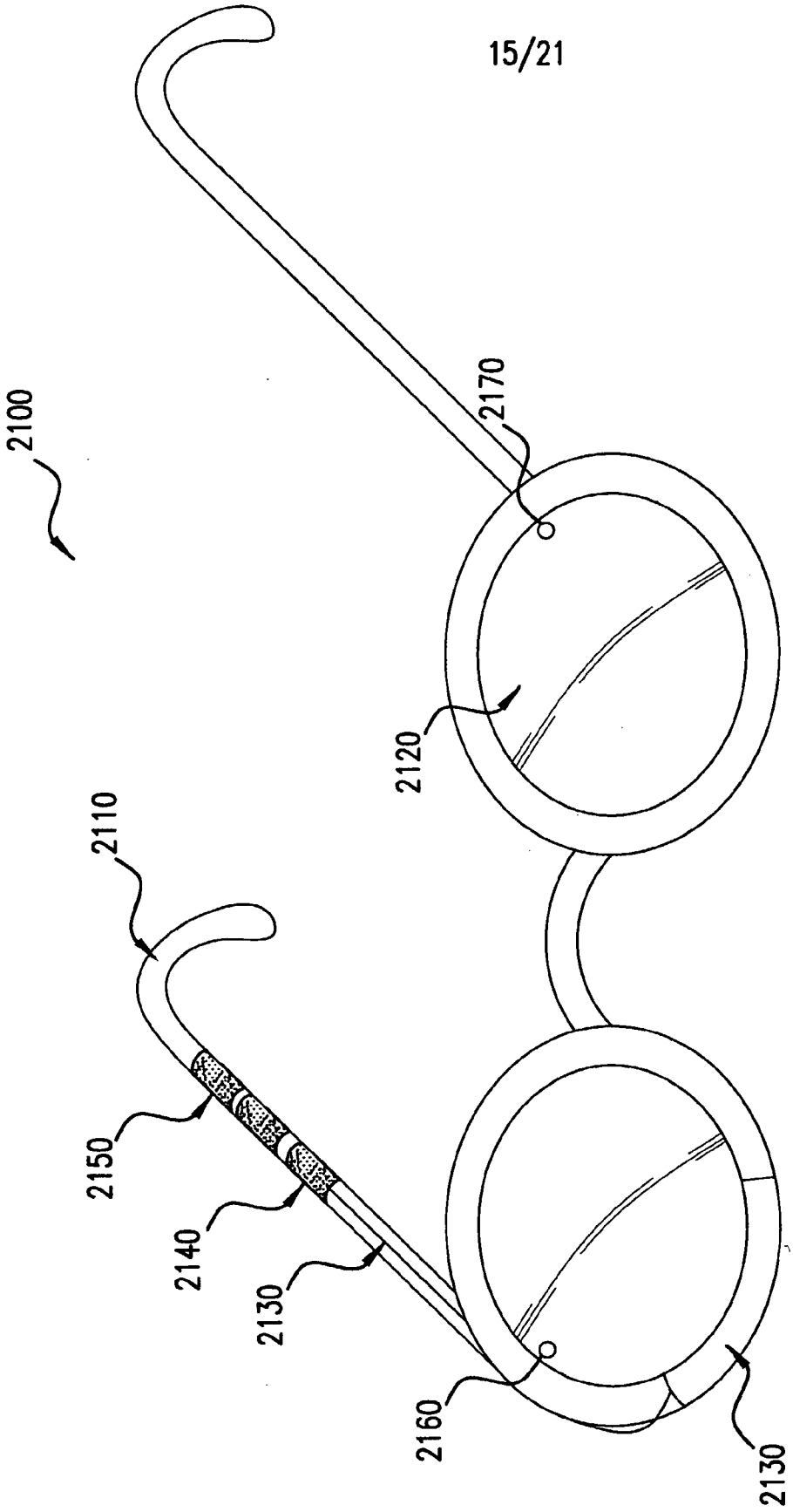


FIG.21

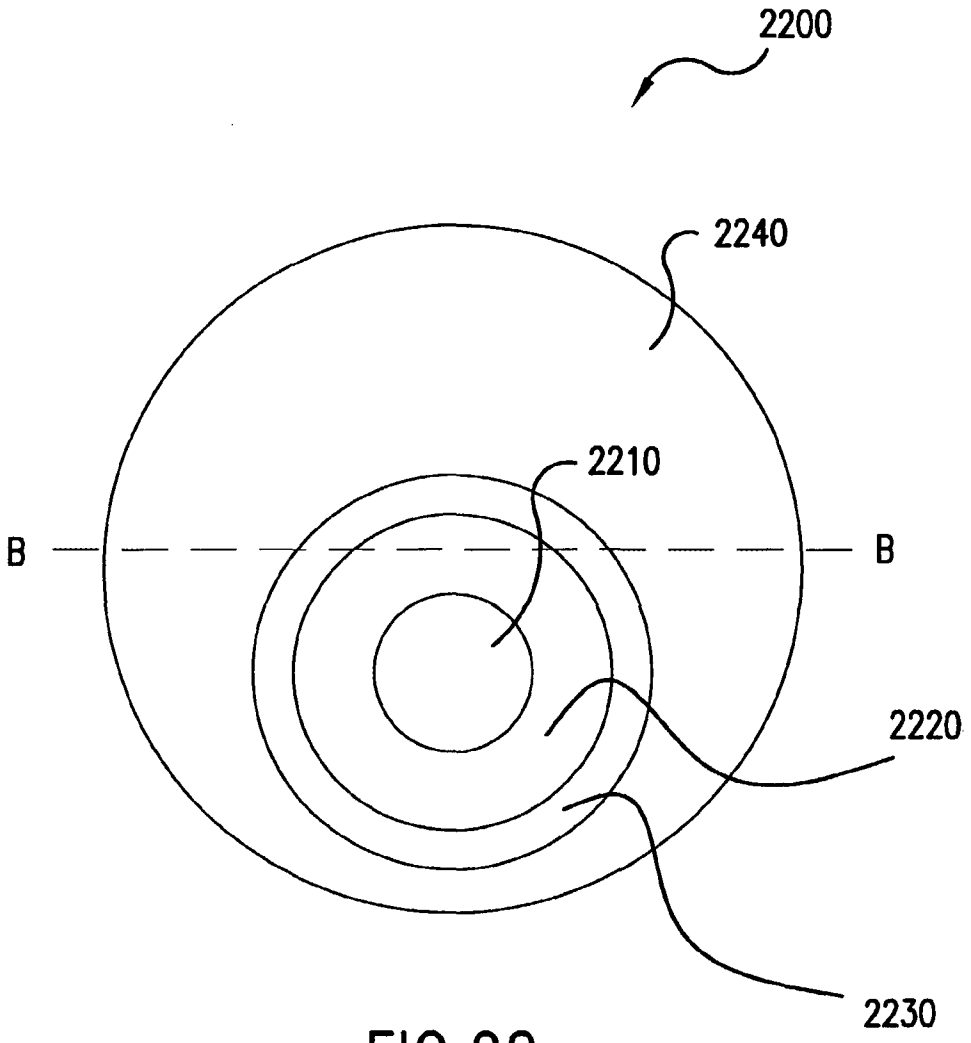


FIG.22

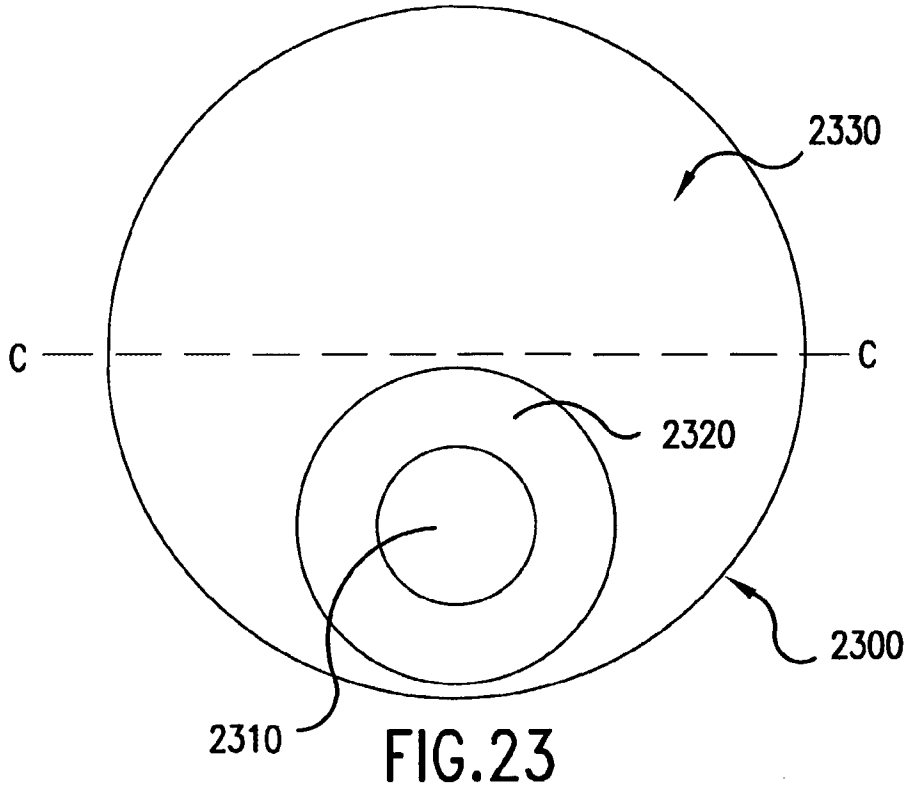


FIG.23

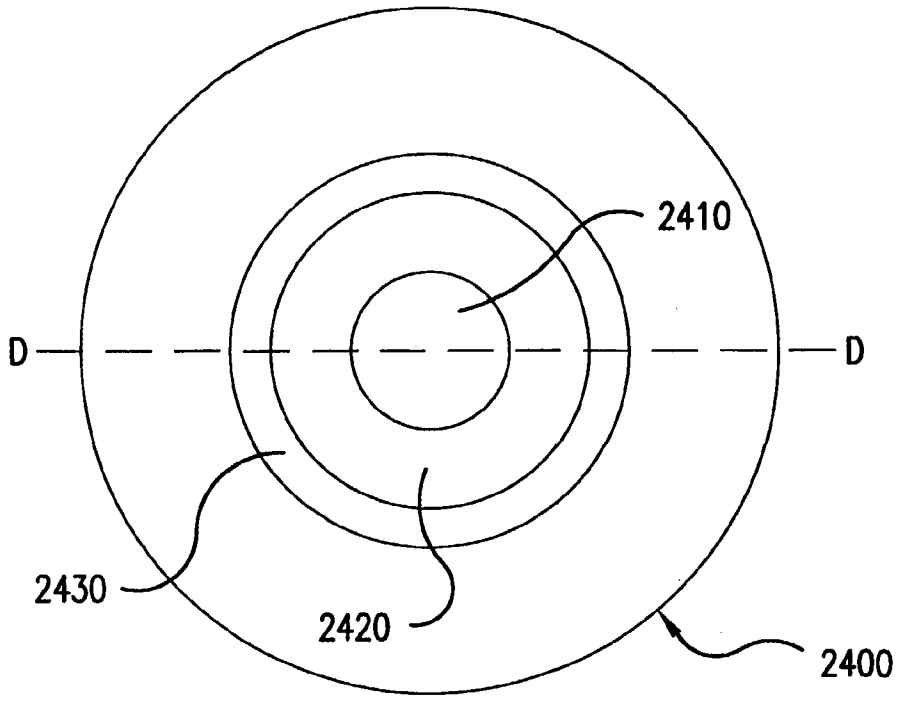


FIG.24

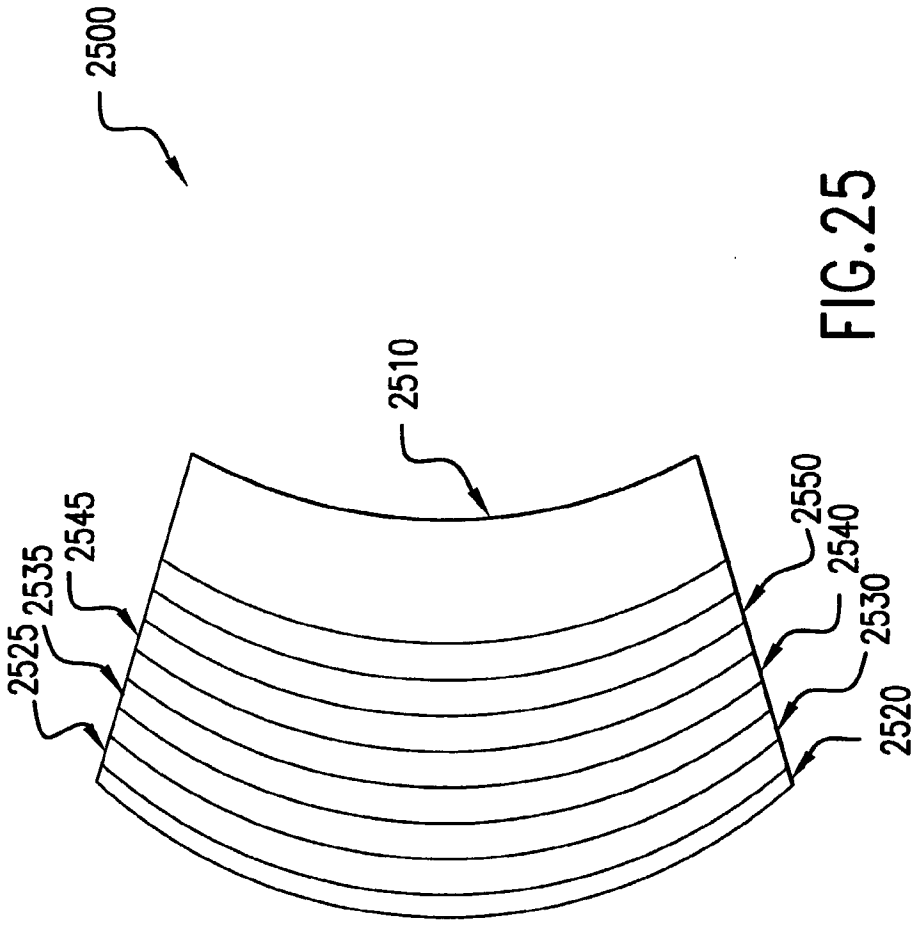


FIG.25

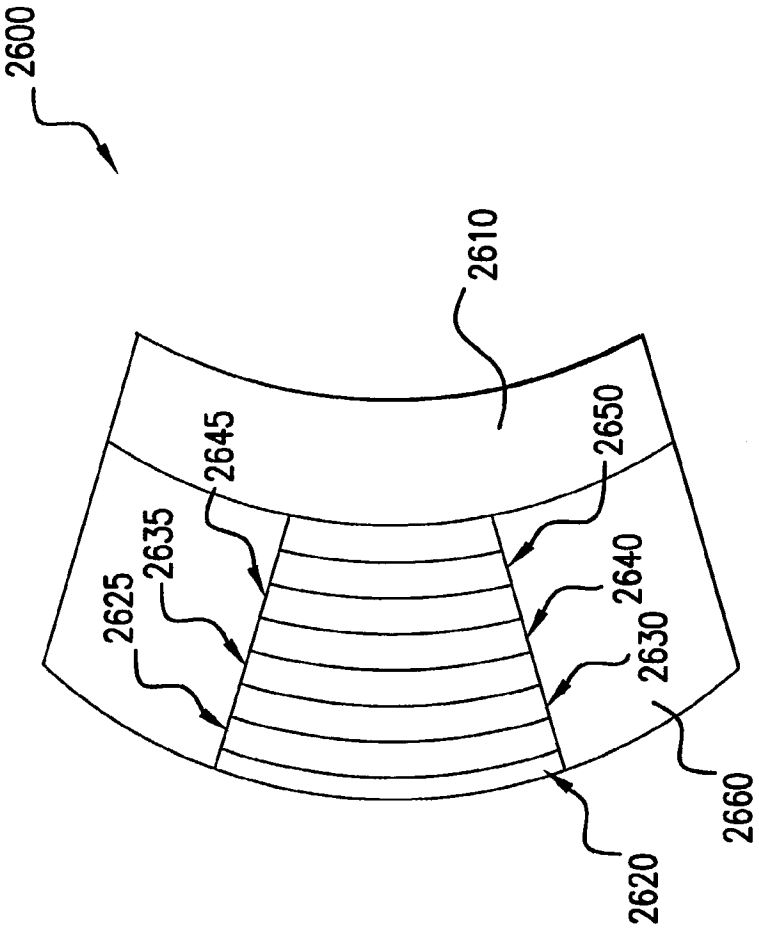


FIG.26

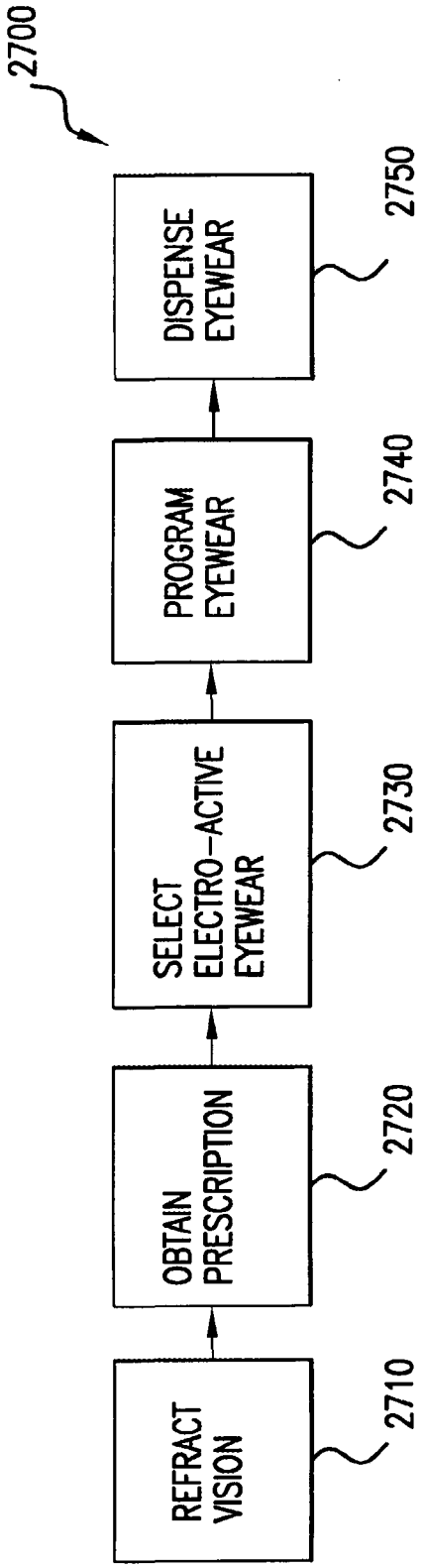

2700
REFRACT VISION
2710
OBTAIN PRESCRIPTION
2720
SELECT ELECTRO-ACTIVE EYEWEAR
2730
PROGRAM EYEWEAR
2740
DISPENSE EYEWEAR
2750

FIG.27

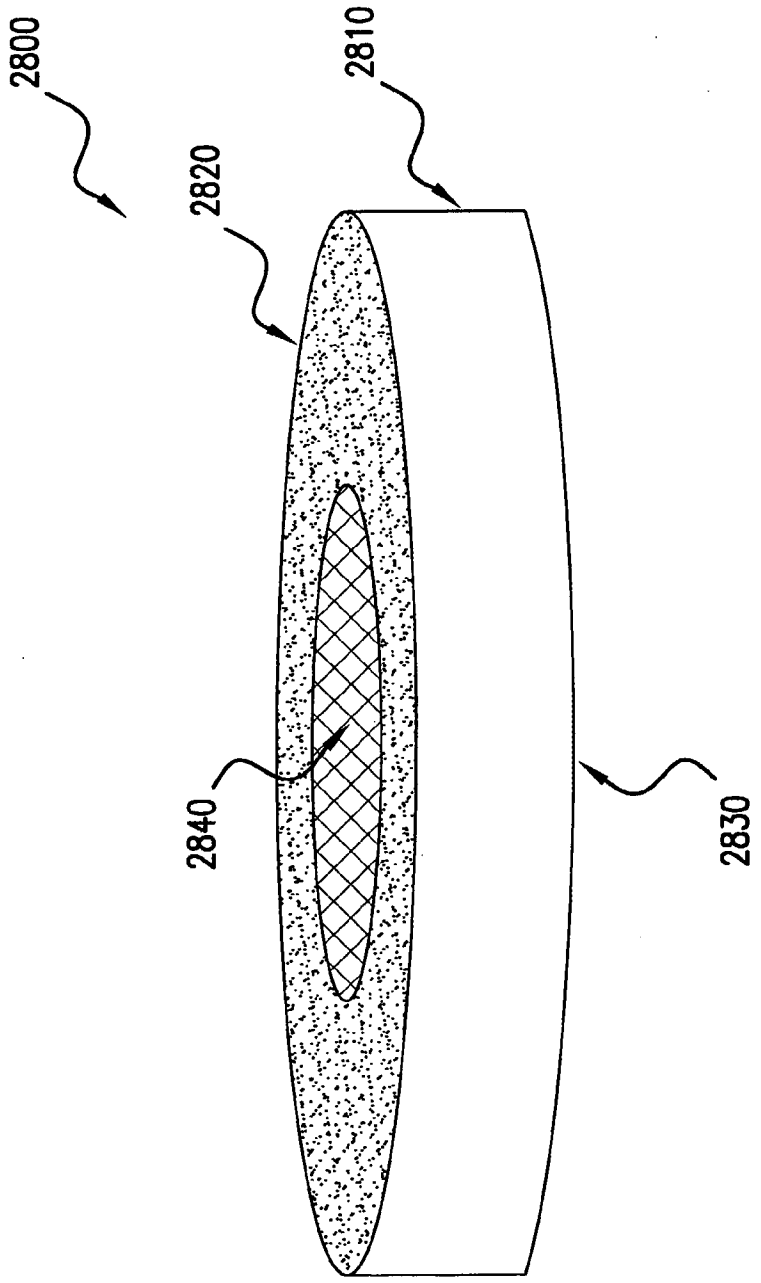


FIG.28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/17964

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G02C 7/02
US CL : 351/159,176

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)

U.S. : 351/41, 44, 159, 161, 163-165, 168-169, 176-177, 205, 209

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

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

East search

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- A	US 5,359,444 A (PIOSENKA ET AL.) 25 October 1994 (25/10/94), Figures 4, 8-12, column 1, line 34 to column 7, line 23.	113-127, 129-214,217-222,228-246 ---------- 1-112, 128, 215-216,223-227,247
X ---- A	US 4,181,408 A (SENDERS) 01 January 1980 (01/01/80), Figures 1-5, column 2, line 63 to column 7, line 11.	1-112, 128, 147-215, 217-222,231-246 ---------- 113-127, 129-146, 216, 223-230, 247

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 21 AUGUST 2000	Date of mailing of the international search report 08 NOV 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JORDAN M. SCHWARTZ Telephone No. (703) 308-1286

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/17964

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- A	US 4,601,545 A (KERN) 22 July 1986 (22/07/86), Figures 1-4, 6-8, column 1, line 42 to column 7, line 43.	117-128, 147-215, 217-222, 231-235, 247 ---------- 1-116, 129-146, 216, 223-230, 236-246
X ---- A	US 5,182,585 A (STONER) 26 January 1993 (26/01/93), Figures 1-4, column 2, line 45 to column 10, line 27.	1-112, 117-126, 128-146, 206-215, 217-222, 231-235 ---------- 113-116, 127, 147-205, 216, 223-230, 236-247

Form PCT/ISA/210 (continuation of second sheet) (July 1998)★

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 91904-813919	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2011/042882	International filing date *(day/month/year)* 01 July 2011 (01.07.2011)	Priority date *(day/month/year)* 02 July 2010 (02.07.2010)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PIXELOPTICS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 11 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 January 2013 (08.01.2013)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Nora Lindner e-mail: pt03.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2011/042882	01.07.2011	02.07.2010

International Patent Classification (IPC) or both national classification and IPC
INV. G02C7/10 G02C1/06 G02C7/08 G02C11/00

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	de Lajarte, Gilles Telephone No. +49 89 2399-2697

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 11, 19, 20

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 11, 19, 20

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b).

☐ See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-10, 12-18, 21-33

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-10, 12-18, 21-33
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-10, 12-18, 21-33
Industrial applicability (IA)	Yes:	Claims	1-10, 12-18, 21-33
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

1 Non unity

It is considered that there are 3 inventions covered by the claims indicated as follows:

- Group 1 (claims 1-10, 12-18, 21-33): connection structure
    - Subgroup 1.1 (claims 1-10, 12-18, 21-28): same two connections for two lenses
    - Subgroup 1.2 (claims 29-33): four connections for two lenses
- Group 2 (claims 11, 19, 20): material choice for electrical isolation

The reasons for which the inventions are not so linked as to form a single general inventive concept, are as follows:

The subject-matter of independent claim 1 is already known (see the grounds for this objection below).

The special technical features of each group are:

- Group 1 : structural connection to the electro-active lenses,
    - Subgroup 1.1: both lenses each connected to the same two electrical paths,
    - Subgroup 1.2: the two lenses are connected with four distinct electrical paths,
- Group 2: choice of materials for improved isolation of the electrical paths.

The problems solved by these special technical features can therefore be construed as:

- Group 1: choice of the electrical structure,
    - Group 1.1: how to reduce the number of electronic components,
    - Group 1.2: how to improve the controlling of the lenses,
- Group 2: how to improve the isolation of the electrical paths.

The requisite unity of invention no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features does not exist between the subject-matter of the 3 groups of claims.

In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 3 different inventions not linked by a single general inventive concept.

The application, hence does not meet the requirements of unity of invention as defined in Rules 13.1 and 13.2 PCT.

Since the search for subgroup 1.1. brought up documents for subgroup 1.2 without additional effort, no extra search fee for subgroup 1.2 has been requested.

Since the applicant chose not to pay the additional search fee for group 2, the following written opinion covers group 1 only.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

D2 WO 01/02895 A1 (VISION L L C E [US]) 11 January 2001 (2001-01-11)

D3 GB 1 563 929 A (AMERICAN CYANAMID CO) 2 April 1980 (1980-04-02)

D4 WO 01/35159 A1 (PPG IND OHIO INC [US]) 17 May 2001 (2001-05-17)

D5 US 4 991 951 A (MIZUNO MITSUYOSHI [JP] ET AL) 12 February 1991 (1991-02-12)

D6 US 2 930 857 A (ELEANOR HOLLINGSWORTH) 29 March 1960 (1960-03-29)

2 Independent claim 1

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claim 1 is not novel.

D1 discloses a first device comprising:

a frame (Fig 1, (1)) further comprising:

a lens housing (Fig 1, (1); Fig 2; Col 3, L 33-38) adapted to support a first lens and a second lens;

a first temple coupled to the lens housing (Fig 4, (51, 52, 55); Col 2, L 67-Col 3, L 12), and

a second temple coupled to the lens housing (Fig 1, (5));

a first conductive path provided by one or more frame elements from the first temple to the lens housing (Fig 1, (11, 51)); and

a second conductive path provided by one or more frame elements from the first temple to the lens housing (Fig 1, (12, 52));

wherein the first conductive path is electrically isolated from the second conductive path (Fig 4, (42, 44, 46, 55); Col 2, L 55-Col 3, L 12).

Thus, the spectacles of D1 have all the features of claim 1, its subject matter being therefore not novel.

Further, D2 and D3 also each anticipates the subject matter of claim 1 (see corresponding passages in the search report).

3 Dependent claims 1-10, 12-18, 21-33

Dependent claims 1-10, 12-18, 21-33 do not appear to contain any additional features which, in combination with the features of any claim to which it refers, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2, 3) PCT), the reasons being as follows:

- claim 2: one electrical insulator between a portion of first and second conductive path (Fig 3, (32); Col 2, L 57-62),

- claim 3: hinge (D1, Fig 4, (40); alternatively, faced with the problem of closing the temples, the person skilled in the art would transform the screw (40) fixation into a hinge without requiring an inventive activity; D2, Fig 4B),

- claim 4: insulator in temple (D1, Fig 4, (55)),

- claim 5: insulator in lens housing (D1, Fig 4, (42)),

- claim 6: electronic module connected to first and second conductive paths (D1, Fig 1, (9); Col 3, L 39-45),

- claim 7: first path (D1, Fig 1, (11)) connected to first contact of first lens (D1, Fig 2, (23); Col 3, L 24-32) and second path (Fig 1, (12)) connected to second contact of second lens (Fig 2, (26)),

- claim 8: first path (D1, Fig 1, (11)) connected to first contact of second lens (D1, Fig 2, (24); Col 3, L 24-32) and second path (Fig 1, (12)) connected to second contact of first lens (Fig 2, (25)),

- claim 9: lens housing with non-conductive material (D1, Fig 4, (42)) and first path with conductive material embedded in the lens housing (D1, Fig 2, (23); Col 3, L 24-32),

- claim 10: second path with conductive material embedded in the lens housing (D1, Fig 2, (25); Col 3, L 24-32),

- claim 12: second temple without electronic module (D1, Fig 1, temple connected to (B1)),

- claim 13: second temple or second lens without electronic module (D1, Fig 1, temple connected to (B1)),

- claim 14: first path provided by first portion of lens housing (D1, Fig 1, (11)),

- claim 15: second path provided by second portion of lens housing (D1, Fig 1, (12)),

- claim 16: first and second portion of lens housing isolated from one another by a piece of electrically insulating material (D1, Fig 5, (42)),

- claim 17: semi-rimless spectacles (D2, claim 14; [0067]),

- claim 18: conductive path within the lens housing of semi-rimless spectacles (implicit from D2, claim 14),

- claim 21: lens housing parts separated by air gap (D1, Fig 4, between (42) and (44) on one hand, (44) and 46) on the other hand),

- claim 22: bridge between first and second lens (D1, Fig 1, (12)), with first and second portion (Fig 1, (11, 12)) of the lens housing, with air gap between these two portions (Fig 3, between (32) and (34)),

- claim 23: air gap less than 10 mm (D1, Fig 1),

- claim 24: first and second portion of lens housing in metal (D1, Claim 1),

- claim 25: first part of insulator comprises the lenses (D1, Fig 1),

- claim 26: second part of insulator comprises air gap or second lens (D1, Fig 1),

- claim 27: second part of insulator between lenses (D1, Fig 1, 3, (12)),

- claim 28: full rimmed spectacles (D1, Fig 1),

- claims 29-33: four conductive paths (D2, Fig 14; [0074, 0099]; D3, Fig 1).

Re Item VIII

Certain observations on the international application

4 Clarity

Claim 1 is lacking the essential feature of "a spectacles frame" rather than "a first device". This is otherwise not clear which category of device is meant, e.g. whether telescopes, microscopes or a pair of spectacles are meant.

Furthermore, no example other than a pair of spectacles is provided in the description. As such, the subject matter of claim 1 is not supported over the whole range claimed.

Electronic Acknowledgement Receipt

EFS ID:	14999693
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	72162
Filer:	John P. McGroarty/Aneta Xhiku
Filer Authorized By:	John P. McGroarty
Attorney Docket Number:	91904-817521
Receipt Date:	20-FEB-2013
Filing Date:	17-NOV-2011
Time Stamp:	11:31:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2013_02_20_SIDS_91904-817521.pdf	165754 18381bb6717d11231660d2cebd18603cf16e095a	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Form (SB08)	3	3

Warnings:					
Information:					
2	Foreign Reference	WO0102895.pdf	10740122 82d15f7c4b3ccff927f8d7a86ef98aff501eacf0	no	116
Warnings:					
Information:					
3	Non Patent Literature	IPER.pdf	440564 13d80639f6c099bb254f52f0f205763e3f9f8ff5	no	11
Warnings:					
Information:					
		Total Files Size (in bytes):	11346440		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on 2/20/13.

KILPATRICK TOWNSEND & STOCKTON LLP

By: Aneta Mihali Xhiku

PATENT
Attorney Docket No.: 91904-817521(008512US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Ronald D. Blum

Application No.: 13/298,992

Filed: November 17, 2011

For: ELECTRONIC SPECTACLE FRAMES

Customer No.: 72162

Confirmation No.: 1095

Examiner: Darryl J. Collins

Art Unit: 2835

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.97 and §1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The references cited on attached form PTO/SB/08A and PTO/SB/08B are being called to the attention of the Examiner. Copies of the references [in compliance with the requirements of 37 CFR §1.98(a)(2)] are enclosed. It is respectfully requested that the cited references be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the "references cited" on any patent to issue therefrom.

Also enclosed is a copy of the International Preliminary Report on Patentability corresponding to the PCT/US2011/042882 application.

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Respectfully submitted,

/John P. McGroarty/

John P. McGroarty
Reg. No. 41,186

KILPATRICK TOWNSEND & STOCKTON LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 202-481-9900
Fax: 202-481-3972
JPM:amx

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Application Number	13/298,992
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First Named Inventor	Ronald D. Blum
Art Unit	2835
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1	Change of Address	2013_02_07_CHANGE_ADDRESS_91904-817521.pdf	223995 b7c7d7e25b569c9c5ad40eb56d22760c7ecc5d0e	no	1

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
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				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	1	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-2011/0058141	3/2011	Cozzani, Laura Maria	

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	AB	WO	01/35159		5/17/01	PPG Industries Ohio, Inc.		☐

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(71) Applicant: PPG INDUSTRIES OHIO, INC. [US/US]; 3800 West 143rd Street, Cleveland, OH 44111 (US).

(72) Inventors: WATANABE, Genji; 30-7-1, Kawashima-Cho, Sabae-Shi, Fukui 916-1116 (JP). COLEMAN, Charles, R.; 38 S. Collinwood Drive, Pittsburgh, PA 15215 (US).

(74) Agents: MARMO, Carol, A.; PPG Industries, Inc., One PPG Place, Pittsburgh, PA 15272 et al. (US).

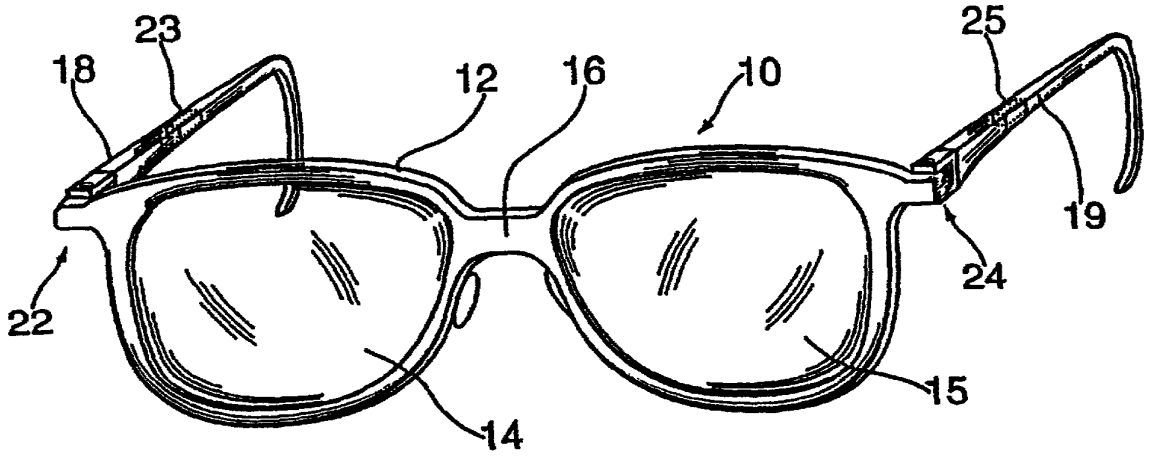
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(54) Title: SPLIT-PIN HINGE WITH WIRE EXTENDING THERETHROUGH



(57) Abstract: Hinge and one or more wires, or electrical conductors, wherein a segment of such wire or wires extends axially through at least one hollow pivot pin portion of a hinge and wherein such segment of the wire or wires is placed in torsion upon the hinge being pivoted. The hinge and wire may be used as part of an eyeglass assembly having electronics within the temple which influence a lens. In such an arrangement the hinge has two hollow pivot pin portions and a wire associated with the electronics routed through each. One pivot pin portion is made of an electrically insulating material and a wire associated with the positive side of the electronics is routed through this portion.

WO 01/35159 A1

SPLIT-PIN HINGE WITH WIRE EXTENDING THERETHROUGH

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of Application No. 09/438,213, filed November 12, 1999.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to a hinge and a wire extending through the hinge and further relates to eyeglasses, such as electrooptic eyeglasses, including a hinge through which one or more, preferably a set, of conductors extend to connect electrical components such as an electrical circuit and power supply to an eyeglass lens, thereby causing the lens to change an optical characteristic such as, for example, color, opaqueness, transmissivity or other optical property.

2. Description of the Background Art

Eyeglasses typically include a frame in which a pair of eyeglass lenses are mounted, a pair of temples and a pair of hinges pivotally interconnecting the frame and the temples. Each hinge typically includes a tang extending outwardly from one end of the eyeglass frame, a clevis provided on one end of a temple and including a pair of spaced apart and generally parallel clevis members, and a pivot pin. The tang is provided with a pivot pin through hole and the clevis members are provided with a pair of axially aligned pivot pin through holes. The clevis members are placed around the tang, the through holes are axially aligned and the connector pin is inserted into the aligned through holes to pivotally interconnect the tang and clevis. A "barrel type" eyeglass hinge is similar except it contains multiple tangs interleaved with clevises. Eyeglasses are known in the art including electrooptical eyeglass lenses which are provided with or comprise an optical element which changes an optical characteristic, such as opaqueness, color, transmissivity, or other optical property, upon an electrical signal or electric charge being applied to the eyeglass lens. For example, U.S.

Patent 4,756,605, entitled LIQUID CRYSTAL SPECTACLES, patented July 12, 1988, Okada et al. inventors, discloses spectacles having a pair of liquid crystal lenses, a frame, a pair of temples and a pair of hinges pivotally interconnecting the temples and the frame of the spectacles. A regulator circuit is provided in each temple and a regulator circuit is connected to the eyeglass lenses through a pair of conductors with the conductor extending through the brow of the spectacle frame and with the conductor extending through the rim of the spectacle frame. The conductors are connected to transparent electrodes and when voltage from the regulator circuit is applied to the electrodes, the liquid crystal molecules of the liquid crystal layers gradually change their direction of orientation toward (i.e., become perpendicular to) the transparent plate. Thus, the refractive indices of liquid crystal layers, with respect to incident light, can be changed in succession.

Other eyeglasses are known in the art which include electrochromic eyeglass lenses or wherein a transparent layer of electrochromic material is applied to the eyeglass lenses. Upon electrical charge being applied to such electrochromic lenses, the lenses change in transmittance property. See, for example, U.S. Patent 5,520,851 entitled "IRRIDIUM OXIDE FILM FOR ELECTROCHROMIC DEVICE", issued to Yu et al. on May 26, 1996, which is incorporated herein by reference.

The incorporation of such electronics into eyeglasses has produced a new need in the art. Unless all of the electronics, including the electrical signal generating circuit and the power supply, are placed between the hinge and the eyeglass frame, electrical connections between the electronics and the eyeglass lens must be made by traversing the hinge. Electrical connections traversing the hinge could provide only temporary electrical connection between the electronics and the lens which is lost when the frame is closed, or such electrical connections could be provided by

sliding wiper contact which is lost momentarily as the wipers slide, or such electrical connections could be permanently connected wires extending between the electronics and the eyeglass lens. For reliability, permanent connection by wires, or electrical conductors, between the electronics and the lens is preferred. Further, since such permanent wired connections require the wired electrical conductors to traverse the hinge, it is preferable that the wires not experience a concentrated bending moment when the eyeglasses are alternately opened and closed because such repeated concentrated bending moments can result in breakage or shearing of the wires or electrical conductors.

Running the wires or electrical conductors past a hinge or pivot point between a temple and the eyeglass frame introduces several problems. If the wires, or conductors, run to the outside of the hinge or pivot point, the wires or conductors are stretched when the temples are closed on the eyeglass frame. If the wires or conductors are on the inside of the hinge or pivot point, the wires or conductors are stretched when the temples are opened away from the eyeglass frames. If the wires or conductors are on the outside of the hinge or pivot point and made long enough to not be under tension when the temples are closed on the eyeglass frame, the wires or conductors are then compressed and could be kinked when the eyeglass frame is opened and the temples pivoted away from the eyeglass frame.

Accordingly, there is a need in the art for a hinge having one or more wires, such as one or more electrical conductors, extending therethrough which overcomes the above-noted problems in the art particularly as experienced in eyeglass frames as set forth above.

Copending and commonly assigned U.S. Patent Application 09/211,787 discloses a hinge for electrooptic devices which places a torsional stress on conductive wires passing through the hinge.

SUMMARY OF THE INVENTION

The disadvantages associated with the prior art are overcome by the invention of a tang/clevis-type hinge and one or more wires, or electrical conductors, wherein a portion of such wire or wires is run axially through the center of at least one of two separate, axially-aligned, pivot pin portions of said hinge, and through a gap between the opposed ends of said pivot pin portions, thereby causing such wire or wire portions to be placed in torsion upon pivoting movement of the hinge. Thus, the novel tang/clevis-type hinge of this invention is a split pin hinge comprising first and second split pin portions, a tang, a clevis and a wire or conductor, wherein a first portion of said split pin is inserted from a first side of said hinge and a second portion of said split pin is inserted from the opposite side into said tang and clevis thereby pivotally connecting said tang and clevis. The opposing ends of the pin portions do not meet when inserted into the hinge, which forms a gap that allows said wire to pass between the opposed ends of the first and second pin portions and into an axial bore in either or both of the pin portions. As such, the split pin assembly eliminates any stretching of the wire(s) upon opening or closing of the hinge. Such a split-pin hinge and wire combination may be utilized as any eyewear hinge and combined advantageously with the other components of a pair of eyeglasses including eyeglass lenses which undergo a change in optical characteristic, such as transmittance, when an electrical signal, or electric charge, is applied to the eyeglass lenses over wires or electrical conductors.

BRIEF DESCRIPTION OF THE DRAWINGS

The teachings of the present invention can be readily understood by considering the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a pair of eyeglasses embodying the present invention;

FIG. 2 is an exploded view of a hinge embodying the present invention and including a tang, clevis and first and second split pin portions;

FIG. 3 is an assembled view of the tang, clevis and first and second split pin portions and further showing a pair of wires or electrical conductors extending through a bore in the lower pin portion and the gap between the axially aligned pin portions;

FIG. 4 is a partial diagrammatical view of a wire or electrical conductor experiencing torsion;

FIG. 5 is a partial diagrammatical view of a wire or conductor experiencing bending about a pivot point;

FIG. 6 is an exploded view of an alternative hinge embodiment of the present invention including a tang, clevis and first and second split pin portions; and

Fig. 7 is an assembled view of the tang, clevis and first and second split pin portions and further showing a wire or electrical conductor extending through a bore in each of the pin portions and the gap between the axially aligned pin portions.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, there are shown electrooptic eyeglasses 10 embodying the present invention. Eyeglasses 10 include a frame 12 in which a pair of eyeglass lenses 14 and 15 are mounted, a nosepiece or bridge 16, temples 18 and 19 and hinges 22 and 24 which mount the temples 18 and 19 pivotally to the frame 12. Electrooptic eyeglass lenses 14 and 15, in a preferred embodiment, are electrochromic lenses of the type known to the art which undergo a change in optical characteristic, for example, a change in their transmittance property, upon the application of a suitable electric charge to the electrochromic lens.

The temples 18 and 19 may have respective electronics, electrical circuits for generating electric charge and power supplies, 23 and 25 mounted suitably internally thereof for respectively applying electric charge to the electrooptic eyeglass lenses 14 and 15 over a pair of wires or electrical conductors not shown in FIG. 1. It will be understood that instead of having two sets of electronics 23 and 25, a single electrical circuit and power supply may be provided in only one of the temples for applying electric charge to only one eyeglass lens and the eyeglass lens 14 and 15 may be electrically interconnected by a suitable conductor (not shown) extending across the bridge 16.

Referring to FIG. 2, representative hinge 24, embodying the present invention, is shown in exploded view. Hinge 24 may include a tang 26, preferably a tang which is generally rectangular, extending outwardly from the eyeglass frame 12, a generally U-shaped clevis 28 extending outwardly from one end of the temple 19 and separate first and second axially-aligned pivot pin portions 30a and 30b, forming split cylindrical and longitudinally extending pivot or connector pins. Alternatively, as depicted in Fig. 6, the tang 26 can extend outwardly from a temple and the clevis 28 can extend outwardly from the frame. Furthermore, the tang 26 may have a rounded distal end to facilitate clearance for movement when the tang 26 is coupled to the clevis 28.

Returning to Fig. 2, the tang 26 is provided with a through hole or bore 31 for receiving pivot or connector pin portions 30a and 30b, and the tang 26 is further provided with a longitudinally extending hole or bore 32 extending through the tang and generally perpendicular to and in communication with the gap 42 (see Fig. 3) between connector pin portions 30a and 30b and hole 31. The clevis 28 includes a pair of spaced apart and substantially parallel clevis members or arms 34 and 35 provided, respectively, with axially aligned pivot

or connector pin through holes or bores 37 and 38 for receiving pivot pin portions 30a and 30b.

One or both of the pivot or connector pin portions 30a and 30b are hollow, i.e., either or both are provided with a centrally formed axial bore 40a and 40b extending longitudinally through the pivot pin portions. Pivot pin portions 30a and 30b are operably connected to the instant hinge by any suitable means. For example, the cylinder shaft diameter of first and second pivot pin portions 30a and 30b can be sized so as to provide a contact or pressure fit within clevis through holes 37 and 38 and a clearance or slip fit through tang through hole 31, or vice versa.

Additionally, pin portions 30a and 30b preferably contain radially extending flanges 54a and 54b. Hole 37 in clevis arm 34 is preferably counterbored to accept the head of flange 54a and hole 38 in clevis arm 35 is preferably counterbored to accept flange 54b. When assembled, flanges 54a and 54b preferably rest against the counterbore surfaces of holes 37 and 38, respectively. Appropriate peens may be used to help secure pivot pin portions 30a and 30b in holes 37 and 38, respectively. Thus, when the pivot pin portions 30a and 30b are fit into bores 37, 38 and 31, they may be retained by peen crimps (not shown) in clevis arms 34 and 35.

It will be understood that bore 32, in the preferred embodiment, provides a passageway for receiving a segment or segments of one or more wires or electrical conductors used to connect the electronics 25 provided in the temple 19 with the electrooptic lens 15 mounted in the eyeglass frame 12. It is noteworthy that the wire(s) or conductor(s) can connect any type of electrical components across the hinge and that direct connection to a lens is not necessary. In a preferred embodiment, axial bores 40a and 40b in either or both of pivot pin portions 30a and 30b, gap 42 formed between the opposing ends of split pin portions 30a and

30b, and bore 32 combine to provide a continuous passageway for various segments of such wires or electrical conductors.

As illustrated in Figs. 3 and 7, the combined length of each pivot pin portion 30a and 30b when placed in opposing relationship is such that when inserted within the clevis 28, they provide a gap 42 through which at least one electrical conductor may pass.

Referring still to FIG. 2, for assembly, the clevis members or arms 34 and 35 are placed over the tang 26 and the pivot or connector pin through hole 31 formed in the tang and the pivot pin through holes 37 and 38 formed respectively in the clevis members 34 and 35 are axially aligned and the pivot pin portions 30a and 30b are inserted through the aligned through holes to hingedly or pivotally interconnect the tang 26 and clevis 28. The opposing ends of pin portions 30a and 30b do not make contact after installation, thereby forming gap 42 which, with bore hole 32 and axial bores 40a and/or 40b, provide a continuous wire passageway. The size of the gap is determined by the relative length of pin portions 30a and 30b and should be sufficient to accommodate all wires or conductors passing therethrough. It should be noted that one or both pivot pin portions 30a and 30b may be slotted at one end to provide a gap in which at least one electrical conductor may pass. In this fashion, the pivot pin portions 30a and 30b may be lengthened so they abut when inserted within the clevis 28.

Preferably, once the pin portions 30a and 30b are inserted such that the flanges 54a and 54b rest against the counterbore surfaces of bores 37 and 38, peens are struck to fix the pin portions 30a and 30b into the hinge 24. Alternatively, it will be understood that the pivot pin portions 30a and 30b, tang pivot pin through hole 31 and clevis pivot pin through holes 37 and 38 are dimensioned such that the cylinders of split pin portions 30a and 30b are alternatively press-fit into the tang through hole 31 to mount

the pivot pin portions 30a and 30b and tang 26 stationarily with respect to each other. Additionally, the cylinders of split pin portions 30a and 30b are alternatively slip-fit into the clevis pivot pin through holes 37 and 38 to permit relative movement between the clevis 28 and the pivot pin portions 30a and 30b, such that pivotal movement is provided between the tang 26 and clevis 28 by the clevis 28 pivoting about the opposed ends of split pin portions 30a and 30b. Alternatively, the pressure and slip-fit sizings can be reversed between the tang and clevis.

Referring now to FIG. 3, the representative hinge 24 is shown assembled as described above with regard to FIG. 2. It will be noted in FIG. 3 that in the assembled condition, gap 42 formed between pivot pin portions 30a and 30b is opposed and in communication with the longitudinal bore 32 formed in tang 26. The eyeglasses 10 may further include one or a plurality, preferably a pair of wires, or electrical conductors 43 and 44, connecting the electronics, electrical circuit and power supply, 25 to electrooptic eyeglass lens 15. The electronics 25 supplies a suitable electric charge over the wires 43 and 44 to the eyeglass lens 15 to cause the eyeglass lens to undergo a change in transmittance property as noted above. In the preferred embodiment, the wires or electrical conductors 43 and 44 are made of spring temper wire, or alternatively, the electrical conductors may include a suitable metal core surrounded by any suitable layer of insulation, such as a plastic insulation layer. As shown in FIG. 3, the wires or electrical conductors 43 and 44 extend along the outside of the clevis 28, are bent inwardly and are extended into the axial bore 40b provided in split pin portion 30b and are bent and extend outwardly and through gap 42 formed between pivot pin portions 30a and 30b and into and through the longitudinal bore 32 formed in the tang 26 for connection, directly or indirectly, to the electrooptic eyeglass lens 15. Connection to lens 15 may be made by any

suitable connection means, for example, by a solder connection to a bus bar applied to lens 15. In a preferred embodiment, the pivot pin portions 30a and 30b are mounted stationarily with respect to the tang 26 and the clevis 28 swings or pivots about the remaining segments of connector pin portions 30a and 30b. Accordingly, it will be understood, that the portions of the wires or electrical conductors 43 and 44 residing in the axial bore 40b of connector pin portion 30b are placed in torsion as indicated diagrammatically in FIG. 4 by the oppositely directed circular arrows, and not subjected to bending as indicated diagrammatically in FIG. 5 about a pivot point, during pivoting movement between the tang 26 and clevis 28 provided by the clevis 28 swinging or pivoting about the opposed pivot pin portions 30a and 30b. In the embodiment shown in FIG. 3, a bore is not required through split pin portion 30a. However, such embodiments are contemplated if, for example, additional wires or conductors extend along both clevis arms 34 and 35.

Referring again to FIG. 3, eyeglasses 10 may further include a suitable cover, not shown, residing over the wires or electrical conductors 43 and 44 and the outer end portion of the temple 19 extending toward the eyeglass frame 12.

FIG. 7 illustrates an alternate embodiment whereby each of the pivot pin portions 30a and 30b has a bore 40a and 40b extending therethrough. Just as before a gap 42 is formed between pivot pin portions 30a and 30b and this gap 42 is in communication with the longitudinal bore 32 formed in tang 26. Details of FIG. 7 are similar to those details in FIG. 3 with the exception of modifications made to accommodate the routing of electrical conductors 43 and 44 such that they pass through axial bore 40a of pivot pin portion 30a and axial bore 40b of pivot pin portion 30b respectively. The electrical conductors 43 and 44 extend along the outside of the clevis 28 but do so on opposite sides of the clevis 28. Both of the electrical

conductors 43 and 44 extend through the longitudinal bore 32 formed in the tang 26 for connection directly or indirectly to the electrooptic eyeglass lens 15 (FIG.2). Therefore, just as before, when the tang 26 is pivoted relative to the clevis 28 about the pivot pin portions 30a and 30b, the portions of the wires or electrical conductors 43 and 44 residing in the axial bores 40a and 40b of the pivot pin portions 30a and 30b respectively are placed in torsion as indicated diagrammatically in FIG. 4 and are not subjected to bending as indicated in diagrammatically in FIG. 5.

In the unlikely event the layer of insulation about the electric conductor 43 or electrical conductor 44 becomes damaged, the spatial separation between the electrical conductors 43 and 44 which occurs along a significant portion of their lengths, will prevent a short between the wires. In particular, if such damage occurs it is likely the result of the torsional motion imparted by pivoting the tang 26 relative to the clevis 28 and as illustrated in FIG. 7, the portions of the electrical conductor 43 and 44 subjected to torsion are routed through the bores 40a and 40b of different pivot pin portions 30a, 30b, and as a result are spatially separate from one another.

To minimize damage that may be caused by abrasion, the edges of pivot pin portions 30a and 30b proximate to the electrical conductors 43 and 44 may be formed with a radius thereby minimizing any cutting action these edges may have.

To provide additional insulation for the electrical conductors 43 and 44, the pivot pin portions 30a and 30b may be comprised of an electrically insulating material, such as plastic. Such plastic may include polyetheretherketone (PEEK) or, in the alternative, polysulfone. For reinforcement, either of these plastics may be glass filled. The plastic may also be 40% glass filled PEEK or 40% glass filled polysulfone. Additionally, other electrically insulating materials may be used in place of plastic.

By providing, as much as possible, separate routing for electrical conductors 43 and 44 as they pass through the clevis 28 and the tang 26, the likelihood of a short between the wires, if and when they become frayed, is minimized. Nevertheless, when and if such damage occurs, the physical separation between the electrical conductors 43 and 44 is such that the likelihood of direct contact between the electrical conductors 43 and 44 when they are damaged is minimal. Therefore to the extent the insulation layer is damaged and the metal core of the wire is not damaged, the electronics associated with the apparatus will maintain their full functionality.

Although pivot pin portions 30a and 30b may be made of plastic, it is also possible to have at least one pivot pin portion made of a material offering greater rigidity, such as metal. To this end, electrical conductors 43 and 44 will be referred to as positive conductor 43 and ground conductor 44. The eyeglass frame and temples may be metal or plastic. When the eyeglass frame and temples are metal, there is a concern that the if the positive electrical conductor 43 becomes frayed in the region of the first pivot pin portion 30a, which is metal, and the positive electrical conductor contacts and shorts with the first pivot pin portion 30a, the power supply of the electronics 25 will be drained. Therefore, in a preferred embodiment of the invention, for an eyeglass frame and temples made of metal, the first pivot pin portion 30a routed through the positive conductor 30a is plastic. The second pivot pin portion 30b associated with the ground conductor 44 may be metal to provide enhanced structural rigidity to the hinge 24.

In the instance of the eyeglass frame and temples made of plastic, or another electrically insulating material, then both pivot pin portions 30a and 30b may be made of metal.

In brief review, it has been discovered that by running a segment of a wire or conductor through the center of

at least one hollow pivot pin portion 30b and then through gap 42 between opposed pivot pin portions 30a and 30b of a hinge, such wire segment is placed in torsion upon pivotal hinge movement, which torsion is distributed along the length of such wire segment and such wire segment experiences relatively moderate strain and such strain is not concentrated at a pivot point as would be the case for such wire portion were the wire portion to experience bending during pivoting of the hinge. Additionally, the inventive arrangement permits the wire(s) to be hidden from view at all times.

Lastly, it will be understood that the present hinge and wire invention may be embodied in apparatus or devices other than eyeglasses and the present hinge and wire invention is not limited to eyeglasses. Furthermore, the foregoing embodiment of the invention contains a single tang that couples to a clevis having two arms. Those skilled in the art will realize from the foregoing disclosure that the hinge can alternatively contain multiple tangs and multiple clevis arms, i.e., the hinge could be a barrel-type hinge.

Although various embodiments which incorporate the teachings of the present invention have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.

What is claimed is:

1. A hinge and wire apparatus comprising at least a first wire and a second wire and a pivotable hinge including first and second opposed, axially aligned, pivot pin portions, at least one of said pivot pin portion having a centrally formed axial bore extending therethrough, wherein a first wire segment of at least one wire extends through the bore of said first pivot pin portion and through a gap between the opposing ends of said pivot pin portions, thereby placing said at least one wire in torsion upon pivoting of said hinge.

2. The hinge and wire apparatus of claim 1 wherein said first pivot pin portion and said second pivot pin portion each have a centrally formed axial bore extending therethrough and wherein a first wire segment of said first wire extends through the bore of said first pivot pin portion and through said gap and wherein a first wire segment of said second wire extends through the bore of said second pivot pin portion and through said gap, thereby placing said first and second wires in torsion upon pivoting of said hinge.

3. The hinge and wire apparatus of claim 1 further comprising a tang and clevis having said pivot pin portions pivotally interconnecting said tang and said clevis.

4. The hinge and wire apparatus of claim 3, wherein said tang further comprises a tang wire passageway, wherein a second segment of said wire extends through said tang wire passageway.

5. The hinge and wire apparatus according to claim 4 wherein said gap between said pivot pin portions is generally opposite said tang wire passageway.

6. The hinge and wire apparatus according to claim 1 wherein said pivot pin portions each comprise a generally cylindrical and longitudinally extending body and wherein said gap is present between the opposing ends of said pivot pin portions when said portions are fully inserted within said hinge.

7. The hinge and wire apparatus according to claim 6 wherein said tang includes a first pivot pin through hole extending therethrough for receiving said pivot pin portions and a longitudinal bore extending generally longitudinally through said tang and generally perpendicular to and in communication with said first pivot pin through hole.

8. The hinge and wire apparatus according to claim 7 wherein said clevis includes a generally U-shaped body including a pair of spaced apart substantially parallel clevis members having, respectively, second and third axially aligned pivot pin through holes extending therethrough for receiving said pivot pin portions, upon said clevis members being placed over said tang and upon said pivot pin through holes being axially aligned said pivot pin portions being inserted through said pivot pin through holes to pivotally interconnect said tang and said clevis.

9. The hinge and wire apparatus of claim 1 wherein said pivot pin portions each comprise a first end and a second end, wherein each of said first ends contains a radially extending flange.

10. An eyeglass apparatus, comprising:

an eyeglass frame, a pair of temples and a pair of hinges respectively pivotally interconnecting said eyeglass frame with said temples, a pair of eyeglass lenses mounted in said eyeglass frame and each of said eyeglass lenses

comprising optical means for changing an optical characteristic of said eyeglass lenses upon receipt of an electrical signal, an electrical circuit for providing an electrical signal to at least one of said eyeglass lenses and said electrical circuit mounted to at least one of said temples, at least one of said hinges including a tang and a clevis and first and second separate, axially-aligned pivot pin portions pivotally interconnecting said tang and said clevis, at least a first electrical conductor interconnecting said electrical circuit with at least one of said eyeglass lenses and a first segment of said first electrical conductor extending through a conductor passageway formed in one of said pivot pin portions.

11. The eyeglass apparatus of claim 10 wherein a conductor passageway is formed in both said first pivot pin portion and said second pivot pin portion and wherein said first electrical conductor extends through said conductor passageway of said first pivot pin portion and wherein a second electrical conductor extends through said conductor passageway of said second pivot pin portion.

12. The eyeglass apparatus of claim 11 wherein

a) said first electrical conductor is an electrical positive conductor for said electrical circuit and said second electrical conductor is an electrical ground conductor for said electrical circuit;

b) at least one of said eyeglass frame and temple associated with said electrical circuit is metal; and

c) said first pivot pin portion is made of an electrically insulating material.

13. The eyeglass apparatus of claim 12 wherein said electrically insulating material is plastic.

14. The eyeglass apparatus of claim 12 wherein said second pivot pin portion is made of metal.

15. The eyeglass apparatus of claim 11 wherein

a) said eyeglass frame and temple associated with said electrical circuit are made of an electrically insulating material; and

b) said first pivot pin portion is made of metal.

16. The eyeglass apparatus of claim 15 wherein the electrically insulating material is plastic.

17. The eyeglass apparatus of claim 15 wherein said second pivot pin member is made of metal.

18. The eyeglass apparatus of claim 10 wherein a second segment of each electrical conductor extends through a gap between opposing end of said pivot pin portions and through a second conductor passageway formed in said tang.

19. The eyeglass apparatus according to claim 11 wherein each of said pivot pin portions comprises a generally cylindrical and longitudinally extending body and wherein each conductor passageway comprises an axial bore extending generally longitudinally through each pivot pin portions and in communication with said gap.

20. The eyeglass apparatus according to claim 19 wherein said tang includes a first pivot pin through hole extending therethrough for receiving said pivot pin portions and wherein said second conductor passageway comprises a longitudinal bore extending generally longitudinally through said tang and generally perpendicular to and in communication with said first pivot pin through hole.

21. The eyeglass apparatus according to claim 10 wherein said clevis includes a generally U-shaped body including a pair of spaced apart substantially parallel and generally rectangular clevis members having, respectively, second and third axially aligned pivot pin through holes extending therethrough for receiving said pivot pin portions, upon said clevis members being placed over said tang and upon said pivot pin through holes being axially aligned said pivot pin portions being inserted through said pivot pin through holes to pivotally interconnect said tang and said clevis.

22. The eyeglass apparatus according to claim 10 wherein said eyeglass apparatus further comprises a second electrical circuit for providing an electrical signal to the other of said eyeglass lenses and said second electrical circuit mounted to the other one of said temples, a second hinge including a second tang and a second clevis and a second pair of separate, axially aligned pivot pin portions pivotally interconnecting said second tang and said second clevis, a second electrical conductor interconnecting said second electrical circuit with the other of said eyeglass lenses and a segment of said second electrical conductor extending through a conductor passageway formed in either of the pivot pin portions comprising said second pair and a second segment of said second electrical conductor extending through a fourth conductor passageway formed in said second tang, said second electrical conductor being placed in torsion upon pivotal movement between said second tang and said second clevis about said second pair of pivot pin portions.

23. The eyeglass apparatus according to claim 22 wherein at least one of said hinges includes a tang which extends outwardly from either said eyeglass frame or from an end of one temple and wherein said clevis extends outwardly from the other of said eyeglass frame or end of one temple.

24. The eyeglass apparatus of claim 10 wherein each of said pivot pin portions further comprise a first end and a second end, wherein each of said first ends contains a radially extending flange.

25. The eyeglass apparatus according to claim 10 wherein at least one of said hinges includes a tang which extends outwardly from either said eyeglass frame or from an end of one temple and wherein said clevis extends outwardly from the other of said eyeglass frame or end of one temple.

26. An eyeglass apparatus, comprising an eyeglass frame, a pair of temples and a pair of hinges respectively pivotally interconnecting said eyeglass frame with said temples, a pair of eyeglass lenses mounted in said eyeglass frame and each of said eyeglass lenses comprising optical means for changing an optical characteristic of said eyeglass lenses upon receipt of an electrical signal, an electrical circuit for providing an electrical signal to at least one of said eyeglass lenses and said electrical circuit mounted to at least one of said temples, each hinge including a tang and a clevis and first and second separate, axially-aligned pivot pin portions pivotally interconnecting said tang and said clevis, at least a first and second electrical conductor interconnecting said electrical circuit with at least one of said eyeglass lenses and a first segment of said first electrical conductor extending through a conductor passageway formed in said first pivot pin portion and a first segment of said second electrical conductor extending through a conductor passageway formed in said second pivot pin portion, wherein said first electrical conductor is an electrical positive conductor for said electrical circuit, wherein at least one of said eyeglass frame and said temple associated with said electrical circuit are metal and wherein said first pivot pin portion is plastic.

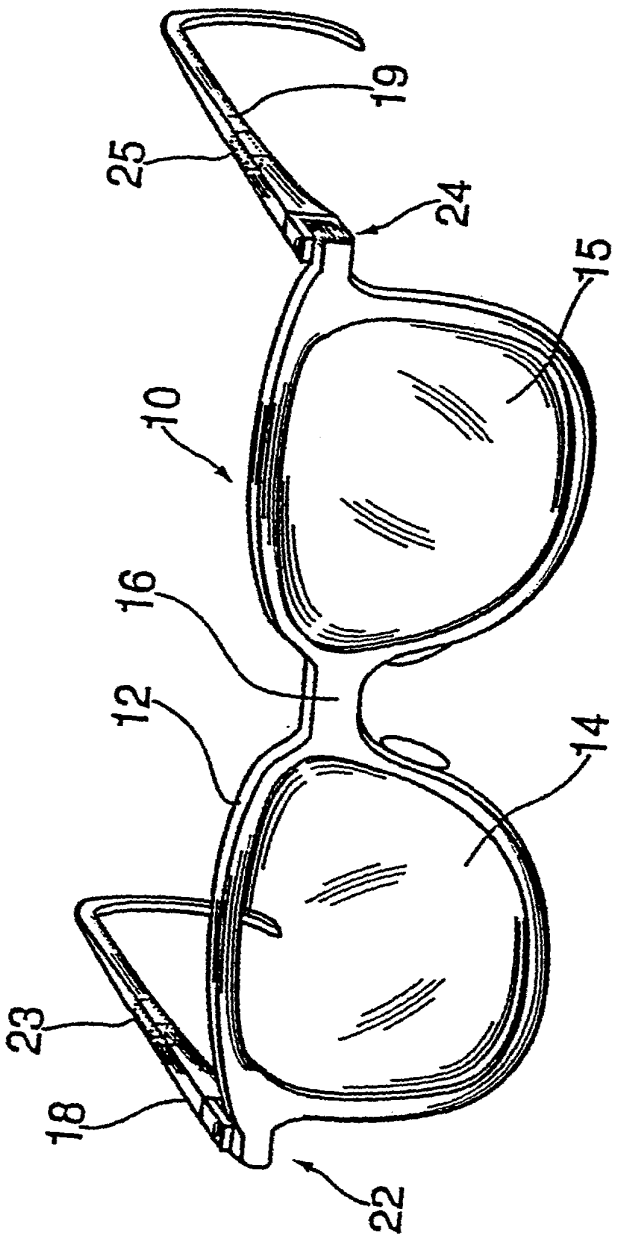


FIG.1

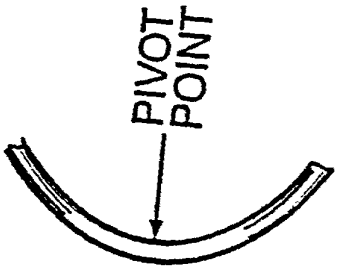


FIG.5

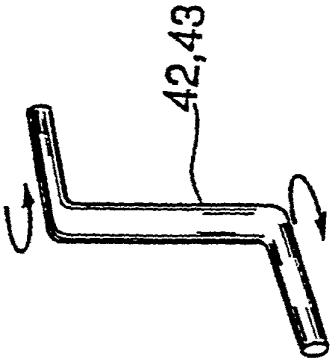


FIG.4

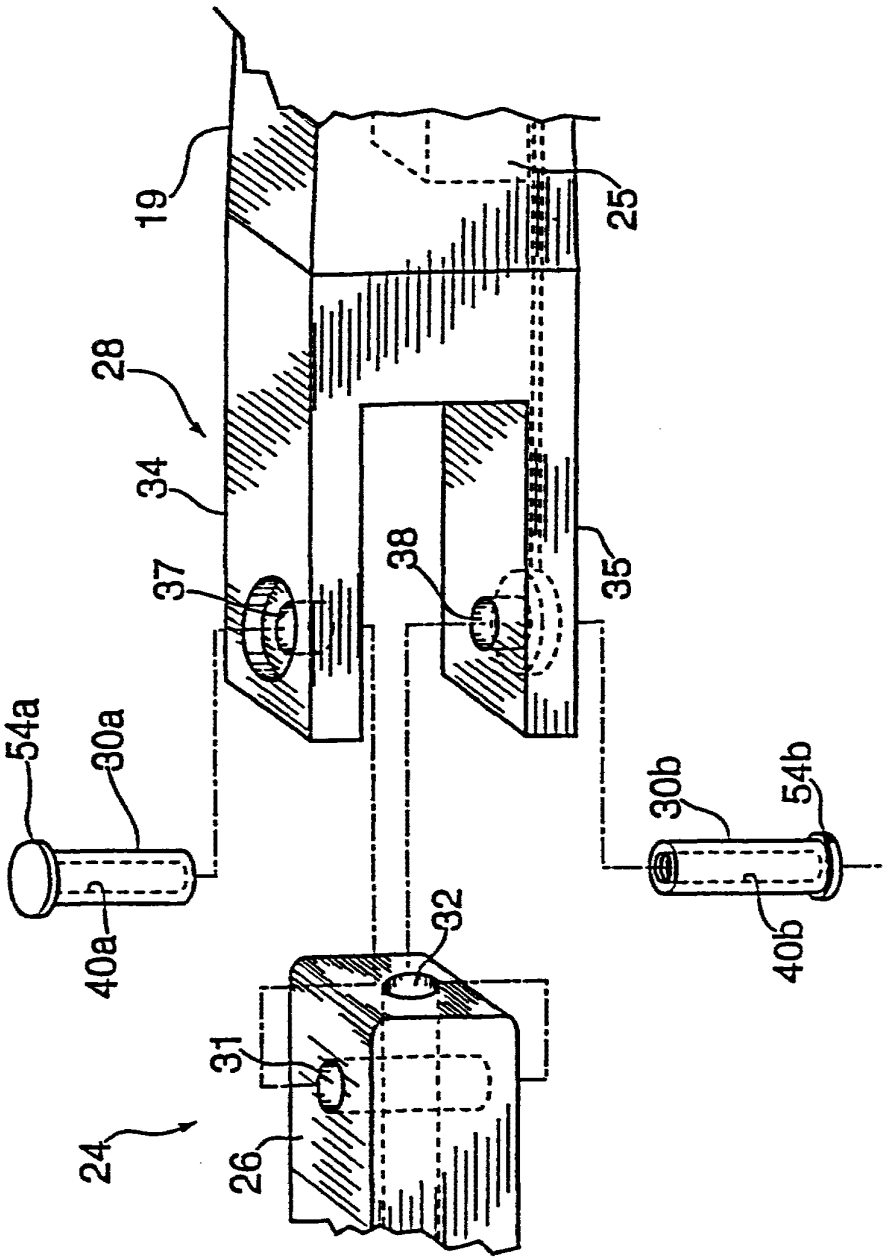


FIG. 2

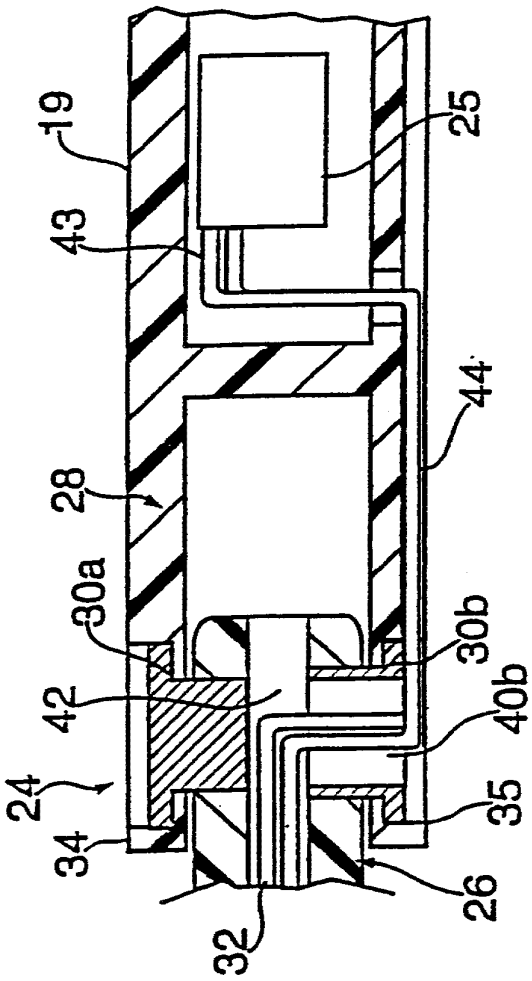


FIG. 3

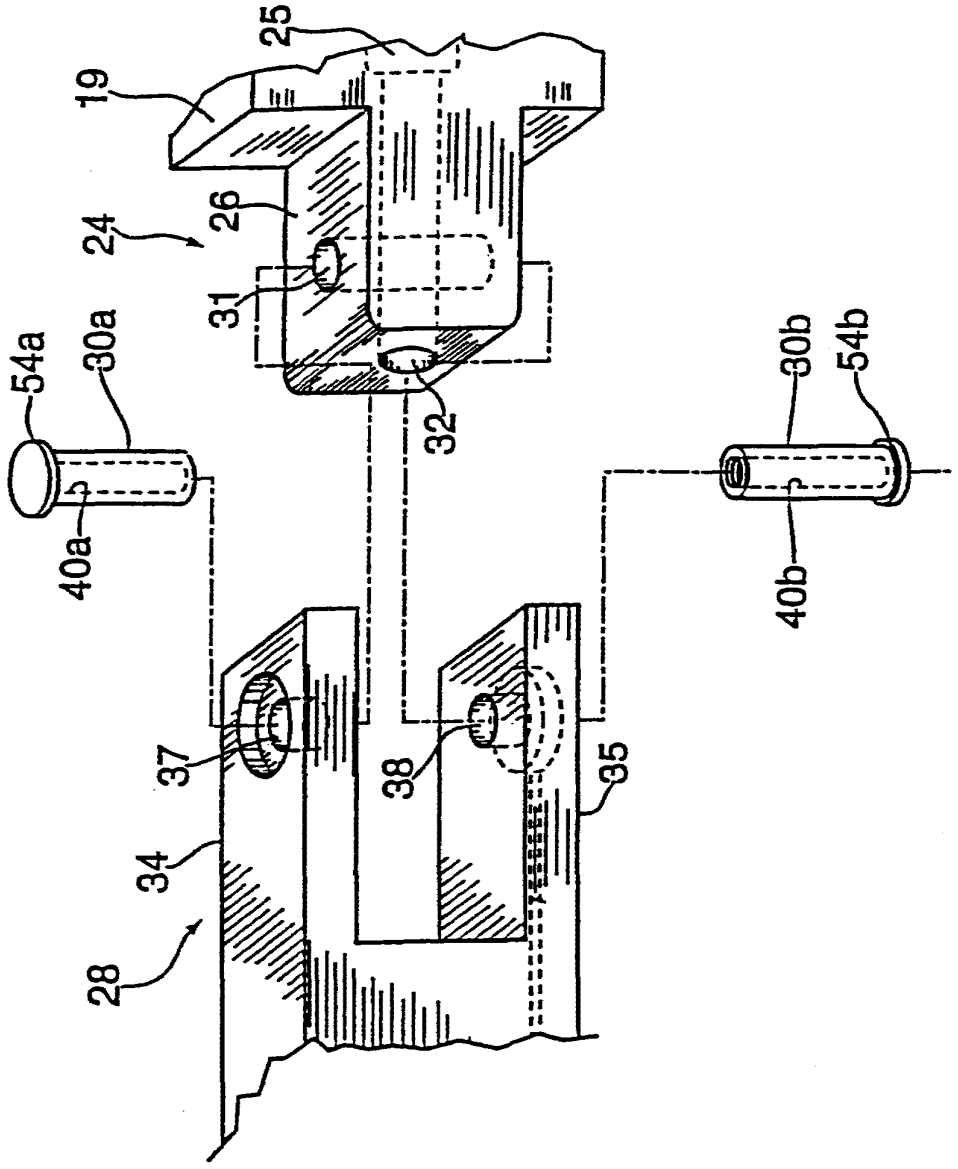


FIG. 6

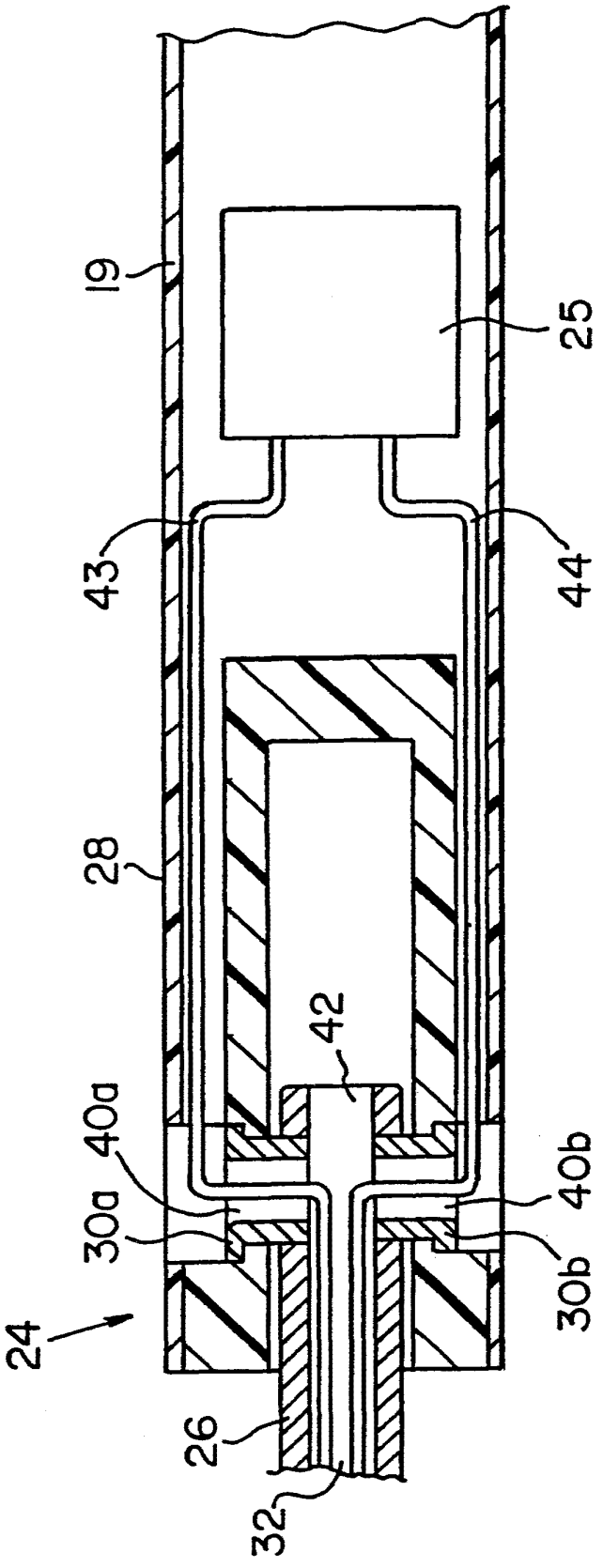


FIG. 7

INTERNATIONAL SEARCH REPORT

Interr nal Application No
PCT/US 00/31087

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G02C7/10 G02C5/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G02C

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 00 36454 A (PPG IND OHIO INC) 22 June 2000 (2000-06-22) cited in the application claims	1-26
A	WO 99 13682 A (ARNELL ROSS LTD) 18 March 1999 (1999-03-18) page 11, line 5 -page 12, line 11	1,10-17
A	US 4 991 951 A (MIZUNO MITSUYOSHI ET AL) 12 February 1991 (1991-02-12) column 2, line 32 -column 3, line 44	1,10,26
A	US 3 603 305 A (OPPENHEIMER JESS) 7 September 1971 (1971-09-07) column 4, line 45 - line 63	1,10,26

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° 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 document 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
5 February 2001	12/02/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	CALLEWAERT, H

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern nal Application No
PCT/US 00/31087

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 835 185 A (DORFMAN LEONARD M ET AL) 10 November 1998 (1998-11-10) column 9, line 45 -column 10, line 24	1,10,26

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Interr nal Application No
PCT/US 00/31087

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0036454 54 A		NONE	
WO 9913682 A	18-03-1999	NONE	
US 4991951 A	12-02-1991	JP 2266322 A JP 2817178 B IT 1239773 B	31-10-1990 27-10-1998 15-11-1993
US 3603305 A	07-09-1971	NONE	
US 5835185 A	10-11-1998	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
McGroarty, John P.
Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
ETATS-UNIS D'AMERIQUE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 15 January 2013 (15-01-2013)
Applicant's or agent's file reference 91904-848074	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2012/051202	International filing date *(day/month/year)* 16 August 2012 (16-08-2012)
Applicant PIXELOPTICS, INC.	

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide,* International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	LUUKKONEN, Kirsi Tel: +49 (0)89 2399-7957

Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
91904-848074		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2012/051202	16/08/2012	17/08/2011
Applicant		
PIXELOPTICS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☒ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant
   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 18
      ☐ as suggested by the applicant
      ☐ as selected by this Authority, because the applicant failed to suggest a figure
      ☒ as selected by this Authority, because this figure better characterizes the invention
   b. ☐ none of the figures is to be published with the abstract

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/051202

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:

see additional 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 an 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, 2, 13, 14

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/051202

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02C7/08 G02B27/01 G02F1/133 G02C7/10 G02C11/00
ADD.

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)
G02C G02B G02F

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/35159 A1 (PPG IND OHIO INC [US]) 17 May 2001 (2001-05-17) page 6, line 1 - line 12 page 9, line 16 - line 27 page 11, line 27 - line 35 page 12, line 31 - line 33 figures 1, 7	1,2
X	US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06) figures 1, 2 paragraphs [0075], [0076], [0087]	1,2,13, 14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* 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
23 October 2012	15/01/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Vazquez Martinez, D

2

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/051202

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0135159 A1	17-05-2001	AU 1485701 A	06-06-2001
		WO 0135159 A1	17-05-2001
US 2008273166 A1	06-11-2008	AR 066226 A1	05-08-2009
		TW 200921179 A	16-05-2009
		US 2008273166 A1	06-11-2008
		US 2010271588 A1	28-10-2010

Form PCT/ISA/210 (patent family annex) (April 2005)

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1, 2, 13, 14

   Sealed electronics module of an eyewear with optical functional member

   ---

2. claims: 3-5, 15-17

   Intermediate electrical contacts between the electronics module and the optical functional member of an eyewear

   ---

3. claims: 6-9, 12, 18-21, 24

   Electrical connection through the rimlock of the electronics module and the optical functional member of an eyewear

   ---

4. claims: 10, 11, 22, 23

   Compressible electrical connective element of an eyewear

   ---

5. claims: 25-29

   Electrical insulation of the electrical conductor of an eyewear of any kind comprising electronics

   ---

6. claims: 30, 31

   Assembling of an electrically insulated rimlock to an eyewear

   ---

7. claims: 32, 33

   Water resistant gasket for the electro-active lens of an eyewear

   ---

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2012/051202	16.08.2012	17.08.2011

International Patent Classification (IPC) or both national classification and IPC
INV. G02C7/08 G02B27/01 G02F1/133 G02C7/10 G02C11/00

Applicant
PIXELOPTICS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Vazquez Martinez, D Telephone No. +49 89 2399-5666

Form PCT/ISA/237 (Cover Sheet) (July 2009)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 3-12, 15-33

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 3-12, 15-33

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b).

☐ See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:

   ☐ paid additional fees

   ☐ paid additional fees under protest and, where applicable, the protest fee

   ☐ paid additional fees under protest but the applicable protest fee was not paid

   ☒ not paid additional fees

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with

   ☒ not complied with for the following reasons:

   see separate sheet

4. Consequently, this report has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1, 2, 13, 14

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	13, 14
	No:	Claims	1, 2
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1, 2, 13, 14
Industrial applicability (IA)	Yes:	Claims	1, 2, 13, 14
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Reference is made to the following documents:

D1 WO 01/35159 A1 (PPG IND OHIO INC [US]) 17 May 2001 (2001-05-17)

D2 US 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06)

Concerning Section IV (Unity):

1 The application does not meet the criteria of unity of the invention (Rule 13.1 PCT), since there is no single general novel and inventive concept to the claims 1 to 33.

1.1 The subject-matter of independent claims 1 and 13 is already known from document D1 (see reasoning in section V below). Unity of invention (Rule 13.1 PCT) therefore no longer exists inasmuch as a technical relationship involving one or more of the same or corresponding special technical features in the sense of Rule 13.2 PCT does not exist between the subject-matter of the following groups of dependent claims and the independent claims 25, 27, 30 and 32. The remaining features of claims 2 to 12 and 14 to 33 relate to the solution of several technical problems that in some cases are similar, but that do not refer in any case to the same or corresponding technical features:

- Claims 1, 2, 13 and 14 relate to the problem of how to protect from fluids the electronic module that controls an electric driven optical functional member of an eyewear.

- Claims 3 to 5 and 15 to 17 relate to the problem of how to connect through intermediate electrical contacts the optical functional member of an eyewear with the electronics module that controls it.

- Claims 6 to 9, 12, 18 to 21 and 24 relate to the problem of how to arrange the electrical connection of an electronics module located in the temple and an optical functional member located in the frame front of the eyewear.

- Claims 10 to 11 and 22 to 23 relate to the problem of how to implement an electrical connection that is flexible and durable across a broad range of

pressures and tensions between an optical functional member of an eyewear with an electronics module that controls it.

- Claims 25 to 29 relate to the problem of how to electrically insulate a portion of an electrical conductor arranged in an eyewear of any kind comprising electronics.

- Claims 30 and 31 relate to the problem of how to assemble an electrically insulated rimlock to an eyewear.

- Claims 32 and 33 relate to the problem of how to isolate from liquids the electro-active lens of an eyewear.

1.2 Therefore, the application contains **seven groups of alleged inventions**:

Claims 1, 2, 13 and 14: sealed electronics module of an eyewear with optical functional member.

Claims 3 to 5 and 15 to 17: intermediate electrical contacts between the electronics module and the optical functional member of an eyewear.

Claims 6 to 9, 12, 18 to 21 and 24: electrical connection through the rimlock of the electronics module and the optical functional member of an eyewear.

Claims 10 to 11 and 22 to 23: compressible electrical connective element of an eyewear.

Claims 25 to 29: electrical insulation of the electrical conductor of an eyewear of any kind comprising electronics.

Claims 30 and 31: assembling of an electrically insulated rimlock to an eyewear.

Claims 32 and 33: water resistant gasket for the electro-active lens of an eyewear.

1.3 In conclusion, the groups of claims are not linked by common or corresponding special technical features and define 7 different inventions not linked by a single general inventive concept.

The application, hence, does not meet the criteria of unity of invention as defined in Rules 13.1 and 13.2 PCT.

According to Article 17(3)(a) PCT, the international search report has been established on those parts of the application which relate to the invention first mentioned in the claims.

Concerning Section VIII (Clarity):

2 The application does not meet the criteria of **Article 6 PCT** for the following reasons:

2.1 The set of claims corresponding to the first alleged invention (see discussion in section 1.2 above) contains 2 formally independent claims relating to an eyewear (**claims 1 and 13**). However, these claims are not independent as to substance and therefore offend against the criterion of Art. 6 PCT as to conciseness. To meet this criterion it would appear necessary to amend the present set of claims so as to include only one independent claim covering the claimed subject-matter in its broadest aspect followed by dependent claims comprising only optional features. Moreover, different limitations imposed on the various independent claims result in an obscure scope of the subject-matter for which protection is sought.

Concerning Section V (Novelty and inventive step):

3 The present application does not meet the criteria of Article 33(1) PCT, because the **subject-matter of claims 1 and 13 is not novel** in the sense of Article 33(2) PCT and the **subject-matter of claims 2 and 14 is not inventive** in the sense of Article 33(3) PCT.

INDEPENDENT CLAIMS

3.1 Document D1 discloses an eyewear comprising (the reference in parentheses applying to document D1):

an optical functional member (electrooptic lenses 14 and 15 of fig. 1; page 6, line 5; page 9, lines 16 to 23));
an electronics module comprising electronics for controlling the optical functional member (electronics module 25 of fig. 7; page 6, lines 1 to 12); and
at least one sealed electrical connective element connecting the electronics of the electronics module to the optical functional member (sealed electrical connective elements, such that they are protected from exposure to moisture and liquids, are disclosed in page 9, lines 23 to 27; page 11, lines 27 to 35).

Since document D1 discloses all structural features of the eyewear of **claim 1**, the subject-matter of this claim is not novel in the sense of Article 33(2) PCT, and the criteria of Article 33(1) PCT are therefore not met.

3.1.1 Moreover, the subject-matter of claim 1 is, at the least, not inventive vis-à-vis the disclosure of document D2 (figs. 1 and 2; par. [0075]).

The subject-matter of claim 1 differs from that disclosed in document D2 in that it is explicitly stated that the electrical connective elements connecting the electronics module and the optical functional member are sealed, i.e. are protected by a material that forms a water resistant barrier. Such an isolation is, however, well known in the art and a usual feature of electrical connective elements (see, for instance, page 9, lines 23 to 27, of document D1).

3.2 The same reasoning used in the case of claim 1 applies, *mutatis mutandis*, to the subject-matter of the **claim 13**.

Therefore, the subject matter of claim 13 is not novel within the meaning of Article 33(2) PCT.

DEPENDENT CLAIMS

3.3 The additional features of **claims 2 and 14** are disclosed in document D2 (pars. [0076] and [0087]).

Electronic Acknowledgement Receipt

EFS ID:	14908566
Application Number:	13298992
International Application Number:	
Confirmation Number:	1095
Title of Invention:	ELECTRONIC SPECTACLE FRAMES
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	20350
Filer:	John P. McGroarty/Aneta Xhiku
Filer Authorized By:	John P. McGroarty
Attorney Docket Number:	91904-817521
Receipt Date:	07-FEB-2013
Filing Date:	17-NOV-2011
Time Stamp:	19:48:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2013_02_07_SIDS_91904-817521.pdf	165825 d224df314fb0bf72f0b33b5c1fe4492871ed2c9d	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Form (SB08)	3	3

Warnings:					
Information:					
2	Foreign Reference	WO0135159.pdf	1045093 be44ec691178c0bf9f0881aedc0ba254504b7fe7	no	28
Warnings:					
Information:					
3	Non Patent Literature	ISR.PDF	685141 fa78a8383f85e21516ff87e46bb30580067d584c	no	15
Warnings:					
Information:					
		Total Files Size (in bytes):	1896059		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on 2/7/13.

KILPATRICK TOWNSEND & STOCKTON LLP

By: Aneta Mihali Xhiku

PATENT
Attorney Docket No.: 91904-817521(008512US)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Ronald D. Blum

Application No.: 13/298,992

Filed: November 17, 2011

For: ELECTRONIC SPECTACLE FRAMES

Customer No.: 72162

Confirmation No.: 1095

Examiner: Darryl J. Collins

Art Unit: 2835

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.97 and §1.98

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

The references cited on attached form PTO/SB/08A and PTO/SB/08B are being called to the attention of the Examiner. Copies of the references [in compliance with the requirements of 37 CFR §1.98(a)(2)] are enclosed. It is respectfully requested that the cited references be expressly considered during the prosecution of this application, and the references be made of record therein and appear among the "references cited" on any patent to issue therefrom.

Also enclosed is a copy of the International Search Report corresponding to the PCT/US2012/051202 application.

As provided for by 37 CFR §1.97(g) and (h), no inference should be made that the information and references cited are prior art merely because they are in this statement and no representation is being made that a search has been conducted or that this statement encompasses all the possible relevant information.

Applicant believes that no fee is required for submission of this statement. However, if a fee is required, the Commissioner is authorized to deduct such fee from the undersigned's Deposit Account No. 20-1430. Please deduct any additional fees from, or credit any overpayment to, the above-noted Deposit Account.

Respectfully submitted,

/John P. McGroarty/

John P. McGroarty
Reg. No. 41,186

KILPATRICK TOWNSEND & STOCKTON LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 202-481-9900
Fax: 202-481-3972
JPM:amx
63992792 v1

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/298,992	11/17/2011	Ronald D. Blum	91904-817521

CONFIRMATION NO. 1095

20350
KILPATRICK TOWNSEND & STOCKTON LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

PUBLICATION NOTICE

OC000000054457419

Title:ELECTRONIC SPECTACLE FRAMES

Publication No.US-2012-0127420-A1
Publication Date:05/24/2012

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	1	of	4	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA	US-5463428	10/31/95	Lipton et al.	
	BA	US-2008/316420	10/25/08	Agazarova Mazal	
	CA	US-5764338	6/9/98	Carol Anne Mack	
	DA	US-4,418,990	12/6/83	Gerber	
	DB	US-5,742,379	4/21/98	Reifer	
	DC	US-6,115,177	9/5/00	Vossler	
	DD	US- 6,719,425	4/13/04	Conner	
	DE	US-2001/0007493	7/2001	Masunaga et al.	
	DF	US-2001/0043266	11/22/01	Robinson et al.	
	DG	US-2002/0140899	10-2002	Blum et al.	
	DH	US-2004/000733	1/1/04	Swab et al.	
	DI	US-2005/0225723	10/13/05	Pilu	
	DJ	US-2005/0237485	10/27/2005	Blum et al.	
	DK	US-2005/0242771	11/3/2005	Blum et al.	
	DL	US-2005/0264752	12-01-2005	Howell et al.	
	DM	US-2005/078274	4/14/05	Howell et al.	
	DN	US-2005/270479	12/8/05	Canavan et al.	
	EA	US-2005/270481	12/8/05	Blum et al.	
	EB	US-2006/023158	2/2/06	Howell et al.	
	EC	US-2006/092340	5/4/06	Blum et al.	
	ED	US-2006/203186	9/14/06	Ifergan	
	EE	US-2007/0296918	12-2007	Blum et al.	
	EF	US-2007/258039	11/8/07	Duston et al.	
	EG	US-2008/0106695	05-08-2008	Kokonaski et al.	
	EH	US-2010/0201938	8/12/10	Jackson et al.	
	EI	US-2010/0309426	12/9/2010	Howell et al.	
	EJ	US-4,152,846	5/8/79	Witt	
	EK	US-4,283,127	8/11/81	Rosenwinket et al.	
	EL	US-4,756,605	07-12-1988	Okada etal.	
	EM	US-4,875,030	10/17/89	Chiu	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

64056449 v1

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	2	of	4	Attorney Docket Number	91904-817521(008512US)

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	EN	US-4,907,860	3/13/90	Noble	
	EO	US-4,967,268	10/30/90	Lipton et al.	
	FA	US-5,182,585	1/26/93	Stoner	
	FB	US-5,835,185	11/10/98	Kallman et al.	
	FC	US-6,097,450	8/1/00	Humphrey	
	FD	US-6,582,075	6/24/03	Swab et al.	
	FE	US-6,595,634	07-22-2003	Pilat, Jr.	
	FF	US-6,626,532	09-30-2003	Nishioka et al.	
	FG	US-6,866,386	03-2005	Chen, Joy	
	FH	US-7,009,757	3/7/06	Nishioka et al.	
	FI	US-7,063,420	06-20-2006	Lerner et al.	
	GA	US-7,104,645	09-12-2006	Pilat, Jr.	
	GB	US-7,140,727	12-28-2006	Pilat, Jr. et al.	
	GC	US-7,425,066	09-16-2008	Blum e tal.	
	GD	US-7,784,935	8/31/10	Jackson et al.	
	GE	US-7,813,048	10/12/2010	Lynch et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	GF	WO 2010/080999	7/15/10	PixelOptics, Inc.		☐
	HA	EP 1647854	4/19/06	Sunshine Optical Company		
	IA	WO 2009/098719	8/13/09	Laura Maria Cozzani		
	JA	WO 2008/002388	1/3/08	PixelOptics, Inc.		
	KA	WO 2009/081542	7/2/09	Panasonic Corp.		
	KB	WO 2010/062504	6/3/2010	CJoahrneson & Johnson Vision		
	LA	DE 2304134	8/30/73	Gould Inc.		
	LB	GB 2170613	08-06-1986	Olympus Optical Co., Ltd.		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of U.S. Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

64056449 v1

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	13/298,992
				Filing Date	November 17, 2011
				First Named Inventor	Blum, Ronald D.
				Art Unit	2835
(Use as many sheets as necessary)				Examiner Name	TBA
Sheet	3	of	4	Attorney Docket Number	91904-817521(008512US)

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]	Number[4]	Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	LC	WO	2007/142520		12-13-2007	Varibel BV.		
	LD	EP	1916561		04-30-2008	Varibel BV.		
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	LO	Copy of the International Search Report corresponding to the PCT/US2011/061505 application	☐
	LP	Copy of the International Search Report corresponding to the PCT/US2011/061495 application	
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	LR	International Search Report and Written Opinion in corresponding PCTIUS2008/058056 application.	
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	LU	"Hearing Mojo: Varibel Hearing-Aid Glasses Integrate Eight Directional Microphones," February 27, 2009, pages 1-4 *URL-http://hearingmojo.com/b/og-mt/blog-mt/2006/04/varibel_hearingaid_glasses_dou.html*	
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(71) Applicant *(for all designated States except US)*: **PIXELOPTICS, INC.** [US/US]; 5241 Valleypark Drive, Roanoke, Virginia 24019 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **KOKONASKI, William** [US/US]; 1807 44th Street Court, N.W., Gig Harbor, Washington 98335 (US). **WANG, Yongping** [US/US]; 2601 Pennsylvania Avenue, room 945, Philadelphia, Pennsylvania 19130 (US). **BLUM, Ronald D.** [US/US]; 5320 Silver Fox Road, Roanoke, Virginia 24018 (US). **GRAHAM, Mark** [US/US]; 474 Amelon Road, Madison Heights, Virginia 24572 (US). **DALLA LONGA, Claudio** [IT/IT]; VIV Ponteggio, 33A, Treviso, I-31049 Valdobbiadene (IT). **HE, Sambo S.** [US/US]; 16649 Morning Mist Court, Riverside, California 92503 (US). **KRUTZIK, Christian** [US/US]; 2741 Starbird Drive, Costa Mesa, California 92626 (US).

(74) Agents: **MCGROARTY, John P.** et al.; Townsend and Townsend and Crew, LLP, Two Embarcadro Center, Eighth Floor, San Francisco, CA 94111 (US).

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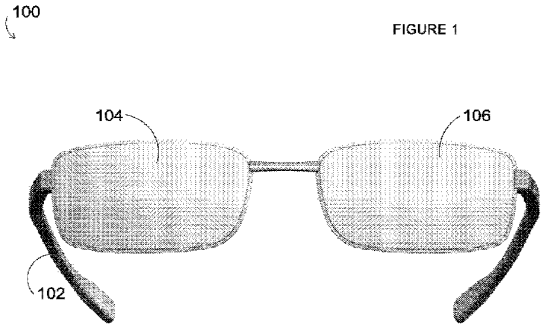


FIGURE 1

(57) Abstract: Aspects of the present invention provide electronics for controlling and synchronizing operation of electro-active lenses regardless of frame type, size or style. The controlling electronics can be contained within one or more electronic modules positioned within the frame temples and can be removable and reprogrammable and can include inductive charge regions. Conductive links between electronic modules and / or between left and right sides of the electro-active spectacles can include left and right upper and lower rim portions of the frame, the bridge, conductive layers of the electro-active lenses, the upper and lower grooves of the electro-active lenses, and / or wires embedded within any portion of the frame. Aspects of the present invention also provide chargers for recharging electro-active spectacles of any size, shape or style using adjustable inductive charging cradles to inductively charge electro-active spectacles of the present invention.

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ELECTRO-ACTIVE SPECTACLES AND ASSOCIATED ELECTRONICS

Inventors: William Kokonaski
Yongping Wang
Ronald D. Blum
Mark Graham
Claudio Dalla Longa
Sambo He
Christian Krutzik

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from and incorporates by reference in their entirety the following provisional applications:

U.S. Appl. No. 61/143,459, filed on January 9, 2009;

U.S. Appl. No. 61/152,140, filed on February 12, 2009;

U.S. Appl. No. 61/157,579, filed on March 5, 2009;

U.S. Appl. No. 61/157,580, filed on March 5, 2009;

U.S. Appl. No. 61/170,222, filed on April 17, 2009;

U.S. Appl. No. 61/242,406, filed on September 15, 2009; and

U.S. Appl. No. 61/252,770, filed on October 19, 2009.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention generally relates to electro-active spectacles. More specifically, the present invention provides electronics for operating and synchronizing electro-active lenses compatible with any frame type, style or size, as well as associated charging devices.

Background Art

[0003] Electro-active lenses generally provide a region of adjustable optical power by changing the refractive index of an electro-active material (e.g., a liquid crystal material) by the application and removal of electrical power. Conventional electro-active lenses and spectacles fail to provide cosmetically acceptable and practical mechanisms for (a) controlling and synchronizing

operation of the electro-active lenses, (b) providing electrical connectivity between controlling electronics and the electro-active lenses, and (c) recharging the electro-active lenses. Further, conventional devices and techniques for addressing these problems are limited in that they are not generally compatible with any frame size, type or style.

[0004] Accordingly, what is needed are electronics for controlling and synchronizing operation of electro-active lenses that can be housed in any type of frame in a cosmetically acceptable and easily implementable manner. Further, power charger devices for recharging electro-active lenses of any frame size, shape or style are also needed.

BRIEF DESCRIPTION OF THE DRAWINGS/FIGURES

[0005] FIG. 1 illustrates electro-active spectacles in accordance with an aspect of the present invention.

[0006] FIG. 2 illustrates a side view of the electro-active spectacles depicted in FIG. 1 in accordance with an aspect of the present invention.

[0007] FIG. 3 illustrates an exemplary configuration of electrical components of the electro-active spectacles in accordance with an aspect of the present invention.

[0008] FIG. 4 illustrates an exemplary configuration of electrical connectivity between a battery and an electronic module depicted in FIG. 3 in accordance with an aspect of the present invention.

[0009] FIG. 5 illustrates an electronic module in accordance with an aspect of the present invention.

[0010] FIG. 6 illustrates an electro-active lens in accordance with an aspect of the present invention.

[0011] FIG. 7 illustrates a portion of a frame in accordance with an aspect of the present invention.

[0012] FIG. 8 illustrates an exploded view of the frame depicted in FIG. 7 in accordance with an aspect of the present invention.

[0013] FIG. 9 illustrates a portion of electro-active spectacles in accordance with an aspect of the present invention.

[0014] FIG. 10 illustrates a front a view of electro-active spectacles in accordance with an aspect of the present invention.

[0015] FIG. 11 illustrates a portion of a right temple of electro-active spectacles in accordance with an aspect of the present invention.

[0016] FIG. 12 illustrates a portion of a right temple of electro-active spectacles in accordance with an aspect of the present invention.

[0017] FIG. 13 illustrates a representative block diagram of electro-active spectacles in accordance with an aspect of the present invention.

[0018] FIG. 14 illustrates a slim line charger in accordance with an aspect of the present invention.

[0019] FIG. 15 illustrates a side view of the slim line charger depicted in FIG. 14 in accordance with an aspect of the present invention.

[0020] FIG. 16 illustrates the slim line charger of FIGs. 14 and 15 in a closed positioned in accordance with an aspect of the present invention.

[0021] FIG. 17 illustrates an electro-active frame in accordance with an aspect of the present invention.

[0022] FIG. 18 illustrates electro-active spectacles in accordance with an aspect of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0023] Aspects of the present invention provide electronics for controlling and synchronizing operation of electro-active lenses. The controlling electronics can be positioned within a variety of frame types, sizes and styles and enable efficient user interaction. The controlling electronics, or a portion thereof, can be contained within an electronic module. The electronic module can be positioned within a frame temple and can be removable and reprogrammable and can include an inductive charge region. Electro-active spectacles of the present invention can use one or more electronic modules. When a single electronic module is used, the electronic module can activate and deactivate each electro-active lens at substantially the same time. If two electronic modules are used, then a first electronic module can synchronize operation of

a second electronic module to ensure coordinated operation of both electro-active lenses.

[0024] Aspects of the present invention provide connectivity between one or more electronic modules and/or between a left-side portion and a right-side portion of electro-active spectacles. Connectivity can vary depending upon frame type. Aspects of the present invention allow electro-active spectacles to include one or more conductive links using left and right upper and lower rim portions of the frame that support the electro-active lenses, the bridge, conductive layers of the electro-active lenses, the upper and lower grooves of the electro-active lenses, wires or other conductive links embedded within any portion of the frame, and/or a wireless connection.

[0025] Aspects of the present invention provide chargers for recharging a power source of electro-active spectacles of any size, shape or style. A slim line charger of the present invention can include a base and arms to support electro-active spectacles of the present invention. The slim line charger can include one or more adjustable inductive charging cradles to inductively charge a power source (e.g., one or more batteries) of electro-active spectacles of the present invention.

[0026] FIG. 1 illustrates electro-active spectacles or eyeglasses 100 in accordance with an aspect of the present invention. The electro-active spectacles 100 shown in FIG. 1 are fully rimmed eyeglasses comprising left and right temples and a frame front (the frame front can comprise left and right eyewires or rims as will be appreciated by one skilled in the pertinent art). Electro-active spectacles and frames of the present invention can be fully rimmed, partially rimmed, or rimless. The electro-active spectacles 100 can include a frame 102, a first electro-active lens 104, and a second electro-active lens 106. The frame 102 can include left and right temple portions, a bridge, and rim portions (e.g., upper and/or lower rim portions) supporting the electro-active lenses 104 and 106. The first and second electro-active lenses 104 and 106 can each be an electro-active lens as described in U.S. Pat. Appl. No. 12/408,973 (hereinafter the '973 application), filed March 23, 2009, entitled "Electro-Active Diffractive Lens and Method for Making the Same," which is

hereby incorporated by reference in its entirety. In general, the first and second electro-active lenses 104 and 106 can be any lens or optic capable of changing, varying or tuning the optical power they each provide with the application of electricity.

[0027] The right temple portion can be considered to be a first temple portion that is positioned adjacent to the first electro-active lens 104. The left temple portion can be considered to be a second temple portion that is positioned adjacent to the second electro-active lens 106. The bridge can be considered to be part of the frame or to be a separate portion of the electro-active spectacles 100 that connects, joins or supports the first and second electro-active lenses 104 and 106.

[0028] The electro-active spectacles 100 can include one or more power sources for powering the first and second electro-active lenses 104 and 106. As an example, each power source can include one or more batteries (e.g., conventional rechargeable batteries and/or solar batteries). The electro-active spectacles 100 can also include electronics that can govern operation of the electro-active lenses 104 and 106. The electronics can comprise one or more control units (e.g., a control unit matched to each electro-active lens) to determine when to activate and when to deactivate the electro-active lenses 104 and 106. The one or more power sources and the electronics of the electro-active spectacles 100 can be housed or contained within any portion of the frame 102. The one or more power sources and the one or more control units of the electro-active spectacles 100 can be grouped together or distributed or dispersed in any manner within or throughout the frame 102.

[0029] In accordance with an aspect of the present invention, the one or more power sources and the one or more control units of the electro-active spectacles 100 can be arranged in a manner that can accommodate a wide variety of frame types and styles. Specifically, an aspect of the present invention enables the one or more power sources and the one or more control units of the electro-active spectacles 100 to be arranged in a manner that can accommodate fully-rimmed, partially rimmed, and rimless frames.

[0030] In accordance with an aspect of the present invention, the operation of the electro-active lenses 104 and 106 can be synchronized. That is, the one or more control units housed in the frame 102 can coordinate the activation and deactivation of the electro-active lenses 104 and 106 such that the electro-active lenses 104 and 106 are activated or deactivated at substantially the same time.

[0031] In accordance with an aspect of the present invention, the one or more control units housed in the frame 102 can automatically operate (e.g., activate and deactivate) the electro-active lenses 104 and 106. As an example, the electro-active lenses 104 and 106 can be activated or deactivated based on a user's head tilt as sensed by the one or more control units. The one or more control units can also enable a user to interact with the electro-active lenses 102 and 104. As an example, a user can manually activate or deactivate the electro-active lenses 104 and 106, override automatic operation of the electro-active lenses 104 and 106, place the electro-active spectacles 100 into a standby mode (in which the electro-active lenses 104 and 106 are neither automatically or manually activated or deactivated), or power off the electro-active spectacles 100.

[0032] The electronics of the electro-active spectacles 100 can include a processor, memory, a power source (e.g., a battery) and a gyroscope or accelerometer. As previously mentioned, these components can be grouped together or can be distributed within different portions of the frame 102. As an example, all or a portion of these components can be grouped together to form a self-contained electronic module. The electro-active spectacles 100 can comprise a single electronic module that governs synchronized operation of both the first and second electro-active lenses 104 and 106. Alternatively, operation of the first electro-active lens 104 can be governed by a first electronic module and operation of the second electro-active lens 106 can be governed by a second electronic module. Under this scenario, the first and second electronic modules can communicate using one or more conductive wires (e.g., embedded within a portion of the frame 102), one or more conductive portions of the frame 102 (e.g., conductive metal layers or

conductive cores encapsulated by non-conductive material), one or more conductive layers of the electro-active lenses 104 and 106, an optical link, and/or via a wireless communications link. Communication between the first and second electronic modules can facilitate coordinated operation of the first and second electro-active lenses 104 and 106.

[0033] FIG. 2 illustrates a side view of the electro-active spectacles 100 depicted in FIG. 1. As shown in FIG. 2, the electro-active spectacles 100 can comprise an electronic module (or control unit) 202. As described above, the electronic module 202 can include various electronics components. The electronic module 202 can be positioned near the front temple of the frame 102. The electronic module 202 can be positioned within the frame 102 (e.g., in an area or cavity of the frame 102) and can be removable and replaceable. Alternatively, the electronic module can be built into the frame 102 and form a part of the frame 102. The electronic module 202 can be located on an outer portion of a temple of the frame 102 (further from a wearer) or can be located on an inner portion of the temple of the frame 102 (closer to the wearer). The electronic module 202 can be positioned on a left temple or a right temple of the frame 102 (i.e., on either side of the frame 102). The electronic module 202, when inserted into the temple of the frame 102, can be flush with the other portions of the frame 102. All or a portion of the electronic components used to operate the electro-active lens 104 can be contained within the electronic module 202.

[0034] The electronic module 202 can also control operation (or at least ensure synchronized operation) of the electro-active lens 106. Electrical connections between the electronic module 202 and one or more of the electro-active lenses 104 and 106 can be routed through the frame 102 and/or the electro-active lenses 104 and 106 as will be described in more detail below. According to an aspect of the present invention, connectivity between the electronic module 202 and one or more of the electro-active lenses 104 and 106 can be accomplished by using a single conductive wire.

[0035] According to an aspect of the present invention, a first electrical connection (e.g., comprising one or more conductive links or wires) can be

used to provide connectivity between one or more power sources of the electro-active spectacles 100 and one or more electronic modules 202 and a second electrical connection (e.g., comprising one or more conductive links or wires) can be used to provide connectivity between the one or more electronic modules 202 and the one or more electro-active lenses (e.g., the electro-active lenses 104 and 106). For example, a battery positioned within the frame 102 can be coupled to an electronic module 202 also positioned within the frame 102 using a first conductive link. A second, distinct conductive link (e.g., electrically isolated from the first conductive link) can be used to couple the electronic module 202 to the electro-active lenses 104 and 106.

[0036] According to an aspect of the present invention, the same conductive link (e.g., comprising one or more electrical wires) can be used to couple the one or more power sources of the electro-active spectacles 100, the one or more electronic modules 202 and the electro-active lenses 104 and 106 as will be appreciated by one skilled in the pertinent art. This can enable a power source to be positioned on one side of the frame 102 (e.g., in a first temple) and an electronic module 202 to be positioned on the other side of the frame 102 (e.g., in a second temple) while using the same conductive link to simultaneously provide power to the electronic module 202 and controlling signals from the electronic module 202 to the electro-active lenses 104 and 106. As a result, the number of conductive links (e.g., embedded wires) positioned within the frame 102 can be minimized.

[0037] FIG. 3 illustrates an exemplary configuration of electrical components of the electro-active spectacles 100. Specifically, FIG. 3 shows a battery 302 located near the end of the frame 102 of the electro-active spectacles 100. A portion of the end of the frame 102 is removed for illustration purposes only. The battery 302 can be a rechargeable battery and can provide power to the electrical components located within the electronic module 202. The battery 302 can provide power to one or more electronic modules of the present invention.

[0038] FIG. 4 illustrates an exemplary configuration of electrical connectivity between the battery 302 depicted in FIG. 3 and the electronic module 202. A

portion of the frame 102 is removed for illustration purposes only. As shown in FIG. 4, conducting wires 402 can couple the battery 302 to the electronic module 202. The conducting wires 402 can be positioned within the frame 102 (e.g., embedded within the frame 102) of the electro-active spectacles 100.

[0039] FIG. 5 illustrates the electronic module 202 in accordance with an aspect of the present invention. The electronic module 202 can contain all or a portion of the electronic components that govern operation of one or more electro-active lenses including a power source (e.g., a rechargeable battery or a solar battery). As shown in FIG. 5, the electronic module 202 can comprise a housing 502, first contacts 504 and second contacts 506. The housing 502 can contain the electrical components of the electronic module 202 – e.g., a processor, memory, power source, and/or a gyroscope/accelerometer.

[0040] The first contacts 504 can provide electrical connectivity between the electrical components of the housing 502 and other portions of one or more associated electro-active lens (e.g., the first electro-active lens 104). The second contacts 506 can provide electrical connectivity to a memory of the electronic module 506. The second contacts 506 can be used, for example, to program or reprogram the electronic module 202 directly. Additional contacts (not illustrated for simplicity), or the first and/or second contacts 504 and 506, can also provide connectivity to a remote battery (e.g., the battery 302 depicted in FIG.s 3 and 4) or to another electronic module or control unit. Alternative or additional contacts (e.g., an antenna) can allow wireless programming of the electronic module 202.

[0041] In general, the electronic module 202 can be positioned anywhere on the frame 102 (e.g., in any portion of the frame 102 having an area or cavity designed to accept insertion of the electronic module 202). The electronic module 202, as shown in FIG. 2, can be located near the front temple of a wide variety of frame types and styles. Specifically, the electronic module 202 can be located within a portion of a frame that is fully rimmed, partially-rimmed, or rimless. The electronic module 202 can be removed and replaced with a new module or can be reprogrammed. As an example, the electronic

module 202 can be initially programmed with a first mode of operation or a first prescription for a user. At a later time, the electronic module 202 can be removed and reprogrammed using the second contacts 506 with a second mode of operation or a second prescription for a user.

[0042] As an alternative to the second contacts 506, the electronic module 202 can be reprogrammed using a wireless communication link such that removal of the electronic module 202 from the frame is not necessary to enable reprogramming. Reprogramming can include changing a specified angle of head tilt for activating or deactivating an associated electro-active lens.

[0043] The electronic module 202 can also include or be coupled to one or more light emitting diodes (LEDs). The one or more LEDs can be used to indicate operating conditions or states of the electro-active spectacles of the present invention including, but not limited to, the power level of the power source of the spectacles.

[0044] A wireless communication link between the electronic module 202 and a remote communication device can, as described above, provide a mechanism for reprogramming the electronic module 202 but can also provide a mechanism for collecting information on the operating status and history of operation of the electro-active spectacles of the present invention. Reprogramming verification (e.g., verifying successful uploaded controlling firmware) and other data collection can be enabled using such a communications link.

[0045] The one or more LEDs of the electronic module 202 can also be used to facilitate communication with a remote device. For example, the one or more LEDs can be opto-coupled to a receiving station to readout electronic module 202 operating parameters and to aid in re-configuration or reprogramming (e.g., verifying uploaded firmware).

[0046] Additionally, a communication link between the electro-active spectacles of the present invention and a remote device can be established using the electro-active lenses themselves. For example, the electro-active lenses of the present invention can be used to transmit a signal to a receiving

station by encoding data with lens "flicker" as will be apparent to one skilled in the pertinent art.

[0047] The electronic module 202 can contain any number of mechanism by which a user can interact with the electronic module 202 to adjust operation of the electro-active spectacles of the present invention. For example, the electronic module 202 can include a switch or device to enable a user to interact with the electronic module 202. The switch or device can be a press button switch, a capacitive switch (e.g., comprising a capacitive sense pad), a toggle switch or other manual switch. The switch or device can enable a user to activate or deactivate the associated electro-active lens or lenses, to override or initiate automatic operation of the associated electro-active lens or lenses, and to select a mode of operation or prescription correction for a user. A capacitive switch can be located on a surface of the electronic module 202 that is exposed or accessible when positioned in the frame 102. Alternatively, or in addition thereto, capacitive sense pads can be deposited or built into the frame 102 that can be coupled to the electronic module 202.

[0048] The electronic module 202 can also include an ability to toggle among modes or be activated or deactivated through voice activation or based on light sensitivity. For example, a user can activate or deactivate the lenses or otherwise adjust operation by issuing or speaking voice commands or instructions. Further, the electronic module 202 can be activated or deactivated or change operating modes based on the amount of light measured or sensed by electronics included in the electronic module 202. For example, in relatively low light, the electronic module 202 can be deactivated automatically (or placed into a standby, non-switchable mode) and can be activated (or switched out of a standby non-switchable mode) when in relatively bright light conditions. Lastly, the electronic module 202 can include electronics to allow remote activation or toggling of operational modes. For example, the electronic module 202 can include electronics to allow remote wireless activation or activation by a switch connected by a wired link from a position remote from the electro-active spectacles of the present invention. Remote activation may be particularly useful for

individuals that are physically challenged (e.g., individuals that cannot move their arms to touch the frame temple with ease).

[0049] All of the mechanism described above can be used by a user to adjust the operation of the electro-active spectacles of the present invention. For example, a user can use one of the mechanisms described above to switch the lens from a first mode to a second mode of operation or between any number of different modes of operation. For example, a first mode of operation can be a standby mode of operation. In a standby mode of operation, the electro-active spectacles of the present invention can be placed into a non-switchable state (such that the electro-active lenses do not automatically activate or deactivate based on a sensed signal received from a tilt sensor, rangefinder or other activation/deactivation sensing device including manual control).

[0050] A second mode of operation can be an active mode of the electro-active spectacles. In the active mode of operation, the electro-active spectacles of the present invention can be placed into a switchable state (such that the electro-active lenses will automatically activate or deactivate based on a sensed signal received from a tilt sensor, rangefinder or other activation/deactivation sensing device or will respond to direct manual control to activate or deactivate).

[0051] The electro-active spectacles of the present invention can also include additional operational states or modes that the user can use (and toggle or transition between them using one of the interaction mechanism described above). For example, the electro-active spectacle of the present invention can include a manual operation state. In a manual operation state, the user can manually direct the electro-active lenses of the present invention to activate or deactivate. Manual direction can be though voice command or the touching or toggling of a switch as described above.

[0052] Another mode of operation can be an on mode. In the on mode or on state, the electro-active spectacles of the present invention can maintain the electro-active lenses of the present invention in an activate state. Accordingly, an off mode can maintain the electro-active lenses of the present invention in a deactivated state.

[0053] The ability to program or reprogram the electronic module 202 enables the electro-active spectacles of the present invention to be customized or re-customized for a particular user. Customizable features of the electro-active spectacles of the present invention include any of the following: head tilt angle at which to active one or more electro-active lenses of the present invention; head title angle at which to deactivate one or more electro-active lenses of the present invention; distance between an object viewed by the user and the user at which to activate or deactivate one or more electro-active lenses of the present invention; number of operational modes (e.g., inclusion or exclusion of operational modes such as standby mode or activation mode or off mode); method of toggling between selected operational modes (e.g., selection of which mechanism described above to use to allow a user to toggle between modes including the order of toggling or states); user prescription (e.g., the optical power provided by the electro-active area of the electro-active lenses of the present invention).

[0054] Any of the customizable features of the electro-active spectacles of the present invention can be programmed into the electronic module 202 directly (e.g., using a flash programmer or direct wired link) or indirectly (e.g., using a wireless link such as an infrared link or RF link).

[0055] The electronic module 202 can include an inductive charge area. That is, the electronic module 202 can include electronics for enabling a power source of the electronic module 202 (or a power source coupled to the electronic module 202) to be recharged inductively by an inductive charging device. The inductive charge area can include inductive charge coils. According to an aspect of the present invention, the inductive charge coils can function as an antenna to communicate with a remote communication device. Communication with a remote communication device can enable remote wireless programming of the electronic module 202 or can enable communication between two or more electronic modules 202 as described above. In general, the inductive charge area can be configured to serve these purposes.

[0056] A gyroscope or accelerometer of the electronic module 202 can be used to facilitate activation and deactivation of the associated electro-active lens or lenses based on a head tilt of a user. For example, the gyroscope or accelerometer can activate the associated electro-active lens or lenses when the user's head dips below a first predetermined threshold angle and can deactivate the associated electro-active lens or lenses when the user's head rises above a second predetermined threshold. Additionally, the gyroscope or accelerometer can power down or power off the associated electro-active lens or lenses when the electro-active spectacles housing the electronic module 202 are positioned upside down. For example, a user can power down or power off electro-active spectacles 100 housing the electronic module 202 by simply placing the electro-active spectacles 100 upside down on a relatively flat surface. Alternatively, positioning the electro-active spectacles 100 upside down can place the electro-active spectacles 100 in a standby mode (e.g., a mode where the electro-active spectacles 100 will not switch between active and deactivate states but otherwise are turned on).

[0057] The electronic module 202 can also include or can alternatively include a rangefinder. The rangefinder can be used to facilitate activation and deactivation of the associated electro-active lens or lenses based on the distance between a wearer of electro-active spectacles of the present invention and an object the wearer is looking at or observing.

[0058] FIG. 6 illustrates an electro-active lens 600 in accordance with an aspect of the present invention. The electro-active lens 600 can represent one of the electro-active lenses 104 or 106. The electro-active lens 600 is depicted as a finished lens in FIG. 6. That is, the electro-active lens 600 has been edged and grooved to fit into an eyeglass frame.

[0059] As shown in FIG. 6, the electro-active lens 600 can comprise a first substrate (e.g., a top substrate) 602 and a second substrate (e.g., a bottom substrate) 604. During an edging process, a groove 606 can be formed (e.g., near or between the interface of the first and second substrates 602 and 604). The groove 606 can be used to position and stabilize the electro-active lens 600 within an eyeglass frame as is done with conventional lenses.

[0060] The electro-active lens 600 can comprise a first electrical lead or connector 608 and a second electrical lead or connector 610. The first and second electrical leads 608 and 610 can provide power (e.g., a drive signal or a control signal) to the electro-active region of the electro-active lens 600. In particular, the first and second electrical leads 608 and 610 can link or connect the electro-active region of the electro-active lens 600 to a power source and electronic components that can be housed within an associated eyeglass frame (e.g., the electronic module/control unit 202 depicted in FIG. 5). The first and second electrical leads 608 and 610 can comprise any conductive material including, but not limited to, silver ink. The first and second electrical leads 608 and 610 can be painted, applied or otherwise deposited onto the transparent conductive layers placed on the substrates 602 and 604.

[0061] To ensure or improve connectivity, after edging and grooving the electro-active lens 600, a small quantity of conductive material, paint or paste can be placed on top of the first and second electrical leads 608 and 610. Specifically, as shown in FIG. 6, a first conductive material 612 can be placed in the groove 604 on top of the first electrical lead 608 and a second conductive material 614 can be placed in the groove 604 on top of the second electrical lead 610. The first and second conductive materials 612 and 614 can be substantially transparent and can comprise an indium tin oxide (ITO) paste or a paint containing silver particles (e.g., silver ink).

[0062] FIG. 7 illustrates a portion of a frame 700 in accordance with an aspect of the present invention. The frame 700 can provide electrical connectivity between the electro-active lenses (not depicted in FIG. 7 for simplicity) and the electrical components used to operate electro-active lenses.

[0063] The frame 700 can include an upper portion of the right eye-wire or rim 702 and a lower portion of the right eye-wire or rim 704. For a fully rimmed frame, the lower portion 704 can extend underneath an electro-active lens to a bridge 706. For a partially-rimmed frame, the lower portion 704 generally does not extend to the bridge 706.

[0064] The frame 700 can include an electronic module 202 and an area to accept an electronic module 202. A first conductor 708 can be positioned

within a groove of the upper rim portion 702. A second conductor 710 can be positioned within a groove of the lower rim portion 704. The first and second conductors 708 and 710 can comprise flexible, compressible materials. When an electro-active lens – e.g., the electro-active lens 600 depicted in FIG. 6 – is positioned within the frame 700, the first and second conductors 708 and 710 can be compressed to fit in the groove of the upper and lower rim portions 708 and 710, respectively, and the groove 606 of the electro-active lens 600. The first conductor 708 can be positioned to make contact with the first conductive material 612. The second conductor 710 can be positioned to make contact with the second conductive material 614.

[0065] The frame 700 can include an upper conducting member 712, a lower conducting member 714 and an insulating or isolation member 716. The upper conducting member 712, the lower conducting member 714 and the insulating member 716 can physically couple the temple of the frame 700 to the eye-wire portion (i.e., the upper and lower rim portions 702 and 704).

[0066] The upper conducting member 712 can provide connectivity between the electronic module 202 and the first conductor 708. The first conductor 708 can provide connectivity to the first conductive material 612 (and, as a result, connectivity to the first electrical lead 608) depicted in FIG. 6. The lower conducting member can provide connectivity between the electronic module 202 and the second conductor 710. The second conductor 710 can provide connectivity to the second conductive material 614 (and, as a result, connectivity to the second electrical lead 610) depicted in FIG. 6. The insulating member 716 can ensure that the connectivity path between the electronic module 202, the upper conducting member 712 and the first conductor 708 remains insulated or electrically separated from the connectivity path between the electronic module 202, the lower conducting member 714 and the second conductor 710.

[0067] Any portion of the upper conducting member 712 and the lower conducting member 714 can provide a conductive link. As an example, the entirety of the upper and lower conducting members 712 and 714 can be conductive (e.g., made of metal and coated with a non-conductive material) or

a portion of the upper and lower conducting members 712 and 714 can be conductive (e.g., an internal portion that is encapsulated by non-conductive material).

[0068] FIG. 8 illustrates an exploded view of the frame 700 depicted in FIG. 7. As shown in FIG. 8, the frame 700 can be assembled by connecting the upper conducting member 712, the insulating member 715 and the lower conducting member 714 to the upper rim portion 702 and the lower rim portion 704. The first conductor 708 and the second conductor 710 can then be positioned in the groove of the upper rim portion 702 and the lower rim portion 704, respectively. The first and second conductors 708 and 710 can be positioned in areas where they will make contact with the first conductive material 612 and the second conductive material 614, respectively.

[0069] The components illustrated in FIGs. 7 and 8 – namely, the upper conducting member 712, the lower conducting member 714, the insulating member 716, the upper rim portion 702, the lower rim portion 704, the first conductor 708 and the second conductor 710 – can be used to form a portion of the frame 700 as a partially-rimmed frame or a fully-rimmed frame and to provide connectivity between an electronic module of the present invention and an electro-active lens of the present invention for each type of frame (and a variety of styles therein).

[0070] For a fully-rimmed frame, both the upper rim portion 702 and the lower rim portion 704 can extend from the upper conducting member 712 and the lower conducting member 714, respectively, to the bridge 706. For a partially-rimmed frame, generally only the upper rim portion 702 extends from the upper conducting member 712 to the bridge 706 while the lower rim portion 704 does not extend to the bridge 706.

[0071] When the frame 700 is implemented as a fully-rimmed frame or a partially-rimmed, the first conductor 708 can be of any size or length. That is, the first conductor 708 can extend along any portion of the upper rim 702 to make electrical connectivity with a desired lead of the electro-active lens 104. When the frame 700 is implemented as a fully-rimmed frame, the second conductor 710 can similarly be of any size or length to make electrical

connectivity with a separate or second desired lead of the electro-active lens 104. However, when the frame 700 is implemented as a partially-rimmed frame, the second conductor 710 will be of the same length or shorter than the lower rim portion 704.

[0072] FIG. 9 illustrates a portion of electro-active spectacles 900 in accordance with an aspect of the present invention. The electro-active spectacles 900 are implemented as rimless spectacles. That is, no upper or lower rim supports the electro-active lens 104.

[0073] As shown in FIG. 9, the electro-active spectacles 900 can include an electronic module 202 and an area to accept an electronic module 202. The electronic module 202 can be electrically coupled to the electro-active lens 104 using upper conducting member 902 and lower conducting member 904 (similar to upper conducting member 712 and lower conducting member 714 depicted in FIGs. 7 and 8). Both the upper and lower conducting members 902 and 904 can be isolated or insulated conductors having a protected, internal conductive routes (e.g., a conductive wire) enclosed by a non-conductive material (e.g., a plastic). Alternatively, the upper and lower conducting members 902 and 904 can entirely comprise conductive material and can be coated with non-conductive material.

[0074] The frame of the electro-active spectacles 900 can support the electro-active lens 104 using upper support member 910 and lower support member 912. As an alternative, one of the upper and lower support members 910 and 912 can be used. Both the upper and lower supporting members 910 and 912 can be positioned through holes residing in the electro-active lens 104. The frame of the electro-active spectacles 900 can also be supported by upper contact 906 and lower contact 908. Both the upper and lower contacts 906 and 908 can be positioned through holes residing in the electro-active lens 104. The upper and lower contacts 906 and 908 can be compression pin connectors having a portion that can make electrical contact with appropriate elements of the electro-active lens 104.

[0075] While simultaneously supporting the electro-active lens 104, the upper contact 906 can make electrical contact with a first electrical lead of the

electro-active lens (e.g., the first electrical lead 608 depicted in FIG. 6). Similarly, the lower contact 908 can support the electro-active lens 104 while also providing electrical contact to a second electrical lead of the electro-active lens (e.g., the second electrical lead 610 depicted in FIG. 6).

[0076] Both the upper contact 906 and the upper support member 910 can form part of an arm or extension of the upper conducting member 902. The upper contact 906 and the upper support member 910 can comprise one or more conductors (e.g., a wire) insulated or contained by an insulating material (e.g., plastic). The upper contact 906 and the upper support member 910 can be positioned in front of the electro-active lens 104 (and connect through to the back of the electro-active lens 104 – as shown in FIG. 9) or can be positioned behind the electro-active lens 104 (and connect through to the front of the electro-active lens 104 – not shown in FIG. 9). The lower contact 908 and the lower support member 912 can be positioned in a manner similar to the upper contact 906 and the upper support member 910 pairing (and can form part of an arm or extension of the upper conducting member 904).

[0077] FIG. 10 illustrates a front a view of electro-active spectacles 1000 in accordance with an aspect of the present invention. The electro-active spectacles 1000 are implemented as partially-rimmed spectacles. Electrical connectivity between a right side of the electro-active spectacles (e.g., from a right-side portion of a frame 1002) to a left side of the electro-active spectacles (e.g., from a left-side portion of a frame 1004) can be provided in a variety of ways and is not limited to partially-rimmed designs. Electrical connectivity between the right-side portion 1002 and the left-hand portion 1004 can enable a single electronic module (e.g., the electronic module 202) located on either side to govern operation of both electro-active lenses 104 and 106. Further, this connectivity can ensure synchronized operation of the electro-active lenses 104 and 106 even if each of the electro-active lenses 104 and 106 is driven by separate electronic modules.

[0078] One or more conducting elements (e.g., conducting wires) can be embedded in a right-side upper frame or rim member 1006, a left-side upper frame or rim member 1008 and a bridge 1010 (as well as a left-side lower

frame or rim member and a right-side lower frame or rim member for some frame designs). The conducting elements can be embedded and surrounded by insulating material. Embedding one or more conducting elements in the right-side upper frame member 1006, the bridge 1010 and the left-side upper frame member 1008 can enable an electronic module on either side of the electro-active spectacles 1000 to control and/or synchronize operation of both electro-active lenses 104 and 106.

[0079] Rimless frames generally do not include the right-side upper frame member 1006 or the left-side upper frame member 1008. Rimless frames, however, do generally include a bridge 1010. Electrical connectively between the right-side portion 1002 and the left-hand portion 1004 of a rimless frame can be accomplished by using conductive elements incorporated into the manufacture of the electro-active lenses 104 and 106. Specifically, the bridge 1010 can electrically connect (e.g., using an embedded conductive link or a conductive link adjacent to or connected to the bridge) one or more conducting elements of the electro-active lenses 104 and 106 (e.g., using one or more ITO layers) which are themselves coupled to the right-side portion 1002 and the left-hand portion 1004, respectively, of a spectacles lens. Electrical connectively between the right-side portion 1002 and the left-hand portion 1004 of a rimless frame can also be accomplished by using conductive wires positioned within the grooves an electro-active lens (e.g., the groove 606 depicted in FIG. 6) to couple the right-side portion 1002 to the left-hand portion 1004. Portions of the groove on the top part of the electro-active lens or on the bottom part of the electro-active lens can be used to house or contain one or more conductive wires. The conductive wires positioned within such a groove can be insulated.

[0080] According to an aspect of the present invention, one or more conductive wires can be embedded in the upper rim connectors, the bridge and/or the lower rim connectors of electro-active spectacles and frames of the present invention during a mold casting process. That is, when the upper rim connectors, the bridge and/or the lower rim connectors are formed using a casting process, one or more conductive wires can be cast over when the upper

rim connectors, the bridge and/or the lower rim connectors are prepared. Generally, thicker conductive wires can be used during such a process. Nylon is an example material that can be used to mold over one or more conductive wires to from the upper rim connectors, the bridge and/or the lower rim connectors.

[0081] According to an aspect of the present invention, one or more conductive wires can be embedded in the upper rim connectors, the bridge and/or the lower rim connectors of electro-active spectacles and frames of the present invention as each frame component is assembled. More specifically, any of the upper rim connectors, the bridge and/or the lower rim connectors that will be used to embed one or more conductive wires can be fabricated by two or more individual or separate pieces. For example, the upper rim connectors can be formed from two substantially symmetrical pieces of substantially the same shape – a front piece and a back piece which individually may appear to be a portion of the upper rim connector split in half lengthwise. Prior to assembling the front and back pieces to form a complete upper rim connector, one or more wires can be embedded (e.g., in a groove formed by mold or machined into the front and/or back pieces) between the front and back pieces (i.e., at the interface between the front and back pieces). The front and back pieces used to form the complete upper rim connector can subsequently be combined, for example, using an adhesive.

[0082] According to an aspect of the present invention, one or more conductive wires can be embedded in the upper rim connectors, the bridge and/or the lower rim connectors of electro-active spectacles and frames of the present invention after the frame is assembled. Specifically, one or more grooves can be machined into the upper rim connectors, the bridge and/or the lower rim connectors that can be used to contain one or more conductive wires. The machined grooves can then be filled or covered with material to cosmetically hide the conductive wires. The assembled frame can then be polished to hide or mask the area in which the wires are embedded. Acetate is an example material that can be manipulated in this fashion to embed one or more conductive wires.

[0083] FIG. 17 illustrates electro-active frame 1700 in accordance with an aspect of the present invention. Electro-active lenses can be mounted within the electro-active frame 1700. For simplicity, a portion of electronics 1702 that can be used to govern operation of the electro-active lenses are shown. The electronics 1702 can represent a portion of an electronic module 202 described above and/or can represent conductive elements positioned to provide electrical connectivity between a temple of the electro-active frame 1700 and a front portion of the electro-active frame 1700. The electro-active frame 1700 is shown as including electronics 1702 on only one side of the electro-frame 1700 but is not so limited.

[0084] As further shown in FIG. 17, the electro-active frame 1700 can include conductive leads 1704 and 1706 and conductive link 1708. Conductive link 1708 can provide electrical connectivity from one side of the electro-active frame 1700 to the other side of the electro-active frame 1700. Conductive leads 1704 can provide electrical connectivity between electronics 1702 and a first electro-active lens mounted within the electro-active frame 1700. Conductive leads 1706 can provide electrical connectivity between the conductive link 1708 and a second electro-active lens mounted within the electro-active frame 1700.

[0085] As shown in FIG. 17, the conductive link 1708 can be embedded or positioned within the electro-active frame 1700. The conductive link 1708 can include any number of conductive elements (e.g., wires) that can be insulated not insulated. If the electro-active frame 1700 uses driver electronics on each side of the frame 1700 (e.g., a master and slave driver electronics or electronic modules 202) then as few as only one single wire can comprise the conductive link 1708). If the electro-active frame 1700 has driver electronics on only one side of the electro-active frame 1700, then at least two wires or conductive elements can be used. The conductive link 1708 can be positioned inside the electro-active frame 1700 in accordance with any of the methods described above for embedding conductive links including, but not limited to, (1) embedding during a mold casting process; (2) embedding during an assembly process of the front frame portion of the electro-active frames 1700; and (3)

embedding after assembly of the electro-active frames by providing a groove or route for the conductive link 1708. The conductive link 1708 can also use or can alternatively comprise the conductive layers of the electro-active lenses of the present invention that can be positioned into the frames 1700 as described above.

[0086] FIG. 18 illustrates electro-active spectacles 1800 in accordance with an aspect of the present invention. The electro-active spectacles 1800 can include an electronic module 202. The electro-active spectacles 1800 can also include conductive link 1802. Conductive link 1802 can include any number of conductive elements (e.g., wires) that can be insulated or not insulated. Conductive link 1802 can provide electrical connectivity between the electronic module 202 and the electro-active lens 104 and the electro-active lens 106.

[0087] As shown in FIG. 18, a portion of the conductive link 1802 can be positioned or embedded within a portion of the frame of the electro-active spectacles 1800. For rimless spectacles, the conductive link 1802 can be routed through a groove in an electro-active lens (e.g., the groove 606 depicted in FIG. 6). As further shown in FIG. 18, the conductive link 1802 can be routed adjacent to a bridge 1804 of the electro-active spectacles 1800. For example, the conductive link can be routed through tubing 1806 that is positioned adjacent to the bridge 1804.

[0088] FIG. 11 illustrates a portion of a right temple 1100 of electro-active spectacles in accordance with an aspect of the present invention. The portion of the right temple 1100 depicted in FIG. 11 shows a right temple area 1102 that can be coupled to an electro-active lens (not depicted in FIG. 11 for simplicity). The right temple area 1102 can include an electro-active module of the present invention. The right temple area 1102 can be coupled to the first conductor 708 through first conductor link 1104. The right temple area 1102 can further be coupled to the second conductor 710 through a second conductor link 1106.

[0089] The first and second link conductors 1104 and 1106 can be shaped and constructed to tolerate bending of the frame (not depicted in FIG. 11 for

simplicity) when the electro-active spectacles are opened and closed. The first and second link conductors 1104 and 1106 can contain one or more conducting elements (e.g., conducting wires) and can enclose them with insulating or non-conductive material or can themselves be entirely conductive. The first and second link conductors 1104 and 1106 can be considered to be continuous conductive links since they provide an uninterruptable physical connection between the right temple area 1102 and the conductive elements of the electro-active lenses (e.g., to conductive elements 708 and 710).

[0090] FIG. 12 illustrates a portion of a right temple 1200 of electro-active spectacles (implemented as rimless spectacles) in accordance with an aspect of the present invention. The portion of the right temple 1200 depicted in FIG. 12 shows a right temple area 1102 that can be coupled to an electro-active lens (not depicted in FIG. 11 for simplicity). The right temple area 1102 can include an electro-active module of the present invention. The right temple area 1102 can be coupled to the upper conducting member 712 through a first spring conductor 1202. The right temple area 1102 can further be coupled to the lower conducting 714 through a second spring conductor 1204. The first and second spring conductors 1202 and 1204 can contain one or more conducting elements (e.g., conducting wires) and can enclose them with insulating or non-conductive material or can themselves be entirely conductive. The first and second spring conductors 1202 and 1204 can be considered to be discontinuous conductive links since they can provide an interruptible physical connection between the right temple area 1102 and the conductive elements of the electro-active lenses (to upper and lower conducting members 712 and 714).

[0091] The first and second spring conductors 1202 and 1204 can extend proud of the right temple portion 1102 when the spectacles are in use (i.e., when they are opened). The first and second spring conductors 1202 and 1204 can retract inside the right temple portion 1102 when the spectacles are not in use (i.e., when they are closed). When opened, the first and second spring

conductors 1202 and 1204 can extend to make contact with the upper and lower conducting members 712 and 714, respectively.

[0092] The connectivity mechanisms illustrated in FIGs. 11 and 12 and described above can be used for any type of frame style – that is, for fully rimmed, partially-rimmed and rimless frames of the present invention. Further, according to an aspect of the present invention, the first and second spring conductors 1202 and 1204 can be used to activate, deactivate, or place electro-active spectacles of the present invention into a standby mode or off mode of operation. For example, when the spring conductors 1202 and 1204 are not coupled or in contact with the upper and lower conducting members 712 and 714, the electro-active spectacles of the present invention can be powered-off or placed into a standby mode. When the spring conductors 1202 and 1204 are coupled or in contact with the upper and lower conducting members 712 and 714, the electro-active spectacles of the present invention can be powered-on and placed into an active mode (e.g., a switchable mode based on sensed input) or can immediately activate the electro-active lenses.

[0093] As will be apparent to one skilled in the pertinent art, electronics housed within the frame can sense such a lens disconnect condition by observing a reduction in capacitance or change in drive signal waveform that can occur when the spring conductors 1202 and 1204 are not coupled or in contact with the upper and lower conducting members 712 and 714. Once in the lens disconnect state, the electronics of the electro-active spectacles of the present invention can transition into a low power, standby or off mode. When in a low power or standby mode, the electronics of the electro-active spectacles of the present invention can periodically or randomly observe sensed capacitance or changes in the drive signal waveform to detect when the frame is re-opened for use.

[0094] FIG. 13 illustrates a representative block diagram of electro-active spectacles 1300 in accordance with an aspect of the present invention. The electro-active spectacles 1300 can represent the electro-active spectacles of the present invention described above (e.g., the electro-active spectacles 100). The electro-active spectacles 1300 can include a right electro-active lens 1302

and a left electro-active lens 1304. The right and left electro-active lenses 1302 and 1304 can represent the first and second electro-active lenses 104 and 106 described earlier. The electro-active spectacles 1300 can include a right control unit 1306 and a left control unit 1308. The left and right control units 1306 and 1308 can each represent an electronic module 202, or a portion thereof, described above.

[0095] The right control unit 1306 can include an isolation switch 1310, driver circuits 1312, and transmitter circuits 1314. The driver circuits 1312 can generate a driver signal for operating (e.g., activating) the right electro-active lens 1302. For example, to activate the right electro-active lens 1302, the driver circuits 1312 can provide, generate or transmit a driver signal or activation signal. Further, to deactivate the right electro-active lens 1302, the driver circuits 1312 can simply stop providing, generating or transmitting the driver signal.

[0096] The transmitter circuits 1314 can generate a synchronization signal for coordinating operation of the right and left electro-active lenses 1302 and 1304. Specifically, the transmitter circuits 1314 can transmit a synchronization signal instructing the left electro-active lens 1304 to activate or deactivate. As an example, the left electro-active lens 1304 can be activated based on receipt of the synchronization signal or a synchronization signal of a first type instructing activation. Further, the left electro-active lens can be deactivated based on the absence of the synchronization signal or receipt of a synchronization signal of a second type instructing deactivation. As a result, the right and left electro-active lenses 1302 and 1304 can be activated and deactivated at substantially the same time.

[0097] The isolation switch 1310 can determine when the driver circuits 1312 and the transmitter circuits 1314 can access a conductive link 1316 coupling the right electro-active lens 1302 to the control unit 1306. The conductive link 1316 can comprise one or more conductive wires. The conductive link 1316 can represent one or more of the connectivity mechanisms depicted and described above (e.g., the routing and connectivity features illustrated in FIGs. 11 and 12 and described above).

[0098] When the electro-active spectacles are implemented with only a single control unit (e.g., the control unit 1306), then the control unit 1306 can control operation of both the right and the left electro-active lenses 1302 and 1304. Under such a scenario, the isolation switch 1310 and transmitter circuits 1314 can be optional. Further, the left and right electro-active lenses 1302 and 1304 can be activated at substantially the same time by a driver signal provided by the driver circuits 1312.

[0099] A communications link between the right and left control units 1306 and 1308 can comprise any portion of the conducive link 1316, conductive elements within the right electro-active lens 1302, a bridge conductive link 1318 contained within or adjacent to a bridge of the electro-active spectacles 1300, conductive elements within the left electro-active lens 1304, and a conductive link 1320. The conductive link 1320 can comprise one or more conductive wires and can represent one or more of the connectivity mechanism depicted and described above (e.g., the routing and connectivity features illustrated in FIGs. 11 and 12 and described above). The communications link between the right and left control units 1306 and 1308 can also include or alternatively include a frame conductive link 1222 (shown in phantom in FIG. 13).

[00100] The frame conductive link 1322 can include one or more conductive wires wrapped over the right and left electro-active lens 1302 and 1304 – e.g., either embedded within a portion of the frame and/or contained in a groove of the right and left electro-active lenses 1302 and 1304 as described above. The frame conductive link 1322 can also include conductive elements of the right and left electro-active lenses 1302 and 1304 (e.g., one or more layers of ITO or other transparent conductive layers of the right and left electro-active lenses 1302 and 1304). For example, the frame conductive link 1322 can be a wireless link that uses conductive layers of the right and left electro-active lenses 1302 and 1304 as antennas to facilitate communication and/or synchronization between the right and left electro-active lenses 1302 and 1304. Alternatively, other conductive elements can be embedded within the electro-active spectacles of the present invention to facilitate communication

and/or synchronization between the right and left electro-active lenses 1302 and 1304. One or more of these embedded antennas could also provide a wireless communication link between the electro-active spectacles of the present invention and a remote communication device.

[00101] Overall, the right control unit 1306 can communicate with the left control unit 1308 and/or can operate the left electro-active lens 1304 using a single conductive wire or link. The single conductive wire can also be used to operate the right electro-active lens 1302. The single conductive wire or link can be embedded within a portion of a frame and can include conductive elements of the electro-active lenses.

[00102] The left control unit 1308 can include an isolation switch 1324, driver circuits 1326, and receiver circuits 1328. The driver circuits 1326 can generate a driver signal for operating (e.g., activating) the left electro-active lens 1302. The receiver circuits 1326 can receive and process a synchronization signal transmitted by the right electro-active module 1306. The isolation switch 1324 can determine when the driver circuits 1312 and the receiver circuits 1328 can access the conductive link 1320 coupling the left electro-active lens 1304 to the control unit 1308.

[00103] The receiver circuits 1326 can listen for a synchronization signal transmitted over conductive link 1320. The receiver circuits 1326 can listen periodically or randomly for a specific or random amount of time. Once a synchronization signal is received, the control unit 1308 can operate accordingly – i.e., either activate or deactivate the left electro-active lens 1304 using a driver signal transmitted by the driver circuits 1328.

[00104] The transmitter circuits 1314 can transmit a synchronization signal in response to detection of a head tilt change of the user (e.g., detected by a gyroscope or accelerometer included in the right control unit 1306 – not illustrated for clarity) or manual command issued by the user. The synchronization signal transmitted by the transmitter circuits 1314 can be coded to distinguish it from noise and to prevent false triggering.

[00105] FIG. 14 illustrates an electro-active spectacles charger 1400 in accordance with an aspect of the present invention. The charger 1400 (as a

slim line charger) can be used to charge/re-charge electro-active spectacles (e.g., the electro-active eyeglasses 100) of the present invention.

[00106] As shown in FIG. 14, the slim line charger 1400 comprises a front member or base member 1402, a first movable arm 1404, and a second movable arm 1406. The front member 1402 can include a raised support member 1408 and a charging state indicator 1410. The charging state indicator 1410 can be a light emitting diode (LED). The first arm 1404 can include a first adjustable charging area 1412 (or first adjustable inductive charging cradle) and the second arm 1406 can include a second adjustable charging area 1414 (or second adjustable inductive charging cradle).

[00107] The base member 1402 can support a front portion of the electro-active spectacles 100 (e.g., the first and second electro-active lenses 104 and 106 and any surrounding frame rim portions). The raised support member 1408 can support a bridge area of the electro-active spectacles 100. Alternatively, or in addition thereto, the raised support member 1408 can support one or more electro-active lenses or rim portions of the electro-active spectacles 100.

[00108] The first arm 1404 can be moveable. Specifically, the first arm 1404 can rotate to an open position from a closed positioned about a point where the first arm 1404 is attached to the front member 1402. The first arm 1404 is depicted in an open position in FIG. 14. In a closed position, the first arm 1404 can be adjacent and parallel to the first member 1402. Similar to the first arm 1404, the second arm 1406 can also be moveable. Specifically, the second arm 1406 can rotate to an open position from a closed positioned about a point where the second arm 1406 is attached to the front member 1402. The second arm 1406 is depicted in an open position in FIG. 14. In a closed position, the second arm 1406 can be adjacent and parallel to the first member 1402.

[00109] The first adjustable charging cradle 1412 can be moved along the first arm 1404. As an example, the first adjustable charging cradle 1412 can be held into position using a set screw and can be moved along a groove positioned in the first arm 1404. The first charging area 1412 can be adjusted to be located near or next to a charging area of the electro-active spectacles

100. The first charging area 1412 can include an indicative charger to inductively charge an inductive charging region of the electro-active spectacles 100. As an example, the electro-active spectacles 100 can include an inductive charger region within an electronic module as described above. To recharge the electro-active spectacles 100, the first adjustable charging area 1412 can be positioned to be in close proximity with the inductive charging region of the electro-active spectacles 100.

[00110] Correspondingly, the second adjustable charging cradle 1414 can be moved along the second arm 1406. As an example, the second adjustable charging cradle 1414 can be held into position using a set screw and can be moved along a groove positioned in the second arm 1406. The second charging area 1414 can be adjusted to be located near or next to a charging area of the electro-active spectacles 100. The second charging area 1414 can include an inductive charger to inductively charge an inductive charging region of the electro-active spectacles 100. To recharge the electro-active spectacles 100, the second adjustable charging area 1414 can be positioned to be in close proximity with the inductive charging region of the electro-active spectacles 100.

[00111] As shown in FIG. 14, the slim line charger 1400 can be used to recharge two electronic modules. The slim line charger 1400 can also be used to charge electro-active spectacles 100 having a single electronic module. By allowing the first and second adjustable charging areas 1412 and 1414 to move, the slim line charger 1400 can be used to recharge a wide variety of frame sizes and styles. That is, since frames sizes may vary for different users, the recharging area of the frames may be located in different positions relative to the front member 1402. Accordingly, the first and second adjustable charging areas 1412 and 1414 can be moved to line up or be close to these charging areas. Overall, the slim line charger 1400 can support any frame type – fully-rimmed, partially-rimmed and rimless – and any frame size or shape.

[00112] As an alternative to inductive charging, the charger 1400 can be used to charge electro-active spectacles directly. That is, the charger 1400 can

include a conductive link that can be used to plug into electro-active spectacles to transfer power directly rather than inductively.

[00113] The charging state indicator 1410 can change states to indicate a change in the charging status of the electro-active spectacles 100. For example, the charging state indicator 1410 can have a first state to indicate the charger 1400 is not charging (e.g., an off state), a second state to indicate the charger 1400 is recharging the electro-active spectacles 100 (e.g., a charging state), and a third state to indicate the charger 1400 has completed or fully recharged the electro-active spectacles 100 (e.g., a charged or completed state). The slim line charger 1400 can include a rechargeable power supply to enable charging of electro-active spectacles 100 when the charger is not connected to a power supply source (e.g., a wall outlet) directly. The slim line charger 1400 can include a port to connect the charger 1400 to a power supply (e.g., a wall outlet). The slim line charger 1400 can therefore charge the electro-active spectacles 100 when either plugged into or not plugged into a power source.

[00114] FIG. 15 illustrates a side view of the slim line charger 1400. As shown in FIG. 15, the electro-active spectacles can be stabilized or supported by the charger 1400 at three locations – a front portion of the spectacles 100 (at or near the lenses of the electro-active spectacles 100), a right side temple area of the frame of the electro-active spectacles 100 (shown in FIG. 15), and a left side temple area of the frame of the electro-active spectacles 100 (not shown in FIG. 15). The second adjustable charging area 1414 can be moved laterally to be in close proximity with any portion of the front temple area of the electro-active spectacles 100 (i.e., to place the second adjustable charging area 1414 in close proximity to an inductive charging area of the electro-active spectacles 100).

[00115] FIG. 16 illustrates the slim line charger 1400 in a closed positioned. Specifically, the first and second arms 104 and 1406 have been rotated and positioned adjacent and parallel to the base member 1402. A hinge or lock or other device can be used to lock each of the first and second arms 1404 and 1406 in place. The charger 1400 can include a button, knob or other device to

release the first and second arms 1404 and 1406 from their closed, locked positions.

[00116] Aspects of the present invention also include a charger case for electro-active spectacles having a top cover and a bottom cover as is found with conventional eyeglass cases. The charger case of the present invention can include one or more inductive charge regions and a power source. The power source of the charger case of the present invention can be rechargeable.

Conclusion

[00117] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example and not limitation. Any conductive element described above (e.g., the upper or lower portions of the frame) can be entirely conductive (and possibly coated with non-conductive material) or can contain an embedded or buried conductive element (e.g., a conductive core) and a non-conductive outer or surrounding layer. Further, any conductive link – e.g., described or referred to as an electrical wire or connection – could alternatively, or in addition thereto, be or include an optical conductive link as will be apparent to one skilled in the pertinent art. The exemplary techniques for coupling or connecting the electrical elements of the electro-active spectacles of the present invention (e.g., the controlling electronics and power supplies and electro-active lenses) using embedded conductive links can be used to embed one or more conductive optical links (e.g., one or more optical fibers) as will be apparent to one skilled in the pertinent art.

[00118] Overall, it will be apparent to one skilled in the pertinent art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention. Therefore, the present invention should only be defined in accordance with the following claims and their equivalents.

WHAT IS CLAIMED IS:

1. Electro-active spectacles, comprising:

a first electro-active lens;

a second electro-active lens;

a bridge connected to the first and second electro-active lenses;

a frame comprising a first temple portion adjacent to the first electro-active lens and a second temple portion adjacent to the second electro-active lens; and

a removable electronic module positioned within the first temple portion,

wherein the electronic module comprises an inductive charge area,

wherein the electronic module provides a first driver signal to activate the first electro-active lens.

2. The electro-active spectacles of claim 1, wherein the first driver signal activates the second electro-active lens.

3. The electro-active spectacles of claim 2, wherein the first and second lenses are activated at substantially the same time by the first driver signal.

4. The electro-active spectacles of claim 1, further comprising a second removable electronic module having an inductive charge area and positioned within the second temple portion.

5. The electro-active spectacles of claim 4, wherein the first electronic module transmits a synchronization signal to the second electronic module.

6. The electro-active spectacles of claim 5, wherein the second electronic module provides a second driver signal to activate the second electro-activate lens based on receipt of the synchronization signal.

7. The electro-active spectacles of claim 6, wherein the first and second

lenses are activated at substantially the same time by the first and second driver signals, respectively.

8. The electro-active spectacles of claim 4, wherein the first electronic module is electrically coupled to the second electronic module over a single conductive link.

9. The electro-active spectacles of claim 4, wherein the frame is a fully-rimmed frame and the first electronic module is electrically coupled to the second module over a conductive link comprising a first upper rim portion of the frame supporting the first electro-active lens, a second upper rim portion of the frame supporting the second electro-active lens, and the bridge.

10. The electro-active spectacles of claim 9, wherein the conductive link further comprises a first lower rim portion of the frame supporting the first electro-active lens and a second lower rim portion of the frame supporting the second electro-active lens.

11. The electro-active spectacles of claim 4, wherein the frame is a partially-rimmed frame and the first electronic module is electrically coupled to the second module over a conductive link comprising a first upper rim portion of the frame supporting the first electro-active lens, a second upper rim portion of the frame supporting the second electro-active lens, and the bridge.

12. The electro-active spectacles of claim 4, wherein the frame is a rimless frame and the first electronic module is electrically coupled to the second module over a conductive link comprising a first conductive layer of the first electro-active lens and a first conductive layer of the second electro-active lens, and the bridge.

13. The electro-active spectacles of claim 12, wherein the conductive link

further comprises a second conductive layer of the first electro-active lens and a second conductive layer of the second electro-active lens.

14. The electro-active spectacles of claim 4, wherein the frame is a rimless frame and the first electronic module is electrically coupled to the second module over a conductive link comprising a first conductive wire positioned in a first groove of the first electro-active lens and a second conductive wire positioned in a first groove of the second electro-active lens, and the bridge.

15. A charger for electro-active spectacles, comprising:

a base member to support a front portion of the electro-active spectacles,

a first movable arm connected to the base member to support a portion of a first frame temple of the electro-active spectacles;

a second movable arm connected to the base member to support a portion of a second frame temple of the electro-active spectacles; and

a first inductive charging cradle connected to the first movable arm.

16. The charger of claim 15, further comprising a second inductive charging cradle connected second movable arm.

17. The charger of claim 16, further comprising a power source for charging the electro-active spectacles inductively using the first and second inductive charging cradles.

18. The charger of claim 17, wherein the power source is rechargeable.

19. The charger of claim 16, wherein a positioning of the first inductive charging cradle is adjustable along the first movable arm and a positioning of the second inductive charging cradle is adjustable along the second movable arm.

20. The charger of claim 15, further comprising at least one light emitting

diode (LED) to indicate a charging status of the electro-active spectacles.

21. The charger of claim 15, wherein the first movable arm can be rotated to be in a locked position parallel and adjacent to the base member and the second movable arm can be rotated to be in a locked position parallel and adjacent to the base member.

22. The charger of claim 21, further comprising one of a button and a knob to release both the first and second movable arms from their locked positions.

23. Electro-active spectacle frames, comprising:

a first temple;

a second temple;

a frame front attached to the first temple and the second temple, the frame front comprising a first rim to house a first electro-active lens and a second rim to house a second electro-active lens;

an electronic module positioned within the first temple; and

a conductive link embedded within the frame front coupled to the electronic module,

wherein the electronic module comprises an inductive charge area.

24. Electro-active spectacle frames, comprising:

a first temple;

a second temple;

a frame front attached to the first temple and the second temple, the frame front comprising a first rim to house a first electro-active lens and a second rim to house a second electro-active lens;

an electronic module positioned within the first temple; and

a conductive link embedded within the frame front coupled to the electronic module,

wherein the electronic module comprises a capacitive switch for toggling between operational modes of the first and second electro-active lenses.

25. A method for controlling electro-active spectacles, comprising:
receiving a first input;
transitioning the electro-active spectacles from a first mode of operation to a second mode of operation based on receipt of the first input;
receiving a second input; and
transitioning the electro-active spectacles from the second mode of operation to a third mode of operation based on receipt of the second input.

26. The method of claim 25, further comprising:
receiving a third input; and
transitioning the electro-active spectacles from the third mode of operation to the first mode of operation based on receipt of the third input.

27. The method of claim 26, wherein the first mode of operation is a standby mode of operation, the second mode of operation is an active mode of operation, and the third mode of operation is an inactive or off mode of operation.

28. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user touching a capacitive switch.

29. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user touching a button switch.

30. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user speaking a voice command or instruction.

31. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user opening a frame of the electro-active spectacles.

32. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user closing a frame of the electro-active spectacles.

33. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user positioning the electro-active spectacles upside down.

34. The method of claim 27, wherein at least one of receiving the first input, receiving the second input, and receiving the third input comprises a user positioning the electro-active spectacles right-side up.

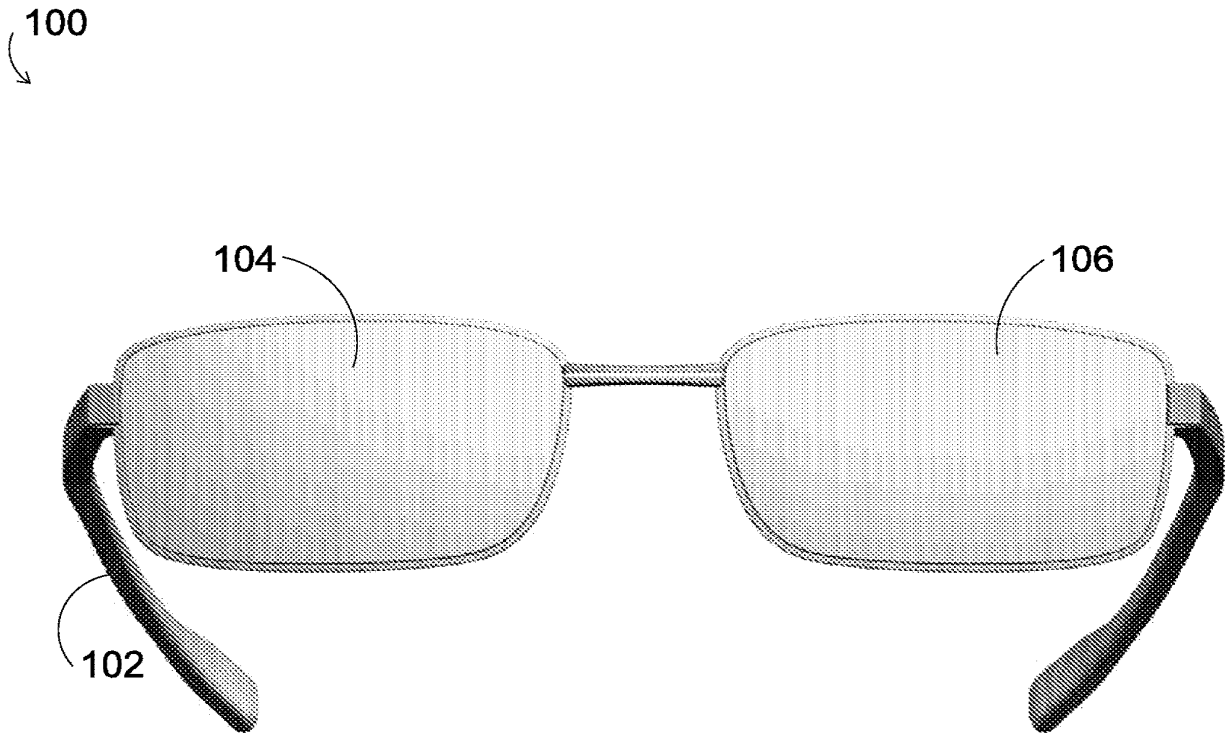


FIGURE 1

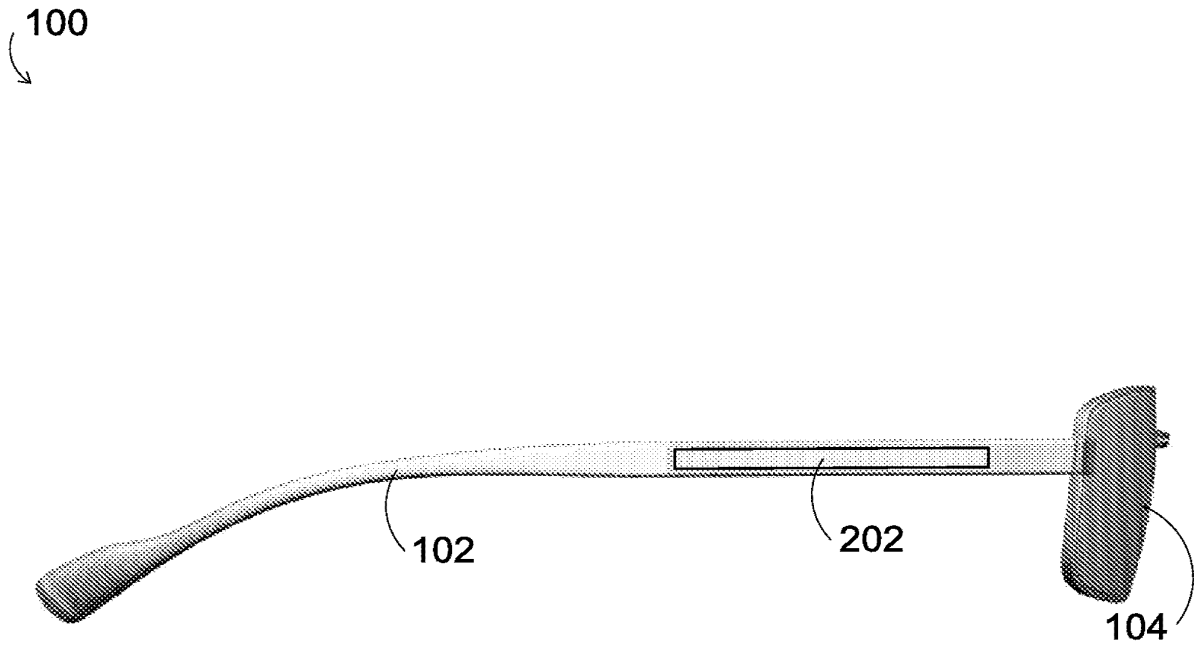


FIGURE 2

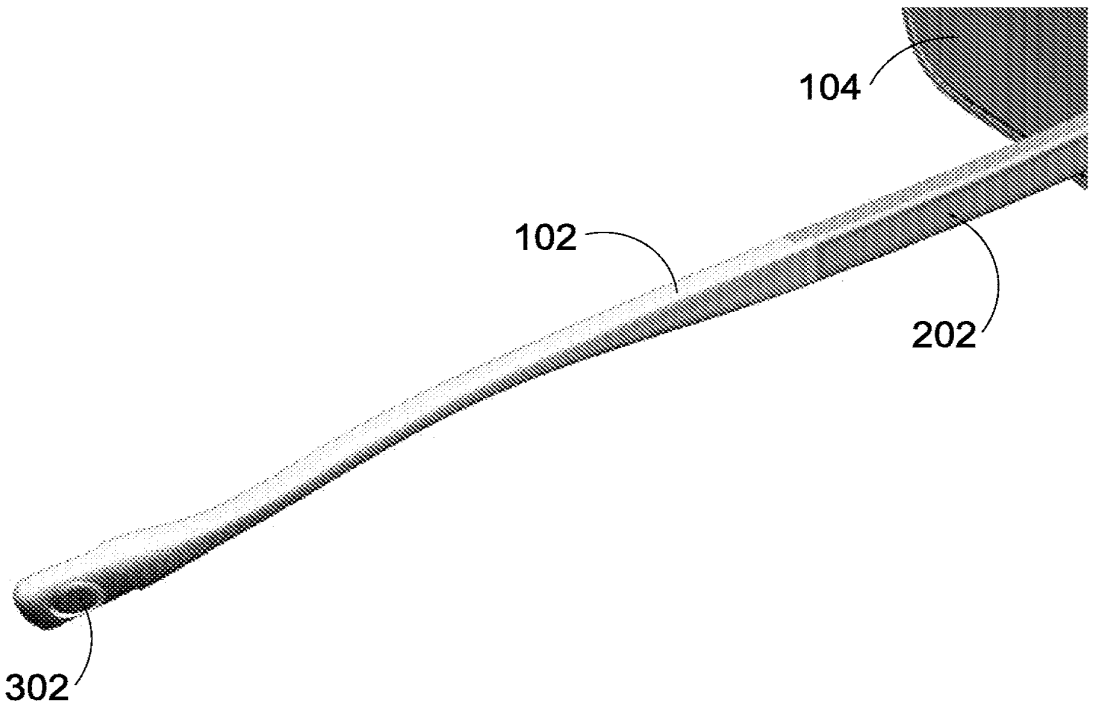


FIGURE 3

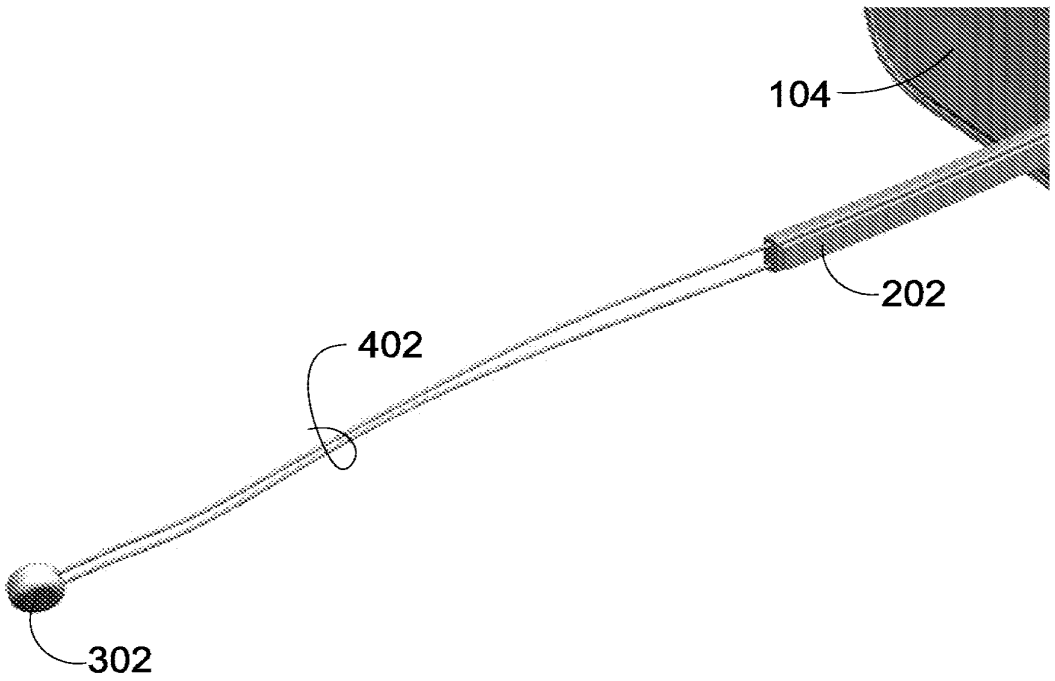


FIGURE 4

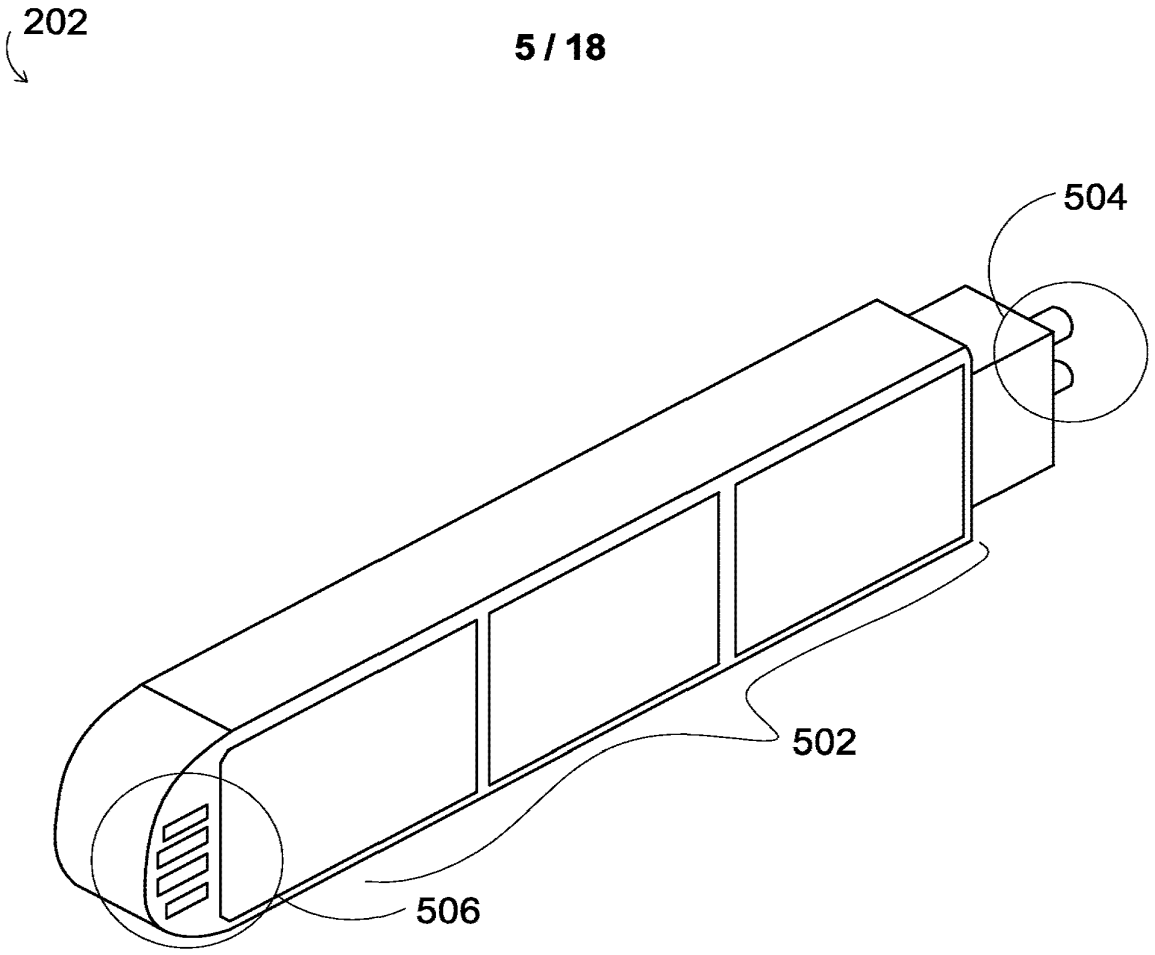


FIGURE 5

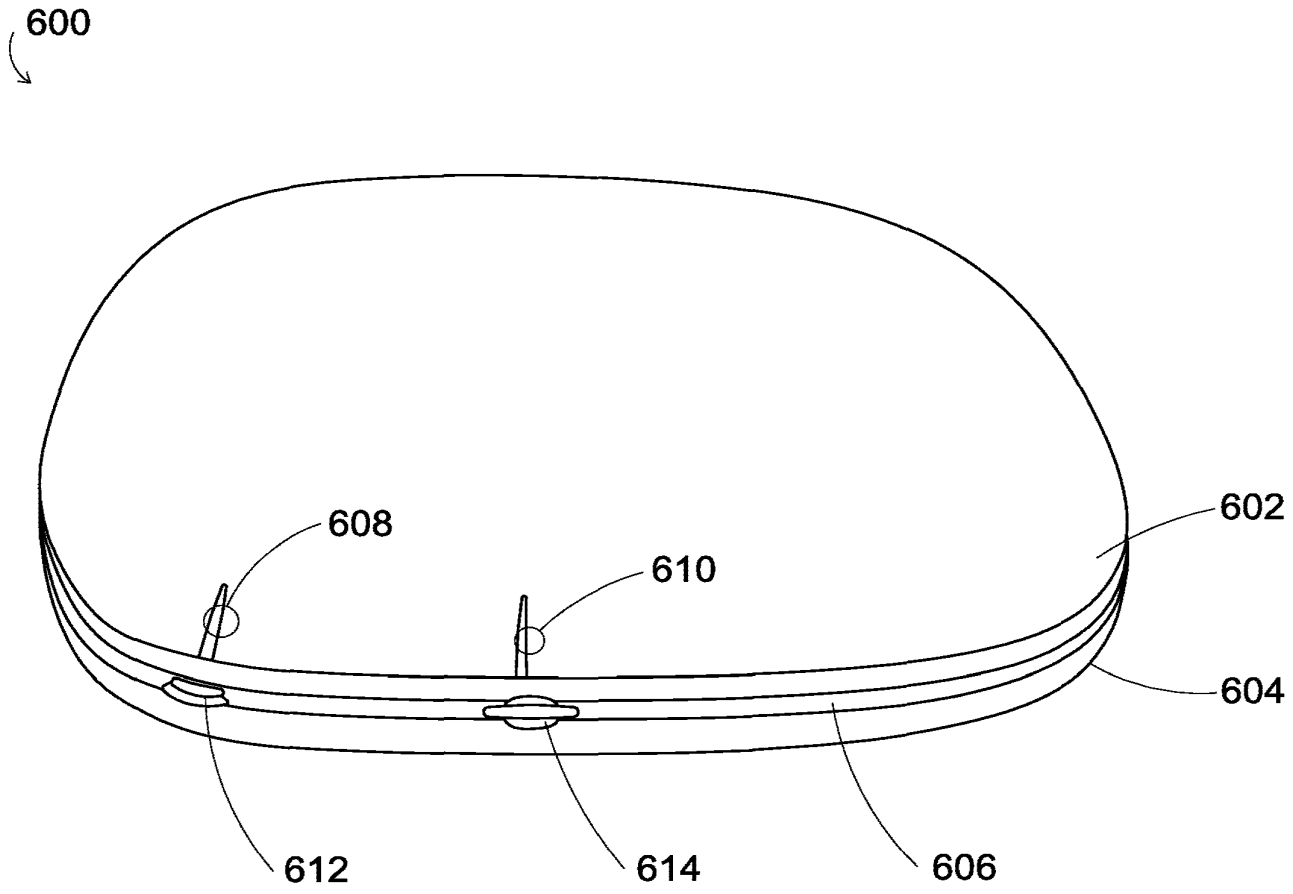


FIGURE 6

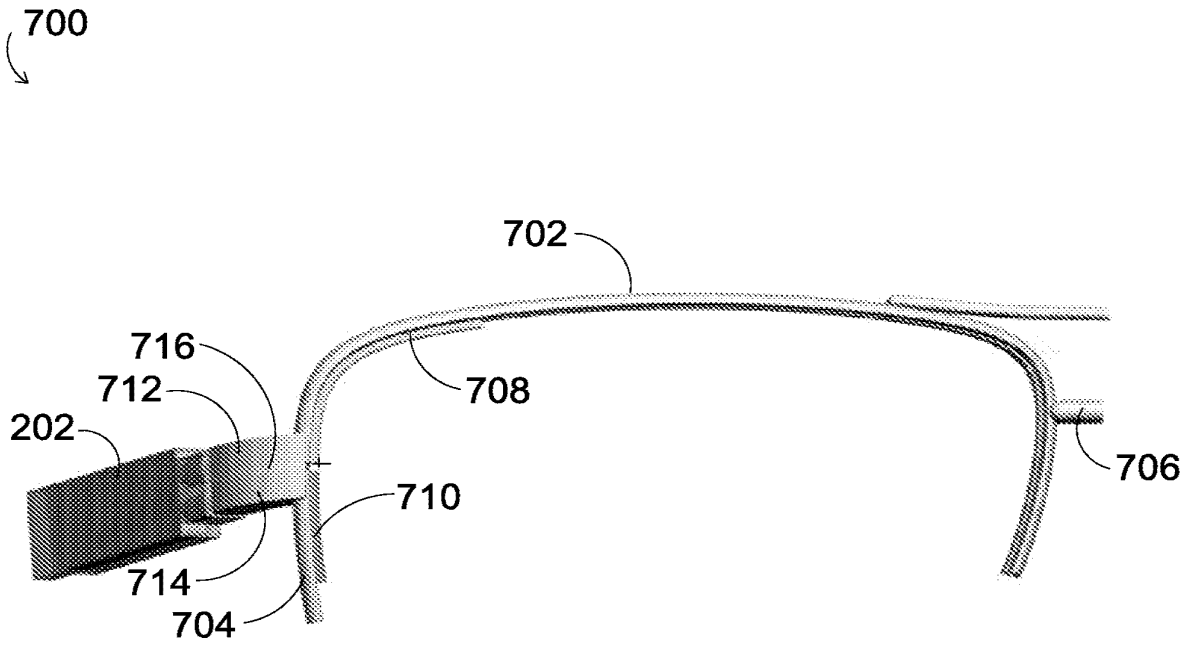


FIGURE 7

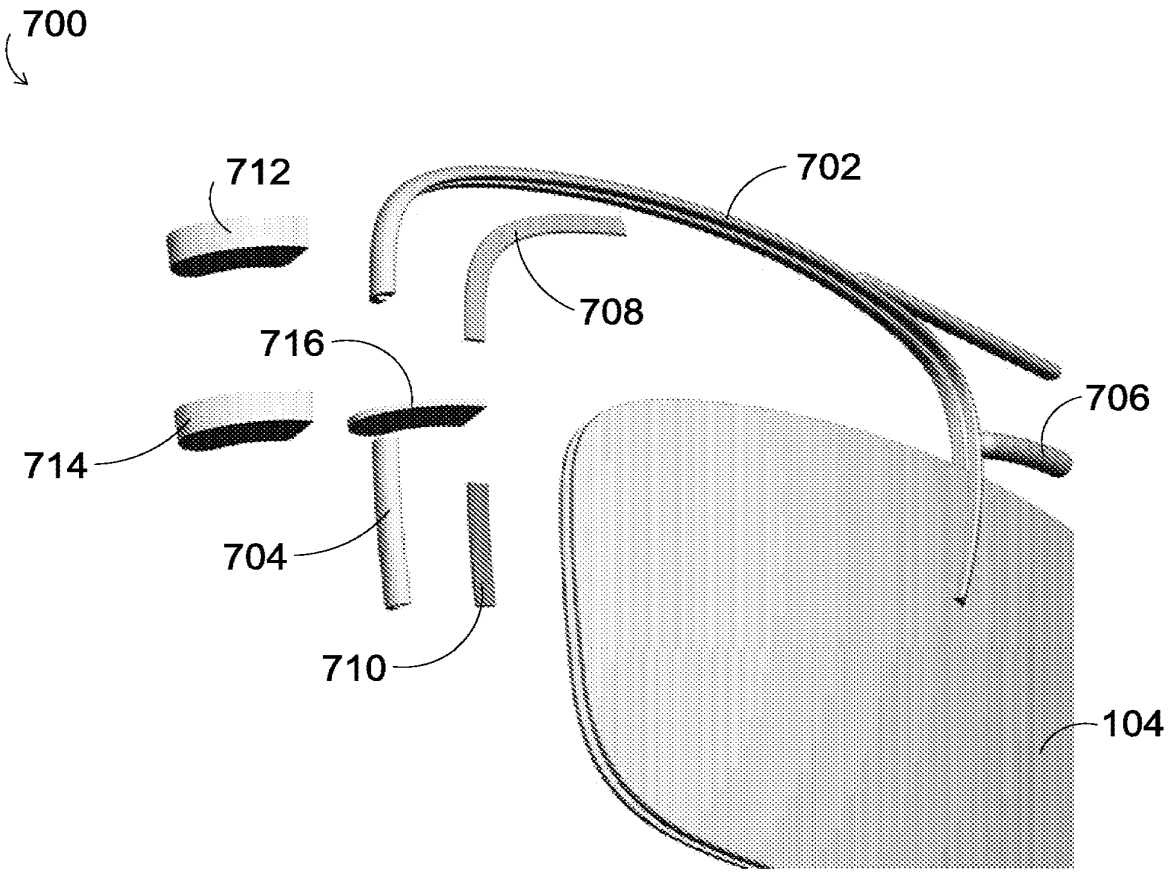


FIGURE 8

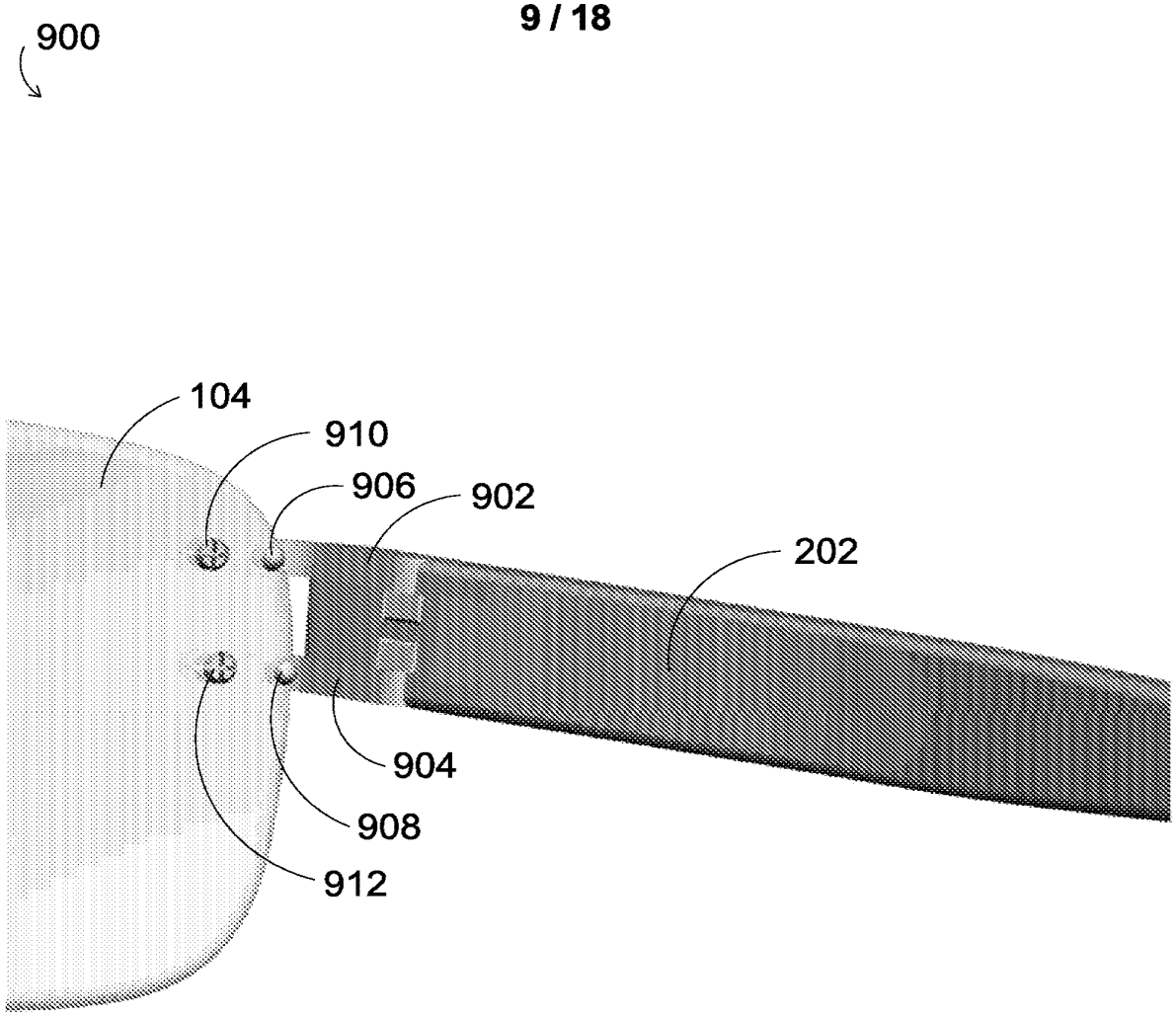


FIGURE 9

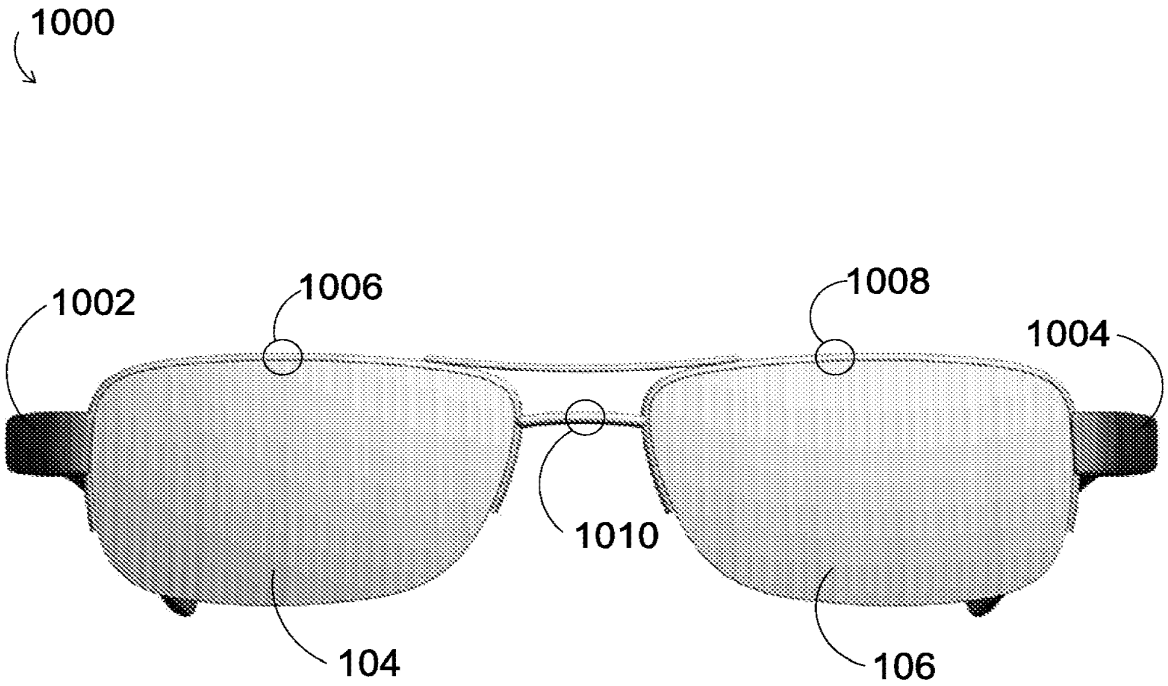


FIGURE 10

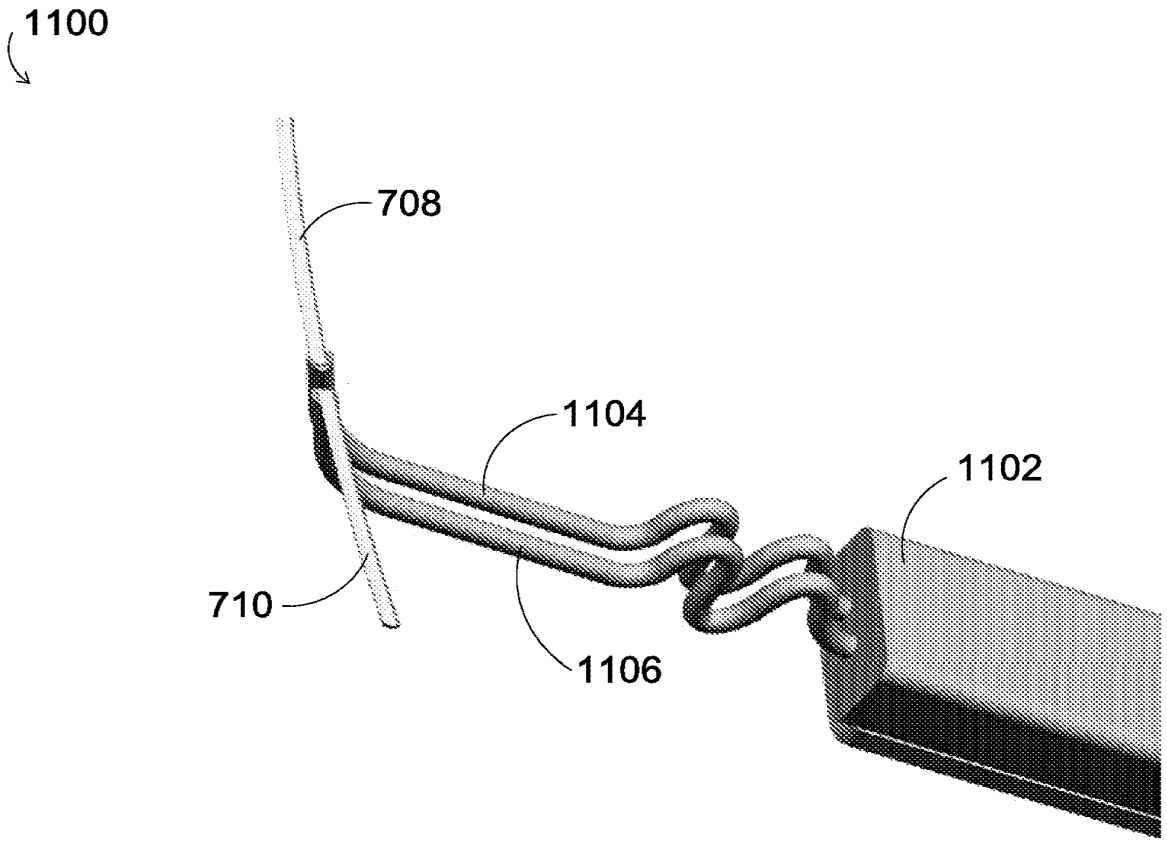


FIGURE 11

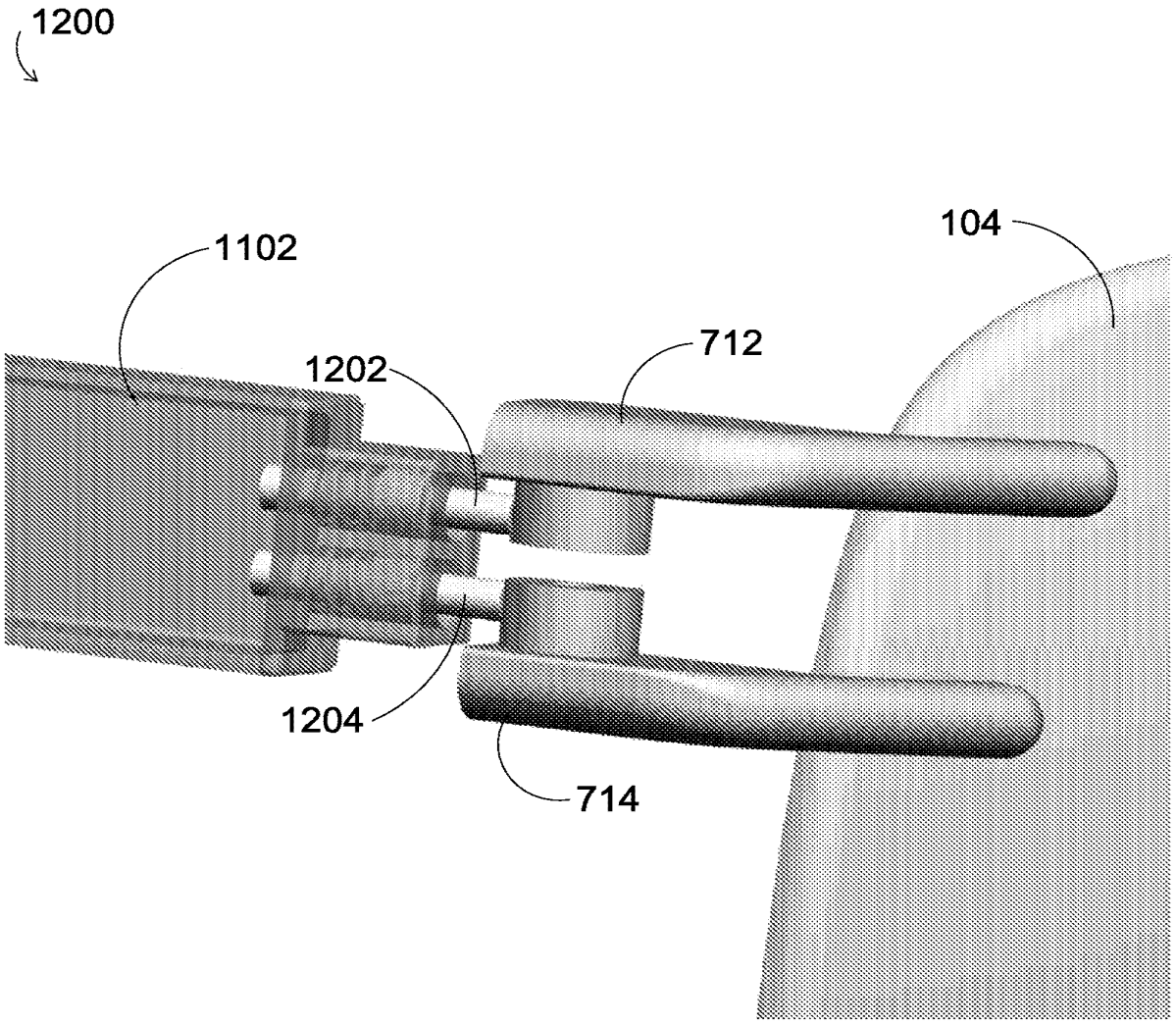


FIGURE 12

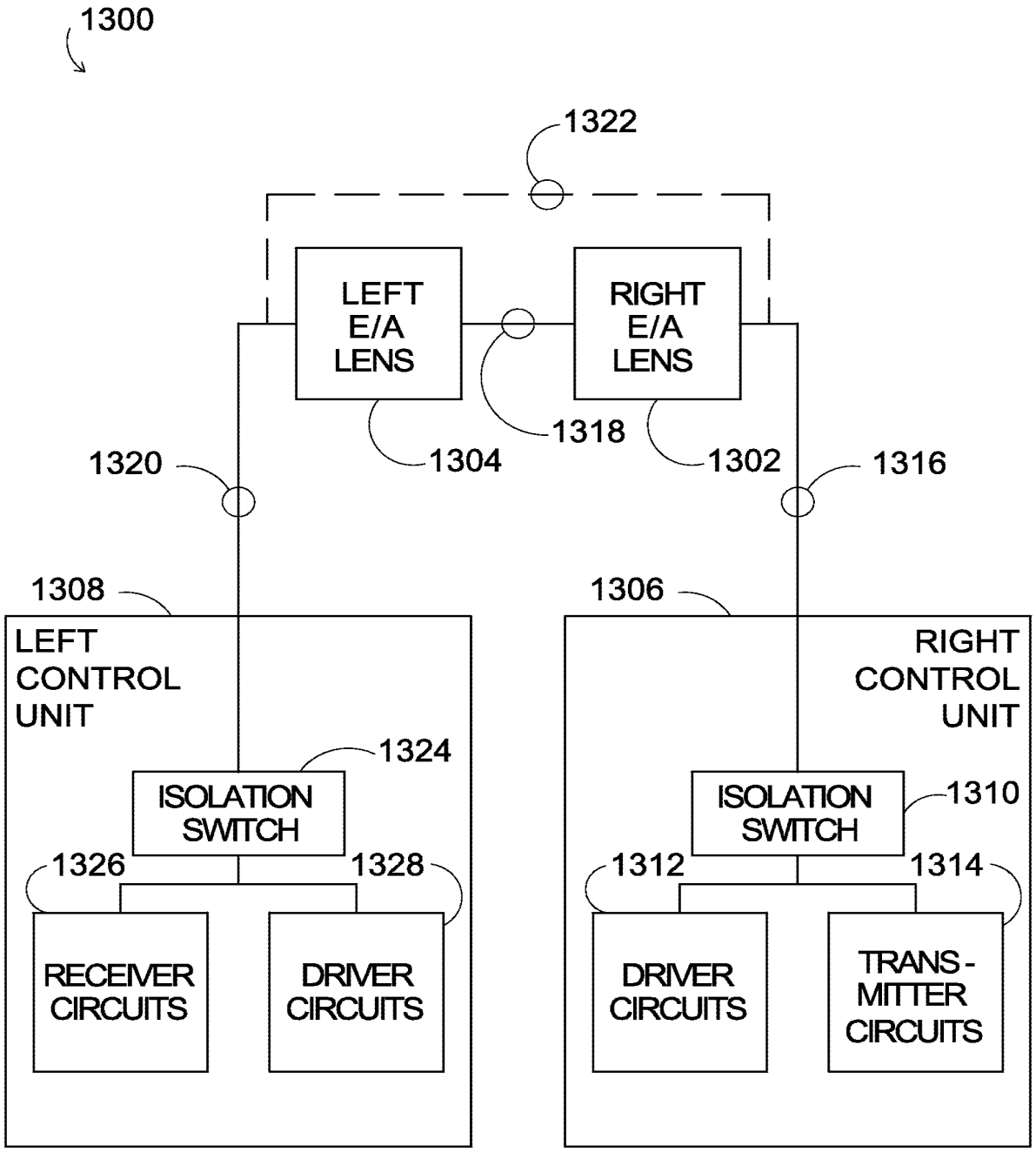

1300
1322
LEFT E/A LENS
RIGHT E/A LENS
1318
1304
1302
1320
1316
1308
1306
LEFT CONTROL UNIT
RIGHT CONTROL UNIT
1324
ISOLATION SWITCH
ISOLATION SWITCH
1310
1326
1328
1312
1314
RECEIVER CIRCUITS
DRIVER CIRCUITS
DRIVER CIRCUITS
TRANS-MITTER CIRCUITS

FIGURE 13

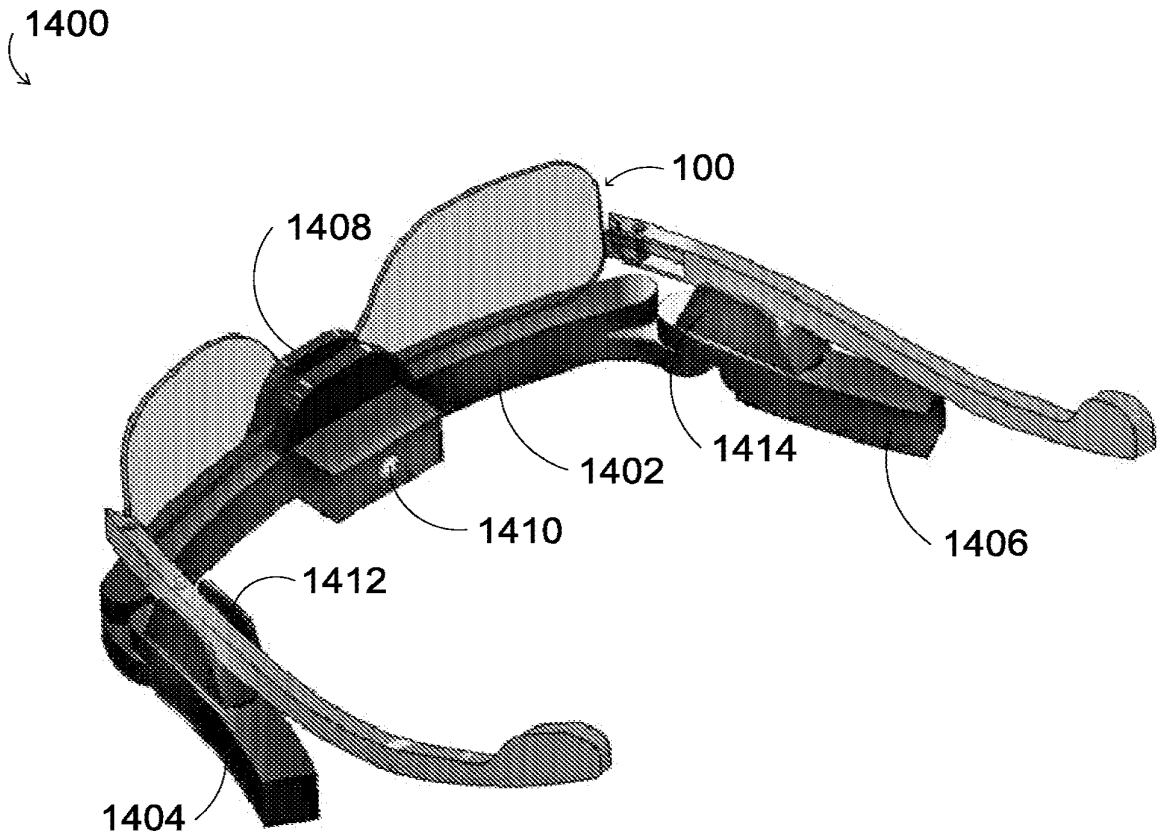


FIGURE 14

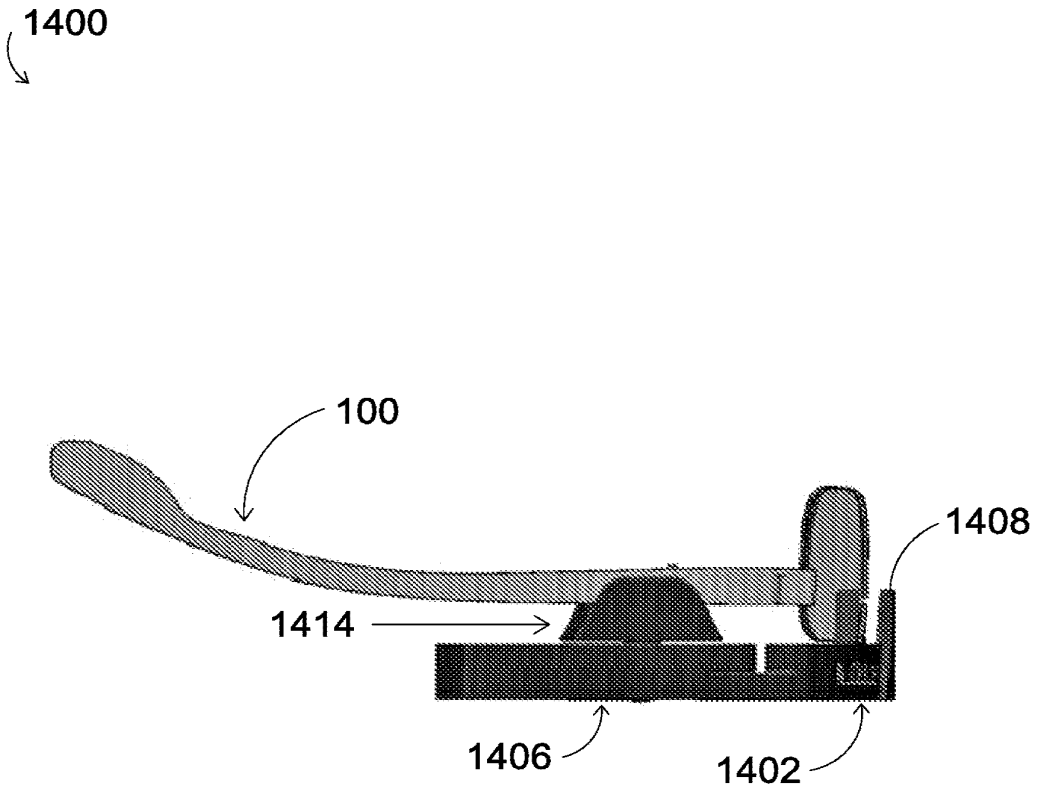


FIGURE 15

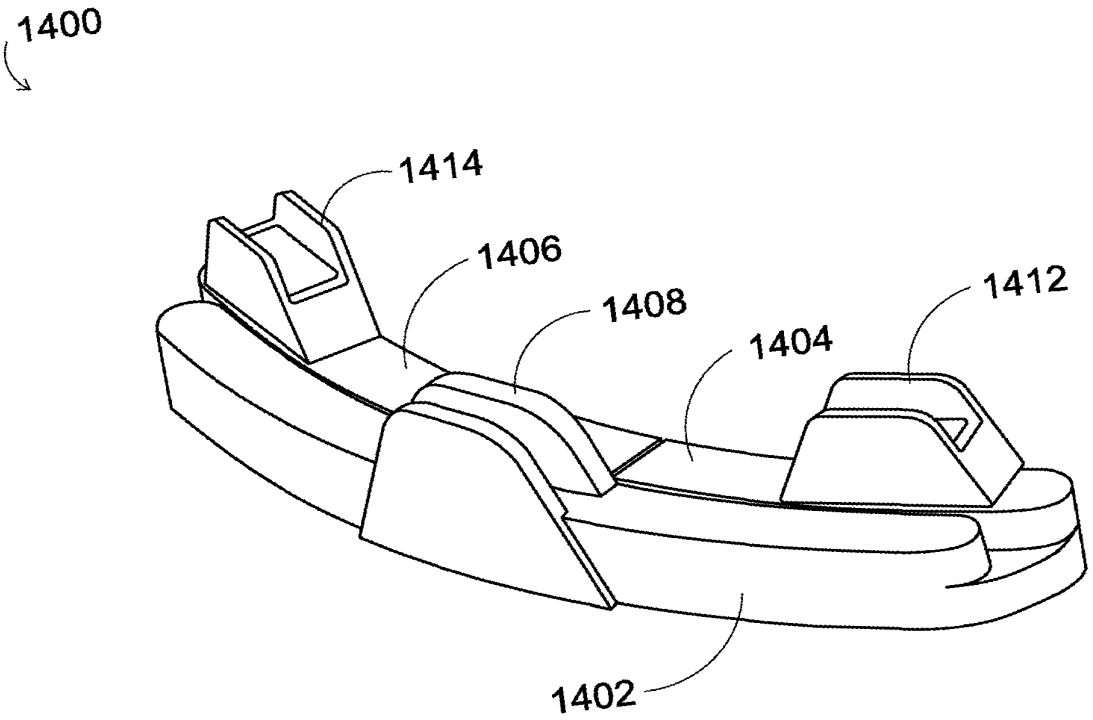


FIGURE 16

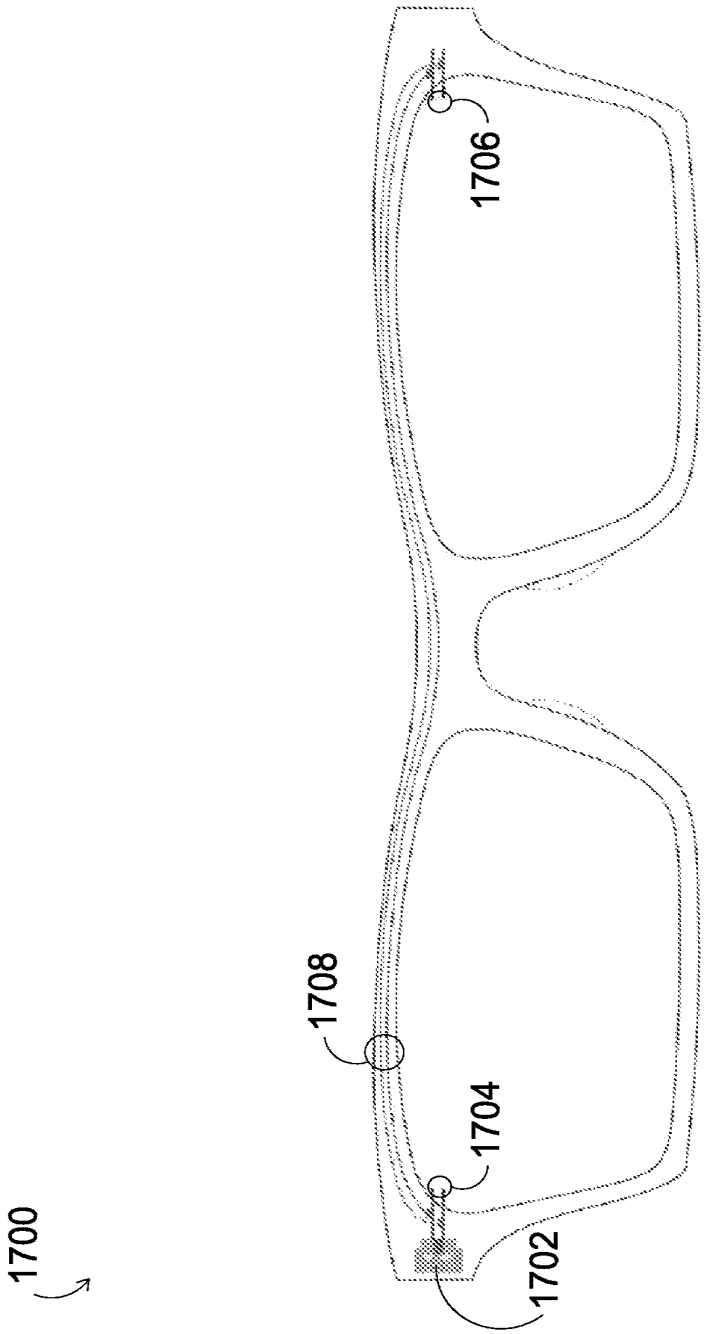


FIGURE 17

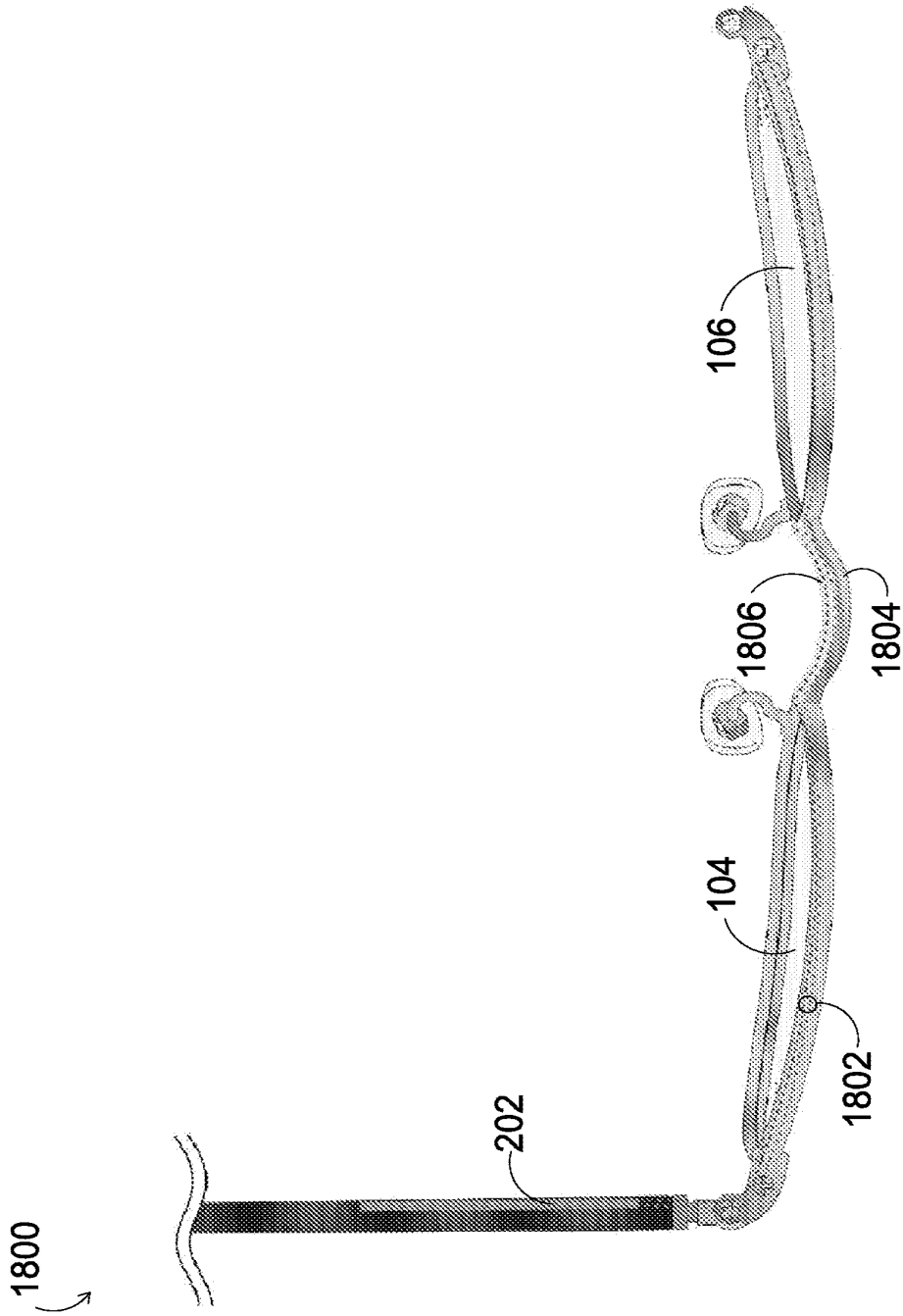


FIGURE 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/020498

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02C7/10 H02J7/00
ADD.

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)
G02C H02J

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, COMPENDEX, INSPEC, WPI Data

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 2008/273166 A1 (KOKONASKI WILLIAM [US] ET AL) 6 November 2008 (2008-11-06) paragraph [0078] - paragraph [0098]; figures 9C,10,11	1-4,23 5-14
X Y	WO 2008/002388 A2 (PIXELOPTICS INC [US]; BLUM RONALD D [US]; HADDOCK JOSHUA N [US]; DUSTO) 3 January 2008 (2008-01-03) paragraph [0027] - paragraph [0033]	24 5-8, 12-14, 25-34
Y	US 4 991 951 A (MIZUNO MITSUYOSHI [JP] ET AL) 12 February 1991 (1991-02-12) * abstract	9-11

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* 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 document 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
15 June 2010	25/06/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Girardin, François

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/020498

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2005/016057 A1 (LEWIS GENE LEE CHEYENNE [GB]) 24 February 2005 (2005-02-24) page 4, line 9 - line 14 figure 3	15-22
Y	WO 2006/126881 A2 (VARIBEL B V [NL]; VAN DER ZWAN JACOB [NL]; SIPKEMA MARCUS KAREL [NL]) 30 November 2006 (2006-11-30) figure 9A page 20, line 22 - page 21, line 13 page 23, line 23 - page 24, line 27	15-22
Y	US 5 455 638 A (KALLMAN WILLIAM R [US] ET AL) 3 October 1995 (1995-10-03) * abstract column 9, line 21 - line 40	25-34
A	US 2007/258039 A1 (DUSTON DWIGHT P [US] ET AL) 8 November 2007 (2007-11-08) paragraphs [0036], [0045]	1-14,23
A	WO 2006/086155 A2 (COLGATE PALMOLIVE CO [US]; WAGUESPACK KENNETH [US]) 17 August 2006 (2006-08-17) * abstract	17,18
A	WO 2008/051520 A2 (PIXELOPTICS INC [US]; KOKONASKI WILLIAM [US]; BOCHNOWSKI JAMES J [US];) 2 May 2008 (2008-05-02) the whole document	15-22
A	US 2004/156012 A1 (JANNARD JAMES [US] ET AL) 12 August 2004 (2004-08-12) paragraph [0125]	26-34

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/020498

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:

see additional 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 an 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.:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14, 23

   Electro-active frames and spectacles having an inductive charge area in one of the temples.

   ---

2. claims: 15-22

   An inductive charger for electro-active spectacles having two movable arms and one inductive charging area.

   ---

3. claims: 24-34

   Frame for electro-active spectacles and method of controlling such spectacles wherein a switch is used to switch the electro-active lenses/spectacles between at least two different states.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2010/020498

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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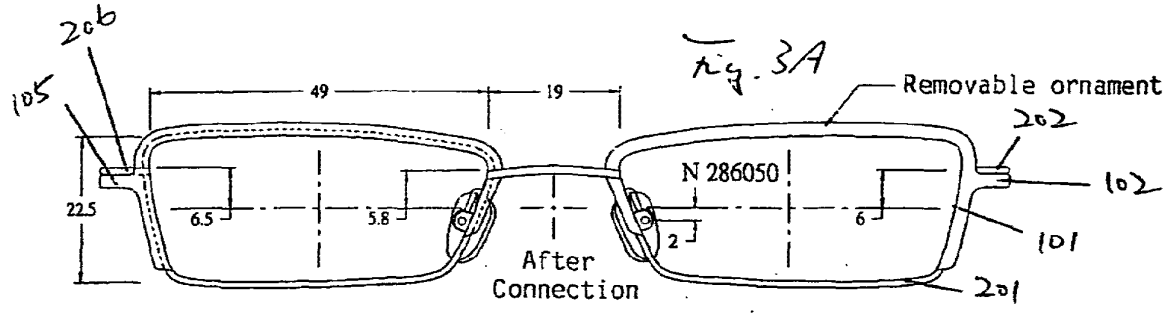
(71) Applicant: **Sunshine Optical Company Limited**
Tsuen Wan, New Territories, Hong Kong (CN)

(72) Inventor: **Chow, Yin Man**
Nos.11-19 Sha Tsui road
Tsuen Wan (HK)

(74) Representative: **Fuhlendorf, Jörn**
Patentanwälte
Dreiss, Fuhlendorf, Steimle & Becker,
Postfach 10 37 62
70032 Stuttgart (DE)

(54) Ornamentation for eyeglasses

(57) A detachable ornamental device with magnets for eyeglasses. The ornamental partial frame is designed similar to an eyeglass frame without lenses, and includes simply a rim and two magnets each positioned and embedded in a respective extension at the two ends of the rim of the ornament. The detachable ornamental device is attached in front of the primary eyeglasses. The primary eyeglasses are composed of lenses, in which a magnet is embedded in the studs positioned at the two ends of the connecting portions corresponding to the positions of the magnets of the ornamental partial frame. By way of the magnet attracting force, the ornamental device is attracted and secured by magnets to the eyeglasses for either clipping-on or clipping-off the studs.



EP 1 647 854 A1

Description

Field of the Invention

[0001] This invention relates to a detachable ornamental device with magnets, and more particularly, a pair of eyeglasses having an ornamental partial frame mounted thereon. The partial frame does not have lenses. The partial frame can be easily attached to and detached from an eyeglasses frame.

Background of the invention

[0002] Nowadays eyeglasses, no matter which frames are made of metal or plastic, sometimes using magnets to attach a pair of auxiliary sunglasses to a pair of primary eyeglasses. This is a very popular and common method for connecting two sets of eyeglasses. These magnetic clip-on or hook-on methods of connection have long been used to transform primary eyeglasses into sunglasses without changing the primary optical eyeglasses. One can simply dispose a pair of clip-on or hook-up auxiliary sunglasses in front of the primary optical eyeglasses. Very often, the attachment is merely a pair of sunglasses and is limited to certain prescriptions of eyeglass frames in order to match with the primary eyeglasses.

[0003] The present invention arises to provide a new and novel configuration to ordinary eyeglasses so as to match with one's taste and sense of fashion.

Summary of the Invention

[0004] In a first aspect of the present invention, a detachable ornamental device with magnets is provided, which comprises an ornamental, partial frame the appearance of which is similar to an eyeglass frame but with no lenses mounted thereon. A magnet is located at both ends of said ornamental partial frame. Eyeglasses composed of lenses and a frame having a magnet at both ends are used with the ornamental partial frame having no temple and lenses attachable to said eyeglasses.

[0005] A second aspect of the present invention is to provide a trendy fashion to eyeglasses in which one may change the pattern of one's primary optical eyeglasses by disposing said ornamental frame in front of the primary frame, whilst said ornamental frame can be made in whatever prescription or color in order to match with one's daily style of fashion. This inventive ornamental frame is different from that of ordinary auxiliary eyeglasses or sunglasses because it is basically an ornament and said ornament cannot be worn by itself in the absence of said ordinary eyeglasses.

This invention includes the following:

Firstly, a pair of primary eyeglasses, either made of metal or plastic materials, including two sides each having a stud on the connecting portion, in which a magnet is embedded, and said ornament for disposing in front of ordinary eyeglasses, wherein said ornament comprises two sides each having an extension extending backward, in which a magnet is embedded and for engaging with the studs of said primary eyeglasses for securing said ornament.

Secondly, this invention is to provide an ornament adapted to be attached to primary eyeglasses in a specific prescription.

Brief description of the drawings

[0006]

FIG. 1A is a plan view of an ornamental device designed similar to an eyeglass frame with a magnet embedded at the two ends of an ornamental partial frame showing one embodiment of the present invention.

FIG. 1B is a front view of FIG. 1A showing the extensions on both ends of the present invention.

FIG. 2A is a plan view of a pair of primary eyeglasses in which a magnet is embedded in the stud positioned at the connecting portion of said primary eyeglasses.

FIG. 2B is a front view of FIG. 2A.

FIG. 3A is a front view showing how said ornamental partial frame is secured to said primary eyeglasses by the magnets according to the present invention.

FIG. 3B is a side view of FIG. 3A.

FIG. 4 is a plan view of another embodiment of said ornament attached to said primary eyeglasses.

FIG. 5A is a front view of an ornamental device attached on a primary frame according to a second preferred embodiment of the present invention.

FIG. 5B is a side view of FIG. 5A.

FIG. 6 is a plan view of an ornamental device and eyeglasses attached together according to the above second embodiment of the present invention.

FIG. 7A is a front view illustrating an ornamental device mounted on the eyeglasses according to a third preferred embodiment of the present invention.

FIG. 7B is a front view of a plastic eyeglass ornament.

FIG. 8A is a front view of an ornamental device mounted on eyeglasses according to a fourth preferred embodiment of the present invention.

FIG. 8B is a front view of a plastic eyeglass ornamental partial frame showing the extension on both ends of the ornamental partial frame according to the above fourth preferred embodiment of the present invention.

FIG. 8C is an exploded view of the right extension of the ornamental partial frame and the right connecting portion of the eyeglasses, illustrating the positioning of the magnets according to the above fourth preferred embodiment of the present invention.

FIG. 9A is a front view of another plastic eyeglass ornamental partial frame.

FIG. 9B is a front view of a plastic eyeglass orna-

mental partial frame mounted on primary eyeglasses according to a fifth preferred embodiment of the present invention.

FIG. 9C is a plan view showing how said ornamental partial frame is secured to primary eyeglasses according to the above fifth embodiment of the present invention.

FIG. 9D is a sectional view taken along line 9D-9D in Figure 9B.

FIG. 10A is a front view of a plastic eyeglass ornamental partial frame mounted on primary eyeglasses according to a sixth preferred embodiment of the present invention.

FIG. 10B is a front view of the plastic ornamental plastic frame according to the above sixth preferred embodiment of the present invention.

FIG. 10C is a perspective view of the extension of the ornamental partial frame illustrating the positioning of the magnet according to the above sixth preferred embodiment of the present invention.

FIG. 11A is a front view of a plastic eyeglass ornamental partial frame having two projecting bend tabs with a magnet located at a terminal end of each bend tab.

FIG. 11B is a front view of the plastic eyeglass ornamental partial frame of FIG. 11A mounted on a pair of primary eyeglasses.

FIG. 11C is a plan view showing how the ornamental partial frame of FIG. 11A is secured to a pair of primary eyeglasses.

FIG. 11D is a perspective view illustrating the bending of the bend tab or projections of the ornamental partial frame of FIG. 11A.

FIG. 12A is a front view of a plastic eyeglass ornamental partial frame mounted on a pair of primary eyeglasses.

FIG. 12B is a front view of the ornamental partial frame shown in FIG. 12A.

FIG. 12C is a partial sectional plan view of the ornamental partial frame of FIG. 12B secured to a pair of primary eyeglasses as shown in FIG. 12A.

FIG. 12D is a sectional view of only the ornamental partial frame of FIG. 12B taken along line 12D-12D as shown in FIG. 12A.

Detailed description of the preferred embodiments

[0007] An eyeglass ornament with magnets of the present invention, referring to FIG. 1A and 1B, includes a device similar to an eyeglass frame 101, connecting portion 101, 105 at two end portion of the device 101 extending rearwardly, each having a stud 103, 106 fixed at the inner side of said connection portions 102, 105. A magnet 104, 107 is embedded in the respective stud 103, 106.

[0008] A pair of eyeglasses, in accordance with the present invention, comprises a primary frame 201, lenses 207, mounted within.the frame, connecting portions 202, 205 at two end portions of the frame 201 extending rearwardly, each having a stud 203, 206 fixed at the inner side of said connection portions 202, 205. A magnet 204, 207 is embedded in the respective studs 203, 206 for supporting the eyeglass ornament 101. The magnets 204, 207 are preferably in a round shape and both sides, upward and downward, may attract another magnet.

[0009] The eyeglass ornament 101, according to the present invention, can be made in any color, and the material employable is not specially limited. An eyeglass ornament 101 is attached to the front of said primary frame 201, namely, as shown in FIGS. 3 and 4, when said eyeglass ornament 101 is disposed in front of said primary frame 201, the magnets 104, 107 of said eyeglass ornament 101 are magnetically connected to the magnets 204, 207 of said primary frame 201. Thus, the appearance of said primary frame 201 can be changed when said eyeglass ornament 101 is put onto said primary frame 201.

[0010] From the above description, it can be understood that the application of the present invention is not limited to eyeglass frames made of metal but is also applicable to plastic eyeglass frames as shown in FIGS. 5 and 6. Referring to FIGS. 8A, 8B and 8C, another preferred embodiment of the present invention is illustrated, wherein a plastic ornamental frame 801 having two extensions 802, 803, 804, 805 at the two ends of said ornamental frame 801 extend backwardly and the two pairs of extensions 802/803, 804/805 parallel to each other form a gap 813, 814 between each other. As shown in FIG. 8C, more particularly, at the upper extension 802, 804 of said ornamental frame, a stud 811 is fixed to the inner side of the extension 802 with a magnet 812 embedded therein. The primary frame 807, having connection portions 805, 806 on both ends of the frame and another stud 808 is fixed to the inner side of the connecting portions 805, 806 with a magnet 812 embedded therein, supports the ornamental frame 801 by means of the magnet force of the interlocking system.

[0011] Referring to FIG. 7A and 7B, there is shown another arrangement that is similar to that of FIG. 8, with the exception that the ornamental frame 701 has one extension 702, 703 on each side and said ornamental frame 701 is mounted on primary frame 704 by attaching the extensions 702, 703 beneath the connecting portions 705, 706 of said primary frame 704.

[0012] Referring to Figures 9A, 9B and 9C, a plastic ornamental partial frame 300 is shown. The two ends 302, 304 of the frame include magnets embedded in the ends in an arrangement similar to that shown in Figures 1A and 1B such that the magnets 306, 308 projecting from a bottom surface of the ends 302, 304 interengage with an upper surface of magnets 310, 312 of a primary pair of eyeglasses 314.

[0013] This is best shown in partial sectional view 9C where the magnet 308 is seen sitting on top of magnet 312 at end 304 of the frame 300. Alternatively, in Figure 9C, the tabs 310, 312 can be made of metal to secure

the magnets 306, 308 to the tabs 310, 312 so as to secure the partial frame 300 to the eyeglasses 314 without the need for magnets in the tabs 310, 312 of the eyeglasses 314.

[0014] In addition, a step-like cut out portion 316 of bridge portion 318 is configured to rest on top of a bridge 320 of the eyeglasses 314. This provides additional support stability to the partial frame 300 mounted on the eyeglasses 314.

[0015] Referring to Figures 10A, 10B and 10C, a plastic ornamental partial frame 350 includes two ends 352, 354. Each of the ends includes a forwardly exposed magnet 356, 358 as shown in greater detail in Figure 10C. The partial frame 350 is positioned on top of a pair of eyeglasses 360 by positioning the portions of the frame including the magnets 356, 358 behind metal tabs 362, 364 so as to secure the magnets 356, 358 to the primary eyeglasses 360.

[0016] Referring to Figures 11A through 11D, a plastic ornamental partial frame 370 is shown having bridge portion 372. Extending from the bridge portion 372 are projecting tabs or projections 374, 376. Each of the tabs 374, 376 terminates in a magnet 378, 380, respectively.

[0017] To mount the partial frame 370 on a pair of primary eyeglasses 382, the tabs or projections 374, 376 are bent as best shown in Figure 11D in the direction of arrows 384 around the bridge portion 386 of the primary eyeglasses 382. The metal bridge portion 386 provides an anchoring of the partial frame 370 due to the attraction of the magnets 378, 380 to the bridge portion 386 of the eyeglasses 382.

[0018] Referring to Figures 12A through 12D, a plastic ornamental partial frame 400 includes a central bridge portion 402. Projecting rearwardly from the bridge portion 402 as shown in Figure 12C are two tabs 404, 406 each including an exposed downwardly surface of a magnet 408, 410, respectively. To mount the partial frame 400 onto a pair of primary eyeglasses 412, the magnets 408, 410 are attracted to a metal bridge portion 414 of the pair of eyeglasses 412. In addition, as was explained with reference to the embodiment of Figures 9A through 9D, the partial frame 400 include a stepped portion 416 which helps interengage the bridge portion 402 of the partial frame 400 with the bridge portion 414 of the pair of primary eyeglasses 412.

[0019] The foregoing description should be considered as illustrative only of the principles of the invention. Since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and, accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

Claims

1. A pair of eyeglasses comprising

   a frame having two opposite ends,
   a pair of lenses installed within and supported by said frame,
   a pair of connecting portions at each opposite end of said frame,
   a pair of studs fixed at an inner side of each of said connecting portions, and
   a pair of magnets, each being embedded within a respective one of said studs of said connecting portions.

2. The eyeglasses as recited in claim 1, wherein said connecting portions and said studs are made of metal.

3. An ornamental frame removably attachable to a pair of eyeglasses, said ornamental frame comprising:

   an at least partial eyeglass frame being made of one of metal and plastic material and being devoid of lenses,
   at least one pair of extensions at each end of said at least partial eyeglass frame,
   a pair of studs fixed at an inner side of each of said extensions, and
   a pair of magnets, each magnet being embedded within a respective one of said studs of said extensions for interengaging with metal portions of a pair of primary eyeglasses so as to aesthetically enhance an appearance of the pair of primary eyeglasses without affecting vision through lenses of the primary eyeglasses.

4. An ornamental frame removably attachable to a pair of eyeglasses, said ornamental frame comprising:

   an at least partial eyeglass frame devoid of lenses,
   two projections extending from the frame, and
   a magnet located in each of said two projections for releasably attaching the frame to a pair of eyeglasses so as to aesthetically enhance an appearance of the pair of eyeglasses without affecting vision through lenses of the pair of eyeglasses.

5. The ornamental frame as claimed in claim 4, wherein said two projections extend from opposite ends of said frame.

6. The ornamental frame as claimed in claim 4, wherein said two projections extend from a bridge portion of said frame.

7. The ornamental frame as claimed in claim 6, wherein said two projections are bendable around a bridge portion of the pair of eyeglasses.

8. The ornamental frame as claimed in claim 7, wherein said magnet is located in a terminal portion of each of said two projections of said frame.

9. The ornamental frame as claimed in claim 5, wherein said two projections are each bifurcated for receipt of a portion of the pair of eyeglasses therebetween.

10. The ornamental frame as claimed in claim 5, wherein said two projections extend under corresponding projections of the pair of eyeglasses.

11. The ornamental frame as claimed in claim 5, wherein said two projections extend behind corresponding projections of the pair of eyeglasses.

12. The ornamental frame as claimed in claim 5, wherein said two projections extend over corresponding projections of the pair of eyeglasses.

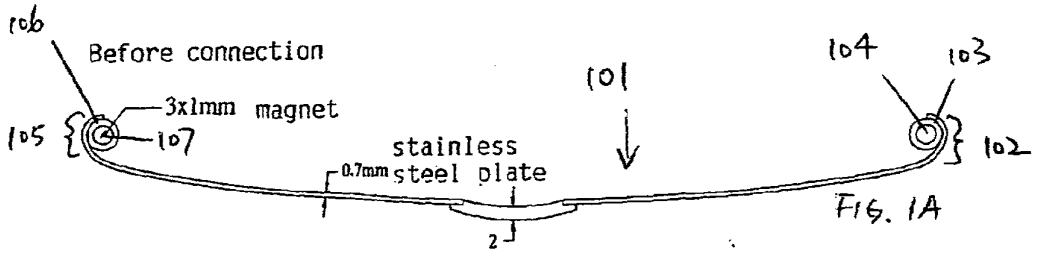


FIG. 1A

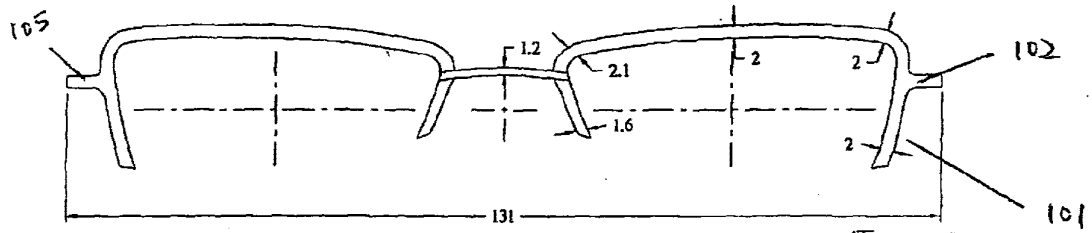


FIG. 1B

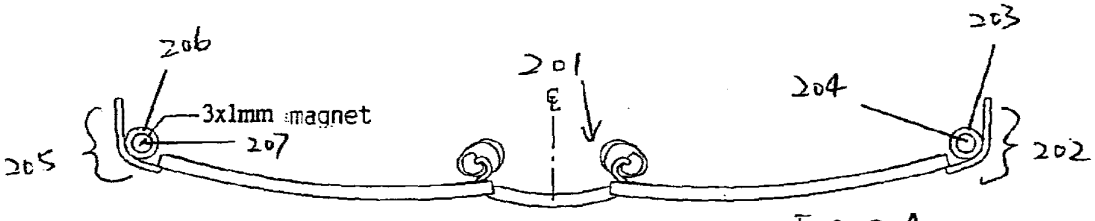


FIG 2A

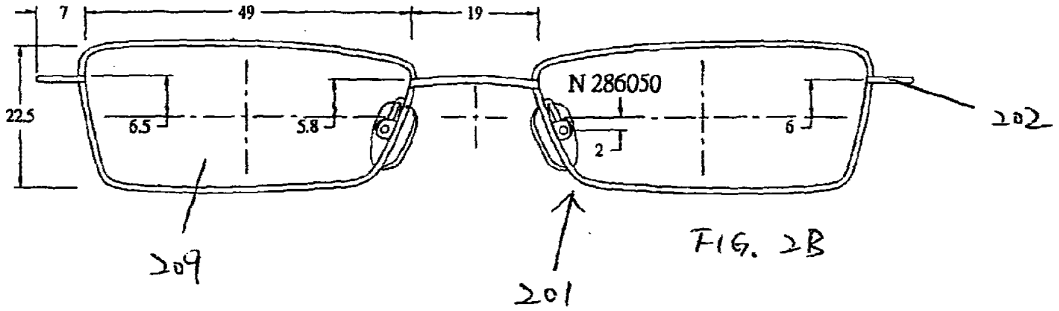


FIG. 2B

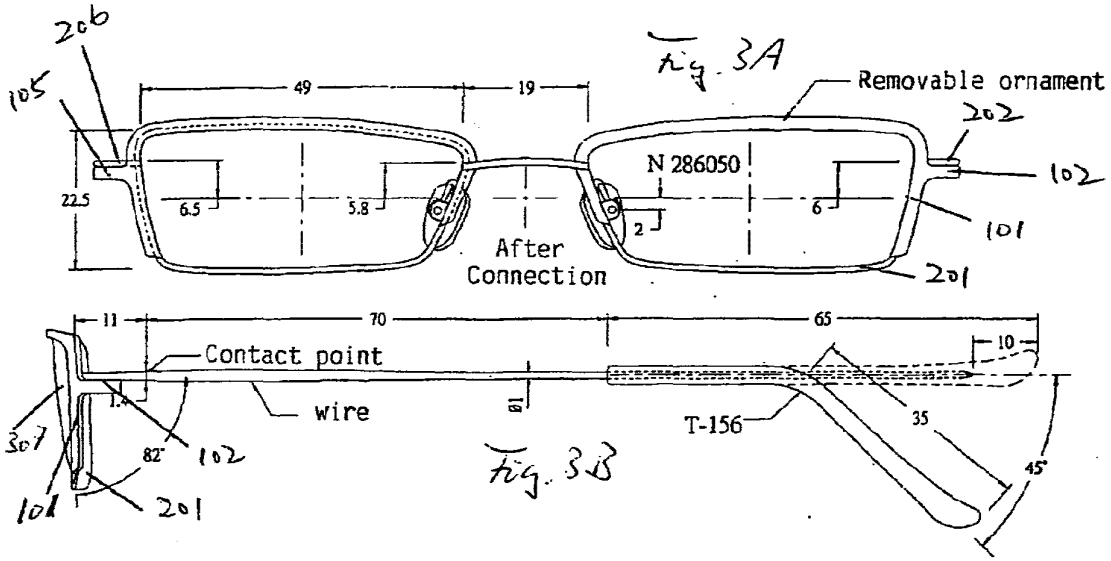


Fig. 3A

Fig. 3B

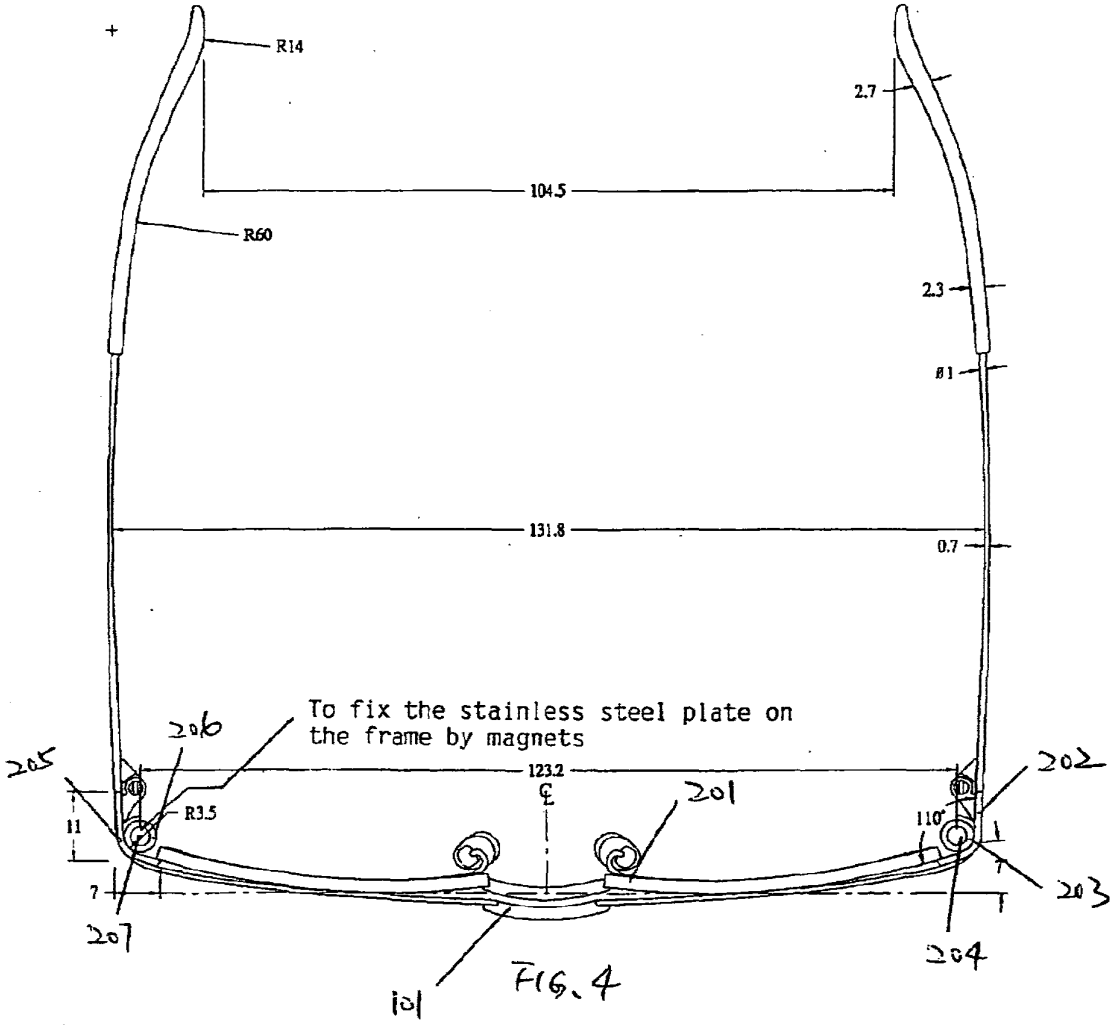


FIG. 4

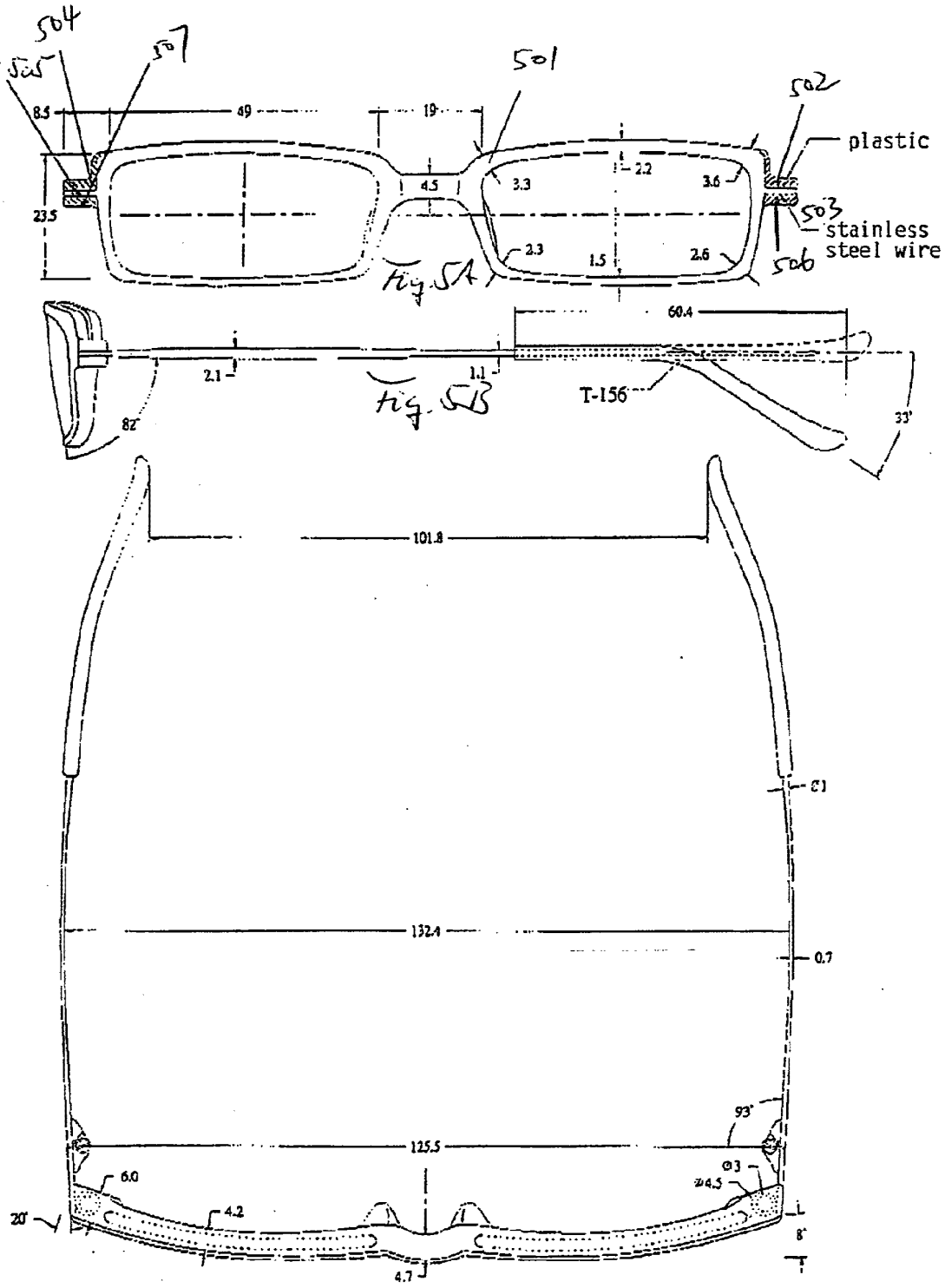

504
505
501
502
plastic
503
stainless steel wire
506
8.5
49
19
23.5
4.5
3.3
2.2
3.6
2.3
1.5
2.6
Fig. 5A
60.4
2.1
1.1
T-156
82°
33°
Fig. 5B
101.8
132.4
0.7
93°
125.5
6.0
4.2
4.7
20°
8°

Fig. 6

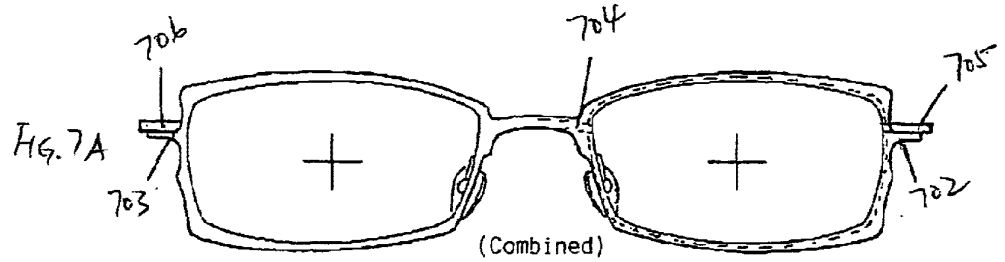


FIG. 7A

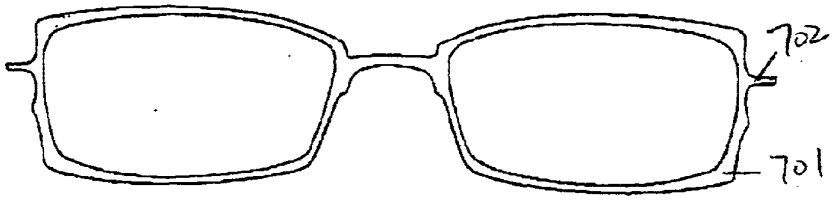


FIG. 7B

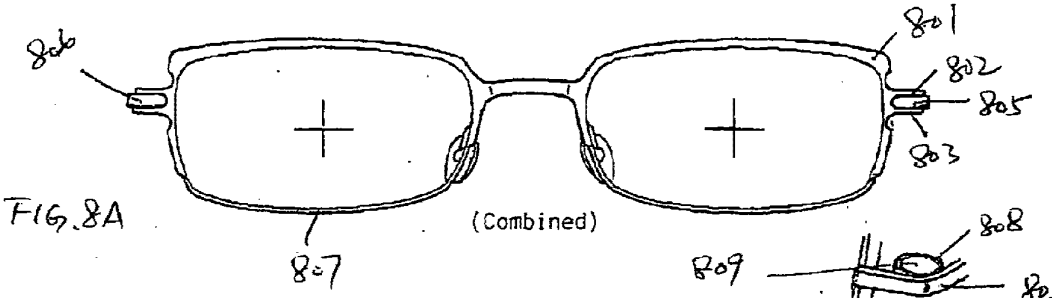


FIG. 8A

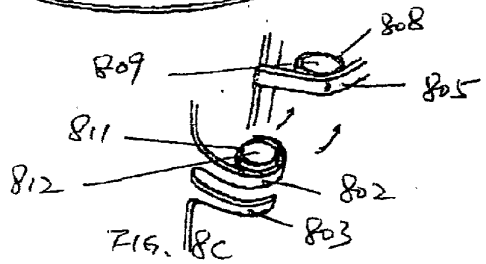


FIG. 8C

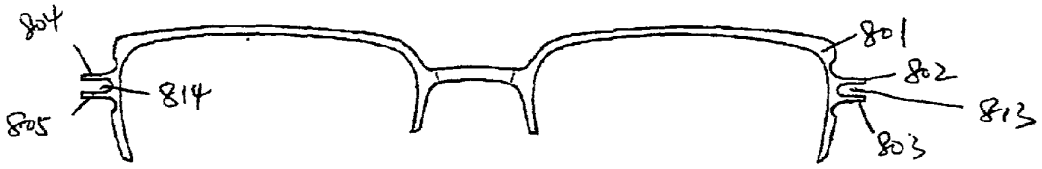


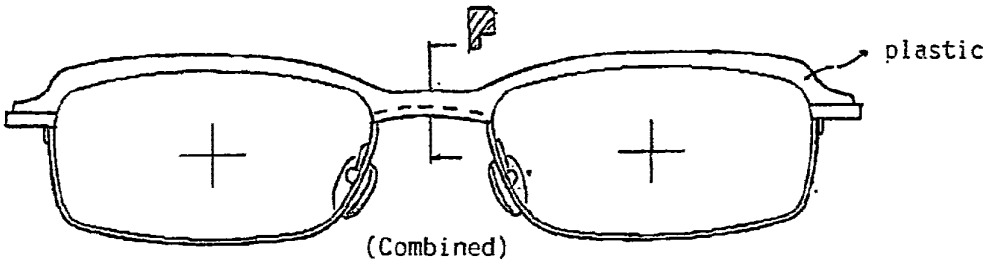
FIG. 8B

FIG. 9

FIG.9A



FIG.9B



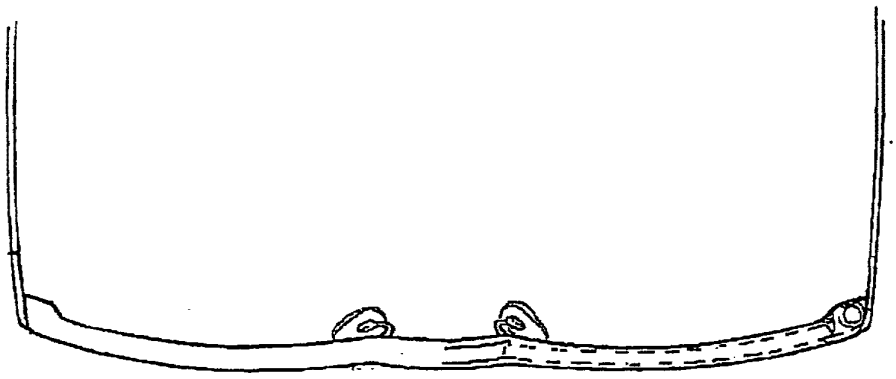


FIG. 9C

FIG. 10

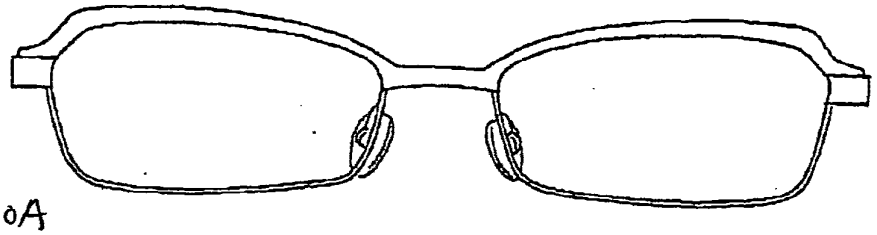


FIG. 10A



FIG. 10B

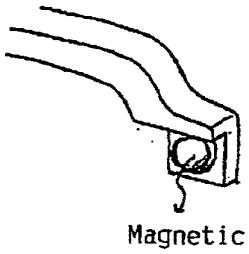


FIG. 10C

FIG. 11

FIG. 11A

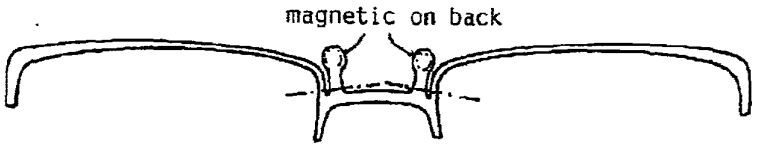


FIG. 11B

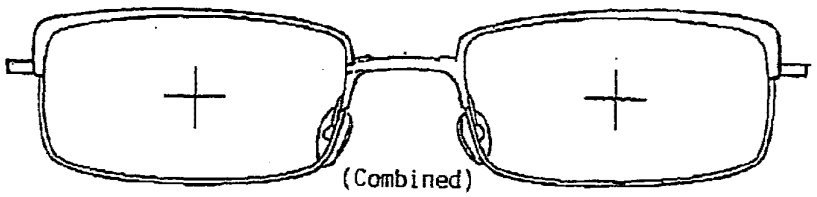


FIG. 11C



FIG. 11D

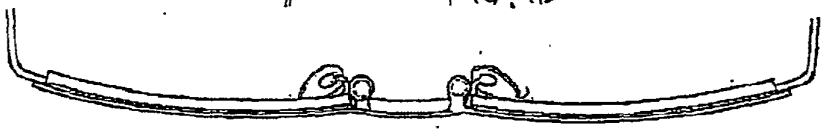


FIG. 12

FIG. 12A

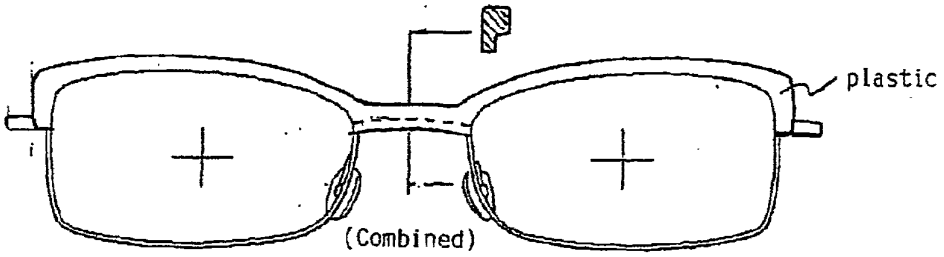


FIG. 12B



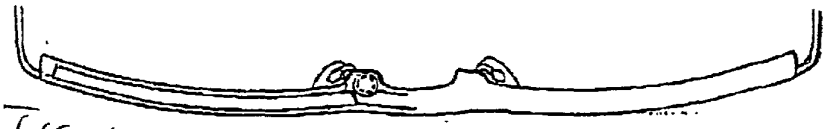


FIG. 12C

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 40 0067

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 December 2005	CALLEWAERT, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 40 0067

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-12-2005

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(71) Applicant and
(72) Inventor: **COZZANI, Laura Maria** [IT/IT]; Via Anzani, 16, 22040 Alzate Brianza (IT).

(74) Agents: **PELLEGRI, Alberto** et al.; c/o Società Italiana Brevetti S.p.A., Via Avegno, 6, I-21100 Varese (IT).

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WO 2009/098719 A1

(54) Title: SPECTACLES WITH LIGHT SOURCES FOR ILLUMINATING AN OBJECT OBSERVED THROUGH THE LENS AND RELATED EARPIECES

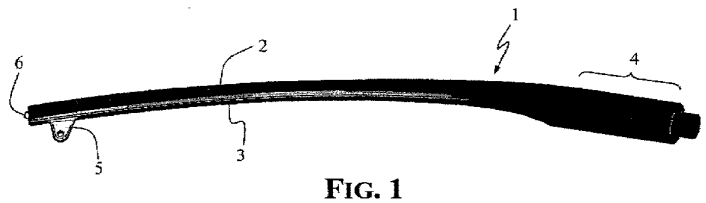


FIG. 1

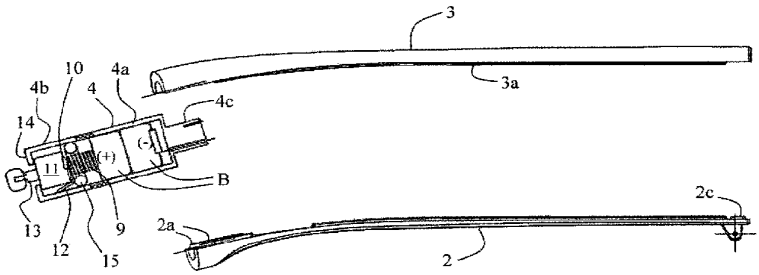


FIG. 2

(57) Abstract: Earpieces (1) for spectacles integrating a light source (6, 16) at its front end have at their free distal end a pre-constituted detachable module (4) containing at least a powering battery (B), a switch (11) and electrical connecting means to said light source (6, 16) and having a certain cross section and an end surface, through an opening (14) of which a control stem (13) of the switch projects. A pair of electrical supply wires (17, 18) of the light source run inside a slender front and proximal part of the earpiece, the cross section of which gradually increases as far as matching the enlarged cross section of the detachable distal end module (4). The front and proximal part of the earpiece may have a box-like structure composed of two channel cross section elements (2, 3) joined together for defining at least a conduit along which run the electrical supply wires (17, 18). Alternatively, the earpiece (1) is made in monolithic form defining in a distal part of enlarged cross section (Ia) a cavity adapted to receive a pre-constituted plug-in module (4) containing said battery (B), switch (11) and electrical connecting means (17b, 18b, partly enveloped by an end shell (Ib), through an opening (14) of which the control stem (13) of the switch projects.

"SPECTACLES WITH LIGHT SOURCES FOR ILLUMINATING AN OBJECT OBSERVED THROUGH THE LENS AND RELATED EARPIECES"

The present invention relates in general to spectacles with light sources for illuminating an object observed through the lens and in particular to earpieces of a spectacles frame incorporating a lighting device.

Endowing common spectacles of battery powered devices for illuminating an object observed through the lens is a practice that has been proposed and developed for a long time and that benefits from the availability of efficient LED type (acronym for Light Emitting Diode) light sources, which beside a high conversion efficiency of electrical energy to a light energy have far smaller sizes compared to the size of a classic miniature lamp. This is documented by the wealth of publications that describe different approaches and solutions to the problem of making spectacles frame with built in light sources.

CN 20061032873 discloses spectacles with LED incorporated in the front frame and in the earpieces.

CN 2906672YY discloses spectacles with LEDs incorporated in the front frame with earpieces, a part of which hinged to the front mask is hollow and accommodates a LED and related electrical hardware including a slider switch. The other part of the earpiece that plugs into the first part contains a powering battery.

GB-2411009 discloses spectacles with lighting LEDs installed at the front end of the earpieces as well as on the central bridge piece of the front frame of the spectacle. The earpieces contain a battery and a switch for turning on /off the LEDs and a jack or inductor coil for recharging the battery.

US-2003-086053 discloses lighting LED modules that may be mounted onto the earpieces of the spectacles.

WO 2007/008062 A1 discloses spectacles with light sources. A button type powering battery is introduced inside a slot cavity defined within the thickness of the earpiece that also includes a slider switch for turning on and off the battery powered LED. The LED are installed at the front end of the earpieces or in the front mask of the spectacles, in the latter case by realizing isolated sliding contacts within the connecting hinge.

These proposal and approaches have so far not been favored by the market because of a persistently poor ergonomicity and because the inevitable additional weight of the powering battery, being them rechargeable or primary batteries, of the LED and of the relative switches and other components of the electrical circuit makes tiresome to wear the spectacles for a long period of time because the increased weight bears for a substantial part of it on the nose of the bearer.

The miniaturized slider switches that is normally incorporated in the earpiece is difficult to locate and operate by relying on tactile sense while wearing the spectacles. The enlarging of the earpieces as far as necessary to accommodate the powering battery, the switch and the electrical hardware and connecting wing to the front LED, makes the general aspect of the worn eyeglasses not so pleasant. Fabrication of the earpieces and the realization at their interior of the electrical powering circuit of one or more LEDs is according to the known approaches rather laborious and costly.

It is a first object of the present invention to provide spectacles integrating light sources for illuminating an object observed through the lens with enhanced ergonomic characteristics and practicalness of use.

It is a further objective of this invention to provide spectacle earpieces integrating a light source and related powering circuit though preserving for the front and proximal part of their extension the aspect of common earpieces even of particularly slender cross section.

According to a first aspect of the present invention, a single light source is incorporated or mounted at the front end of the earpiece while the powering battery of the light source and a switch are accommodated in a terminal distal portion of the earpiece, substantially beyond the point of rest of the earpiece on the ear of the wearer of the spectacles, of enlarged cross section compared to the cross section of the front and proximal part of the earpiece. The extra weight of the powering module is born mainly by the ears, practically relieving from it the more sensible nose of the bearer.

According to another aspect of the present invention, turning on and off the light source is effected through a switch, the control stem of which projects from the end surface of the earpiece, to be immediately felt by the finger of the bearer and easily operated.

A further aspect of the present invention consists in that the connecting wires of the frontally installed light source to the electrical powering circuit components housed at the farther or distal end of the earpiece, run inside part of the earpiece having a box-like hollow structure composed by two channel cross section elements or semi-earpiece joined together.

The invention is defined in the annexed claims.

Figure 1 is a photographic rendering of an earpiece for spectacles integrating a light source of the present invention.

Figure 2 is an exploded view of an earpiece according to first exemplary embodiment.

Figures 3 and 4 are views showing respectively the two channel cross section semi-earpieces that compose the front and proximal part of the earpiece of Figure 2, coupled to a distal cartridge-shaped part of the earpiece containing the electrical powering devices.

Figure 5 shows enlarged details of the earpiece of the preceding figures.

Figure 6 is a schematic view of an earpiece made according to an alternative exemplary embodiment.

Figure 7 shows the other side of the earpiece of the Figure 6.

Figure 8 is an exploded view showing the way electrical contacts between a separable powering module and a two-wire connecting line to the front light source are established.

Figure 9 is an electrical diagram of the circuit incorporated in the earpiece of Figures 6-8.

Figures 10 and 11 are photographic renderings of a pair of spectacles with earpieces of Figures 1-5.

Figure from 1 to 5 illustrate a first exemplary embodiment of an earpiece for spectacles integrating a light source according to the present invention.

According to this first embodiment, the front and a proximal part of the earpiece 1 has a box-like structure resulting by joining channel cross section relatively slender semi-earpieces 2 and 3 and a distal part 4 of enlarged cross section compared to the front and proximal part of the earpiece.

From the external surface of the semi-earpiece 3 extends, in the example shown, a holed wing 5 which will eventually be engaged in a common fastening hinge of the earpiece to a front frame of the spectacles (not depicted in the Figure).

A light source is accommodated and retained in a front end recess defined by coupling together two channel-cross section semi-earpieces 2 and 3. Of the light source, typically a LED, in Figure 1 is observable only the terminal lens 6.

In the exploded view of Figure 2, the two channel cross section semi-earpieces 2 and 3 may be better observed and so is the geometry of the coupling perimeters provided with moldings 2a and 2b and 2c that are destined to engage themselves in specularly formed channels or recesses formed along the coupling perimeter of

the other semi-earpiece 3, which has a median longitudinal stiffening rib 3a the crest molding of which engages in a corresponding longitudinal recess formed along the crest of a corresponding longitudinal median rib formed in the first semi-earpiece 2, such that upon coupling together the two pieces, the inner space of the so-defined box-like structure is longitudinally divided, for a good portion of the length of the earpiece, in two distinct channels. Moreover, the median longitudinal ribs present along both channel cross section semi-earpieces 2 and 3 confer to the resulting hollow body an enhanced rigidity.

As may be observed, the distal end portion of the two semi-earpieces 2 and 3 is shaped such to confer to the distal end of this part of the earpiece of box-like structure a cross section that gradually increases as far as matching without any substantial discontinuity the enlarged cylindrical cross section of the distal part of the earpiece 4 which, in the illustrated example, comprises a cylindrical cartridge of aluminum or other light weight electrically conducting metallic material composed by telescopically screwing together two parts: respectfully a coupling end part 4a and an end or closing part 4b.

The coupling end part 4a has a central tail 4c transversed by a hole 7 for receiving a blocking pin passed across the tailed portion 4c, after having introduced it inside an end receptacle defined by the two semi-earpieces 2 and 3 joined together and at least the wall of one or of both the two semi-earpieces, according to common assembling practices.

The cartridge 4 contains at least one, in the depicted example two, button type batteries B in series held by a metal spring 9 that establishes also the electrical connection between the positive terminal (+) of the series of two batteries B to a first lead 10 of a push-button switch 11, a second lead 12 of which is bent in order to establishing electrical contact with the metal cartridge 4 itself. The control stem 13 of the switch emerges through an opening of the end face 14 of the distal cartridge part 4 of the earpiece 1.

A common O-ring 15 stops and sustains in position the switch 11.

Figures 3 and 4 show the end cartridge 4 respectfully associated to one and to the other of the two semi-earpieces 2 and 3 that compose the box-like front and proximal part of the earpiece.

In Figure 4 that shows the terminal cartridge 4 and the semi-earpiece 3 may be observed the front end LED 16, held between the tongued ends of the two semi-earpieces, and the pair of connecting wires respectively running in the two channels defined in the interior of the box-like structure of the earpiece. The wire 17 connects the respective lead of the LED 16 to the metallic bulk of the cylindrical cartridge 4 that is short circuited through the switch 11 to the positive pole of the series of two button batteries B by the bent lead 12. The other wire 18, optionally provided with an isolating sleeve, passes through a longitudinal hole purposely formed in the tail 4c and establish an electric contact with the negative pole of the series of batteries B.

Details of the electrical paths may be better observed in the enlarged view of Figure 5.

Figures 6, 7 and 8 are schematic views in transparency of an earpiece of the present invention according to an alternative embodiment employing a single button battery B and a switch 11 of the so-called slider type instead of a push button switch of the prior embodiment and further implementing a different way of establishing the electrical connection between the powering and control elements contained at the free or distal end of the earpiece and a LED incorporated at the front end of the earpiece.

According to this alternative embodiment, the earpiece 1 of thermoplastic material may be formed in a mold in a substantially "monolithic" form, such to incorporate in the molded resin the front LED (which of course will only be partially encapsulated in the molded resin), a pair of conducting wires 17 and 18 for the powering of the LED 16 and two semi contacts 17a and 18a, to which the ends of the two wires 17 and 18 are connected. The semi contacts 17a and 18a are

partially embedded in the resin at the bottom of the cavity of a hollow portion of enlarged cross section 1a of the molded earpiece.

A plug-in part 4 that is eventually inserted in side the cavity of the hollow portion 1a of the molded resin earpiece is a pre-constituted assembly or module, the portion of which that is received into the end cavity of the molded earpiece has on its lead surface two semi contacts 17b and 18b that establish electric contacts with the respective partially embedded terminations 17a and 18a of the pair of conducting wires incorporated in the molded resin. A secure electrical contact between the two pairs of semi contacts 17a-17b and 18a-18b, may be ensured by making the pair of semi contacts 17a and 18a of termination of the respective wires 17 and 18 incorporated in the molded resin of a ferromagnetic metallic material and the pair of semi contacts 17b and 18b with permanent magnets of an electrical conducting material. The magnetic attraction force beside ensuring a stable electrical contact also retains the pre-assembled module 4 once it is pushed fully inside the end cavity of the molded earpiece.

The pre-constituted end module 4 adapted to be at least partly received inside the end cavity of the molded earpiece houses a button battery B, the negative pole (-) of which is connected to the semi-contact 18b. The positive pole (+) is connected to the common lead of a slider switch 11, while the "output" lead 12 of the switch 11 is electrically connected to the semi-contact 17b on the lead surface of the plug-in module 4 pushed inside in the cavity, as shown in Figure 9.

A shell 1b of the same plastic material with which is formed the molded front and proximal part of the earpiece 11 encapsulates the switch 11, the relative connecting leads or pins 10 and 12 and the plastic housing of the battery B and of the semi contacts 17b and 18b, letting protrude through a narrow slot 14 present on the terminal surface of the shell 1b, the control stem 13 of the slider switch 11.

Alternatively, a secure electrical contact between the semi contacts pairs 17a-17b and 18a-18b, may be ensured by making the pair of semi contacts 17b and 18b in the form of mobile metallic buttons with biasing springs, installed in respective

cavities of the plastic housing of the battery. In this case, the retention of the module 4 plugged inside the end cavity of the molded front and proximal parts of the earpiece, may be ensured by common snap-action moldings or tonguings that are forcibly engaged exploiting the elastic memory of the cooperating geometric details formed in the molded material of which is made at least one of the two joinable parts, according to common practices of pre-arrangement of lockable features in separable parts of an assembled piece.

Figures 10 and 11 are photographic rendering of spectacles of the present invention employing earpieces according to the embodiment of Figure 1-5.

As will be obvious to an informed reader, the battery or series of batteries used as sources of electrical energy for powering the light source, typically a LED, may be primary batteries, replaceable upon exhaustion, or alternatively they may be rechargeable batteries.

In the latter case, it may be contemplated the presence in the earpiece of a common jack for connection to an external battery charger or an embedded coil (secondary of an air transformer) and relative battery charging circuit powerable in a "contactless" fashion by an external device having a coil (primary of an air transformer) driven at high frequency mutually coupled to the embedded coil, according to common practices of contactless recharging of an embedded rechargeable battery of the earpiece.

CLAIMS

1. Spectacles with light sources, connected in a powering circuit comprising a battery and an on/off switch, for illuminating an object observed through the lens of the spectacles, having earpieces hingedly connected to a front frame, characterized in that

each earpiece has at its free distal end a pre-constituted detachable module containing said battery, said switch and electrical connecting means of a certain cross sectional size and having an end surface, through an opening of which a control stem of the switch projects;

a pair of electrical supply wires of at least one light source present at the front end of the earpiece run inside a front and proximal part of the earpiece having a cross section that gradually increases as far as matching the cross section of said detachable distal end module.

2. The spectacles according to claim 1, wherein said earpieces have a box-like structure comprising two channel cross section semi-earpieces joined together defining at least a conduit inside which runs said pair of electrical supply wires of a LED held at the front end of the earpiece.

3. The spectacles according to claim 2, wherein said two channel cross section semi-earpieces joined together to constitute said front and proximal part of the earpiece have a slender cross section than the cross section of said detachable distal end module of the earpiece.

4. The spectacles according to claim 3, wherein said module is a metallic cartridge composed by a first half cartridge having a tail insertable inside a distal cavity of said box-like structure part of the earpiece formed by two semi-earpieces joined together and by a second half cartridge screwed to said first half cartridge and having an opening through its end surface through which a control stem of the switch projects;

said pre-constituted detachable cartridge containing said switch, powering battery and electrical connection means to said pair of electric supply wires of said LED.

5. The spectacles according to claim 1, wherein

said earpieces are made in a monolithic form defining in a distal part of enlarged cross section a cavity adapted to receive a pre-constituted plug-in module containing said battery, switch and electrical connecting means, partly enveloped by an end shell, through an opening of which the control stem of the switch projects;

said electrical connection means comprising a pair of semi contacts adapted to contact respective semi contacts of termination of said pair of supply wires, of the light source partly embedded in the material of the formed monolithic earpiece at the bottom of said cavity.

6. The spectacles according to claim 5, wherein the electrical contact between said semi contact pairs is ensured by biasing springs acting on semi contacts present on the lead surface of said plugged-in module introduced a blocked inside said cavity.

7. The spectacles according to claim 5, wherein the electrical contact between said semi contact pairs is ensured by making said pair of terminations semi contacts with a ferromagnetic metallic material and said pair of semi contacts present on the lead surface of said plugged-in module with two permanent magnets of an elastically conducting material.

8. An earpiece for spectacles integrating a light source at its front end having at its free distal end a pre-constituted detachable module containing at least a powering battery, a switch and electrical connecting means to said light source and having a certain cross sectional size and an end surface, through an opening of which a control stem of said switch projects;

a pair of electrical supply wires of said light source present at the front end of the earpiece run inside a front and proximal part of the earpiece having a cross section that gradually increases as far as matching the cross section of said detachable distal end module.

9. The earpiece according to claim 8, characterized in that said front and proximal part has a box-like structure composed of two channel cross section elements joined together for defining at least a conduit inside which runs said pair of electrical supply wires of a LED held at the front end of the earpiece.

10. The earpiece according to claim 9, wherein said two channel cross section elements joined together to constitute said front and proximal part of the earpiece have a slender cross section than the cross section of said detachable distal end module of the earpiece.

11. The earpiece according to claim 10, wherein said module is a metallic cartridge composed by a first half cartridge having a tail insertable inside a distal cavity of said box-like structure part of the earpiece formed by two elements joined together and by a second half cartridge screwed to said first half cartridge and having an opening through its end surface through which a control stem of the switch projects;

said pre-constituted detachable cartridge containing said switch, powering battery and electrical connection means to said pair of electric supply wires of said LED.

12. The earpiece according to claim 8, characterized in that

it is made in a monolithic form defining in a distal part of enlarged cross section a cavity adapted to receive a pre-constituted plug-in module containing said battery, switch and electrical connecting means, partly enveloped by an end shell, through an opening of which the control stem of the switch projects;

said electrical connection means comprising a pair of semi contacts adapted

to contact respective semi contacts of termination of said pair of supply wires, of the light source partly embedded in the material of the formed monolithic earpiece at the bottom of said cavity.

13. The earpiece according to claim 12, wherein electrical contact between said semi contact pairs is ensured by biasing springs acting on movably held semi contacts present on the lead surface of said plugged-in module introduced and blocked inside said cavity.

14. The earpiece according to claim 12, wherein the electrical contact between said semi contact pairs is ensured by making said pair of terminations semi contacts of a ferromagnetic metallic material and said pair of semi contacts present on the lead surface of said plugged-in module with two permanent magnets of an electrically conducting material.

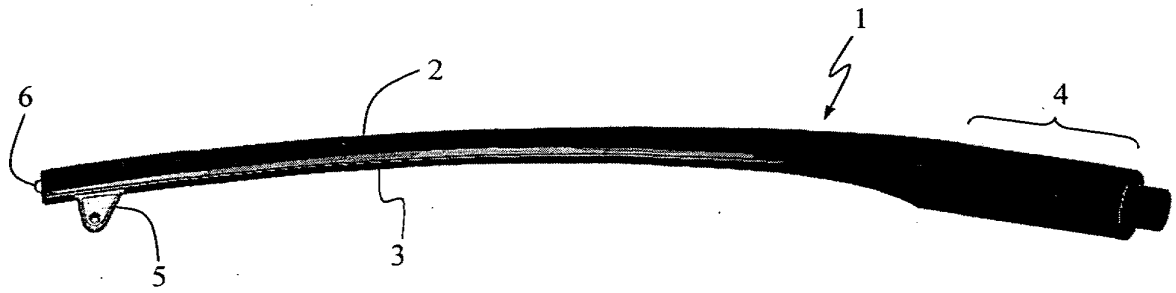


FIG. 1

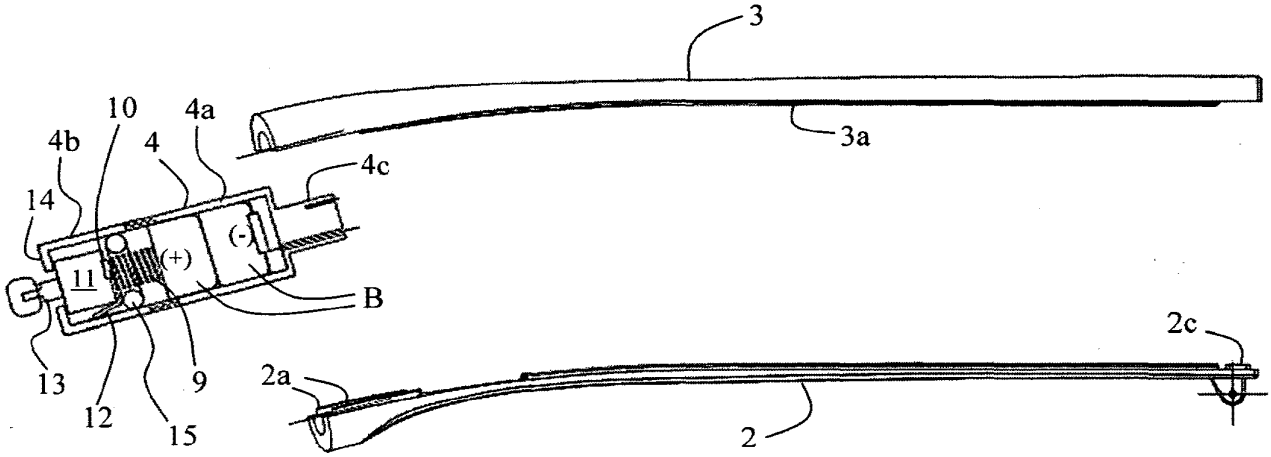


FIG. 2

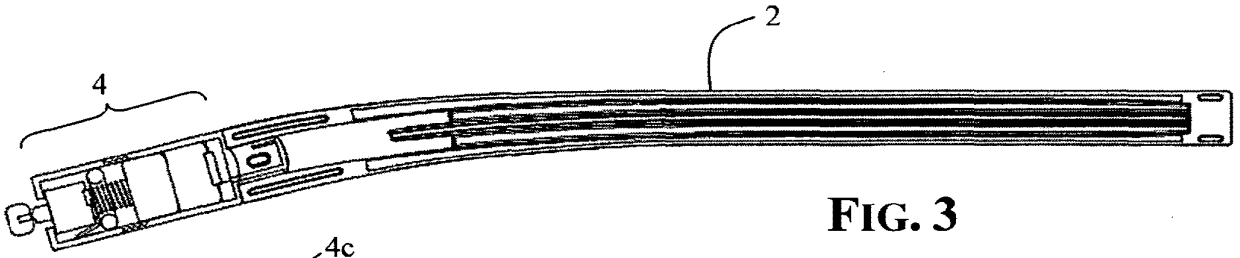


FIG. 3

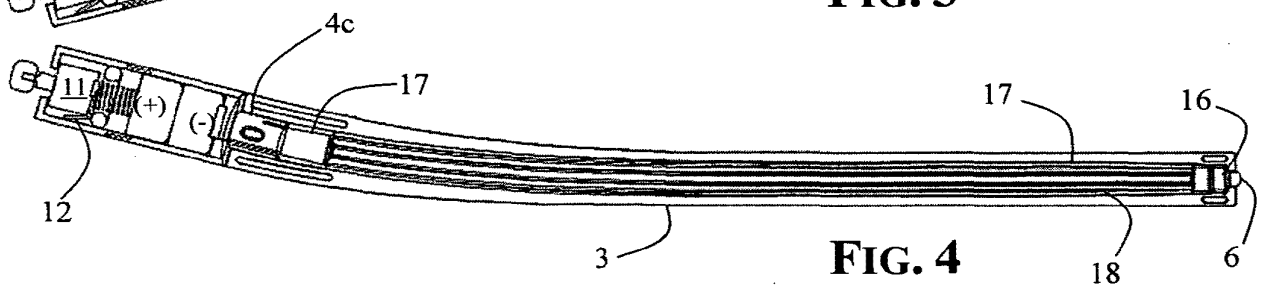


FIG. 4

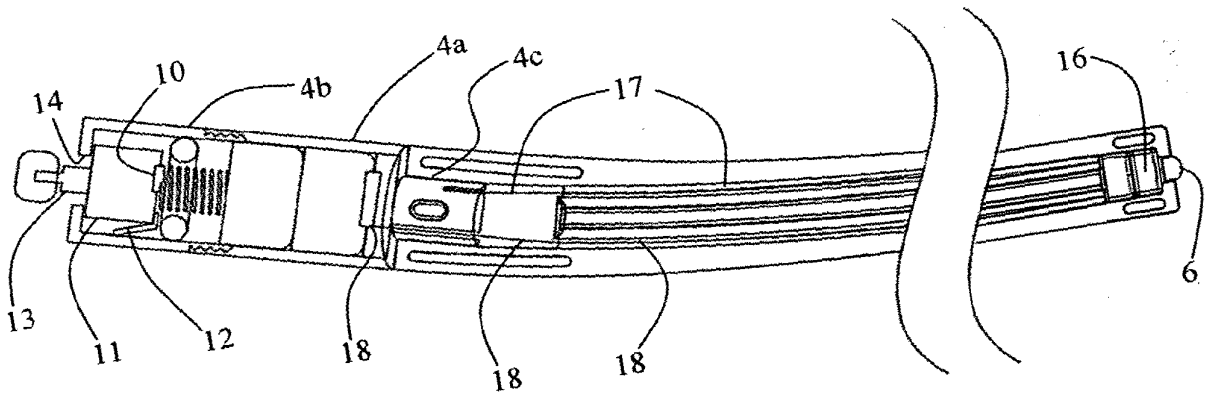


FIG. 5

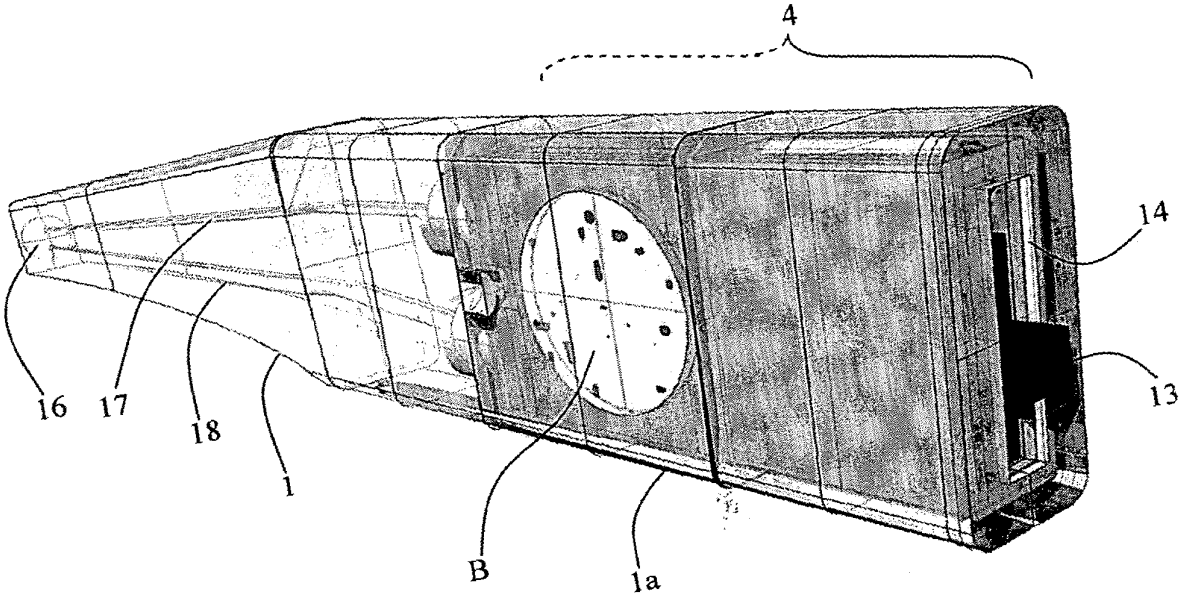


FIG. 6

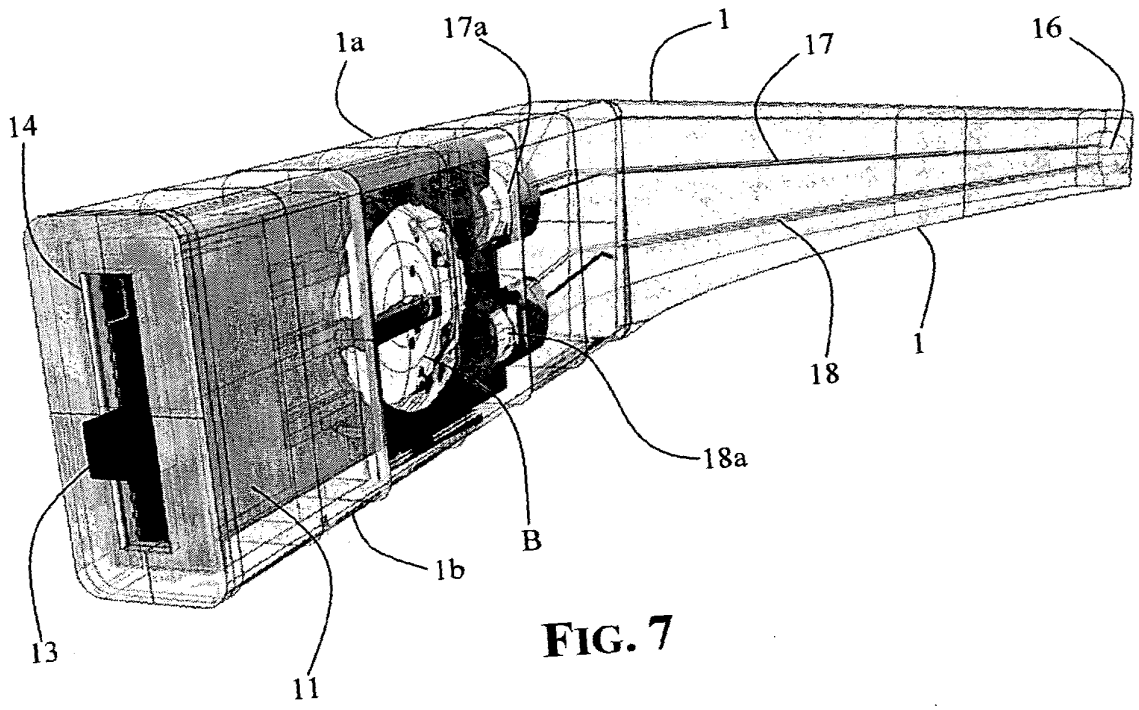


FIG. 7

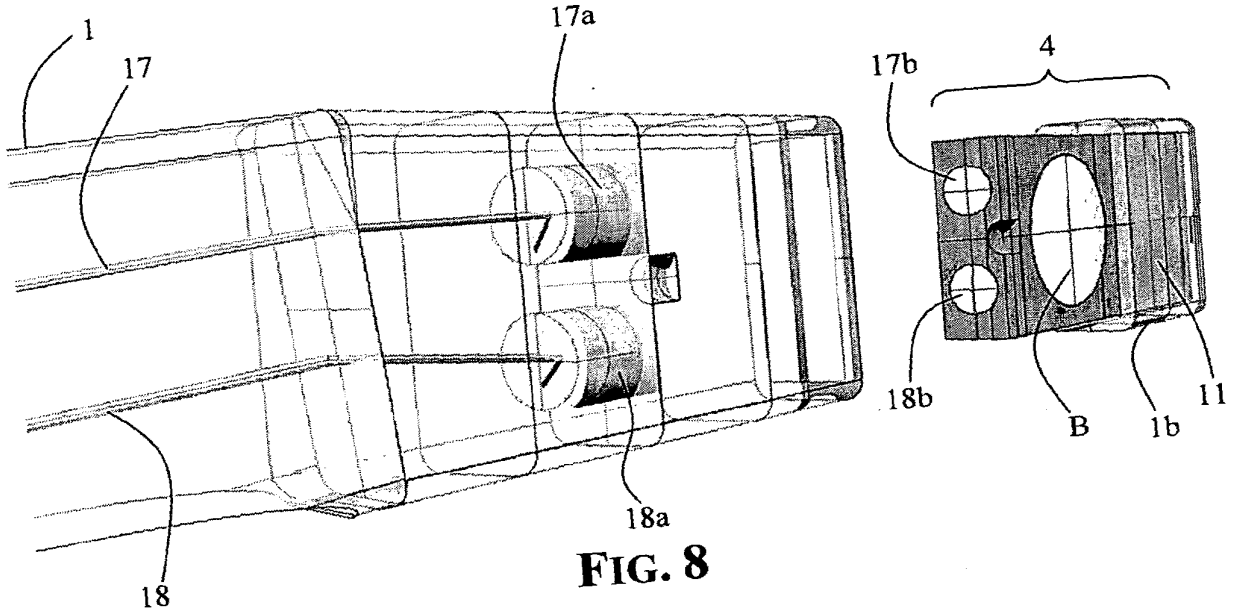


FIG. 8

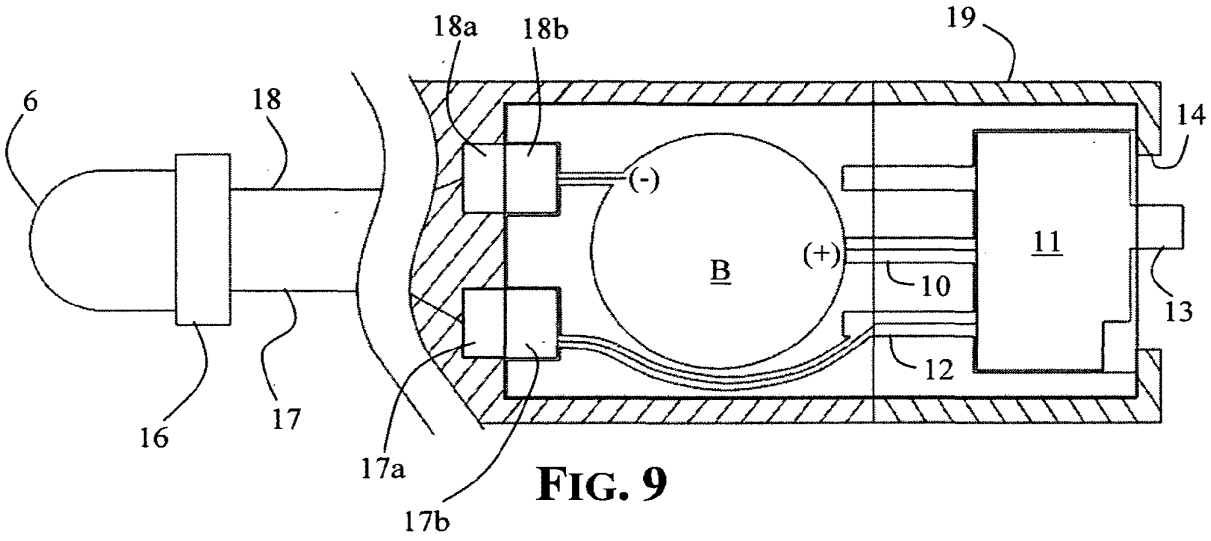


FIG. 9

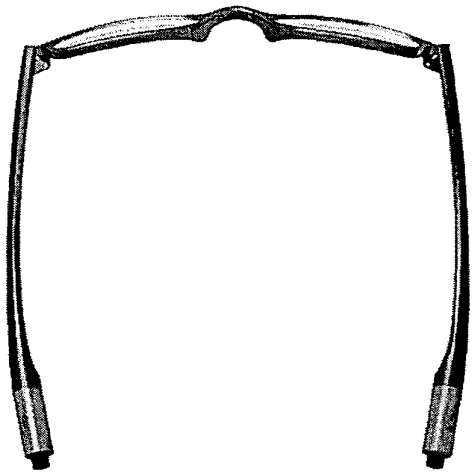


FIG. 10

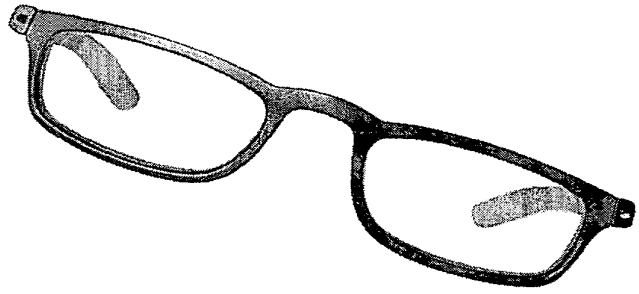


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2008/000069

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02C11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G02C

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 2007/008062 A (SPEEKENBRINK ADRIANUS [NL]) 18 January 2007 (2007-01-18) figures 2,4D page 4, lines 5-9,15,16,19,20	1,5,6,8, 12,13 1-3,5,6, 8-10,12, 13
Y	US 2007/046887 A1 (HOWELL THOMAS A [US] ET AL) 1 March 2007 (2007-03-01) figure 13B paragraphs [0071], [0079], [0080], [0083], [0087], [0088], [0170], [0176]	1,5,6,8, 12,13
Y	US 2007/200998 A1 (SCHRIMMER MICHAEL L [US] ET AL) 30 August 2007 (2007-08-30) figures 1-4 paragraph [0029]	2,3,9,10

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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"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

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"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
15 September 2008	02/12/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	de Lajarte, Gilles

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2008/000069

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 2006 015334 A1 (LEE CHING-HUI [TW]) 11 October 2007 (2007-10-11) figures 5,6 paragraphs [0016] - [0024]	1,5,8,12
A	DE 101 17 446 A1 (OPTIK SOMMER [DE]) 17 October 2002 (2002-10-17) the whole document	1,5,8,12
A	GB 2 127 254 A (HEANEY JAMES) 4 April 1984 (1984-04-04) the whole document	1,5,8,12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IT2008/000069

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:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an 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 reportcovers 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.:

1-3, 5, 6, 8-10, 12, 13

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1 - 3, 5, 6, 8 - 10, 12, 13

   Detachable module linked via spring connection to wires in earpiece

1.1. claims: 1, 8

   A spectacles temple with a light source in the front part, a battery and a switch in the distal part; the battery and the switch are in a detachable module.

1.2. claims: 2, 3, 9, 10

   The front and proximal part of temple is made with two parts which form a conduit for the wires.

1.3. claims: 5, 12

   The front and proximal part of temple is one monolithic part.

1.4. claims: 6, 13

   The electrical connection to the detachable module is done with biasing springs.

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2. claims: 4, 11

   The detachable module is split in two half cartridges screwed into one another.

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3. claims: 7, 14

   The electrical connection to the detachable module is done with magnets.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IT2008/000069

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007008062 A	18-01-2007	NL 1029496 C1	15-01-2007
US 2007046887 A1	01-03-2007	NONE	
US 2007200998 A1	30-08-2007	NONE	
DE 102006015334 A1	11-10-2007	NONE	
DE 10117446 A1	17-10-2002	NONE	
GB 2127254 A	04-04-1984	NONE	

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(19) World Intellectual Property Organization
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3 January 2008 (03.01.2008)

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(25) Filing Language: English

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(30) Priority Data:
60/815,870 23 June 2006 (23.06.2006) US

(71) Applicant *(for all designated States except US)*: **PIXELOPTICS, INC.** [US/US]; 2840 Hershberger Road, Suite A, Roanoke, VA 24017 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BLUM, Ronald, D.** [US/US]; 5320 Silver Fox Road, Roanoke, VA 24018 (US). **HADDOCK, Joshua, N.** [US/US]; 17 Church Avenue Sw, Apt. 202, Roanoke, VA 24011 (US). **DUSTON, Dwight, P.** [US/US]; 59 Fairlane, Laguna Niguel, CA 92677 (US).

(74) Agent: **SCHAFFER, Robert, D.**; Pearl Cohen Zedek Latzer, LLP, 1500 Broadway, 12th Floor, New York, NY 10036 (US).

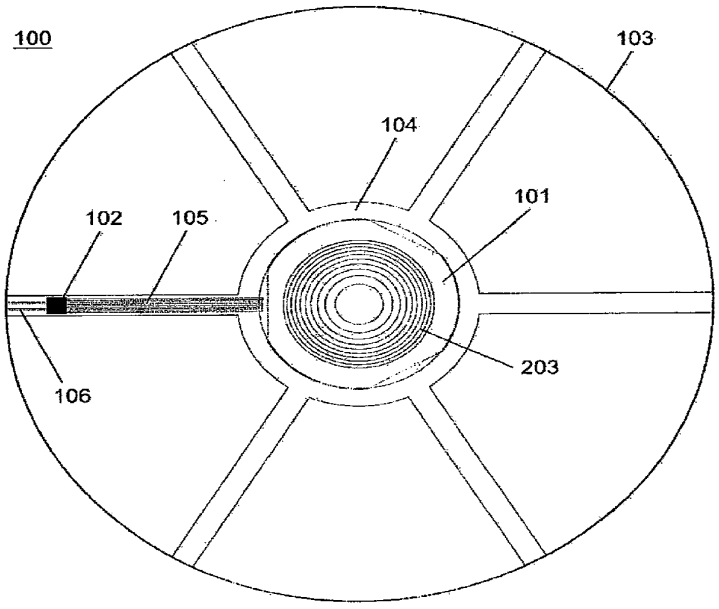
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** ELECTRONIC ADAPTER FOR ELECTRO-ACTIVE SPECTACLE LENSES



(57) **Abstract:** An adapter for a spectacle frame is disclosed which is configured for enabling the spectacle frame to operate and control electro-active lenses housed therein. In particular the spectacle frame may allow electro-active lenses housed therein to focus and be controlled both automatically and manually with heretofore unrealized results.

WO 2008/002388 A2

ELECTRONIC ADAPTER FOR ELECTRO-ACTIVE SPECTACLE LENSES

Inventors: Ronald D. Blum, Joshua N. Haddock, and Dwight P. Duston

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims the benefit of Provisional Application U.S. Serial No. 60/815,870, filed on June 23, 2006 (and entitled Electronic Adapter For Electro-Active Spectacle Lenses That Enables Near Universal Frame Compatibility) which is incorporated in its entirety herein by reference

BACKGROUND OF THE INVENTION

Field of the Invention

[002] The present invention generally relates to an adapter for a spectacle frame housing electro-active lenses. Specifically, this invention relates to an adapter configured for enabling a spectacle frame to operate and control electro-active lenses housed therein without the need to either uniquely design and manufacture the spectacle frame or to perform undue modifications of an existing spectacle frame. In particular, the spectacle frame may allow electro-active lenses housed therein to focus and be controlled both automatically and manually with heretofore unrealized results.

Description of the Related Art

[003] With the invention of electro-active spectacle lenses that provide dynamic changes in focus there is a desire to engineer these lenses such that they can be compatible with most, if not all, pre-existing spectacle frame designs. To accomplish such a task, all of the components required to operate the electro-active functionality must be incorporated either internally or externally to the body of the lens so that the lens can be mounted into any unmodified spectacle frame and still be both aesthetically acceptable and fully functional.

[004] Historically, the optical industry has been structured in such a way that the patient selects his or her eyewear based largely on aesthetics that relate to frame comfort and appearance. Generally the frames are the first item selected in picking out prescription eyeware. Lenses, including tints, coatings, and optical design are usually picked second. Given the significant number of available frame styles, sizes, and colors, the manner in which the industry has historically functioned, and the desire of the consumer or patient to have a vast selection of frames to choose from, there is a desire to provide a means and system for near universal compatibility between the new electro-active lenses and existing frame designs.

[005] Accordingly, there is now provided with this invention an improved spectacle frame adapted for housing electro-active lenses that effectively overcomes the aforementioned difficulties and longstanding problems inherent in the art. These problems have been solved in a simple, convenient, and highly effective way by which to control electro-active lenses.

SUMMARY OF THE INVENTION

[006] According to one aspect of the invention, an adapter for an electro-active lens is disclosed, wherein the electro-active lens is housed in a spectacle frame and the electro-active lens has a first set of electrical contacts. The adapter is a separate element from the electro-active lens and has a second set of electrical contacts for providing an electrical signal to the electro-active lens through the first set of electrical contacts.

[007] As will be appreciated by those persons skilled in the art, a major advantage provided by the present invention is enabling a spectacle frame to operate and control electro-active lenses housed therein without the need to either uniquely design and manufacture the spectacle frame or to perform undue modifications of an existing spectacle frame. The spectacle frame may allow electro-active lenses housed therein to focus and be controlled both automatically and manually with heretofore unrealized results. Additional objects of the present invention will become apparent from the following description.

[008] The method and apparatus of the present invention will be better understood by reference to the following detailed discussion of specific embodiments and the attached figures which illustrate and exemplify such embodiments.

DESCRIPTION OF THE DRAWINGS

[009] A specific embodiment of the present invention will be described with reference to the following drawings, wherein:

[0010] Figure 1 is a diagrammatic representation of an example of an electro-active lens and its drive components.

[0011] Figure 2A is a front view of a spectacle frame housing the adapter of the present invention.

[0012] Figure 2B is a top view of a spectacle frame housing the adapter of the present invention.

[0013] Figure 3A is a top view of the left temporal side of an embodiment of the electro-active spectacle lens of the present invention.

[0014] Figure 3B is a top view of the top left temporal side of an embodiment of the adapter of the present invention.

[0015] Figure 3C is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0016] Figure 3D is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0017] Figure 3E is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0018] Figure 3F is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0019] Figure 3G is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0020] Figure 3H is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0021] Figure 3I is a top view of the left temporal side of another embodiment of the electro-active spectacle lens of the present invention.

[0022] Figure 3J is a top view of the top left temporal side of another embodiment of the adapter of the present invention.

[0023] Figure 4 is a front view of an embodiment of the right side of the electro-active spectacle lens and adapter of the present invention.

[0024] Figure 5 is a front view of another embodiment of the right side of the electro-active spectacle lens and adapter of the present invention.

[0025] Figure 6 is a front view of another embodiment of the right side of the electro-active spectacle lens and adapter of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0026] The following preferred embodiment as exemplified by the drawings is illustrative of the invention and is not intended to limit the invention as encompassed by the claims of this application.

[0027] As shown in FIG. 1, as in all embodiments of the present invention, the electro-active spectacle lenses **100** contain an electro-active lens element **101** and drive electronics, including one or more focus sensors **102**, all of which are embedded within the body of a lens **103** that act to correct refractive errors of the eye not associated with presbyopia. The drive electronics are contained within a driver. The driver may also include all necessary control components for providing the appropriate electrical signal for providing the proper optical power in the electro-active lens. The body of the lens may be either a finished blank (two optical quality surfaces) or a semi-finished blank (one optical quality surface). The focus sensors, drive electronics, and

electro-active lens element may be typically attached to the anterior and/or posterior surface of a flexible but transparent star shaped substrate **104** where electrical connection is made via thin film transparent electrical leads **105** (such as, by way of example only, indium tin oxide, ITO). These thin film transparent electrical leads include connections **106** for an electrical power source. These thin film transparent electrical leads may also include connections for digital or analog signal transfer. In certain other embodiments, the power source and signal connections may be of a different design where they are connected to the flexible substrate but contain non thin-film conductors, such as, by way of example only, fine gauge metal wire. This alternative design is such that the connection does not significantly interfere with the user's vision or the aesthetics of the lens. These power source and signal connections as well as the focus sensors and drive electronics are placed near the edge of the lens, near where the frame eye-wire and temple connect, such that when the lens is fitted within the frame, the power source, drive electronics, and focus sensors do not interfere with the vision of the user. Alternatively, the drive components may be placed distal from the electro-active lenses either in the spectacle frame, the temples, or in the adapter of the present invention.

[0028] In an embodiment of the invention shown in FIG. 2, the electro-active lens **201** with electro-active region **203** is edged (cut to the shape of the spectacle frame) using techniques well known in the art. The process of edging the lens acts to either partially or fully expose the electrical leads that connect to the power source. This edged lens is then combined with an electrical adapter **202** that, as shown in FIG 3B, may contain one or more electrical power sources **305**, one or more electrical switches to provide manual control of the lenses to the user **306**, and one or more sensors **307** that acts to detect the presence of the user (determine if spectacles are being worn). As an alternative design, the sensor 307 may also include the drive electronics **102** for the electro-active lens. The sensor 307 may also sense if the frame is opened. This adapter has electrical contacts **308** that correspond to the power source and signal electrical contacts in the lens **106** such that when the adapter is placed between the spectacle lens and the eye wire of the spectacle frame, the pressure associated with securing the lens within the frame acts to make positive electrical contact between the lens and the adapter as well as physically secure the adapter to the spectacles. Components within the adapter are connected electrically by means of internal wiring **309**. Power sources included within the adapter may be, by way of example only, disposable zinc-air batteries or rechargeable Li-ion or Li-polymer batteries. Manual switches included within the adapter may be, by way of example only, pressure switches, capacitive touch switches or optical proximity switches. Sensors to determine if the spectacles are being worn may be, by way of example only, optical proximity switches or accelerometers which, if activated, instruct the drive electronics to operate the focus sensors

within the body of the lens. In this embodiment each of the lenses would be identical and would each require an individual adapter. The driver may provide an electrical signal for generating the appropriate amount of optical power in each of the electro-active lenses. The driver may also include a focusing sensor for determining the appropriate signal for the electro-active lenses.

[0029] As also shown in FIGS. 3A-3J, the use of such an adapter **202** may require, in certain embodiments, other machining steps in addition to edging where, by way of example only, one or more of a slot, groove, or notch **301** is machined into the body of the lens **201** such that robust physical and electrical connection is made between the frame, lens, and adapter. As the adapter would be placed near to where the frame eye-wire and temple connect, such a machining step may allow the adapter to be located on the posterior surface of the lens **302** and be mostly hidden from view by the temple hinge. Such a placement would be advantageous for preserving the aesthetic quality of the spectacles. It is preferable that the edge profile of the adapter **303** match that of the lens **304** such that a secure fit is guaranteed between the frame, lens, and adapter.

[0030] Embodiments of the adapter of the present invention may contain any of a combination of components. For example, as shown in FIG. 3B, the adapter may have an on/off switch, a power source, and a sensor for sensing the presence of the user. Alternatively, as shown in FIG. 3C, the adapter may only have a power source. Alternatively, as shown in FIG. 3D, the adapter may only have an on/off switch. Alternatively, as shown in FIG. 3E, the adapter may only have a sensor for sensing the presence of the user. As shown in FIG. 3F, the adapter may have an on/off switch, and a sensor for sensing the presence of the user. As shown in FIG. 3G, the adapter may have an on/off switch, and a power source. As shown in FIG. 3H, the adapter may have a power source and a sensor for sensing the presence of the user.

[0031] As further illustrated in FIGS. 3I and 3J, the electrical connection made between the frame, lens, and adapter may include a physical connection in which mating elements between the lens and the adapter are screwed to one another. As shown, the adapter may include screw threads 311 which secure into mating threads 310 in the lens. Of course, as is well known in the art, such physical connections can further include a wide variety of equivalents, for example, a bayonet-type connection, a detent, snap-like connection and etc. As is also well known in the art, the electrical connection may be made with a wide variety of electrical mating elements, for example, male/female connectors, plugs, sockets, pins, and the like.

[0032] The adapter may be positioned so that it simultaneously contacts the lens and the frame or, alternatively, it may be positioned so that it only contacts the lens and does not contact the frame. The adapter may be positioned so that it is located under and above the surface of the

lens when it is in contact therewith. The adapter may be further positioned so that it is located near a periphery of the surface of the lens when it is in contact therewith.

[0033] One issue with the above embodiments is that each lens operates independently from the other. Therefore, the possibility exists that under certain operational conditions one lens may be triggered to operate while the other is not. To eliminate this problem a means for synchronizing the operation of the two lenses must be devised such that when one of the two lenses is activated, the other will be activated by default In another embodiment of the invention the electrical adapters of the two lenses are connected by means of discrete signal conduit such as, by way of example only, one or more of a small gauge metal wire or optical fiber. Such signal conduits could be hidden in the gap between the frame eye wire and the lens as well as behind the bridge that joins the two lenses.

[0034] In another embodiment the two lenses are synchronized by means of a wireless optical connection designed to transmit data across the bridge as shown in FIG. 4. In this embodiment an infrared optical transceiver unit **401** is tethered to each adapter **202** by means of a flex circuit **402**, which may be hidden between the superior eye-wire of the frame and the edged electro-active spectacle lens **201**. The transceiver unit is preferred to be located at the location of where the superior vertical distance of each eye-wire allows for the best, unhindered optical communication between the IR transceivers. As with the adapter, an additional machining step may be required where, by way of example only, one or more of a slot, groove, or notch **403** is machined into the body of the lens such that a robust physical connection is made between the transceiver unit and the spectacles. Furthermore, such machining steps would allow the transceiver unit to be mounted to either the anterior or posterior surface of the lens.

[0035] In another embodiment the two lenses are synchronized by means of a wireless, radio frequency (RF) communication system as shown in FIG. 5. In this embodiment the electrical adapter **202** contains circuitry for an RF transceiver that is tethered to a flex circuit antenna **501** (for example only). This flex circuit antenna may be hidden between the frame eye wire and the edged spectacle lens **201**.

[0036] In another embodiment the two lenses are synchronized by means of inductive coupling as shown in FIG. 6. In this embodiment the electrical adapter **202** contains circuitry for a pulsed current source that is tethered to multiple-turn coils of an electrical conductor made using flex circuit **601** (for example only). These flex circuit coils may be hidden between the frame eye wire and the edged spectacle lens. In this approach, current pulses in the coils of lens 1 generates a magnetic field which, by way of Faraday's law of induction, generates a current in the coils of lens 2, which is then be detected by the circuitry of the electrical adapter of lens 2. In this manner communication between the two lenses is enabled.

[0037] In another embodiment, the two lenses may be synchronized by means of ultrasonic signals transmitted over free space. In this embodiment the electrical adapter contains circuitry for an ultrasonic transceiver. Such an approach is advantageous in that no additional components are required to be tethered to the electrical adapter.

[0038] In yet another embodiment, the two lenses may be synchronized by means of vibrations transmitted through the spectacle frame. In this embodiment the electrical adapter contains a vibration transducer and detector that makes physical contact to the frame when the lenses, adapters, and frames are assembled. Transducers and detectors of vibrations may be made from, by way of example only, piezoelectric materials. Such an approach is advantageous in that no additional components are required to be tethered to the electrical adapter.

[0039] In order to simplify any of the above embodiments, only one lens could be outfitted with one or more focus sensors and a synchronization transmitter while the other lens would not include any focus sensors and only a synchronization receiver. In such an embodiment the lens with the focus sensor(s) would operate as the "master" while the other lens would operate as the "slave" and only operate when directed by the master. Such a one-way communication system would reduce power consumption (by eliminating synchronization transmitters and a focus sensors) and simplify synchronization, but at the expense of eliminating redundancy in the focus sensors.

[0040] Although the particular embodiments shown and described above will prove to be useful in many applications in the spectacle art and the electro-active lens art to which the present invention pertains, further modifications of the present invention will occur to persons skilled in the art. All such modifications are deemed to be within the scope and spirit of the present invention as defined by the appended claims.

CLAIMS

What is claimed is:

1 An adapter for an electro-active lens, wherein the electro-active lens is housed in a spectacle frame and the electro-active lens has a first set of electrical contacts, wherein said adapter is a separate element from the electro-active lens, and wherein said adapter has a second set of electrical contacts for providing an electrical signal to the electro-active lens through said first set of electrical contacts.

2 The adapter of Claim 1, further comprising a power source operatively connected to said second set of contacts.

3. The adapter of Claim 2, further comprising a manually operable on/off switch connected to said power source.

4. The adapter of Claim 1, further comprising a sensor operatively connected to said second set of electrical contacts, wherein said sensor is for detecting if the electro-active lens is to be provided with the signal.

5. The adapter of Claim 1, further comprising a driver operatively connected to said second set of electrical contacts, wherein said signal is for generating a predetermined optical add power to the electro-active lens.

6. The adapter of Claim 1, wherein said first set of electrical contacts and said second set of electrical contacts further comprise electrical mating elements.

7 The adapter of Claim 4, wherein said sensor senses the presence of the user.

8. The adapter of Claim 7, wherein said sensor senses if the frame is opened

9. The adapter of Claim 5, wherein said driver provides said signal for generating the appropriate amount of optical power in the electro-active lens.

10. The adapter of Claim 5, wherein said driver further comprises a focusing sensor for determining the appropriate signal for the electro-active lenses.

11. The adapter of Claim 1, further comprising a synchronizing means operatively connected to the adapter for controlling one lens based upon the control of another lens.

12. The adapter of Claim 11, wherein said synchronizing means comprises infrared optical transmission signals.

13. The adapter of Claim 11, wherein said synchronizing means comprises RF transmission signals.

14. The adapter of Claim 11, wherein said synchronizing means comprises an inductive coupling.

15. The adapter of Claim 11, wherein said synchronizing means comprises a flexible circuit extending through the spectacle frame.

16. The adapter of Claim 11, wherein said synchronizing means comprises ultrasonic transmission signals.

17. The adapter of Claim 11, wherein said synchronizing means comprises vibration transmission signals.

18. The adapter of Claim 17, wherein said synchronizing means comprises piezoelectric materials.

19. The adapter of Claim 1, wherein the adapter is for simultaneously contacting the lens and the frame.

20. The adapter of Claim 1, wherein the adapter is for contacting the lens without contacting the frame.

21. The adapter of Claim 1, wherein the adapter is located under and above the surface of the lens when in contact therewith.

22 The adapter of Claim 1, wherein the lens has a surface and adapter is located near the periphery of said surface when in contact with the lens.

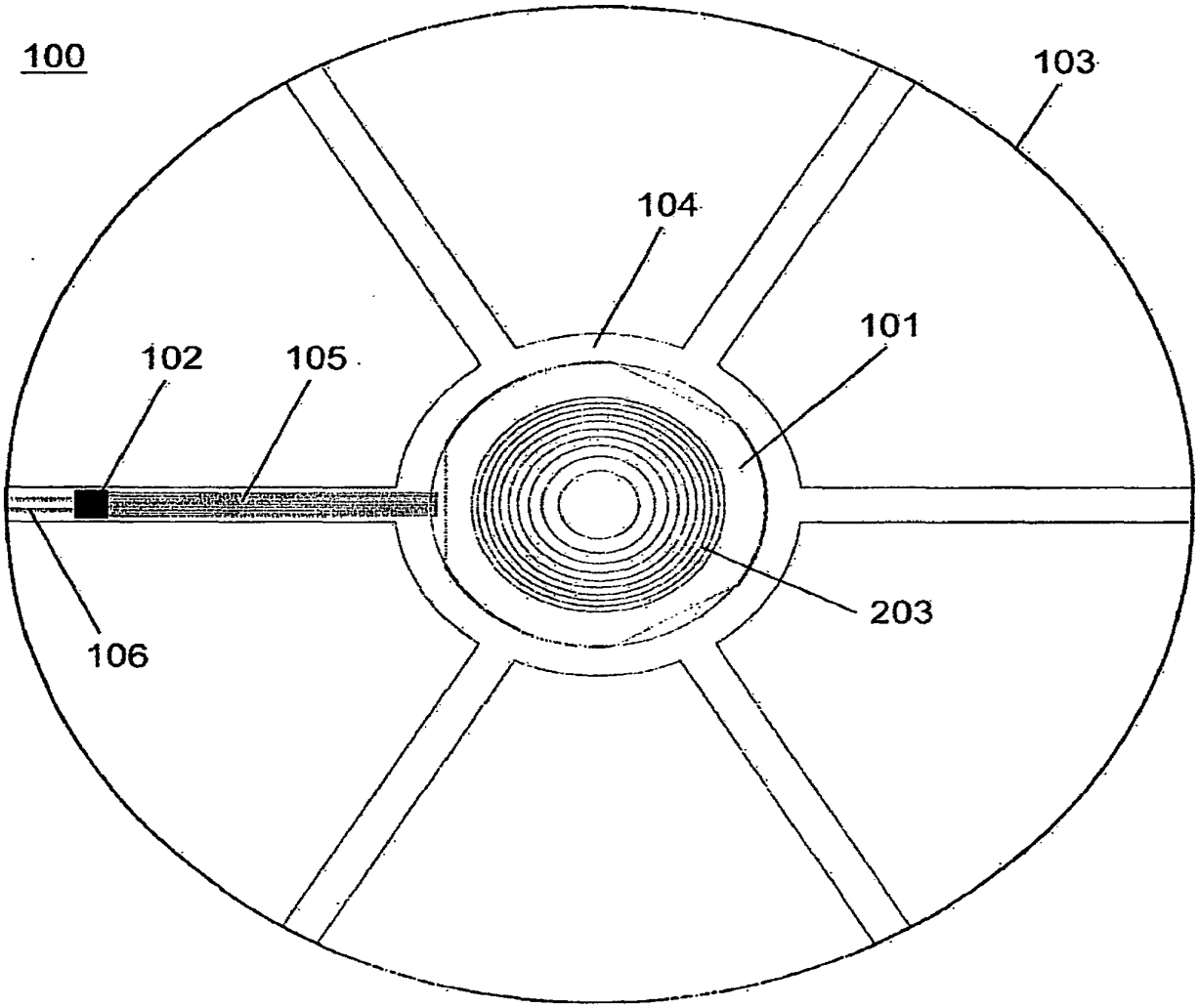


FIG. 1

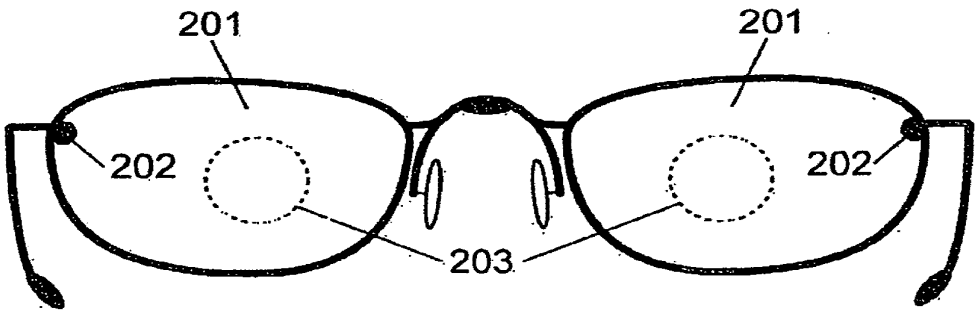


FIG. 2A

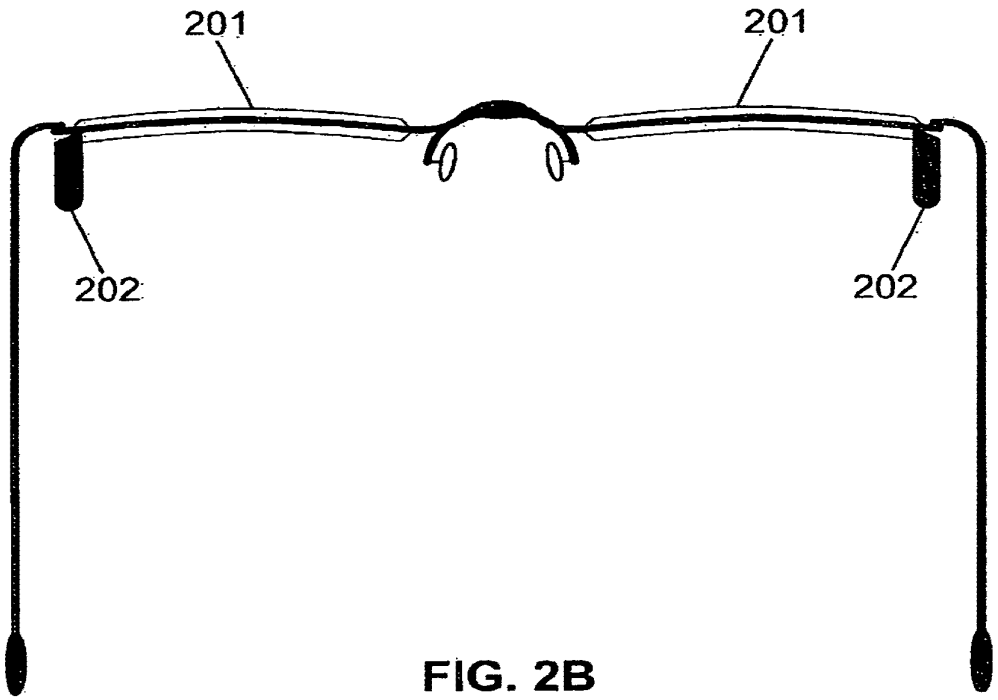


FIG. 2B

FIG. 3A

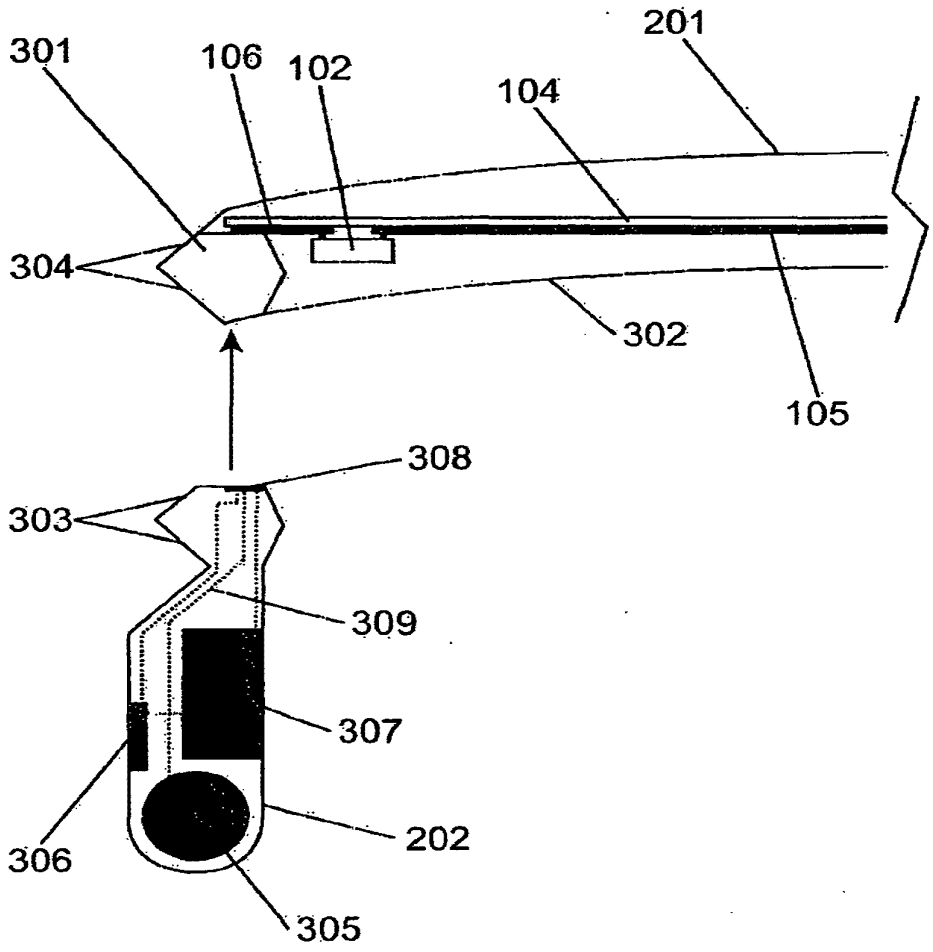


FIG. 3B

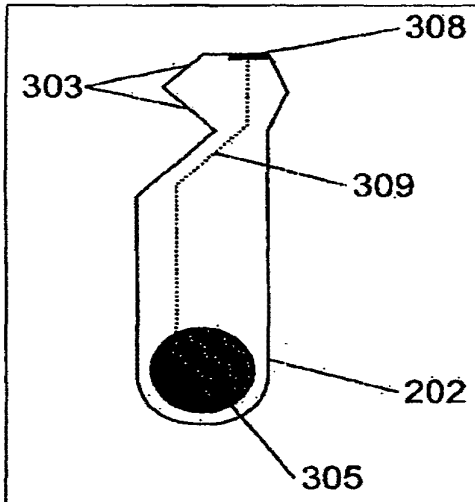


FIG. 3C

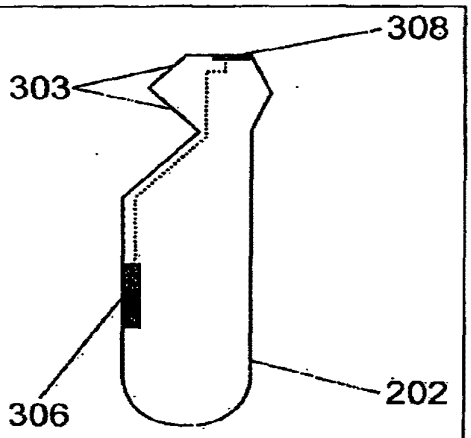


FIG. 3D

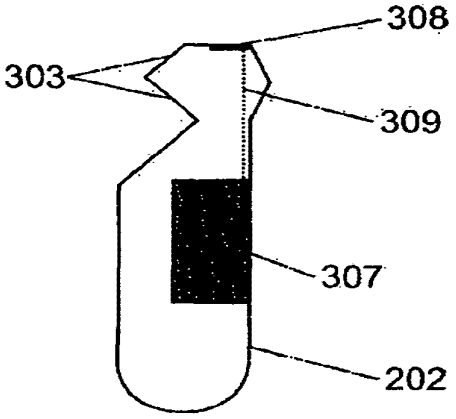


FIG. 3E

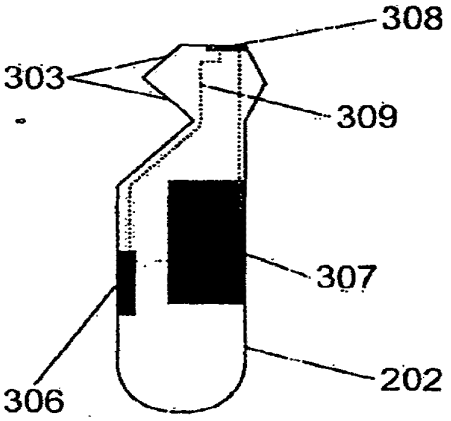


FIG. 3F

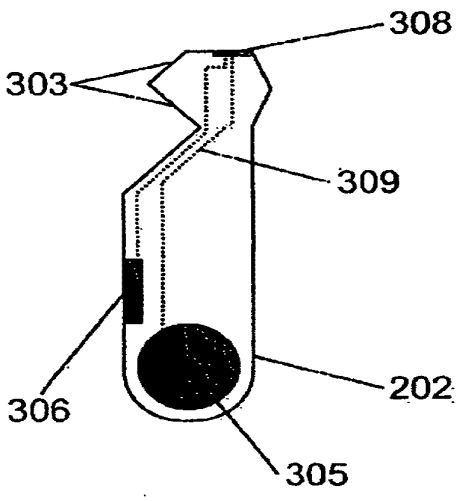


FIG. 3G

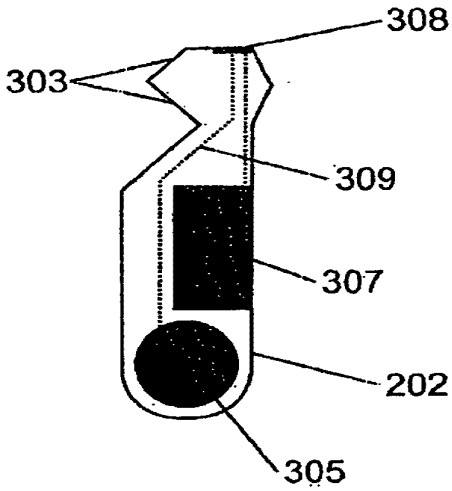


FIG. 3H

FIG. 3I

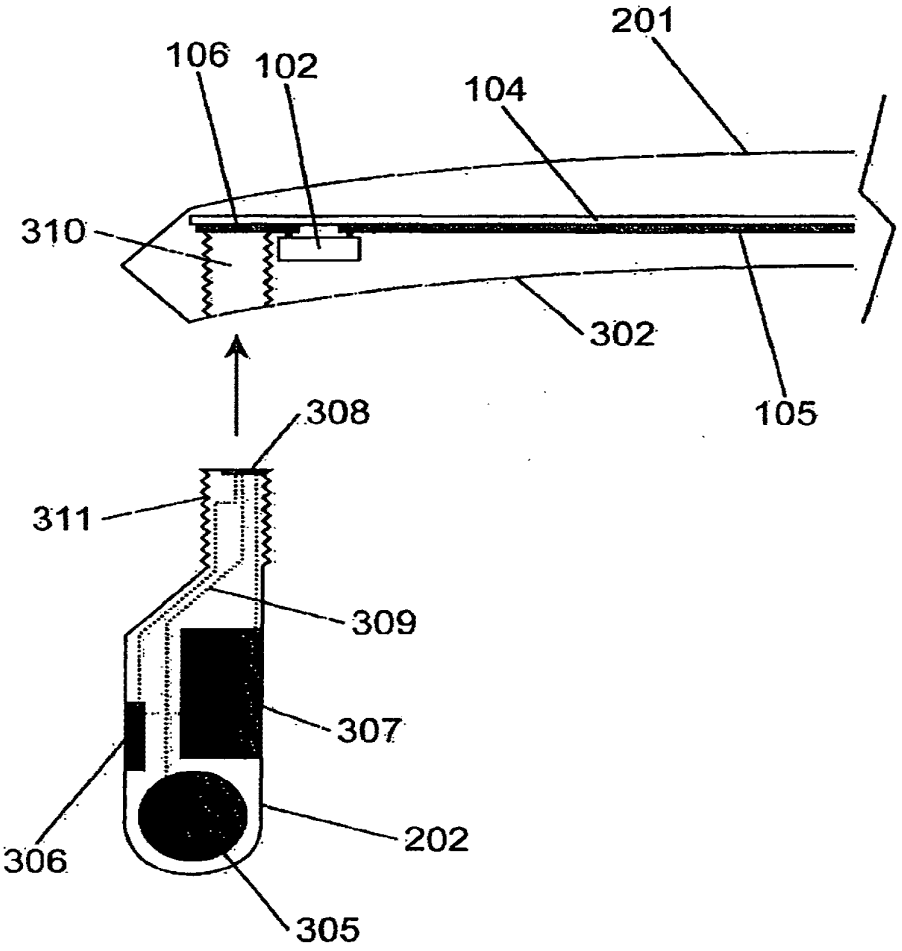


FIG. 3J

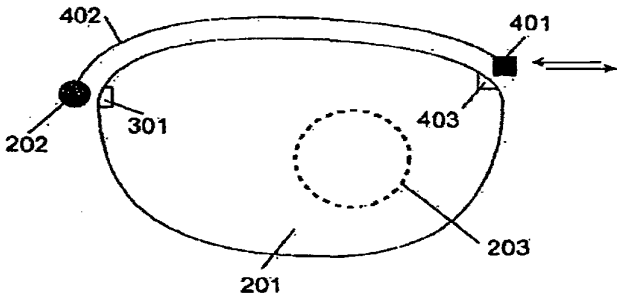


FIG. 4

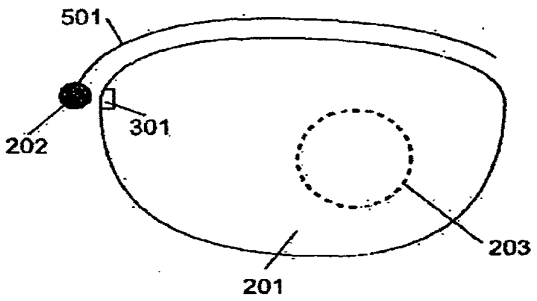


FIG. 5

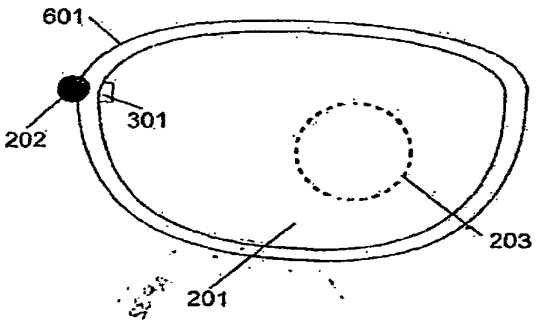


FIG. 6

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(71) 出願人 (米国を除く全ての指定国について): パナソニック株式会社 (PANASONIC CORPORATION) [JP/JP]; 〒5718501 大阪府門真市大字門真１００６番地 Osaka (JP).

(72) 発明者; および

(75) 発明者/出願人 (米国についてのみ): 松井昌朋 (MATSUI, Masatomo).

(74) 代理人: 原田洋平 (HARADA, Yohei); 〒5500005 大阪府大阪市西区西本町１丁目１０番１０号オーエックス西本町ビル４階 Osaka (JP).

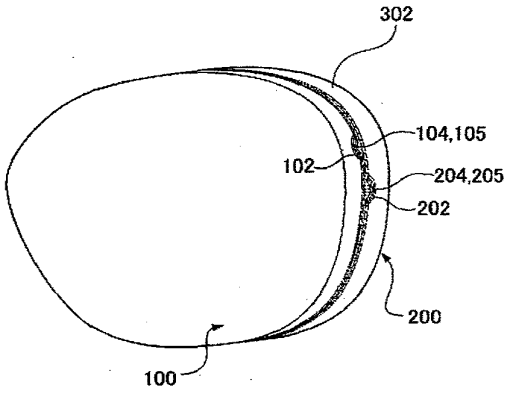
(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

[続葉有]

(54) **Title:** METHOD FOR MANUFACTURING LENS FOR ELECTRONIC SPECTACLES, LENS FOR ELECTRONIC SPECTACLES, AND ELECTRONIC SPECTACLES

(54) 発明の名称: 電子メガネ用レンズの製造方法と電子メガネ用レンズおよび電子メガネ

[図35]



(57) **Abstract:** A lens for electronic spectacles including an electrode pattern which is used for supplying electrical energy to an electric element provided in the lens and has a relatively low resistance and exhibiting an excellent light transmittance. The lens is characteristic in that a first recess (102) in a lower substrate (100) is coated with a conductive ink to form a first auxiliary electrode layer (104), a lower electrode pattern (105) is formed on the first auxiliary electrode layer (104) by vacuum deposition, a second recess (202) in an upper substrate (200) is coated with a conductive ink to form a second auxiliary electrode layer (204), an upper electrode pattern (205) is formed on the second auxiliary electrode layer (204) by vacuum deposition, the lower and upper substrates (100, 200) are joined with an electric element (300) interposed therebetween, the joined body is cut along the multilayer portion of the first auxiliary electrode layer (104) and the lower electrode pattern (105) and the multilayer portion of the second auxiliary electrode layer (204) and the upper electrode pattern (205) to expose the cut surface.

(57) 要約: レンズの内部に設けられて電気素子に電気エネルギーを供給する電極パターンとしての抵抗値を比較的小さくでき、しかも光透過率が良好な電子メガネ用レンズを提供することを目的として、下基板（１００）の第１の凹部（

[続葉有]

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(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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— 国際調査報告書

１０２）に導電性インクでコーティングして第１の補助電極層（１０４）を形成し、その上に下部電極パターン（１０５）を蒸着して形成し、上基板（２００）の第２の凹部（２０２）に導電性インクでコーティングして第２の補助電極層（２０４）を形成し、その上に上部電極パターン（２０５）を蒸着して形成し、下基板（１００）と上基板（１００）の間に電気素子（３００）を挟んで貼り合わせ、第１の補助電極層（１０４）と下部電極パターン（１０５）との積層部分、第２の補助電極層（２０４）と上部電極パターン（２０５）との積層部分に掛かる位置でカットして切断面を露出させたことを特徴とする。