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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/890,809	05/09/2013	Ronald D. Blum	3585.1260000	9971

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EXAMINER	
O'NEILL, GARY WILLIAM	

ART UNIT	PAPER NUMBER
2872	

MAIL DATE	DELIVERY MODE
12/27/2017	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. 13/890,809	Applicant(s) BLUM ET AL.	
	Examiner GARY O'NEILL	Art Unit 2872	AIA (First Inventor to File) Status Yes

-- 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 *09/13/2017*.

☐ 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) *1,4,10,11 and 20-28* 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5a) Of the above claim(s) _____ is/are withdrawn from consideration.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) *1, 4, 10, 11 and 20-28* 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 *05/09/2013* 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 _____.

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

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

2. Applicant's arguments filed 09/13/2017 have been fully considered but they are not persuasive. In the fourth paragraph of page 6 of the Remarks, Applicant states “- the cited section of Cochran doesn't say whether or not the copper strips or the flexible ribbon is deposited over an electronic assembly. Rather, it says that conductive strips are deposited on the flexible ribbon. Assuming arguendo that the copper strips of Cochran are conformally deposited over the flexible ribbon, Applicant respectfully submits that the flexible ribbon of Cochran is not an "electronics assembly" as required by claim 28. It also doesn't say whether the flexible ribbon actually conforms or is shaped to fit an electronic assembly. Thus, this section of Cochran doesn't provide the step of the depositing a conformal layer over an electronics assembly recited in claim 28.

3. First, the examiner reminds applicant of the definitions in paragraph 0150 of Applicants specification as filed, "… a conformal layer (e.g. an encasing or encapsulating layer)…” and “However, the entire assembly may not be covered by the conformal layer…". In paragraph 0151 “a ‘conformal coating’ may refer to any coating that is designed to substantially protect or enclose the electrical connections of the

plurality of electronic components (and/or the components themselves)…". Thus the examiner understands from Applicants original disclosure that the "conformal layer" may be exemplified by an encasing or encapsulating layer, which may or may not cover the entire assembly, and may refer to any coating that is designed to substantially protect or enclose the electrical connections of the plurality of electronic components (and/or the components themselves). The office action mailed 03/14/2017 rejects the relevant limitation of claim 28 as anticipated by Cochran (U.S. Patent 4,254,451) wherein "…depositing a conformal layer (*flexible plastic ribbon layer*, italics added, column 3, lines 44-48) over the electronic assembly (*plurality of copper strips* are deposited in flexible plastic, column 3, lines 43-48, italics added, figures 4, 5);…". The office action is particularly pointing to the structure of element 30 as depicted in figures 4 and 5 of Cochran. Cochran says "…, the LED's are wired by means of a "flex circuit" 30, which is a flexible ribbon of plastic on which is deposited a plurality of thin strips of conductive material such as copper. Flex circuits, which may be likened to flexible printed circuit boards, are readily available from several manufacturers". The examiner understands that the well-known flex circuit 30 structure, which Cochran says is readily available from several manufacturers, and is shown in figures 4 and 5 includes both a "*plurality of copper strips"* (which the office action equates to an electronic assembly of individual copper strips) and a flexible plastic layer which partially or fully encases or encapsulates the plurality of copper strips. In this way Cochran meets the relevant limitation of claim 28. Moreover, the examiner understands that Cochran depicts a structure in figure 4 which is well-known in the electrical and eyewear arts and available from several

manufacturers. The flexible ribbon 30 as shown in figure 4 comprises a plurality of parallel conductors which are encapsulated by an insulating plastic layer to form the ribbon. This structure allows the LED's 28 to be energized by allowing the flow of current through the plurality of parallel conductors without short circuiting the LED terminals such that the lighted LEDS are operable during actuation. Simultaneously, this structure allows for safe operation by preventing the user of the eyewear from receiving electrical shocks as current flow is contained within the plurality of parallel conductors that are insulated by an encapsulating plastic layer of the ribbon. For example, power contacts 38 (as shown in figure 4) on each side of the lens holding portion 16 are wired into the flex circuit 30, without electrocuting the user of the eyewear even during the flow of electrical power sufficient to light the LED's while the lens holding portion is mounted upon and in contact with the users head (Cochran column 4, lines 1-18). Moreover, figures 4 and 5 both depict an additional layer 16 which as shown partially or completely encapsulates or encases at least the electronic components 30 (a plurality comprising a plurality of copper strips) and 38 a plurality, which all comprise an electronic assembly.

4. Second, the examiner further notes that Applicant has chosen to claim very broadly (for example in claim 1 "…an electronic assembly comprising electronic components…") while in the Remarks argues for a narrow interpretation of this and other claim limitations, as in the bottom of page 5 of the Remarks, "... The specification provides an example of an electronics assembly, a capacitive touch switch coupled to a printed circuit board, and possibly other electronic components,..". Stated otherwise, the

scope of the claims may not be commensurate with Applicants disclosure, if interpreted according to Applicants argument here. Likewise, Applicant here argues limitations ('a capacitive touch switch', etc.) which have not been claimed.

5. Third, with respect to the rejection of claim 1 under 35 U.S.C. 103 as being unpatentable over Cochran (U.S. Patent 4,254,451) in view of Howell et al. (U.S. Patent Publication 2005/0230596), Howell specifically teaches construction of a module housing in an eyewear system which excludes holes so as to be water proof (paragraph 0194), such a structure being well known in the art, wherein the rejections of record are maintained.

Claim Rejections - 35 USC § 102

6. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

7. 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 –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.
>
> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the

> patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

8. Claim 28 is rejected under 35 U.S.C. 102(a)(1)(a)(2) as being anticipated by Cochran (U.S. Patent 4,254,451), of record.

9. Regarding claim 28, Cochran teaches a method of manufacturing an eyewear system (figures 1-5) comprising: providing a plurality of electronic components (18, 28, 30, 36, 38, etc.); connecting the plurality of electronics via electrical connections (plurality of conductive copper strips in flex circuit 30, column 3, lines 43-48) to form an electronic assembly (figure 4); depositing a conformal layer (flexible plastic ribbon layer, column 3, lines 44-48) over the electronic assembly (plurality of copper strips are deposited in flexible plastic, column 3, lines 43-48, figures 4, 5); and coupling the electronic assembly with the conformal layer to an enclosure of an eyewear frame (figures 4, 5).

Claim Rejections - 35 USC § 103

10. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences

> between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

14. Claims 1, 10, 11, 20-24 and 26 are rejected under 35 U.S.C. 103 as being unpatentable over Cochran (U.S. Patent 4,254,451) in view of Howell et al. (U.S. Patent Publication 2005/0230596) of record.

15. Regarding claim 1, Cochran teaches an eyewear system (figures 1-5) comprising: an eyewear frame (10); an electronics assembly (18, 30, 36, 38, etc.) comprising electronic components configured to control (column 4, lines 1-20) an electrical functional member (28); at least one electrical connective element (plurality of conductive copper strips in flex circuit 30, column 3, lines 43-48) electrically connected to the electronics assembly and the electrical functional member (column 3, lines 44-51), and a conformal layer (flexible plastic ribbon layer, column 3, lines 44-48) over the electronic assembly to seal the electronic components (plurality of copper strips are deposited in flexible plastic, column 3, lines 43-48, figures 4, 5); wherein the conformal layer is disposed in an enclosure of the eyewear frame (figures 4, 5); wherein the eyewear frame comprises a temple (12); and wherein the electronic assembly is enclosed in the temple (18, 36, column 3, lines 7-25), but fails to explicitly teach wherein the conformal layer is moisture proof and seals electrical connections of the electronic component. Within the same field of endeavor Howell discloses an eyewear system (paragraph 0007, figures 14G, 19) wherein a conformal layer (1490) is moisture proof and seals electrical connections (epoxy, paragraph 0151) of an electronic component (1480). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was effectively filed to use the eyewear as taught by Cochran with the epoxy encapsulant as taught by Howell for the purpose of blocking unwanted radiation away from electronic components in a water proof eyewear system (Howell, paragraphs 0151, 0194).

16. Regarding claim 10, Cochran teaches wherein the electrical functional member includes at least one of an electronic display, a gaming function, and an active 3D function (displaying a plurality of sequentially actuated flashing light-emitting diodes to achieve an ornamental or decorative effect, abstract and column 1, lines 9-11).

17. Regarding claim 11, Cochran teaches wherein the electrical connective element is a conductive compressible member or a multiconductor cable (plurality of conductive copper strips in flex circuit 30, column 3, lines 43-48).

18. Regarding claim 20, Cochran teaches wherein the electronics assembly comprises at least one of a touch sensor or a micro-processor (programmable integrated circuit, column 3, lines 50-52).

19. Regarding claim 21, Cochran teaches wherein the enclosure comprises at least one of an outer casing of the electronic assembly or a cavity of the eyewear frame (figures 4, 5).

20. Regarding claim 22, Cochran teaches wherein the conformal layer comprises at least one of an encasing layer or an encapsulating layer (plurality of copper strips are deposited within an encasing flexible plastic layer, column 3, lines 43-48, figure 5).

21. Regarding claim 23, Cochran lacks the explicit teaching wherein the conformal layer protects the electronic components from external environmental damage. Within the same field of endeavor Howell discloses an eyewear system (paragraph 0007, figures 14G, 19) wherein the conformal layer protects the electronic components from external environmental damage (Howell, paragraph 0151). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was

effectively filed to use the eyewear as taught by Cochran with the block epoxy encapsulant as taught by Howell for the purpose of blocking unwanted radiation away from electronic components and to water proof the eyewear system (Howell, paragraphs 0151, 0194).

22. Regarding claim 24, Cochran lacks the explicit teaching wherein the conformal layer is a conformal coating. Within the same field of endeavor Howell discloses an eyewear system (paragraph 0007, figures 14G, 19) wherein the conformal layer is a conformal coating (epoxy encapsulant, Howell, paragraph 0151). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was effectively filed to use the eyewear as taught by Cochran with the epoxy encapsulant as taught by Howell for the purpose of blocking unwanted radiation away from electronic components in a water proof eyewear system (Howell, paragraphs 0151, 0194).

23. Regarding claim 26, Cochran lacks the explicit teaching wherein the conformal coating comprises at least one of an acrylic, urethane, silicone, or epoxy. Within the same field of endeavor Howell discloses an eyewear system (paragraph 0007, figures 14G, 19) wherein the conformal coating comprises an epoxy (paragraph 0151). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was effectively filed to use the eyewear as taught by Cochran with the epoxy encapsulant as taught by Howell for the purpose of blocking unwanted radiation away from electronic components in a water proof eyewear system (Howell, paragraphs 0151, 0194).

24. Claims 25 and 27 are rejected under 35 U.S.C. 103 as being unpatentable over Cochran (U.S. Patent 4,254,451) in view of Howell et al. (U.S. Patent Publication 2005/0230596), as applied to claims 23 and 26 above respectively, and further in view of Archambeau et al. (U.S. Patent Publication 2011/0013136) of record.

25. Regarding claim 25, although Cochran in view of Howell discloses the eyewear system of claim 23, Cochran in view of Howell lacks the explicit teaching wherein a thickness of the conformal coating is less than 1 mm. Within the same field of endeavor Archambeau discloses an eyewear system (figures 1-3) wherein a thickness of the conformal coating is less than 1 mm (Archambeau, paragraph 0017). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was effectively filed to use the conformal coating of plastic having a constant thickness of 10 nm to 500 nm as taught by Archambeau, along with the eyewear system as taught by Cochran in view of Howell for the purpose of providing a complete hermetic seal while optimizing operating voltages (Archambeau, paragraph 0017).

26. Regarding claim 27, although Cochran in view of Howell discloses the eyewear system of claim 26, Cochran in view of Howell lacks the explicit teaching wherein the conformal coating is brush applied, spray applied, or dip applied. Within the same field of endeavor Archambeau discloses an eyewear system (figures 1-3) wherein the conformal coating is brush applied, spray applied, or dip applied (projection applied, Archambeau, paragraphs 0054, 0055). It would have been obvious to one having ordinary skill in the art before the time that the claimed invention was effectively filed to

use the projection application as taught by Archambeau, along with the eyewear system as taught by Cochran in view of Howell for the purpose of providing a complete hermetic seal while controlling component amounts (Archambeau, paragraphs 0054, 0055).

Conclusion

27. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GARY O'NEILL whose telephone number is (313)446-6521. The examiner can normally be reached on Monday - Friday; EST 8:30-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Mack can be reached on 571-272-2333. 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). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GARY O'NEILL/
Examiner, Art Unit 2872

/RICKY MACK/
Supervisory Patent Examiner, Art Unit 2872

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 19:35
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S2	5	"2009126946".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 15:09
S3	5	"2010080999".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 15:13
S4	2	"2008273166".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 15:13
S5	2	"5463428".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 15:13
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S16	2	"6719425".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 15:17
S17	4	"4418990".pn.	US-PGPUB;	OR	ON	2013/09/12

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		swimming or swimmer or snow or snowing or weather or precipitation or condensation or liquid or wet)				
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S31	503	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:37
S32	90	351/159.03.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:37
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S35	23094	S29 or S30 or S31	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:38
S36	4948	S35 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or wet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:38
S37	267	G02C7/083.cpc.	US-PGPUB; USPAT;	OR	ON	2013/09/12 16:41

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S38	504	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:43
S39	255	S38 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or wet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:43
S40	5032	S36 or S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:44
S41	2932767	glasses or eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:45
S42	4100	S40 and S41	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:46
S43	755	S42 and (hinge or rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:47
S44	171	S43 and silicone	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:48
S45	2	S44 and grease	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:49
S46	84	S44 and (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor)	US-PGPUB; USPAT;	OR	ON	2013/09/12 16:50

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S47	1	S46 and grease	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 16:51
S48	1	S43 and (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric) and (silicone near6 grease)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:40
S49	1769	S41 and (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric) and (silicone near6 grease)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:41
S50	1	S43 and S49	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:41
S51	148	S49 and (hinge or rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:41
S52	147	S51 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or wet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:42
S53	137	S52 and (conduct$5 or wire)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:43
S54	254107	(glasses or eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:43
S55	4	S53 and S54	US-PGPUB; USPAT;	OR	ON	2013/09/12 18:43

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S56	133	S53 not S55	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:45
S57	0	S56 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:46
S58	1556	(silicone near6 (paste or compound or oil or viscosity or lubrican$4 or grease)) and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:49
S59	97	(silicone near6 (paste or compound or oil or viscosity or lubrican$4 or grease)) same(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:49
S60	11	S59 and (hinge or rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:50
S61	155	S58 and (hinge or rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:56
S62	144	S61 not S60	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:56
S63	0	S62 and ((silicone near6 (paste or compound or grease)) same (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 18:57
S64	30	S62 and ((silicone near6 (paste or compound or grease)) and (eyeglasses or eye-glasses or (eye adj2 glasses) or	US-PGPUB; USPAT; USOCR;	OR	ON	2013/09/12 18:57

		spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S65	1	S62 and ((silicone near6 (grease)) and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:00
S66	165	S41 and ((insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric) near6 (silicone near6 grease))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:02
S67	2	S66 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:03
S68	49	(silicone near6 (paste or grease)) and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:05
S69	45	S68 not (S60 or S65 or S67)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:05
S70	2	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric) near6 (silicone near6 grease))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:17
S71	3	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((conduct$6 or wire) near6 (silicone near6 grease))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:19
S72	11	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((conduct$6 or wire) and (silicone near6 grease)) and (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:21

S73	65	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((conduct$6 or wire) and (silicone and grease)) and (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:21
S74	54	S73 not S72	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:22
S75	107	S32 or S33	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:25
S76	38	S75 and silicone	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:25
S77	0	S76 and (grease or paste)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:26
S78	38	S76 not S72	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:26
S79	2	"20100076553".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:36
S80	1	S79 and silicone	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 19:36
S81	126	("20010043266" | "20050237485" | "20050264752" | "20070296918" | "7784935" | "20050270479" | "20060203186" | "20080106695" |	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	2013/09/12 20:21

		"5764338" | "6626532" | "20050078274" | "4152846" | "4875030" | "4967268" | "5463428" | "20020140899" | "20050242771" | "20100177277" | "4418990" | "4907860" | "5835185" | "6336250" | "7063420" | "20070121061" | "20070258039" | "20080316420" | "4991258" | "5742379" | "5760869" | "6595634" | "6719425" | "6866386" | "7813048" | "20110058141" | "20040000733" | "20050270481" | "20100309426" | "4283127" | "4991951" | "7104645" | "7140727" | "20010007493" | "20060231158" | "6097450" | "7009757" | "7425066" | "2930857" | "20050225723" | "20060092340" | "20080273166" | "20100201938" | "4756605" | "5182585" | "5657107" | "6115177" | "6582075").PN.	DERWENT; IBM_TDB			
S82	5	"2006023158".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 20:45
S83	2	"20060231580".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 20:45
S84	2	"20060023158".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/12 20:46
S85	56	("20010043266" | "20050237485" | "20050264752" | "20070296918" | "7784935" | "20050270479" | "20060203186" | "20080106695" | "5764338" | "6626532" | "20050078274" | "4152846" | "4875030" | "4967268" | "5463428" | "20020140899" | "20050242771" | "20100177277" | "4418990" | "4907860" | "5835185" | "6336250" | "7063420" | "20070121061" | "20070258039" | "20080316420" | "4991258" | "5742379" | "5760869" | "6595634" | "6719425" | "6866386" | "7813048" | "20110058141" | "20040000733" | "20050270481" | "20100309426" | "4283127" | "4991951" | "7104645" | "7140727" | "20010007493" | "20060231158" | "6097450" | "7009757" | "7425066" | "2930857" | "20050225723" | "20060092340" | "20080273166" | "20100201938" | "4756605" | "5182585" | "5657107" | "6115177" |	US-PGPUB; USPAT; EPO; JPO	OR	ON	2013/09/12 21:15

		"6582075").PN.				
S86	24469	conduct$5 adj2 rubber	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:08
S87	15772	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S88	7988	351/159.$.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S89	503	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S90	23094	S87 or S88 or S89	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S91	22	S86 and S90	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S92	17	S91 and silicone	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:10
S93	7	S92 and (grease or paste)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:11
S94	10	S92 not S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:14
S95	5	S91 not S92	US-PGPUB; USPAT;	OR	ON	2013/09/13 16:24

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S96	68	S86 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:29
S97	34	S96 and silicone	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:29
S98	21	S97 not S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 16:29
S99	1	(US-6772448-$).did.	USPAT	OR	ON	2013/09/13 16:45
S100	0	"2008273166".pn.	US-PGPUB	OR	ON	2013/09/13 17:20
S101	2	"2008273166".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 17:20
S102	1	"20080273166".pn.	US-PGPUB	OR	ON	2013/09/13 17:21
S103	0	"4991951".pn.	US-PGPUB	OR	ON	2013/09/13 17:21
S104	1	"4991951".pn.	USPAT	OR	ON	2013/09/13 17:22
S105	3	S99 or S102 or S104	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 17:22
S106	126	("20010043266" | "20050237485" | "20050264752" | "20070296918" | "7784935" | "20050270479" | "20060203186" | "20080106695" | "5764338" | "6626532" | "20050078274" | "4152846" | "4875030" | "4967268" | "5463428" | "20020140899" | "20050242771" | "20100177277" | "4418990" | "4907860" | "5835185" | "6336250" | "7063420" | "20070121061" |	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 17:59

		"20070258039" | "20080316420" | "4991258" | "5742379" | "5760869" | "6595634" | "6719425" | "6866386" | "7813048" | "20110058141" | "20040000733" | "20050270481" | "20100309426" | "4283127" | "4991951" | "7104645" | "7140727" | "20010007493" | "20060231158" | "6097450" | "7009757" | "7425066" | "2930857" | "20050225723" | "20060092340" | "20080273166" | "20100201938" | "4756605" | "5182585" | "5657107" | "6115177" | "6582075").PN.				
S107	2	S105 and S106	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/09/13 17:59
S108	69172	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses or lens) same (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric or impedance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:20
S109	2121	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) same (insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric or impedance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:27
S110	1284	S109 and (conduct$5 or wire)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:42
S111	354	S110 and (grease or paste or silicone)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:44
S112	749	S110 and (grease or paste or silicone or coating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:45
S113	806	S110 and (grease or paste or silicone or coating or coated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:45

S114	167	S113 and (hinge or rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:48
S115	116	S114 and (silicone)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:51
S116	36	S115 and ((grease or paste or coating or coated) same silicone)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 08:52
S117	80	S115 not S116	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 11:30
S118	51	S114 not S115	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 11:56
S119	14	S118 and gasket	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 11:56
S120	1	(US-5835185-$).did.	USPAT	OR	ON	2014/04/28 12:10
S121	3	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric or impedance) same (rimlock or rim-lock))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:17
S122	8	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and ((insulat$5 or nonconduct$5 or non-conduct$5 or resistive or resistor or dielectric or impedance) and (rimlock or rim-lock))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:32
S123	5	S122 not S121	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2014/04/28 12:32

			EPO; JPO; DERWENT; IBM_TDB			
S124	694	351/86,154.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:38
S125	79	S124 and (grease or paste or silicone or coating or coated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:39
S126	20	S125 and (silicone or (polymerized adj2 siloxanes) or polysiloxane)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:41
S127	12	S126 and (grease or paste or coating or coated)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:42
S128	8	S126 not S127	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:45
S129	2	S128 and (conduct$5 or wire)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:45
S130	59	S125 not S126	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:46
S131	19	S130 and (conduct$5 or wire)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:46
S132	20	S130 and (conduct$5 or wire or cable)	US-PGPUB; USPAT;	OR	ON	2014/04/28 12:47

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S133	109	S124 and (conduct$5 or wire or cable)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:48
S134	87	S133 not S125	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:49
S135	87	S134 and (conduct$5 or wires or cable)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:49
S136	15	S135 and (conduct$5 or cable)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:49
S137	21	S124 and (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or signal)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 12:53
S138	1	(US-7527374-$).did.	USPAT	OR	ON	2014/04/28 13:19
S139	154	S109 and ((grease or paste or coating or coated) same (silicone or (polymerized adj2 siloxanes) or polysiloxane))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 13:23
S140	74	S109 and ((grease or paste or coating or coated) near5 (silicone or (polymerized adj2 siloxanes) or polysiloxane))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 13:24
S141	61	S140 and (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or signal)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/04/28 13:24

			DERWENT; IBM_TDB			
S142	1	(US-20100265456-$).did.	US-PGPUB	OR	ON	2014/04/28 18:24
S143	14	("4285819" | "4612247" | "4681712" | "4798694" | "4868106" | "4935147" | "5076950" | "5279936" | "5283064" | "5319397" | "5536644" | "5642177" | "5770388").PN. OR ("6231703").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2014/04/28 21:04
S144	2	S143 and (silicone or (polymerized adj2 siloxanes) or polysiloxane)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 21:05
S145	1	(US-6231703-$).did.	USPAT	OR	ON	2014/04/28 21:15
S146	1	(US-20100265456-$).did.	US-PGPUB	OR	ON	2014/04/28 21:16
S147	2	S145 or S146	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 21:16
S148	2	S147 and (silicone or (polymerized adj2 siloxanes) or polysiloxane)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 21:16
S149	1	S148 and (grease or paste or gel or oil)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/28 21:17
S150	1	(US-6231703-$).did.	USPAT	OR	ON	2014/04/29 10:14
S151	1	(US-20100265456-$).did.	US-PGPUB	OR	ON	2014/04/29 10:14
S152	2	S150 or S151	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 10:14
S153	2	S152 and (silicone or (polymerized adj2 siloxanes) or polysiloxane)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 10:14

S154	1	S151 and (conduct$5 near rubber)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 10:21
S155	12	"2007329719"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 14:42
S156	0	JP2008/003799	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:29
S157	0	JP20080003799	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:29
S158	8	"20080003799"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:29
S159	25	"2008003799"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:30
S160	0	WO2009081542	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:32
S161	9	"2009081542"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 15:32
S162	3985	(anisotropic and conduct$5 and rubber and (silicone or (polymerized adj2 siloxanes) or polysiloxane) and (grease or paste or gel or oil))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2014/04/29 18:59

			DERWENT; IBM_TDB			
S163	52	351/41-178.ccls. and S162	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:02
S164	1137	(anisotropic and conduct$5 and rubber and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) near6 (grease or paste or gel or oil)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:05
S165	0	351/41-178.ccls. and S164	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:05
S166	1684	(anisotropic and conduct$5 and rubber and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) same (grease or paste or gel or oil)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:06
S167	44	351/41-178.ccls. and S166	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:06
S168	13	S164 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:09
S169	80	S166 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:13
S170	67	S169 not S168	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:13
S171	1758	(anisotropic and conduct$5 and rubber and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) same	US-PGPUB; USPAT; USOCR;	OR	ON	2014/04/29 19:15

		(grease or paste or gel or oil or lubricant)))	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S172	67	S170 and S171	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:15
S173	1137	(anisotropic and conduct$5 and rubber and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) same (grease or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:20
S174	865	(anisotropic and conduct$5 and rubber and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:20
S175	6	((anisotropic near4 conduct$5 near4 rubber) and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:21
S176	0	S175 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:22
S177	8	((anisotropic near4 conduct$5 near4 rubber) and ((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:24
S178	2	S177 not S175	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:24
S179	1186	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:27

S180	27	S179 and anisotropic	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:27
S181	477	S179 and (rubber)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:28
S182	11	S179 and (conduct$5 near4 rubber)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:28
S183	21	S180 not S182	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:33
S184	121	S179 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm. and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:37
S185	108	S179 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant))).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:38
S186	107	S185 not (S180 or S177 or S175 or S172 or S170)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:40
S187	666	S179 and (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or signal)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:46
S188	8092	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or	US-PGPUB; USPAT; USOCR;	OR	ON	2014/04/29 19:47

		sunglasses or sun-glasses) near6 (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or signal)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S189	52	S187 and S188	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:47
S190	163	351/159.39.ccls. or 351/159.4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:55
S191	2	S179 and S190	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:55
S192	2	S190 and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:56
S193	52	S188 and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:57
S194	0	S193 not S189	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 19:57
S195	677	S179 and (connect or connected or connector or connecting or connection)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 20:08
S196	48	S179 and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) same (grease or paste or gel or oil or lubricant))) same (connect or connected or connector or connecting or connection)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 20:09
S197	972	S179 not (S180 or S182 or S183 or	US-PGPUB;	OR	ON	2014/04/29

		S186 or S189 or S191 or S192 or S193 or S196)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			20:17
S198	76	S197 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 20:18
S199	1	(US-4243306-$).did.	USPAT	OR	ON	2014/04/29 20:27
S200	3	(eyewire or eye-wire or (eye adj2 wire)) near4 (rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 23:07
S201	15	(eyewire or eye-wire or (eye adj2 wire)) same (rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 23:09
S202	12	S201 not S200	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/29 23:10
S203	17	(eyewire or eye-wire or (eye adj2 wire)) and (rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:27
S204	35	(upper or lower or top or bottom or halves or half) same (rimlock or rim-lock)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:27
S205	16	S203 and S204	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:28
S206	53305	(coat or coated or coating or film or dipped or dip or deposit or depositing or deposited or apply or applied or applying) same (insulating or insulated or insulation or nonconductive or non-conductive or nonconducting or non-conducting) same (frame or rim or eyewire or eye-wire or (eye adj2 wire))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:57

S207	1138	351/90-102.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:59
S208	0	S206 and S207	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 09:59
S209	37998	S206 and ((split$4 or bisect$5 or dual or two or upper or lower) same (frame or rim or eyewire or eye-wire or (eye adj2 wire)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:02
S210	16194	S209 and ((split$4 or bisect$5 or dual or two or upper or lower) near6 (frame or rim or eyewire or eye-wire or (eye adj2 wire)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:02
S211	11719	S210 and (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:06
S212	10147	S209 and ((electronics or electrical or conduct$4 or current or circuit or node) near6 (frame or rim or eyewire or eye-wire or (eye adj2 wire)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:09
S213	5051	S211 and ((electronics or electrical or conduct$4 or current or circuit or node) near6 (frame or rim or eyewire or eye-wire or (eye adj2 wire)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:09
S214	39	S213 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 10:10
S215	1	(US-20100177277-$).did.	US-PGPUB	OR	ON	2014/04/30 10:29
S216	1	(US-20100177277-$).did.	US-PGPUB	OR	ON	2014/04/30 17:30
S217	1	(US-4243306-$).did.	USPAT	OR	ON	2014/04/30 17:31
S218	1	"20100265456".pn.	US-PGPUB	OR	ON	2014/04/30 17:31
S219	2	S216 or S217 or S218	US-PGPUB	OR	ON	2014/04/30 17:32

S220	3	S216 or S217 or S218	US-PGPUB; USPAT	OR	ON	2014/04/30 17:32
S221	697	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 17:43
S222	697	S221	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 17:43
S223	214	S222 and ((electronics or electrical or conduct$4 or current or circuit or node) near6 (frame or rim or eyewire or eye-wire or (eye adj2 wire)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 17:44
S224	2	S223 and (((silicone or (polymerized adj2 siloxanes) or polysiloxane) near4 (grease or paste or gel or oil or lubricant)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/30 17:44
S225	141458	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 16:49
S226	42370	S225 and (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or electroactive or electro-active)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 16:53
S227	19470	S225 same (electronics or electrical or battery or batteries or circuit or microchip or processor or antenna or computer$4 or electroactive or electro-active)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 16:54
S228	9712	S227 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or wet or humid or humidity or fluid or liquid or damp)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 16:59

S229	769368	((conduct$5 or metal$5) near4 (rubber$5 or compress$5 or flexib$4 or coil or coiled or bend$5))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:09
S230	726	S228 and S229	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:09
S231	627	S230 and (electro-activ$4 or electroactiv$4 or electro-chromic$4 or electrochromic$4 or display$4 or sensor or sensing or sensed or GPS or (global adj position$5) or alarm$4 or hearing or ((virtual or augment$4) near3 reality) or gaming or audio or microphone or recording or transmitter or pedometer or 3D or 3-D)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:18
S232	549	S231 and (cable$2 or wire or connector or plug$4 or receptacle or multiconduct$5 or multi-conduct$5 or (multi$4 adj2 conduct$5))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:30
S233	13200	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:30
S234	162	S232 and S233	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:31
S235	104	S234 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:37
S236	90	S235 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:51
S237	89	S236 and (electro-activ$4 or	US-PGPUB;	OR	ON	2014/10/30

		electroactiv$4 or electro-chromic$4 or electrochromic$4 or display$4 or sensor or sensing or sensed or ((virtual or augment$4) near3 reality) or gaming or 3D or 3-D)	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			17:54
S238	58	S237 and (electro-activ$4 or electroactiv$4 or electro-chromic$4 or electrochromic$4 or display$4 or sensor or sensing or sensed or ((virtual or augment$4) near3 reality) or gaming or 3D or 3-D).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 17:54
S239	1	(US-20060132382-$).did.	US-PGPUB	OR	ON	2014/10/30 18:22
S240	2	"20060095128".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 18:38
S241	60841	BLUM.in. or KOKONASKI.in. or LONGA.in. or GRAHAM.in. or HADDOCK.in. or WILLEY.in. or TABACCHI.in. or BOCK.in. or PINAZZA.in. or RICHMAN.in. or OZGUZ.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:19
S242	13953	Pugh.in. or Otts.in. or Riall.in. or Snook.in. or Putt.in. or Kernick.in. or Flitsch.in. or Higham.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:26
S243	153256	Jannard.in. or Nattress.in. or Mathur.in. or DaSilva.in. or Land.in. or Rose.in. or Davis.in. or Neil.in. or Reyes.in. or Yee.in. or Thixton or Baden.in. or Arnette.in. or Tackels.in. or Houston.in. or Moritz.in. or Rohrbach.in. or Zentil.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:41
S244	226757	S241 or S242 or S243	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:41
S245	17	S236 and S244	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:42
S246	6	S245 not S238	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:42
S247	73	S236 not S245	US-PGPUB; USPAT;	OR	ON	2014/10/30 19:44

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S248	73	S225 and S247	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:44
S249	73	S248 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 19:45
S250	1	(US-5455638-$).did.	USPAT	OR	ON	2014/10/30 20:27
S251	1	(US-4520238-$).did.	USPAT	OR	ON	2014/10/30 20:28
S252	9	"20100265456".pn. or "42433068".pn. or "20080273166".pn. or "4991951".pn. or "6772448".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 20:57
S253	2	"20050239502".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:02
S254	2	"20090201460".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:02
S255	2	"20120262667".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:02
S256	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:03
S257	16629	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:20
S258	16979	351/41-158,178.ccls.	US-PGPUB; USPAT; USOCR;	OR	ON	2014/10/30 21:21

			EPO; JPO; DERWENT; IBM_TDB			
S259	359	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:32
S260	563	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:32
S261	17348	S258 or S259 or S260	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:34
S262	1410	S261 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:34
S263	1381	S262 not (S238 or S245)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:35
S264	347	S263 and (electro-activ$4 or electroactiv$4 or electro-chromic$4 or electrochromic$4 or display$4 or sensor or sensing or sensed or ((virtual or augment$4) near3 reality) or gaming or 3D or 3-D)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:36
S265	188	S264 and (cable$2 or cord or wire or connector or multiconduct$5 or multi-conduct$5 or (multi$4 adj2 conduct$5))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:37
S266	63	S265 and (plug$4 or receptacle)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:38
S267	9	S266 and (plug$4 and receptacle)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:39

S268	54	S266 not S267	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/30 21:41
S269	1	(US-6824265-$).did.	USPAT	OR	ON	2014/10/31 01:05
S270	4	S239 or S250 or S251 or S269	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/31 01:05
S271	327074	((conduct$5 or (metal or metallic or metalic or metalized or metalization or metalizing)) near4 (elast$8 or rubber$5)) or (conductive near6 polymer near6 metal$4 near6 ion)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/31 01:17
S272	2	S270 and S271	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/10/31 01:17
S273	1	(US-4520238-$).did.	USPAT	OR	ON	2014/10/31 02:07
S274	1	(US-5455638-$).did.	USPAT	OR	ON	2014/10/31 02:07
S275	1	(US-20060132382-$).did.	US-PGPUB	OR	ON	2014/10/31 02:07
S276	1	(US-20060132382-$).did.	US-PGPUB	OR	ON	2015/06/24 11:34
S277	1	S276 and (insulat$5 or grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 11:35
S278	1	(US-5455638-$).did.	USPAT	OR	ON	2015/06/24 11:46
S279	1	S278 and (insulat$5 or grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 11:46
S280	1	(US-6824265-$).did.	USPAT	OR	ON	2015/06/24 11:51
S281	1	(US-4520238-$).did.	USPAT	OR	ON	2015/06/24 11:51
S282	2	S280 or S281	USPAT	OR	ON	2015/06/24 11:51
S283	2	S282 and (insulat$5 or grease or acrylic or silicone or urethane or	US-PGPUB; USPAT;	OR	ON	2015/06/24 12:12

		epoxy)	USOCR; EPO; JPO; DERWENT; IBM_TDB			
S284	342	US-2437642-$.DID. OR US-2576581-$.DID. OR US-2930857-$.DID. OR US-3161718-$.DID. OR US-3245315-$.DID. OR US-3309162-$.DID. OR US-3614215-$.DID. OR US-3738734-$.DID. OR US-3791719-$.DID. OR US-4062629-$.DID. OR US-4152846-$.DID. OR US-4174156-$.DID. OR US-4181408-$.DID. OR US-4190330-$.DID. OR US-4243306-$.DID. OR US-4264154-$.DID. OR US-4279474-$.DID. OR US-4283127-$.DID. OR US-4300818-$.DID. OR US-4320939-$.DID. OR US-1563929-$.DID. OR US-2170613-$.DID. OR US-4373218-$.DID. OR US-4395736-$.DID. OR US-4418990-$.DID. OR US-4423929-$.DID. OR US-4431262-$.DID. OR US-4457585-$.DID. OR US-4461550-$.DID. OR US-4466703-$.DID. OR US-4466706-$.DID. OR US-4529268-$.DID. OR US-4537479-$.DID. OR US-4564267-$.DID. OR US-4572616-$.DID. OR US-4577928-$.DID. OR US-4601545-$.DID. OR US-4609824-$.DID. OR US-4712870-$.DID. OR US-4756605-$.DID. OR US-4772094-$.DID. OR US-D298250-$.DID. OR US-2169417-$.DID. OR US-4787733-$.DID. OR US-4787903-$.DID. OR US-4795248-$.DID. OR US-4813777-$.DID. OR US-4818095-$.DID. OR US-4836652-$.DID. OR US-4842400-$.DID. OR US-4875030-$.DID. OR US-4880300-$.DID. OR US-4890903-$.DID. OR US-4904063-$.DID. OR US-4907860-$.DID. OR US-4909626-$.DID. OR US-4919520-$.DID. OR US-4921728-$.DID. OR US-5011990-$.DID. OR US-4927241-$.DID. OR US-4929865-$.DID. OR US-4930884-$.DID. OR US-4944584-$.DID. OR US-4952788-$.DID. OR US-4955712-$.DID. OR US-4958907-$.DID. OR US-4961639-$.DID. OR US-4967268-$.DID. OR US-4968127-$.DID. OR US-4981342-$.DID. OR US-4991258-$.DID. OR US-4991951-$.DID. OR US-5015086-$.DID. OR US-5030882-$.DID. OR US-5050981-$.DID. OR US-5066301-$.DID. OR US-5067795-$.DID. OR US-5073021-$.DID. OR US-5076665-$.DID. OR US-5089023-$.DID. OR US-5091801-$.DID. OR US-5108169-$.DID. OR US-5114218-$.DID. OR US-1011200-$.DID. OR US-5114628-$.DID. OR US-5130856-$.DID. OR US-5142411-$.DID. OR US-5150234-$.DID. OR US-5171266-$.DID. OR US-5182585-$.DID. OR US-	US-PGPUB; USPAT; USOCR; EPO	OR	ON	2015/06/24 13:28

		5184156-$.DID. OR US-5200859-$.DID. OR US-5208688-$.DID. OR US-5229885-$.DID. OR US-5231430-$.DID. OR US-5239412-$.DID. OR US-D342063-$.DID. OR US-5305028-$.DID. OR US-5306926-$.DID. OR US-5319397-$.DID. OR US-5324930-$.DID. OR US-D350342-$.DID. OR US-5352886-$.DID. OR US-5359444-$.DID. OR US-5375006-$.DID. OR US-5382986-$.DID. OR US-5386308-$.DID. OR US-5739959-$.DID. OR US-5424927-$.DID. OR US-5774273-$.DID. OR US-5440357-$.DID. OR US-5443506-$.DID. OR US-5451766-$.DID. OR US-5455638-$.DID. OR US-5463428-$.DID. OR US-5488439-$.DID. OR US-5489302-$.DID. OR US-5522323-$.DID. OR US-5526067-$.DID. OR US-5552841-$.DID. OR US-5608567-$.DID. OR US-5615588-$.DID. OR WO-2006126881-$.DID. OR WO-20061235960-$.DID. OR WO-2007142520-$.DID. OR WO-2007142602-$.DID. OR WO-2008002388-$.DID. OR WO-200802407-$.DID. OR JP-2008083299-$.DID. OR WO-2008045283-$.DID. OR US-5654789-$.DID. OR US-5657107-$.DID. OR US-5668620-$.DID. OR US-5682223-$.DID. OR US-5683457-$.DID. OR US-1265686-$.DID. OR US-5710615-$.DID. OR US-5712721-$.DID. OR US-5728155-$.DID. OR US-5742379-$.DID. OR US-5760869-$.DID. OR US-5764338-$.DID. OR US-5777719-$.DID. OR US-5815233-$.DID. OR US-5815239-$.DID. OR US-5835185-$.DID. OR US-5861936-$.DID. OR US-5877876-$.DID. OR WO-2008046858-$.DID. OR EP-1916561-$.DID. OR WO-2008051520-$.DID. OR WO-2008115251-$.DID. OR WO-2009081542-$.DID. OR WO-2009098719-$.DID. OR WO-2009109749-$.DID. OR WO-2009126946-$.DID. OR US-5900720-$.DID. OR US-5949521-$.DID. OR US-5953098-$.DID. OR US-5956183-$.DID. OR US-5963300-$.DID. OR US-5971540-$.DID. OR US-5980037-$.DID. OR US-5999328-$.DID. OR US-6040947-$.DID. OR US-6050687-$.DID. OR US-6069742-$.DID. OR US-6086203-$.DID. OR US-6086204-$.DID. OR US-6095651-$.DID. OR US-6097450-$.DID. OR US-6099117-$.DID. OR US-6115177-$.DID. OR US-6145987-$.DID. OR US-6163926-$.DID. OR WO-2009125184-$.DID. OR WO-2009136667-$.DID. OR JP-09294654-$.DID. OR WO-2010062504-$.DID. OR WO-				

		2010080999-$.DID. OR EP-2233964-$.DID. OR WO-2011119601-$.DID. OR US-6213602-$.DID. OR US-6191881-$.DID. OR US-6270220-$.DID. OR US-6271915-$.DID. OR US-6288846-$.DID. OR US-20010043266-$.DID. OR US-6325508-$.DID. OR US-20010055094-$.DID. OR US-6336250-$.DID. OR US-6350031-$.DID. OR US-6390623-$.DID. OR US-6396622-$.DID. OR US-6412941-$.DID. OR US-6437762-$.DID. OR US-6437925-$.DID. OR US-20020140899-$.DID. OR US-6464363-$.DID. OR US-20020149739-$.DID. OR US-20020186346-$.DID. OR US-20030018383-$.DID. OR US-6554425-$.DID. OR US-20030095336-$.DID. OR US-6582075-$.DID. OR US-6595634-$.DID. OR US-20030151721-$.DID. OR US-6607271-$.DID. OR US-6609794-$.DID. OR US-6614408-$.DID. OR US-6618208-$.DID. OR US-6616275-$.DID. OR US-6616279-$.DID. OR US-6626532-$.DID. OR US-6631001-$.DID. OR US-20030210377-$.DID. OR US-20040000733-$.DID. OR US-20040001180-$.DID. OR US-20040008319-$.DID. OR US-6682195-$.DID. OR US-6709105-$.DID. OR US-6709108-$.DID. OR US-6715876-$.DID. OR US-6719425-$.DID. OR US-6738199-$.DID. OR US-20040108971-$.DID. OR US-20040117011-$.DID. OR US-20040130677-$.DID. OR US-6768536-$.DID. OR US-6772448-$.DID. OR US-6774871-$.DID. OR US-20040156012-$.DID. OR US-6778246-$.DID. OR US-20040179280-$.DID. OR US-20040196435-$.DID. OR US-20040246440-$.DID. OR US-6833938-$.DID. OR US-6840619-$.DID. OR US-6851805-$.DID. OR US-7333272-$.DID. OR US-6866386-$.DID. OR US-6871951-$.DID. OR US-20050073739-$.DID. OR US-20050078274-$.DID. OR US-6883916-$.DID. OR US-6886938-$.DID. OR US-6893124-$.DID. OR US-20050124983-$.DID. OR US-20050140922-$.DID. OR US-20050140924-$.DID. OR US-6918670-$.DID. OR US-6938277-$.DID. OR US-6948818-$.DID. OR US-20050237477-$.DID. OR US-6951391-$.DID. OR US-20050225723-$.DID. OR US-6955433-$.DID. OR US-6956682-$.DID. OR US-20050237485-$.DID. OR US-20050239502-$.DID. OR US-20050242771-$.DID. OR US-20050248719-$.DID. OR US-20050264752-$.DID. OR US-20060001827-$.DID. OR US-6986579-$.DID. OR US-20060023158-$.DID. OR US-20060044510-$.DID. OR US-				

		7009757-$.DID. OR US-7008054-$.DID. OR US-7019890-$.DID. OR US-7030411-$.DID. OR US-20060077562-$.DID. OR US-20060092340-$.DID. OR US-7041133-$.DID. OR US-7063420-$.DID. OR US-20060164593-$.DID. OR US-7085065-$.DID. OR US-7090348-$.DID. OR US-7104645-$.DID. OR US-20060203186-$.DID. OR US-7133172-$.DID. OR US-7140727-$.DID. OR US-7142369-$.DID. OR US-7159983-$.DID. OR US-20070059503-$.DID. OR US-20070091257-$.DID. OR US-7229173-$.DID. OR US-20070258039-$.DID. OR US-20070263293-$.DID. OR US-20070296918-$.DID. OR US-20080019015-$.DID. OR US-20080084532-$.DID. OR US-20080100792-$.DID. OR US-7369321-$.DID. OR US-20080106695-$.DID. OR US-7425066-$.DID. OR US-7452075-$.DID. OR US-20080273166-$.DID. OR US-1062008-$.DID. OR US-7453646-$.DID. OR US-20090002626-$.DID. OR US-20090116118-$.DID. OR US-7553019-$.DID. OR US-20090201460-$.DID. OR US-7594726-$.DID. OR US-20090256977-$.DID. OR US-20100039709-$.DID. OR US-7675686-$.DID. OR US-20100177277-$.DID. OR US-20100201938-$.DID. OR US-20100208194-$.DID. OR US-20100208195-$.DID. OR US-7782541-$.DID. OR US-7784935-$.DID. OR US-7806525-$.DID. OR US-7813048-$.DID. OR US-20100265456-$.DID. OR US-20100271588-$.DID. OR US-20100309426-$.DID. OR US-7850304-$.DID. OR US-20110058141-$.DID. OR US-8016415-$.DID. OR US-20120002159-$.DID. OR US-20120002160-$.DID. OR US-20120127420-$.DID. OR US-20120262667-$.DID. OR US-8337014-$.DID. OR US-20130010256-$.DID. OR US-20130201439-$.DID. OR US-20130250233-$.DID. OR US-8922902-$.DID. OR US-2008535-$.DID. OR US-151997D-$.DID. OR US-1061505-$.DID. OR US-3890809-$.DID. OR US-2008536-$.DID.				
S285	0	S281 and S284	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 14:34
S286	17064	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11

S287	9755	351/159.$.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S288	628	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S289	26018	S286 or S287 or S288	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S290	891	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S291	1160	351/90-102.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S292	891	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S293	891	S292	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S294	17431	351/41-158,178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S295	366	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S296	786	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11

S297	17903	S294 or S295 or S296	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S298	26808	351/41-178.ccls. or S289 or S290 or S297 or S291 or S293	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:11
S299	4397	S298 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or tight or tightly)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:13
S300	766	S299 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:13
S301	3051	S299 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:16
S302	1685	S301 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:18
S303	357	S302 and ((electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:19
S304	77	S303 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or tight or tightly).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:22

S305	77	S304 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:23
S306	77	S304 or S305	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 16:24
S307	1	(US-20080002141-$).did.	US-PGPUB	OR	ON	2015/06/24 16:27
S308	62422	BLUM.in. or KOKONASKI.in. or LONGA.in. or GRAHAM.in. or HADDOCK.in. or WILLEY.in. or TABACCHI.in. or BOCK.in. or PINAZZA.in. or RICHMAN.in. or OZGUZ.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:41
S309	123031	mitsui.as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:42
S310	185436	S308 or S309	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:42
S311	23775	S310 and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or tight or tightly)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:43
S312	3510	S311 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:46
S313	159	S312 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 18:47

S314	1	(US-20130215374-$).did.	US-PGPUB	OR	ON	2015/06/24 18:51
S315	34	"9028062".pn. or "8979259".pn. or "8944590".pn. or "8905541".pn. or "20140293215".pn. or EP2745167.pn. or "8708483".pn. or "20140104566".pn. or AU2012296482.pn. or "20130278881".pn. or "20130242253".pn. or "20130201439".pn. or "20130070198".pn. or CA2844986.pn. or WO2013025933.pn. or "20130010256".pn. or "8337014".pn. or "20120127420".pn. or "20120127423".pn. or "20120002160".pn. or "20120002159".pn. or "20100271588".pn. or "20100177277".pn. or "20080273166".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/06/24 19:04
S322	21015	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/11/30 19:08
S323	5667	S322 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/11/30 19:09
S324	2805	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/11/30 19:10
S325	1095	S323 and S324	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/11/30 19:11
S326	202	S325 and (insulat$5 or grease or acrylic or silicone or urethane or epoxy).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/11/30 19:11
S327	21023	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and	US-PGPUB; USPAT;	OR	ON	2015/12/01 01:02

		((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)))	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S328	5671	S327 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:02
S329	2806	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:02
S330	1096	S328 and S329	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:02
S331	202	S330 and (insulat$5 or grease or acrylic or silicone or urethane or epoxy).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:02
S332	162	S331 and (wire or wiring or wired or connector or cable or interconnect$3 or inter-connect$3 or conduct$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:05
S333	842	((insulat$5 same (grease or acrylic or silicone or urethane or epoxy)) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:13
S334	807	S333 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:14
S335	90	S334 and ((eyeglasses or eye-glasses	US-PGPUB;	OR	ON	2015/12/01

		or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			01:15
S336	88	S335 and (wire or wiring or wired or connector or cable or interconnect$3 or inter-connect$3 or conduct$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 01:15
S337	1	(US-5946071-$).did.	USPAT	OR	ON	2015/12/01 01:19
S338	1	(US-6231703-$).did.	USPAT	OR	ON	2015/12/01 01:21
S339	1	(US-20020140899-$).did.	US-PGPUB	OR	ON	2015/12/01 01:26
S340	1	(US-20120310339-$).did.	US-PGPUB	OR	ON	2015/12/01 01:37
S341	1	(US-20130070198-$).did.	US-PGPUB	OR	ON	2015/12/01 01:38
S342	1	(US-20140213917-$).did.	US-PGPUB	OR	ON	2015/12/01 01:40
S343	1	(US-20130215374-$).did.	US-PGPUB	OR	ON	2015/12/01 01:40
S344	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 07:33
S345	1	S344 and (insulat$5 or grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 07:34
S346	1349	(((silicone or (polymerized adj2 siloxanes) or polysiloxane) near6 (paste or compound or oil or viscosity or lubrican$4 or grease)) and (insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((water near3 resistant) or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or tight or tightly) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 08:38
S347	1173	S346 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4	US-PGPUB; USPAT; USOCR;	OR	ON	2015/12/01 08:39

		or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S348	54781	(((silicone or (polymerized adj2 siloxanes) or polysiloxane) near6 (paste or compound or oil or viscosity or lubrican$4 or grease)) and (insulat$5 or grease or acrylic or silicone or urethane or epoxy) same (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 08:42
S349	544	S347 and S348	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 08:43
S350	29	S349 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 08:44
S351	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2015/12/01 08:53
S352	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2015/12/01 09:08
S353	515	S349 not S350	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 09:10
S354	317	S353 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 09:26
S355	32	S354 and insulat$5 and grease and (acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 09:27

S356	285	S354 not S355	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 09:30
S357	1	(US-20080130272-$).did.	US-PGPUB	OR	ON	2015/12/01 10:37
S358	21023	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:18
S359	5671	S358 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control$5 or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:18
S360	2806	((insulat$5 or grease or acrylic or silicone or urethane or epoxy) and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:18
S361	1096	S359 and S360	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:18
S362	308	S361 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy or polyurethane)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:18
S363	303	S362 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 11:21
S364	1	(US-20080239452-$).did.	US-PGPUB	OR	ON	2015/12/01 11:36
S365	1836	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2015/12/01 12:23

			IBM_TDB			
S366	2723	G02C11/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:23
S367	625	G02C11/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:23
S368	951	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:23
S369	1827	351/158.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:24
S370	84	S365 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:24
S371	13	"11261035"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:40
S372	3388	S365 or S366 or S367 or S368 or S369	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:43
S373	124	S372 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:44
S374	40	S373 not S370	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2015/12/01 12:44

			IBM_TDB			
S375	40	S374 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 12:59
S376	1	(US-20100265456-$).did.	US-PGPUB	OR	ON	2015/12/01 13:01
S377	986	(insulat$5 and (grease or acrylic or silicone or urethane or epoxy)) same (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4) and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:01
S378	97	S377 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:02
S379	1836	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S380	2723	G02C11/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S381	625	G02C11/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S382	951	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S383	1827	351/158.ccls.	US-PGPUB;	OR	ON	2015/12/01

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			14:04
S384	84	S379 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S385	3388	S379 or S380 or S381 or S382 or S383	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S386	124	S385 and insulat$5 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S387	40	S386 not S384	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S388	40	S387 and (grease or acrylic or silicone or urethane or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S389	73	S378 not (S384 or S386 or S388)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:04
S390	81	(US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2015/12/01 14:15

		20040050072-$ or US-20040059212-$ or US-20060132382-$ or US-20130293448-$).did. or (US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$).did.				
S391	54	S390 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 14:16
S393	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2015/12/01 19:06
S394	1	(US-20090082835-$).did.	US-PGPUB	OR	ON	2015/12/01 19:15
S395	1	(US-20090082835-$).did.	US-PGPUB	OR	ON	2015/12/01 19:18
S396	1	(US-20090082835-$).did.	US-PGPUB	OR	ON	2015/12/01 23:28
S397	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/01 23:51
S398	2	S397 and (configured or adapted or designed or capable)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT;	OR	ON	2015/12/01 23:52

			IBM_TDB			
S399	2	(US-5455638-$ or US-4520238-$).did.	USPAT	OR	ON	2015/12/02 00:43
S400	2	"20060132382".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/02 00:43
S401	1	(US-6824265-$).did.	USPAT	OR	ON	2015/12/02 00:45
S402	6	S396 or S399 or S401 or S400	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/12/02 00:45
S403	5	(US-20090082835-$ or US-20060132382-$).did. or (US-5455638-$ or US-4520238-$ or US-6824265-$).did.	US-PGPUB; USPAT	OR	ON	2015/12/02 00:46
S404	163251	(eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:06
S405	17858	S404 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:07
S406	13048	S405 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or wet)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:08
S407	1061	S406 and ((waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or seal or sealed or sealing or sealer) with (grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:10
S408	137	S407 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) same ((waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:10

		seal or sealed or sealing or sealer) same (grease or acrylic or silicone or urethane or epoxy)))				
S409	132	S408 and (seal or sealed or sealing or sealer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:11
S410	94	S409 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:12
S411	96	S409 and (power or electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:12
S412	96	S409 and (hearing or power or electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 00:13
S413	1	(US-5066022-$).did.	USPAT	OR	ON	2016/06/19 00:14
S414	1	(US-6166849-$).did.	USPAT	OR	ON	2016/06/19 00:15
S415	1	(US-20010024719-$).did.	US-PGPUB	OR	ON	2016/06/19 00:15
S416	1	(US-20020140899-$).did.	US-PGPUB	OR	ON	2016/06/19 00:16
S417	1	(US-6787606-$).did.	USPAT	OR	ON	2016/06/19 00:17
S418	1	(US-20120029367-$).did.	US-PGPUB	OR	ON	2016/06/19 00:19
S419	1	(US-20140104566-$).did.	DERWENT	OR	ON	2016/06/19 00:20
S420	1	(US-20120029367-$).did.	US-PGPUB	OR	ON	2016/06/19 18:21
S421	1	(US-20030231293-$).did.	US-PGPUB	OR	ON	2016/06/19 18:23

S422	1	(US-6166849-$).did.	USPAT	OR	ON	2016/06/19 18:29
S423	1	(US-5066022-$).did.	USPAT	OR	ON	2016/06/19 18:31
S424	837179	((seal or sealed or sealing or sealer) with (hearing or power or electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 18:47
S425	2688	S424 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 18:48
S426	1458	S425 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 18:49
S427	223	S426 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 18:50
S428	1	(US-4254451-$).did.	USPAT	OR	ON	2016/06/19 18:58
S429	837179	((seal or sealed or sealing or sealer) with (hearing or power or electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:46
S430	2688	S429 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:46
S431	1458	S430 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/06/19 22:46

			DERWENT; IBM_TDB			
S432	223	S431 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:46
S433	33	S432 and (optic$4 adj2 power)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:46
S434	190	S432 not S433	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:47
S435	166	S434 and (wire or wired or wiring or cable or cabling or conductor or conductive or conducting)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 22:49
S436	1	(US-4254451-$).did.	USPAT	OR	ON	2016/06/19 23:07
S437	60	S435 and (battery or batteries or solar)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 23:09
S438	172	S434 and (wire or wired or wiring or cable or cabling or conductor or conductive or conducting or ribbon or circuit$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 23:09
S439	64	S438 and (battery or batteries or solar)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/19 23:10
S440	1	(US-6433913-$).did.	USPAT	OR	ON	2016/06/19 23:38
S441	1	(US-20030095336-$).did.	US-PGPUB	OR	ON	2016/06/19 23:41
S442	1	(US-20040160538-$).did.	US-PGPUB	OR	ON	2016/06/19 23:43
S443	1	(US-4254451-$).did.	USPAT	OR	ON	2016/06/20

						00:24
S444	1	(US-5455638-$).did.	USPAT	OR	ON	2016/06/20 01:33
S445	1	S444 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:34
S446	134	((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) same ((seal$4) with (grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:36
S447	62	S446 and (optic$4 adj2 power)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:37
S448	40	S446 and (optic$4 adj power)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:37
S449	94	S446 not S448	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:37
S450	66	S449 and ((light$3 or ("LED") or diode or hearing or power or electronics or electrical or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:39
S451	1877	351/158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:56
S452	248	S451 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/06/20 01:57

			DERWENT; IBM_TDB			
S453	229	S452 and ((light$3 or ("LED") or diode or hearing or power or electronics or electrical or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:58
S454	208	S453 and ((lamp or ("LED") or diode or hearing or power or electronics or electrical or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 01:59
S455	1	(US-5654786-$).did.	USPAT	OR	ON	2016/06/20 02:07
S456	1	(US-5946071-$).did.	USPAT	OR	ON	2016/06/20 02:10
S457	1	(US-20070030442-$).did.	US-PGPUB	OR	ON	2016/06/20 02:20
S458	1	(US-7581833-$).did.	USPAT	OR	ON	2016/06/20 02:30
S459	3	"20070046887".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 02:31
S460	1	S459 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 02:31
S461	1	(US-20070046887-$).did.	US-PGPUB	OR	ON	2016/06/20 02:32
S462	1	(US-7874666-$).did.	USPAT	OR	ON	2016/06/20 02:40
S463	1	(US-20110187989-$).did.	US-PGPUB	OR	ON	2016/06/20 02:43
S464	101	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2016/06/20 09:47

		or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$).did.				
S465	74	S464 and ((grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 09:48
S466	26	S465 and ((seal or sealed or sealing or sealer or sealant) same (grease or	US-PGPUB; USPAT;	OR	ON	2016/06/20 09:52

		acrylic or silicone or urethane or epoxy))	USOCR; EPO; JPO; DERWENT; IBM_TDB			
S467	23	S466 and ((seal or sealed or sealing or sealer or sealant) with (grease or acrylic or silicone or urethane or epoxy))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/20 09:52
S468	1	(US-6433913-$).did.	USPAT	OR	ON	2016/06/20 10:11
S469	1	(US-6433913-$).did.	USPAT	OR	ON	2016/06/20 13:07
S470	1	(US-4254451-$).did.	USPAT	OR	ON	2016/06/20 13:07
S471	1	(US-5455638-$).did.	USPAT	OR	ON	2016/06/20 13:07
S472	3	S468 or S470 or S469 or S471	USPAT	OR	ON	2016/06/20 13:07
S473	3	(US-4254451-$ or US-5455638-$ or US-6433913-$).did.	USPAT	OR	ON	2016/06/20 13:08
S474	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 11:11
S475	1	S474 and conform$6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 11:12
S476	3	(US-4254451-$ or US-5455638-$ or US-6433913-$).did.	USPAT	OR	ON	2017/02/21 11:59
S477	0	S476 and conform$6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 11:59
S478	3	S476 and (coat or coated or coating or film or dipped or dip or deposit or depositing or deposited or encas$4 or encapsulat$6 or conform$6 or spray$4 or dipping or brush$4)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 12:04
S479	101	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2017/02/21 12:19

		20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$).did.				
S480	76	S479 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 12:20
S481	75	S480 and ((lamp or ("LED") or diode or hearing or power or electronics or electrical or electric or electrically or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 12:22

		active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))				
S482	73	S481 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 12:24
S483	67	S482 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/21 13:09
S484	101	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2017/02/22 07:10

		5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$).did.				
S485	76	S484 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:10
S486	75	S485 and ((lamp or ("LED") or diode or hearing or power or electronics or electrical or electric or electrically or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:10
S487	73	S486 and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:10
S488	67	S487 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:10
S489	67	S488	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:10
S490	45	S489 and (encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or	US-PGPUB; USPAT; USOCR;	OR	ON	2017/02/22 07:12

		conform$6)	EPO; JPO; DERWENT; IBM_TDB			
S491	37	S490 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 07:12
S492	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2017/02/22 07:21
S493	13517	(((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) and conform$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:22
S494	4078	(((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) and (conformal or conforming))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:23
S495	838	(((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) and (conformal))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:23
S496	341	(((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) and (conformal) and (temple or arm))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:24
S497	106	S496 and (((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)).clm. and (conformal) and (temple or arm))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:24
S498	96	S497 and ((lamp or ("LED") or diode or hearing or power or electronics or electrical or electric or electrically or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:25
S499	89	S498 and (waterproof$4 or water-proof$4 or moistureproof$4 or	US-PGPUB; USPAT;	OR	ON	2017/02/22 08:26

		moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S500	85	S499 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 08:27
S501	1	(US-20040084790-$).did.	US-PGPUB	OR	ON	2017/02/22 08:42
S502	1	(US-20090306594-$).did.	US-PGPUB	OR	ON	2017/02/22 10:23
S503	1	(US-20120262667-$).did.	US-PGPUB	OR	ON	2017/02/22 10:33
S504	13	"11261035"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 10:42
S505	7	"11261035"	US-PGPUB	OR	ON	2017/02/22 10:42
S506	235	S496 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 11:03
S507	228	S506 and ((lamp or ("LED") or diode or hearing or power or electronics or electrical or electric or electrically or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 11:03
S508	223	S507 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 11:08
S509	138	S508 not S500	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 11:09
S510	1	(US-20060126698-$).did.	US-PGPUB	OR	ON	2017/02/22 12:09

S511	2	"20050140924".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:24
S512	1	S511 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:26
S513	0	S512 and (brush$4 or spray$5 or dip$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:26
S514	1	S512 and (deposit$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:27
S515	1	S514 and (size or sized or sizing or mm or micron or thick or thickness)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:28
S516	1	S515 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:33
S517	1	S516 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 12:34
S518	1	(US-20050140924-$).did.	US-PGPUB	OR	ON	2017/02/22 12:47
S519	1	(US-20050140924-$).did.	US-PGPUB	OR	ON	2017/02/22 13:05
S520	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2017/02/22 13:05
S521	1	(US-4254451-$).did.	USPAT	OR	ON	2017/02/22 13:06
S522	0	S521 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid or fluid$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 14:16
S523	1	S520 and (acrylic or urethane or silicon$5 or epox$3)	US-PGPUB; USPAT;	OR	ON	2017/02/22 16:16

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S524	1	S523 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 16:17
S525	0	S524 and (brush$4 or spray$5 or dip$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 16:17
S526	1	S524 and (size or sized or sizing or mm or micron or thick or thickness)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 16:18
S527	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2017/02/22 17:28
S528	0	S519 and (brush$4 or spray$5 or dip$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:29
S529	1	S519 and (size or sized or sizing or mm or micron or thick or thickness)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:29
S530	6571	(((lamp or ("LED") or diode or hearing or power or electronics or electrical or electric or electrically or battery or batteries or solar or photovoltaic or photo-voltaic or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)) and (((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)) and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6) and (brush$4 or spray$5 or dip$5) and ((layer or coating or film) with (size or sized or sizing or mm or um or micron or thick or thickness))))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:46

S531	6460	S530 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or short-circuit or atmospher$6 or rain or water or moisture or liquid or fluid$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:49
S532	6340	S531 and (coat or coated or coating)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:50
S533	282	S532 and ((coat or coated or coating) with (conform$6))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:51
S534	33	S533 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 17:53
S535	1	(US-20110013136-$).did.	US-PGPUB	OR	ON	2017/02/22 21:23
S536	2	(US-20110013136-$).did. or (US-5898470-$).did.	US-PGPUB; USPAT	OR	ON	2017/02/22 21:29
S537	2	S536 and (brush$4 or spray$5 or dip$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/02/22 21:29
S538	1	(US-20040121528-$).did.	US-PGPUB	OR	ON	2017/02/22 21:59
S539	1	(US-4254451-$).did.	USPAT	OR	ON	2017/02/22 22:00
S540	3	S535 or S538 or S539	US-PGPUB; USPAT	OR	ON	2017/02/22 22:00
S541	2	"20040121528".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:19
S542	1	"20120262667".pn.	US-PGPUB	OR	ON	2017/03/06 20:27
S543	1	"20080273166".pn.	US-PGPUB	OR	ON	2017/03/06 20:27
S544	1	"20100228689".pn.	US-PGPUB	OR	ON	2017/03/06 20:28
S545	1	"20140028966".pn.	US-PGPUB	OR	ON	2017/03/06 20:28

S546	4	S542 or S543 or S544 or S545	US-PGPUB	OR	ON	2017/03/06 20:29
S547	4	S546 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:29
S548	3	S547 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:31
S549	3	S548 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:34
S550	112	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/06 20:51

		20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$ or US-20040084790-$ or US-20090306594-$ or US-20120262667-$ or US-20060095128-$ or US-20060126698-$ or US-20050140924-$ or US-20070144913-$ or US-20110013136-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$ or US-6986579-$ or US-7396126-$ or US-5898470-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$).did.				
S551	94	S550 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:51
S552	89	S551 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:52
S553	89	S552 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:52
S554	89	S553 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:52
S555	87	S554 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/06 20:52

		or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S556	71	S555 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:53
S557	41	S556 and "351".clas.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:53
S558	31	S557 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:57
S559	17	S558 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:58
S560	11	S559 and (coat or coated or coating)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 20:58
S561	6805	"351".clas. and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:06
S562	1168	S561 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:06
S563	725	S562 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/03/06 21:07

		controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	DERWENT; IBM_TDB			
S564	212	S563 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:07
S565	132	S564 and (coat or coated or coating)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:07
S566	17	S565 and (conform$6 with (coat or coated or coating))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:08
S567	12	S566 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:08
S568	11	S567 not S560	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:08
S569	132	S565 and (conform$6 and (coat or coated or coating))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:13
S570	73	S569 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:14
S571	21	S570 and (conform$6 same (acrylic or urethane or silicone or epoxy))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:14
S572	12	S571 not S568	US-PGPUB; USPAT;	OR	ON	2017/03/06 21:14

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S573	11	S572 not S560	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:15
S574	1920	351/158.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:18
S575	1150	S574 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:19
S576	55	S575 and (conform$6 and (coat or coated or coating))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:19
S577	32	S576 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:19
S578	23	S577 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:20
S579	16	S578 not (S560 or S568)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:20
S580	272	S575 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/06 21:27

		moisture)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S581	101	S580 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:27
S582	78	S581 not (S560 or S568 or S579)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:27
S583	15	S582 and ((acrylic or urethane or silicone or epoxy) same (coat or coated or coating))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:28
S584	1050	"351".clas. and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) same (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:35
S585	169	S584 and ((acrylic or urethane or silicone or epoxy) same (coat or coated or coating))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:35
S586	132	S585 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:36
S587	77	S586 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:36

S588	62	S587 not (S560 or S568 or S579 or S583)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/06 21:37
S589	1580	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 05:57
S590	311	S589 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 05:58
S591	166	S590 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 05:58
S592	161	S591 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:00
S593	161	S592 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:00
S594	112	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/07 06:02

		20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$ or US-20040084790-$ or US-20090306594-$ or US-20120262667-$ or US-20060095128-$ or US-20060126698-$ or US-20050140924-$ or US-20070144913-$ or US-20110013136-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$ or US-6986579-$ or US-7396126-$ or US-5898470-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$).did.				
S595	94	S594 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S596	89	S595 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S597	89	S596 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/07 06:02

		encapsulating or conform$6 or seal$5)	EPO; JPO; DERWENT; IBM_TDB			
S598	89	S597 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or hermetic or hermetically or short or atmospher$6 or rain or water or moisture or liquid)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S599	87	S598 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S600	71	S599 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S601	41	S600 and "351".clas.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S602	31	S601 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S603	17	S602 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S604	11	S603 and (coat or coated or coating)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S605	6805	"351".clas. and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2017/03/07 06:02

			IBM_TDB			
S606	1168	S605 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S607	725	S606 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S608	212	S607 and (conform$6)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S609	132	S608 and (coat or coated or coating)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S610	17	S609 and (conform$6 with (coat or coated or coating))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S611	12	S610 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S612	11	S611 not S604	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S613	1920	351/158.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S614	1150	S613 and (electronics or electrical or battery or batteries or microchip or	US-PGPUB; USPAT;	OR	ON	2017/03/07 06:02

		processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S615	55	S614 and (conform$6 and (coat or coated or coating))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S616	32	S615 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S617	23	S616 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S618	16	S617 not (S604 or S612)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S619	272	S614 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S620	101	S619 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S621	78	S620 not (S604 or S612 or S618)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S622	15	S621 and ((acrylic or urethane or silicone or epoxy) same (coat or coated or coating))	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/07 06:02

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S623	1050	"351".clas. and ((eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses) same (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S624	169	S623 and ((acrylic or urethane or silicone or epoxy) same (coat or coated or coating))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S625	132	S624 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or control or controled or controlled or controller or controling or controlling or controler or controller or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S626	77	S625 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S627	62	S626 not (S604 or S612 or S618 or S622)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S628	142	S593 not (S604 or S612 or S618 or S622 or S627)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:02
S629	1962	G02C11/10.cpc.	FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/07 06:17
S630	43	S629 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2017/03/07 06:17

			EPO; JPO; DERWENT; IBM_TDB			
S631	41	S630 not (S604 or S612 or S618 or S622 or S627 or S628)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:17
S632	0	S631 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:18
S633	16	S631 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/07 06:19
S634	25	S631 not S633	FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/07 06:21
S635	1	(WO-2007062601-$).did.	FPRS	OR	ON	2017/03/07 06:23
S636	13	"11261035"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:27
S637	2	"20060095128".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:28
S638	8	"12054299"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:33
S639	2	"2004160572".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:39
S640	2	"20040160572".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 06:40
S641	2	"20110013136".pn.	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/07 09:00

			EPO; JPO; DERWENT; IBM_TDB			
S642	0	S641 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:04
S643	31255	G02C.cpcg.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:07
S644	51691	"351".clas. or S643	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:08
S645	6812	S644 and (acrylic or urethane or silicone or epoxy)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:08
S646	3922	S645 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:09
S647	1795	S646 and (electronics or electrical or battery or batteries or microchip or processor or antenna or computer$4 or electroactive or electro-active or microprocess$4 or circuit$4 or chip or "IC" or microelectronic$4 or micro-electronic$4 or microelectric$4 or micro-electric$4 or microcontrol$4 or micro-control$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:09
S648	2	S647 and (coat or coated or coating or encased or encasing or encapsule or encapsulated or encapsulation or encapsulating or conform$6 or seal$5)	FPRS; EPO; JPO; DERWENT	OR	ON	2017/03/07 09:10
S649	963	S647 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:11
S650	336	S649 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or moisture)	US-PGPUB; USPAT; USOCR;	OR	ON	2017/03/07 09:12

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S651	73	S650 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:12
S652	39	S651 not (S604 or S612 or S618 or S622 or S627 or S628 or S634)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:13
S653	1	(US-20050230596-$).did.	US-PGPUB	OR	ON	2017/03/07 09:29
S654	1	(US-20050230596-$).did.	US-PGPUB	OR	ON	2017/03/07 09:35
S655	1	S654 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or liquid or wet or environment$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/03/07 09:35
S656	3	"4254451".pn. or "20050230596".pn. or "20110013136".pn.	US-PGPUB; USPAT	OR	ON	2017/03/07 10:34
S657	117	(US-20080273166-$ or US-20110139163-$ or US-20110102734-$ or US-20090147215-$ or US-20090059159-$ or US-20080143954-$ or US-20070030442-$ or US-20060023158-$ or US-20040217555-$ or US-20030025228-$ or US-20020037232-$ or US-20120162600-$ or US-20070146627-$ or US-20020140899-$ or US-20100076553-$ or US-20100265456-$ or US-20080068559-$ or US-20120220234-$ or US-20110051982-$ or US-20080144854-$ or US-20070248238-$ or US-20100296027-$ or US-20100177277-$ or US-20040050076-$ or US-20040050072-$ or US-20040059212-$).did. or (US-20060132382-$ or US-20130293448-$ or US-20140078462-$ or US-20090082835-$ or US-20050239502-$ or US-20080002141-$ or US-20090115962-$ or US-20130169924-$ or US-20130215374-$ or US-20130242262-$ or US-20100201938-$ or US-20030058406-$ or US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2017/12/19 12:31

		20030231293-$ or US-20040027501-$ or US-20040051846-$ or US-20080130272-$ or US-20120288654-$ or US-20120310339-$ or US-20130070198-$ or US-20140213917-$ or US-20030068505-$ or US-20040121528-$ or US-20080239452-$ or US-20120155064-$ or US-20010024719-$ or US-20040099356-$ or US-20120029367-$).did. or (US-20030095336-$ or US-20040160538-$ or US-20070279584-$ or US-20070046887-$ or US-20110187989-$ or US-20040084790-$ or US-20090306594-$ or US-20120262667-$ or US-20060095128-$ or US-20060126698-$ or US-20050140924-$ or US-20070144913-$ or US-20110013136-$ or US-20070033717-$ or US-20050099799-$ or US-20050230596-$).did. or (US-2930857-$ or US-4418990-$ or US-4991951-$ or US-6719425-$ or US-4338377-$ or US-6772448-$ or US-5835185-$ or US-5900720-$ or US-5455638-$ or US-5455637-$ or US-6074059-$ or US-7527374-$ or US-6231703-$ or US-5846649-$ or US-4243306-$ or US-4520238-$ or US-5606743-$ or US-6824265-$ or US-5164707-$ or US-5946071-$ or US-6517203-$ or US-5229885-$ or US-5066022-$ or US-6166849-$ or US-4254451-$ or US-6433913-$).did. or (US-5654786-$ or US-6431705-$ or US-7581833-$ or US-7874666-$ or US-8979295-$ or US-6986579-$ or US-7396126-$ or US-5898470-$).did. or (US-2930857-$).did. or (EP-2233964-$ or WO-2009081542-$ or WO-2007062601-$).did. or (WO-2009098719-$).did. or (JP-2003149607-$).did. or (WO-2009081542-$ or US-20030174277-$ or US-4991951-$ or DE-3221690-$ or US-20140104566-$ or WO-2013103985-$).did.				
S658	1	(US-6824265-$).did.	USPAT	OR	ON	2017/12/19 12:32
S659	2	"20130250233".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 12:45
S660	1	S659 and conform$6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 12:46
S661	1	(US-4254451-$).did.	USPAT	OR	ON	2017/12/19 13:31

S662	1	(US-20050230596-$).did.	US-PGPUB	OR	ON	2017/12/19 14:57
S663	1	S662 and (waterproof$4 or water-proof$4 or moistureproof$4 or moisture-proof$4 or rain or water or moisture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 14:57
S664	11	"3866035".pn. or "4076976".pn. or "3737647".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:10
S665	3	"3866035".pn. or "4076976".pn. or "3737647".pn.	USPAT	OR	ON	2017/12/19 15:10
S666	0	S665 and flex$6	USPAT	OR	ON	2017/12/19 15:11
S667	18085	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S668	11098	351/159.$.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S669	706	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S670	28292	S667 or S668 or S669	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S671	1686	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S672	18085	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S673	11098	351/159.$.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT;	OR	ON	2017/12/19 15:22

			IBM_TDB			
S674	706	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S675	28292	S672 or S673 or S674	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S676	796	351/86,154.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S677	254	351/159.39.ccls. or 351/159.4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S678	1188	351/90-102.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S679	1686	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S680	18477	351/41-158,178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S681	495	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S682	1924	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S683	19997	S680 or S681 or S682	US-PGPUB; USPAT; USOCR;	OR	ON	2017/12/19 15:22

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S684	18085	351/41-158.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S685	11098	351/159.$.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S686	706	351/178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S687	28292	S684 or S685 or S686	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S688	1686	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S689	1188	351/90-102.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S690	1686	G02C7/083.cpc. or G02C7/101.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S691	1686	S690	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S692	18477	351/41-158,178.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S693	495	G02C11/06.cpc.	US-PGPUB; USPAT;	OR	ON	2017/12/19 15:22

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S694	1924	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S695	19997	S692 or S693 or S694	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S696	30545	351/41-178.ccls. or S687 or S688 or S695 or S689 or S691	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S697	3552	G02C11/10.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S698	3130	G02C11/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S699	789	G02C11/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S700	1150	G02C11/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S701	2010	351/158.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S702	4787	S697 or S698 or S699 or S700 or S701	US-PGPUB; USPAT;	OR	ON	2017/12/19 15:22

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S703	2327	G02C11/10.cpc.	FPRS; EPO; JPO; DERWENT	OR	ON	2017/12/19 15:22
S704	32820	S670 or S671 or S675 or S676 or S677 or S678 or S679 or S683 or S696 or S702 or S703	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:22
S705	334	S704 and (flex$6 near3 circuit$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:32
S706	251	S705 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:32
S707	209	S706 and (eyeglasses or eye-glasses or (eye adj2 glasses) or spectacles or eyewear or eye-wear or (eye adj2 wear) or sunglasses or sun-glasses).clm,ti,ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:33
S708	189	S707 and (water or waterproof$4 or water-proof$4 or moisture or moistureproof$4 or moisture-proof$4 or sweat or sweating or sweaty or salt or salted or salty or hermetic or hermetically or seal or sealed or sealing or sealer or proof or proofing or proofed or rain or swim or swimming or swimmer or snow or snowing or weather or precipitation or condensation or liquid or wet or environment$6)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/19 15:35

12/ 19/ 2017 8:31:01 PM
C:\ Users\ goneill\ Documents\ EAST\ Workspaces\ 13890809.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13890809	BLUM ET AL.
	Examiner	**Art Unit**
	GARY O'NEILL	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	10/31/2014	06/24/2015	12/02/2015	06/20/2016	02/22/2017	12/19/2017			
	1	✓	✓	✓	✓	✓	✓			
	2	✓	✓	✓	✓	-	-			
	3	✓	✓	✓	-	-	-			
	4	✓	✓	✓	✓	✓	✓			
	5	✓	✓	✓	✓	-	-			
	6	✓	✓	✓	✓	-	-			
	7	✓	✓	✓	✓	-	-			
	8	✓	✓	✓	✓	-	-			
	9	✓	✓	✓	✓	-	-			
	10	✓	✓	✓	✓	✓	✓			
	11	✓	✓	✓	✓	✓	✓			
	12	✓	✓	✓	✓	-	-			
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	14		✓	✓	✓	-	-			
	15		✓	-	-	-	-			
	16		✓	✓	✓	-	-			
	17		✓	✓	✓	-	-			
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	19				✓	-	-			
	20					✓	✓			
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	22					✓	✓			
	23					✓	✓			
	24					✓	✓			
	25					✓	✓			
	26					✓	✓			
	27					✓	✓			
	28					✓	✓			

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13890809	BLUM ET AL.
	Examiner	Art Unit
	GARY O'NEILL	2872

CPC- SEARCHED		
Symbol	Date	Examiner
G02C 11/06, 11/10	10/30/14	GO
UPDATED	6/24/15	GO
UPDATED	12/1/15	GO
G02C 11/00, 11/04	12/1/15	GO
UPDATED	6/19/16	GO
UPDATED	2/22/17	GO
UPDATED	12/19/17	GO

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
351	41-158,178	10/30/14	GO
	UPDATED	6/24/15	GO
	UPDATED	12/1/15	GO
	UPDATED	6/19/16	GO
	UPDATED	2/22/17	GO
	UPDATED	12/19/17	GO

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST BRS Search (US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB) attached	10/30/14	GO
EAST BRS Search (Updated and attached)	6/24/15	GO
EAST BRS Search (Updated and attached)	12/1/15	GO
EAST BRS Search (Updated and attached)	6/20/16	GO

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
G02C 11/06, 11/10 (See search history printout)	10/30/14	GO
G02C 11/00, 11/04 (See search history printout)	12/1/15	GO
EAST BRS Search (Updated and attached)	2/22/17	GO
EAST BRS Search (Updated and attached)	12/19/17	GO

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 58249

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

e-Vision, LLC

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	11/5/18
Name	Joel D. Zychick		
Title	President & CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 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 the Freedom of Information Act requires disclosure of these records.
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 inspections 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.

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: e-Vision, LLC

Application No./Patent No.: 13/726,267 Filed/Issue Date: 12-24-2012

Titled: ELECTRONIC EYEGLASS FRAME

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

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

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

2. [ ] An assignee of less than the entire right, title, and interest (check applicable box):

   [ ] The extent (by percentage) of its ownership interest is _____ %). Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   [ ] There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. [ ] The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. [ ] The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

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 thereof is attached.

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: Kokonaski et al. To: PIXELOPTICS, INC.
   The document was recorded in the United States Patent and Trademark Office at
   Reel 035144 , Frame 0386 , 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 035159 , Frame 0134 , or for which a copy thereof is attached.

164146521 v1

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: HPO ASSETS LLC To: MITSUI CHEMICALS, INC.
The document was recorded in the United States Patent and Trademark Office at
Reel 035159 , Frame 0209 , 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.

5. 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.

6. 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).

☒ As required by 37 CFR 3.73(c)(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/	January 31, 2018
Signature	Date
Christopher Max Colice	65,634
Printed or Typed Name	Title or Registration Number

164146521 v1

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	13/890,809
Filing Date	May 9, 2013
First Named Inventor	Ronald BLUM
Title	MOISTURE-RESISTANT EYE WEAR
Art Unit	2872
Examiner Name	G. W. O'Neill
Attorney Docket Number	EVSO-027/17US 320676-2202

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christopher Max Colice/	Date (Optional)	February 2, 2018
Name	Christopher Max Colice, Ph.D.	Registration Number	65,634
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of 1 forms are submitted.

164667551 v1

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fail under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Mr.	Ronald	D.	BLUM	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	State/Province	VA
Postal Code	24019	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Mr.	William		KOKONASKI	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Gig Harbor	State/Province	WA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	State/Province	VA
Postal Code	24019	Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Claudio	Dalla	LONGA	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	State/Province	VA
Postal Code	24019	Country	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Mark		GRAHAM	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	State/Province	VA
Postal Code	24019	Country	US

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Joshua		HADDOCK	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	State/Province	VA
Postal Code	24019	Country	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Charles		WILLEY	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Tiziano		TABACCHI	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Roanoke	**State/Province**	VA	**Country of Residence**	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

Inventor 8 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Martin		BOCH	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Roanoke	**State/Province**	VA	**Country of Residence**	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

Inventor 9 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Massimo		PINAZZA	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Roanoke	**State/Province**	VA	**Country of Residence**	US

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

Inventor 10 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Scott	N.	RICHMAN	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

Inventor 11 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Volkan		OZGUZ	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	Roanoke	State/Province	VA	Country of Residence	US

Mailing Address of Inventor:

Address 1	5241 Valleypark Drive		
Address 2			
City	Roanoke	**State/Province**	VA
Postal Code	24019	**Country**	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	~~115626~~ 58249		
Email Address		Add Email	Remove Email

EFS Web 2.2.12

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

Application Information:

Title of the Invention	MOISTURE-RESISTANT EYE WEAR		
Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	26	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	~~115626~~ 58249		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~91994-857754~~ 3585.1260000
	Application Number	~~TBA~~ 13/890,809
Title of Invention	MOISTURE RESISTANT EYE WEAR	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status			
Application Number	**Continuity Type**	**Prior Application Number**	**Filing Date**
This Application	Continuation in Part of	13/587,645	August 16, 2012
13/587,645	Non-Provisional of	61/563,937	November 28, 2011
13/587,645	Non-Provisional of	61/537,205	September 21, 2011
13/587,645	Non-Provisional of	61/524,567	August 17, 2011
13/587,645	Continuation in Part of	13/372,240	February 13, 2012
This Application	Continuation in Part of	13/726,267	December 24, 2012
13/726,267	Non-Provisional of	60/978,517	October 9, 2007
13/726,267	Non-Provisional of	60/929,991	July 20, 2007
13/726,267	Non-Provisional of	60/929,419	June 26, 2007
13/726,267	Non-Provisional of	60/924,225	May 4, 2007
13/726,267	Continuation of	12/834,526	July 12, 2010
13/726,267	Continuation of	12/054,299	March 24, 2008
This Application	Continuation in Part of	13/372,240	February 13, 2012
13/372,240	Non-Provisional of	61/441,817	February 11, 2011
This Application	Continuation in part of	13/169,996	June 27, 2011
13/169,996	Non-Provisional of	61/382,963	September 15, 2010
13/169,996	Non-Provisional of	61/366,746	July 22, 2010
13/169,996	Non-Provisional of	61/358,447	June 25, 2010
13/169,996	Non-Provisional of	61/326,703	April 22, 2010

PTO/AIA/14 (08-12)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~91904-867754~~ 3585.1260000
	Application Number	~~TBA~~ 13/890,809
Title of Invention	MOISTURE RESISTANT EYE WEAR	

13/169,996	Non-Provisional of	61/317,100	March 24, 2010
13/169,996	Continuation in Part of	PCT/US2011/029419	March 22, 2011
This Application	Continuation in Part of	12/834,526	July 12, 2010
12/834,526	Non-Provisional of	60/978,517	October 9, 2007
12/834,526	Non-Provisional of	60/929,991	July 20, 2007
12/834,526	Non-Provisional of	60/929,419	June 26, 2007
12/834,526	Non-Provisional of	60/924,225	May 4, 2007
12/834,526	Continuation of	12,054,299	March 24, 2008
This Application	Continuation in Part of	13/298,997	November 17, 2011
13/298,997	Non-Provisional of	61/481,353	May 2, 2011
13/298,997	Non-Provisional of	61/415,391	November 19, 2010
13/298,997	Non-Provisional of	61/376,719	August 25, 2010
13/298,997	Non-Provisional of	61/362,877	July 9, 2010
13/298,997	Non-Provisional of	61/361,110	July 2, 2010
13/298,992	Continuation in Part of	13/179,219	July 8, 2011
13/298,992	Continuation in Part of	13/175,633	July 1, 2011
13/298,992	Continuation in Part of	13/175,634	July 1, 2011
This Application	Continuation in Part of	13/298,992	November 17, 2011
13/298,992	Non-Provisional of	61/481,353	May 2, 2011
13/298,992	Non-Provisional of	61/415,391	November 19, 2010
13/298,992	Non-Provisional of	61/376,719	August 25, 2010
13/298,992	Non-Provisional of	61/362,877	July 9, 2010
13/298,992	Non-Provisional of	61/361,110	July 2, 2010
This Application	Continuation in Part of	13/866,575	April 19, 2013

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~91904-857754~~ 3585.1260000
	Application Number	~~TBA~~ 13/890,809
Title of Invention	MOISTURE RESISTANT EYE WEAR	

13/866,575	Non-Provisional of	61/638,290	April 25, 2012

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a). When priority is claimed to a foreign application this is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectualy property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country	Filing Date	Access Code (if applicable)

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☒ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to claimed invention that has an effective filing date on or after March 16, 2013.

Authorization to Permit Access:

[X] Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	~~Mitsui Chemicals, Inc.~~ E-Vision, LLC		
Mailing Address Information For Applicant:			
Address 1	~~Shiodome City Center 1-5-2~~ 1144 Tallevast Road		
Address 2	~~Higashi-Shimbashi, Minato-ku~~ Suites 113-115		
City	~~Tokyo~~ Sarasota	**State/Province**	FL
Country	~~JP~~ FL	Postal Code	~~105-7117~~ 34243
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Christopher Max Colice/			Date (YYYY-MM-DD)	2018-01-31
First Name	Christopher	Last Name	Colice	Registration Number	65,634

Additional Signature may be generated within this form by selecting the Add button.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~3585.1260000~~ EVSO-027/17US 320676-2202
	Application Number	13/890,809
Title of Invention	MOISTURE-RESISTANT EYE WEAR	

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

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 the Freedom of Information Act requires disclosure of these records.

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 CooperationTreaty.

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 inspections 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:	31665220
Application Number:	13890809
International Application Number:	
Confirmation Number:	9971
Title of Invention:	MOISTURE-RESISTANT EYE WEAR
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	115626
Filer:	Christopher M. Colice/Lindsey Lovato
Filer Authorized By:	Christopher M. Colice
Attorney Docket Number:	3585.1260000
Receipt Date:	02-FEB-2018
Filing Date:	09-MAY-2013
Time Stamp:	14:17:03
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	Power of Attorney	EVSO-GPOA.pdf	1179304 7712820bdac516142b4ff6b8ed0b0d5bf9a8ba90	no	2
Warnings:					

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	EVSO-027_17US-Statement.pdf	85748 4fbc3b81d955fc2c30c6b8cf0a561d7e59d2de31	no	2
Warnings:					
Information:					
3	Power of Attorney	EVSO02717US-POATransmittal.pdf	68329 8a599e35f195b6be59936cf27f9cae3bd08a6651	no	1
Warnings:					
Information:					
4	Application Data Sheet	EVSO-027_17US_Corrected_Application_Data_Sheet.PDF	579135 82953057d88f352e8c841ec5d9b5d963a274d63c	no	12
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	1912516	

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.

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
13/890,809	05/09/2013	Ronald D. Blum	3585.1260000

CONFIRMATION NO. 9971

POWER OF ATTORNEY NOTICE

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

OC000000097210393

Date Mailed: 02/07/2018

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/02/2018.

- The Power of Attorney to you in this application has been revoked by the applicant. 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**.

/zabraha/

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
13/890,809	05/09/2013	Ronald D. Blum	EVSO-027/17US 320676-2202

CONFIRMATION NO. 9971

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

POA ACCEPTANCE LETTER

OC000000097210460

Date Mailed: 02/07/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/02/2018.

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**.

/zabraha/

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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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/890,809	05/09/2013	2872	1740	EVSO-027/17US 320676-2202	13	1

CONFIRMATION NO. 9971

REPLACEMENT FILING RECEIPT

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



Date Mailed: 02/07/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ronald D. Blum, Roanoke, VA;
William Kokonaski, Gig Harbor, WA;
Claudio Dalla Longa, Roanoke, VA;
Mark Graham, Roanoke, VA;
Joshua Haddock, Roanoke, VA;
Charles Willey, Roanoke, VA;
Tiziano Tabacchi, Roanoke, VA;
Martin Bock, Roanoke, VA;
Massimo Pinazza, Roanoke, VA;
Scott N. Richman, Roanoke, VA;
Volkan Ozguz, roanoke, VA;

Applicant(s)

E-Vision, LLC, Sarasota, FL;

Power of Attorney: The patent practitioners associated with Customer Number 58249

Domestic Priority data as claimed by applicant

This application is a CIP of 13/587,645 08/16/2012 ABN
which claims benefit of 61/563,937 11/28/2011
and claims benefit of 61/537,205 09/21/2011
and claims benefit of 61/524,567 08/17/2011
and is a CIP of 13/372,240 02/13/2012 PAT 8801174
This application 13/890,809
is a CIP of 13/726,267 12/24/2012 PAT 8708483
which is a CON of 12/834,526 07/12/2010 PAT 8337014
which is a CON of 12/054,299 03/24/2008 ABN

This application 13/890,809
is a CIP of 13/372,240 02/13/2012 PAT 8801174
which claims benefit of 61/441,817 02/11/2011
This application 13/890,809
is a CIP of 13/169,996 06/27/2011 ABN
which claims benefit of 61/382,963 09/15/2010
and claims benefit of 61/366,746 07/22/2010
and claims benefit of 61/358,447 06/25/2010
and is a CIP of PCT/US2011/029419 03/22/2011
This application 13/890,809
is a CIP of 12/834,526 07/12/2010 PAT 8337014
which is a CON of 12/054,299 03/24/2008 ABN
This application 13/890,809
is a CIP of 13/298,997 11/17/2011 PAT 8944590
which claims benefit of 61/481,353 05/02/2011
and claims benefit of 61/541,391 09/30/2011 ABN

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 06/11/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/890,809**
Projected Publication Date: Not Applicable
Non-Publication Request: No
Early Publication Request: No
Title

MOISTURE-RESISTANT EYE WEAR

Preliminary Class

351

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: Yes

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing

of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of

State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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To: zpatdcdocketing@cooley.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 58249

Feb 07, 2018 03:29:04 AM

Dear PAIR Customer:

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

The following USPTO patent application(s) associated with your Customer Number, 58249 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

Disclaimer:
The list of documents shown below is provided as a courtesy and is not part of the official file wrapper. The content of the images shown in PAIR is the official record.

Application	Document	Mailroom Date	Attorney Docket No.
13890809	N570	02/07/2018	EVSO-027/17US 320676-2202
	N570	02/07/2018	EVSO-027/17US 320676-2202
	APP.FILE.REC	02/07/2018	EVSO-027/17US 320676-2202

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

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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.
13/890,809	05/09/2013	Ronald D. Blum	EVSO-027/17US 320676-2202	9971

58249 7590 03/22/2018

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

EXAMINER	
O'NEILL, GARY WILLIAM	

ART UNIT	PAPER NUMBER
2872	

NOTIFICATION DATE	DELIVERY MODE
03/22/2018	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

zpatdcdocketing@cooley.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)		
	13/890,809	BLUM ET AL.		
	Examiner	Art Unit	AIA (First Inventor to File) Status	Page
	GARY O'NEILL	2872	Yes	1 of 2

All participants (applicant, applicant's representative, PTO personnel):

1. GARY O'NEILL (Examiner); Telephonic
2. Christopher Max Colice (Attorney); Telephonic

Date of Interview: 12 March 2018

Identification of prior art discussed: Cochran 4,254,451

Brief Description of main topic of discussion: Generally discussed the intrpretation of the limitation "electronic assembly" in claim 1.

Issues Discussed:

Claim Interpretation and/or scope:
As Applicant's attorney is new to this case, we briefly reviewed how the examiner has interpreted the "electronic assembly" limitation of claim 1 in previous office actions and how the Cochran reference has been applied.

We briefly discussed seeking technology differences of the instant invention before deciding on specific claim language.

No agreement was reached

Other:
Examiner ONeill recommended that if Applicant seeks continued prosecution, the particular silicone gasket structure shown in figures 12A, B and/or the capacitive touch switch shown in fig 25 of the original drawings may provide a basis for future narrowing amendments to advance the case.

Applicant's representative indicated that he would consider this further with Applicant.

No agreement was reached.

Attachment(s): Agenda

/GARY O'NEILL/ Examiner, Art Unit 2872	

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable time limit of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicant's responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04

Please further see:

MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

U.S. Patent and Trademark Office
PTOL-413/413b (Rev. 01/01/2015) **Interview Summary** Paper No. 20180312

Doc Code: M865 or FAI.REQ.INTV

PTOL-413A (07-16)
Approved for use through 08/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Applicant Initiated Interview Request Form

Application No.: 13/890,809 First Named Applicant: Ronald BLUM
Examiner G. W. O'Neill Art Unit: 2872 Status of Application: OFFICE ACTION

Tentative Participants:

(1) Examiner O'Neill (2) Max Colice

(3) _____ (4) _____

Proposed Date of Interview: March 12, 2018 **Proposed Time:** 1 pm ET (☐ AM ☐ PM)

Type of Interview Requested:

(1) [X] Telephonic (2) [ ] Personal (3) [ ] Video Conference

Exhibit To Be Shown or Demonstrated: [ ] YES [X] NO

If yes, provide brief description: _____

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) 102 Rej.	28	Cochran	☐	☐	☐
(2) 103 Rej.	1	Cochran and Howell	☐	☐	☐
(3)			☐	☐	☐
(4)			☐	☐	☐

☐ Continuation Sheet Attached ☐ Proposed Amendment or Arguments Attached

Brief Description of Arguments to be Presented: Distinguishing the "electronics assembly" in claims 1 and 28 from Cochran's "flexible plastic ribbon layer"

An interview was conducted on the above-identified application on _____

NOTE: This form should be completed and filed by applicant in advance of the interview (see MPEP § 713.01). If this form is signed by a registered practitioner not of record, the Office will accept this as an indication that he or she is authorized to conduct an interview on behalf of the principal (37 CFR 1.32(a)(3)) pursuant to 37 CFR 1.34. This is not a power of attorney to any above named practitioner. See the Instruction Sheet for this form, which is incorporated by reference. By signing this form, applicant or practitioner is certifying that he or she has read the Instruction Sheet. After the interview is conducted, applicant is advised to file a statement of the substance of this interview (37 CFR 1.133(b)) as soon as possible. This application will not be delayed from issue because of applicant's failure to submit a written record of this interview.

/Christopher Max Colice/
Applicant/Applicant's Representative Signature

_____
Examiner/SPE Signature

Christopher Max Colice
Typed/Printed Name of Applicant or Representative

(617) 937-2362
Applicant's/Applicant's Representative's Telephone Number

65,634
Registration Number, if applicable

168969992 v1

To: zpatdcdocketing@cooley.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 58249

Mar 22, 2018 03:31:11 AM

Dear PAIR Customer:

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

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Application	Document	Mailroom Date	Attorney Docket No.
13890809	INTV.SUM.APP	03/22/2018	EVSO-027/17US 320676-2202
	OA.APPENDIX	03/22/2018	EVSO-027/17US 320676-2202

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If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-14)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	13/890,809	Filing Date	2013-05-09	Docket Number (if applicable)	EVSO-027/17US 320676-220	Art Unit	2872
First Named Inventor	Ronald D. Blum			Examiner Name	Gary William O'Neill		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, to any international application that does not comply with the requirements of 35 U.S.C. 371, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV.

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 501283

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (07-14)
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Signature of Registered U.S. Patent Practitioner			
Signature	/Christopher Max Colice/	Date (YYYY-MM-DD)	2018-04-27
Name	Christopher Max Colice	Registration Number	65634

This collection of information is required by 37 CFR 1.114. 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.

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 the Freedom of Information Act requires disclosure of these records.

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 inspections 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.

Docket No.: EVSO-027/17US 320676-2202
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor:	Ronald BLUM	Confirmation No.:	9971
Application No.:	13/890,809	Group Art Unit:	2872
Filed:	May 9, 2013	Examiner:	G. W. O'Neill

For: MOISTURE-RESISTANT EYE WEAR

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT/RESPONSE TO OFFICE ACTION

In response to the Office Action dated December 27, 2017, to which the deadline for responding is April 27, 2018, with a one-month extension of time, Applicant submits the following Amendments and/or Remarks, and respectfully requests reconsideration of the application in view thereof.

Any extensions of time necessary to prevent abandonment of this application are hereby petitioned for under 37 C.F.R. §1.136(a), and any additional fees required (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 50-1283.

Amendments to the Claims are reflected in the listing of the claims which begins on page 2 of this paper.

Remarks begin on page 6 of this paper.

171255627 v1

IN THE CLAIMS:

Set forth below in ascending order, with status identifiers, is a complete listing of all claims currently under examination. Changes to any amended claims are indicated by [[double brackets]],~~strikethrough~~ and /or underlining. This listing also reflects any cancellation and/or addition of claims.

1. (Currently Amended) An eyewear system comprising:

an eyewear frame;

an electronics assembly comprising electronic components configured to control an electrical functional member;

a capacitive touch switch coupled to at least one electronic component in the electronics assembly;

at least one electrical connective element electrically connected to the electronic assembly and the electrical functional member; and

a conformal layer over the electronic assembly to seal the electronic components;

wherein the conformal layer is moisture proof and seals electrical connections of the electronic component;

wherein the conformal layer is disposed in an enclosure of the eyewear frame;

wherein the eyewear frame comprises a temple; and

wherein the electronic assembly is enclosed in the temple.

2. (Canceled)

3. (Canceled)

4. (Previously Presented) The eyewear system of claim 1, wherein the electrical functional member comprises a lens.

5–9. (Canceled)

10. (Currently Amended) The eyewear system of claim 1, wherein the electrical functional member includes at least one of an electro-active lens, an electro-chromic lens, an electronic

display, a sensor, an imager, a GPS, an alarm, a hearing aid, a virtual reality function, an augmented reality function, a gaming function, an audio output function, a microphone function, a recording function, a transmitter function, a pedometer, and an active 3D function.

11. (Currently Amended) The eyewear system of claim 1, wherein the at least one electrical connective element is a conductive compressible member or a multi-conductor cable.

12–19. (Canceled)

20. (Currently Amended) The eyewear system of claim 1, wherein the electronic assembly comprises ~~at least one of a touch sensor or~~ a micro-processor.

21. (Previously Presented) The eyewear system of claim 1, wherein the enclosure comprises at least one of an outer casing of the electronic assembly or a cavity of the eyewear frame.

22. (Previously Presented) The eyewear system of claim 1, wherein the conformal layer comprises at least one of an encasing layer or an encapsulating layer.

23. (Previously Presented) The eyewear system of claim 1, wherein the conformal layer protects the electronic components from external environmental damage.

24. (Previously Presented) The eyewear system of claim 1, wherein the conformal layer is a conformal coating.

25. (Currently Amended) The eyewear system of claim [[23]] 24, wherein a thickness of the conformal coating is less than 1 mm.

26. (Currently Amended) The eyewear system of claim [[23]] 24, wherein the conformal coating comprises at least one of an acrylic, urethane, silicone, or epoxy.

27. (Previously Presented) The eyewear system of claim 26, wherein the conformal coating is brush applied, spray applied, or dip applied.

28. (Currently Amended) A method of manufacturing an eyewear system comprising:

~~providing~~ disposing a plurality of electronic components on a capacitive touch switch;

connecting the plurality of ~~electronics~~ electronic components via electrical connections to form an electronic assembly;

depositing a conformal layer over at least a portion of the electronic assembly and at least a portion of the capacitive touch switch; and

coupling the electronic assembly and the capacitive touch switch with the conformal layer to an enclosure of an eyewear frame.

29. (New) Eyewear comprising:

an eyewear frame comprising a temple;

a plurality of electronic components disposed within a cavity formed in the temple, the plurality of electronic components comprising at least two of a processor, a controller, a memory, a power source, a gyroscope, an antenna, a transmitter, a receiver, and an accelerometer;

a conformal coating, deposited over at least a portion of the plurality of electronic components, to protect the plurality of electronic components; and

a touch switch operably coupled to an electronic component in the plurality of electronic components.

30. (New) The eyewear of claim 29, wherein the conformal coating exposes an electrical contact of the electronics assembly.

31. (New) The eyewear of claim 29, wherein the conformal coating has a thickness of less than 1 mm.

32. (New) The eyewear of claim 29, wherein the conformal coating has a thickness of less than 0.5 mm.

33. (New) The eyewear of claim 29, wherein the touch switch comprises a capacitive touch switch.

34. (New) The eyewear of claim 33, wherein the electronic component is disposed on a surface of the capacitive touch switch.

35. (New) The eyewear of claim 33, wherein the conformal coating protects a portion of the capacitive touch switch.

36. (New) The eyewear of claim 33, wherein the capacitive touch switch is fit to the cavity in the temple.

37. (New) The eyewear of claim 33, wherein the capacitive touch switch is electrically connected to an electronic component disposed on the eyewear frame.

REMARKS

In response to the Office Action dated December 27, 2017, in the above-identified application, Applicant respectfully requests reconsideration. All of the issues raised in the Office Action have been carefully considered and are addressed in this response. The application as now presented is believed to be in allowable condition.

1. Status of the Claims and Summary of Amendments

Upon entry of this response, claims 1, 4, 10, 11, and 20–37 will be pending in this application, of which claims 1, 28, and 29 are independent claims.

In this paper, claims 1, 10, 11, 25, 26, and 28 are being amended and new claims 29–37 are being added. Support for the amendments and new claims appears at least in paragraphs [00147]–[00155] of the specification as filed and in FIG. 25 as filed.

2. Summary of Telephone Interview with Examiner

Applicants' representative Christopher Max Colice appreciates the courtesies extended by Examiner O'Neill in granting and conducting a telephone interview on March 12, 2018, to discuss the file history of this patent application and proposed amendments in response to the Office Action.

During the telephone interview, the participants discussed the interpretation of "electronic assembly" in claim 1. They also discussed possible claim amendments, including possibly adding the gasket shown in FIGS. 12A and 12B or the capacitive touch switch in FIG. 25 to the claims.

This summary of the telephone interview is not intended to limit the claims in any manner. In particular, Examiner O'Neill is respectfully encouraged to evaluate the patentability of all claims based solely on the specific language recited in each claim.

3. Rejections Under 35 U.S.C. § 102

Claim 28 stands rejected as anticipated by Cochran (U.S. Patent 4,254,451), which discloses an eyewear frame studded with light-emitting diodes (LEDs). Applicant respectfully traverses this rejection because Cochran doesn't disclose "depositing a conformal layer over the electronic assembly" as recited in claim 28 and explained in Applicant's last response.

Nevertheless, solely in an effort to expedite allowance, Applicant is amending claim 28 to recite "disposing a plurality of electronic components on a capacitive touch switch" and "depositing a conformal layer over at least a portion of the electronic assembly and at least a portion of the capacitive touch switch." As pointed out by Examiner O'Neill during the March 12 interview, Cochran doesn't disclose a capacitive touch switch. Therefore, Cochran doesn't anticipate claim 28 as amended.

In view of the foregoing, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 102.

4. Rejections Under 35 U.S.C. § 103

4.1 Claims 1, 10, 11, 20–24, and 26

Claims 1, 10, 11, 20–24, and 26 stand rejected as unpatentable over Cochran in view of Howell *et al.* (U.S. Patent Publication 2005/0230596). Applicant respectfully traverses these rejections because: (1) Cochran's flexible ribbon is not a conformal layer, nor is it deposited over an electronic assembly; (2) neither Cochran nor Howell discloses a conformal layer that is "moisture proof" like the conformal layer recited in claim 1; and (3) the motivation to modify or combine Cochran and Howell does not make sense.

Nevertheless, solely in an effort to expedite allowance, Applicant is amending claim 1 to recite "a capacitive touch switch coupled to at least one electronic component in the electronics assembly." The proposed combination of Cochran and Howell lacks such a capacitive touch switch. Therefore, the eyewear system of claim 1 is patentably distinct from the proposed combination of Cochran and Howell.

In view of the foregoing, Applicant respectfully requests withdrawal of the rejections under 35 U.S.C. § 103.

5.2 Claims 25 and 27

Claims 25 and 27 stand rejected as unpatentable over Cochran in view of Howell and Archambeau *et al.* (U.S. Patent Publication 2011/0013136). These claims depend from claims that are in condition for allowance, so Applicant requests that they be allowed as well.

CONCLUSION

In view of the foregoing, Applicant respectfully submits that no further impediments exist to the allowance of this application and, therefore, requests an indication of allowability. However, the Examiner is requested to call the undersigned if any questions or comments arise.

The Director is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 50-1283.

The Director is hereby authorized to charge any additional fees which may be required with respect to this communication, or credit any overpayment, to Deposit Account No. 50-1283, under Order No. EVSO-027/17US 320676-2202.

Dated: April 27, 2018

Respectfully submitted,
COOLEY LLP

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Tel: (617) 937-2300
Fax: (202) 842-7899

Electronic signature: /Christopher Max Colice/
Christopher Max Colice, Ph.D.
Reg. No. 65,634

Electronic Patent Application Fee Transmittal

Application Number:	13890809
Filing Date:	09-May-2013
Title of Invention:	MOISTURE-RESISTANT EYE WEAR
First Named Inventor/Applicant Name:	Ronald D. Blum
Filer:	Christopher M. Colice
Attorney Docket Number:	EVSO-027/17US 320676-2202

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

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:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	1900	1900
		Total in USD ($)		**2100**

Electronic Acknowledgement Receipt	
EFS ID:	32461902
Application Number:	13890809
International Application Number:	
Confirmation Number:	9971
Title of Invention:	MOISTURE-RESISTANT EYE WEAR
First Named Inventor/Applicant Name:	Ronald D. Blum
Customer Number:	58249
Filer:	Christopher M. Colice/Francesca Vandermaelen
Filer Authorized By:	Christopher M. Colice
Attorney Docket Number:	EVSO-027/17US 320676-2202
Receipt Date:	27-APR-2018
Filing Date:	09-MAY-2013
Time Stamp:	09:26:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$2100
RAM confirmation Number	042718INTEFSW00002810501283
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	EVSO-02717US_IDS.pdf	86246 6490ae53213cd43c4d47f4dfbd65bcf3c604b325	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	EVSO-02717US_SB08.pdf	282714 0af25b20c307ea7c3bc9d58bb40134bd55e80097	no	10
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	DE20103525U1wAbstract.pdf	835121 82c4530442711 5f6faf308a9113df8a8621a7ca4	no	6
Warnings:					
Information:					
4	Foreign Reference	GB2011640A.pdf	930514 0e10f39e55fdb423670b884b074b4db702049753	no	5
Warnings:					
Information:					
5	Foreign Reference	WO1999001063A1Abstract.pdf	1479353 4facc59b3a985e226af08c53a9558018124ce98d	no	15
Warnings:					
Information:					
6	Foreign Reference	WO2007062601A1.pdf	2422256 2a55214ab4d4de8d9d4cf1e0c5cc28b6cae8b6ec	no	19
Warnings:					

Information:					
7	Foreign Reference	WO2007142602A1.pdf	1888264 61032e88e9af7e9308f77f50db54147b383aab1e	no	43
Warnings:					
Information:					
8	Foreign Reference	WO2008002388A2.pdf	630123 8df0a6f6f1a1ca05bf4631bf57bc85d6df003392	no	17
Warnings:					
Information:					
9	Foreign Reference	WO2012068527A2.pdf	8205143 1953b5bbfdfc27a12acded512b583f4e33e8ab40	no	158
Warnings:					
Information:					
10	Foreign Reference	WO2014184137A1.pdf	5545253 6394d94b181748d46c332289fa2bbd46ff8f7de1	no	36
Warnings:					
Information:					
11	Request for Continued Examination (RCE)	EVSO-02717US_RCE.pdf	1349901 5ad6aafc87137147eb97ed7b2eeb35655ccd7db3	no	3
Warnings:					
Information:					
12		EVSO-02717US_Response.pdf	170426 a802544d41b0b0c39be393b93cce9638794a160c	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment Submitted/Entered with Filing of CPA/RCE	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	8

Warnings:					
Information:					
13	Fee Worksheet (SB06)	fee-info.pdf	32450 753ca01a257cd3ed56db36fe2a882dd1cddd3ae2	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	23857764	

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	Ronald D. Blum et al.	Confirmation No.:	9971
Application No.:	13/890,809	Group Art Unit:	2872
Filed:	May 9, 2013	Examiner:	O'NEILL, GARY WILLIAM

FOR: MOISTURE-RESISTANT EYE WEAR

VIA EFS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97(b)

In accordance with the duty of disclosure set forth in 37 C.F.R. §1.56, Applicant(s) hereby submits the following information in conformance with 37 C.F.R. §§1.97 and 1.98.

☒ Pursuant to 37 C.F.R. §1.98, a copy of each non-US patent document cited in the attached Form PTO/SB/08 is enclosed.

☐ No copies of any U.S. Office Actions cited on the accompanying Form PTO/SB/08 are being provided because they are available on PAIR. Copies will be provided to the Examiner upon request.

☐ No copies of the publications listed on the attached Form PTO/SB/08 are being provided pursuant to 37 C.F.R. §1.98(d) because the publications were previously cited by or submitted to the Office in prior Application No. to which the above-identified application claims priority under 35 U.S.C. §120.

☒ No copies of any U.S. patents or U.S. patent application publications listed on the attached Form PTO/SB/08 are being provided pursuant to 37 C.F.R. §1.98.

☐ Publication(s) _____ listed on the attached Form PTO/SB/08 were cited in a foreign search or examination report corresponding to _____ application serial no. _____ and mailed on _____.

☐ Enclosed is a copy of a non-English publication(s) _____ Pursuant to §609 of the M.P.E.P., Applicant submits the attached foreign search or examination report, which cites such non-English language publication(s).

☐ Enclosed is a copy of a non-English publication(s) _____ English language publication _____ (copy enclosed) claims priority from this non-English publication.

☐ Enclosed is an explanation of non-English publication(s) _____ for which an English translation is not available.

☒ English language Abstracts are provided for each of non-English publications 205, 207, 208 and 212 cited in the attached Form PTO/SB/08.

☐ Enclosed is a copy of pending patent Application Serial No. _____.

This Information Disclosure Statement is filed within any one of the following time periods:

☐ within three months from the filing date of this national application other than a CPA under 37 C.F.R. § 1.53(d);

☐ within three months from the date of entry of the national stage as set forth in 37 C.F.R. §1.491 in this international application;

☐ 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.

It is respectfully requested that the Examiner consider the above-noted information and return an initialed copy of the attached Form PTO/SB/08 to the undersigned.

Dated: April 27, 2018

Respectfully submitted,
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By: /Christopher Max Colice/
Christopher Max Colice
Reg. No. 65634

171248824 v1

PTO/SB/08a (07-09)
Approved for use through 07/31/2016. 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 contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT LIST BY APPLICANT
(Use as many sheets as necessary)

Complete if Known	
Application Number	13/890,809
Filing Date	05-09-2013
First Named Inventor	Ronald D. Blum
Art Unit	2872
Examiner Name	O'NEILL, GARY WILLIAM
Attorney Docket Number	EVSO-027/17US 320676-2202

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code2 (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
	1.	D755,281	05-03-2016	BLUM et al.	
	2.	4,873,029	10-10-1989	BLUM	
	3.	5,147,585	09-15-1992	BLUM	
	4.	5,178,800	01-12-1993	BLUM	
	5.	5,219,497	06-15-1993	BLUM	
	6.	5,526,067	06-11-1996	CRONIN et al.	
	7.	5,774,273	06-30-1995	BORNHORST	
	8.	5,861,934	01-19-1999	BLUM et al.	
	9.	6,136,926	12-26-2000	WATANABE	
	10.	6,142,941	11-07-2000	BENHALIMA et al.	
	11.	6,433,913	08-13-2002	BAUER et al.	
	12.	6,491,391	12-10-2002	BLUM et al.	
	13.	6,517,203	02-11-2003	BLUM, et al.	
	14.	6,619,799	09-16-2003	BLUM et al.	
	15.	6,733,130	05-11-2004	BLUM et al.	
	16.	6,778,246	08-17-2004	SUN et al.	
	17.	6,857,741	02-22-2005	BLUM et al.	
	18.	6,918,570	03-18-2004	BLUM, et al,	
	19.	6,927,894	08-09-2005	BLUM et al.	
	20.	7,018,040	03-28-2006	BLUM et al.	
	21.	7,023,594	04-04-2006	BLUM et al.	
	22.	7,077,519	07-18-2006	BLUM et al.	

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Application Number	13/890,809
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First Named Inventor	Ronald D. Blum
Art Unit	2872
Examiner Name	O'NEILL, GARY WILLIAM
Attorney Docket Number	EVSO-027/17US 320676-2202

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code2 (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
	23.	7,188,948	03-13-2007	BLUM et al.	
	24.	7,192,136	03-20-2007	HOWELL et al.	
	25.	7,195,353	03-27-2007	BLUM et al.	
	26.	7,234,809	06-26-2007	BLUM et al.	
	27.	7,255,437	08-14-2007	HOWELL et al.	
	28.	7,264,354	09-04-2007	BLUM et al.	
	29.	7,290,875	11-06-2007	BLUM et al.	
	30.	7,290,876	11-06-2007	DUSTON et al.	
	31.	7,374,283	05-20-2008	BLUM et al.	
	32.	7,380,936	06-03-2008	HOWELL et al.	
	33.	7,396,126	07-08-2008	BLUM et al.	
	34.	7,401,918	07-22-2008	HOWELL et al.	
	35.	7,404,636	07-29-2008	BLUM et al.	
	36.	7,438,410	10-21-2008	HOWELL et al.	
	37.	7,475,984	01-13-2009	BLUM et al.	
	38.	7,475,985	01-13-2009	BLUM et al.	
	39.	7,481,531	01-27-2009	HOWELL et al.	
	40.	7,500,746	03-10-2009	HOWELL et al.	
	41.	7,500,747	03-10-2009	HOWELL et al.	
	42.	7,517,083	04-14-2009	BLUM et al.	
	43.	7,533,993	05-19-2009	BLUM et al.	
	44.	7,543,934	06-09-2009	HOWELL et al.	

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	45.	7,581,833	09-01-2009	HOWELL et al.	
	46.	7,588,332	09-15-2009	BLUM et al.	
	47.	7,604,349	10-20-2009	BLUM et al.	
	48.	7,621,634	11-24-2009	HOWELL et al.	
	49.	7,654,667	02-02-2010	BLUM et al.	
	50.	7,656,509	02-02-2010	HADDOCK et al.	
	51.	7,677,723	03-16-2010	HOWELL et al.	
	52.	7,728,949	06-01-2010	CLARKE et al.	
	53.	7,731,358	06-08-2010	BLUM et al.	
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	55.	7,527,375	05-05-2009	BLUM et al.	
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	57.	7,760,898	07-20-2010	HOWELL et al.	
	58.	7,771,046	08-10-2010	HOWELL et al.	
	59.	7,777,660	08-17-2010	CHEN et al.	
	60.	7,883,206	02-08-2011	BLUM et al.	
	61.	7,883,207	02-08-2011	IYER et al.	
	62.	7,883,206	02-08-2011	BLUM et al.	
	63.	7,922,321	04-12-2011	HOWELL et al.	
	64.	7,926,940	04-19-2011	BLUM et al.	
	65.	7,926,941	04-19-2011	BLUM et al.	
	66.	7,971,994	07-05-2011	BLUM et al.	

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	Attorney Docket Number	EVSO-027/17US 320676-2202

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	67.	7,988,286	08-02-2011	BLUM et al.	
	68.	8,047,651	11-01-2011	BLUM et al.	
	69.	8,066,373	11-29-2011	BLUM et al.	
	70.	8,075,132	12-13-2011	BLUM et al.	
	71.	8,092,016	01-10-2012	BLUM et al.	
	72.	8,109,629	02-07-2012	HOWELL et al.	
	73.	8,154,804	04-10-2012	McGINN et al.	
	74.	8,197,063	06-12-2012	IYER et al.	
	75.	8,215,770	07-10-2012	BLUM et al.	
	76.	8,317,321	11-27-2012	HADDOCK et al.	
	77.	8,319,937	11-27-2012	CLARKE et al.	
	78.	8,308,295	11-13-2012	BLUM et al.	
	79.	8,333,470	12-18-2012	BLUM et al.	
	80.	8,408,699	04-02-2013	BLUM et al.	
	81.	8,434,864	05-10-2011	GUPTA et al.	
	82.	8,337,013	12-25-2012	HOWELL et al.	
	83.	8,337,014	12-25-2012	KOKONASKI et al.	
	84.	8,430,507	04-30-2013	HOWELL et al.	
	85.	8,434,863	05-07-2013	HOWELL et al.	
	86.	8,465,151	06-18-2013	HOWELL et al.	
	87.	8,500,271	08-06-2013	HOWELL et al.	
	88.	8,523,354	09-03-2013	HADDOCK et al.	

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	89.	8,534,832	09-17-2013	GUPTA et al.	
	90.	8,573,774	11-05-2013	GUPTA et al.	
	91.	8,579,435	11-12-2013	BLUM et al.	
	92.	8,641,191	02-04-2014	BLUM et al.	
	93.	8,662,665	03-04-2014	IYER et al.	
	94.	8,678,581	03-25-2014	BLUM	
	95.	8,708,483	04-29-2014	KOKONASKI et al.	
	96.	8,770,742	07-08-2014	HOWELL et al.	
	97.	8,778,022	07-15-2014	BLUM et al.	
	98.	8,783,861	07-22-2014	BLUM et al.	
	99.	8,801,174	08-12-2014	WILEY	
	100.	8,827,446	09-09-2014	IYER et al.	
	101.	8,830,408	09-09-2014	HADDOCK et al.	
	102.	8,854,519	10-07-2014	DUSTON et al.	
	103.	8,905,541	12-09-2014	BLUM et al.	
	104.	8,915,588	12-23-2014	BLUM et al.	
	105.	8,921,445	12-30-2014	TURSHANI et al.	
	106.	8,928,796	01-06-2015	VAN HEUGTEN et al.	
	107.	8,931,896	01-13-2015	BLUM	
	108.	8,944,590	02-03-2015	BLUM et al.	
	109.	8,979,259	03-17-2015	HADDOCK et al.	
	110.	9,022,563	05-05-2015	BLUM et al.	

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	111.	9,028,062	05-12-2015	KOKONASKI et al.	
	112.	9,033,494	05-19-2015	BLUM et al..	
	113.	9,074,040	07-07-2015	TURSHANI et al.	
	114.	9,081,208	07-14-2015	BLUM et al.	
	115.	9,096,026	08-04-2015	HALL et al.	
	116.	9,122,077	09-01-2015	GUPTA et al.	
	117.	9,122,083	09-01-2015	BLUM et al.	
	118.	9,124,796	09-01-2015	BLUM et al.	
	119.	9,142,329	09-22-2015	TRAJKOVSKA et al.	
	120.	9,146,407	09-29-2015	CLARKE et al.	
	121.	9,155,614	10-13-2015	BLUM et al.	
	122.	9,199,420	12-01-2015	TRAJKOVSKA et al.	
	123.	9,207,467	12-08-2015	GUPTA et al.	
	124.	9,229,248	01-05-2016	KOKONASKI et al.	
	125.	9,268,153	02-23-2016	BLUM et al.	
	126.	9,323,101	04-26-2016	BLUM et al.	
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	128.	9,411,172	08-09-2016	HADDOCK et al.	
	129.	9,442,305	09-13-2016	BLUM et al.	
	130.	9,470,909	10-18-2016	WILLEY et al.	
	131.	9,588,396	03-07-2017	HADDOCK et al.	
	132.	9,625,767	04-18-2017	DUSTON et al.	

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	133.	9,690,117	06-27-2017	BLUM et al.	
	134.	9,712,738	07-18-2017	VAN HEUGTEN et al.	
	135.	9,801,709	10-31-2017	BLUM et al.	
	136.	2004/0223113	11-11-2004	BLUM et al.	
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	147.	2007/0159562	07-12-2007	HADDOCK et al.	
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	149.	2008/0106694	05-08-2008	BLUM et al.	
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	151.	2008/0218684	09-11-2008	HOWELL et al.	
	152.	2008/0273167	11-06-2008	CLARKE	
	153.	2008/0273169	11-06-2008	BLUM et al.	
	154.	2009/0015785	01-15-2009	BLUM et al.	

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PTO/SB/08a (07-09)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT LIST BY APPLICANT (Use as many sheets as necessary)	Complete if Known	
	Application Number	13/890,809
	Filing Date	05-09-2013
	First Named Inventor	Ronald D. Blum
	Art Unit	2872
	Examiner Name	O'NEILL, GARY WILLIAM
	Attorney Docket Number	EVSO-027/17US 320676-2202

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code2 (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
	155.	2009/0091818	04-09-2009	HADDOCK et al.	
	156.	2009/0120901	05-14-2009	WHITE et al.	
	157.	2009/0264966	10-22-2009	BLUM et al.	
	158.	2009/0296044	12-03-2009	HOWELL et al.	
	159.	2010/0002190	01-07-2010	CLARKE et al.	
	160.	2011/0249230	10-13-2011	BLUM	
	161.	2012/0019773	01-26-2012	BLUM et al.	
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	166.	2012/0301604	11-29-2012	HALL et al.	
	167.	2012/0300171	11-29-2012	GUPTA et al.	
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	169.	2013/0070198	03-21-2013	WILLEY et al.	
	170.	2013/0208238	08-15-2013	KOKONASKI et al.	
	171.	2013/0215374	08-22-2013	BLUM et al.	
	172.	2013/0235332	09-12-2013	BLUM et al.	
	173.	2013/0242253	09-19-2013	BLUM et al.	
	174.	2013/0250135	09-26-2013	BLUM et al.	
	175.	2013/0282117	10-24-2013	VAN HEUGTEN et al.	
	176.	2013/0293825	11-07-2013	GUPTA et al.	

Examiner Signature:		Date Considered	

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[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO 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. This collection of information is required by 37 CFR 1.97 and 1.98. 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 2 hours 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, 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.**

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	Attorney Docket Number	EVSO-027/17US 320676-2202

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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code2 (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
	177.	2013/0329183	12-12-2013	BLUM et al.	
	178.	2013/0342807	12-26-2013	BLUM et al.	
	179.	2014/0036172	02-06-2014	TRAJKOVSKA et al.	
	180.	2014/0132916	05-15-2014	IYER et al.	
	181.	2014/0198370	07-17-2014	TRAJKOVSKA-BROACH et al.	
	182.	2014/0204333	07-24-2014	BLUM et al.	
	183.	2014/0237817	08-28-2014	TRAJKOVSKA-BROACH et al.	
	184.	2014/0293215	10-02-2014	DALL LONGA et al.	
	185.	2014/0313473	10-23-2014	WILLEY	
	186.	2014/0327875	11-06-2014	BLUM et al.	
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	191.	2015/0335420	11-26-2015	BLUM et al.	
	192.	2015/0378177	12-31-2015	BLUM et al.	
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	198.	2017/0176777	06-22-2017	BLUM et al.	

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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code2 (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
	199.	2017/0108713	04-20-2017	BLUM et al.	
	200.	2017/0205680	07-20-2017	TRAJKOVSKA-BROACH 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]
	205.	DE 201 03 525 U1	03-13-2003	Eckert		Abstract
	206.	GB 2 011 640 A	07-11-1979	Western Electric Co.		
	207.	WO 99/01063 A1	01-14-1999	Acritec Gmbh		Abstract
	208.	WO 2007/062601 A1	06-07-2007	Golden Technology Co., Ltd.		Abstract
	209.	WO 2007/142602 A1	12-13-2007	Agency for Science, Technology and Research		
	210.	WO 2008/002388 A2	01-03-2008	PixelOptics Inc		
	211.	WO 2012/068527 A2	05-24-2012	PixelOptics Inc		
	212.	WO 2014/184137 A1	11-20-2014	Ophtimalia		Abstract

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Examiner Signature:		Date Considered	

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(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENT- UND MARKENAMT

(12) **Gebrauchsmusterschrift**

(10) **DE 201 03 525 U 1**

(51) Int. Cl.[7]: **G 02 C 11/00**

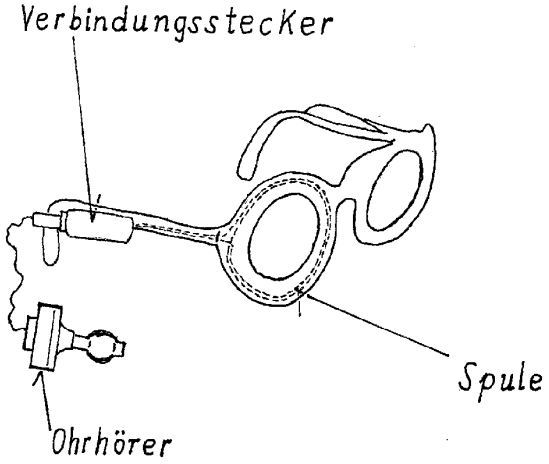
(21) Aktenzeichen: 201 03 525.1
(22) Anmeldetag: 28. 2. 2001
(47) Eintragungstag: 13. 3. 2003
(43) Bekanntmachung im Patentblatt: 17. 4. 2003

(73) Inhaber:
Eckert, Eberhard, Dipl.-Ing., 53125 Bonn, DE

(74) Vertreter:
Plantiko, C., Rechtsanw., 53123 Bonn

(54) Brille, Brillenzusatz oder brillenähnliches Gebilde

(57) Brille, Brillenzusatz oder brillenähnliches Gebilde, dadurch gekennzeichnet daß die Fassung, insbesondere die Halterung der Brillengläser, ein oder mehrere Induktivitäten enthält oder aus diesen besteht



DE 201 03 525 U 1

DE 201 03 525 U 1

BUNDESDRUCKEREI 02.03 503 160/10/30A 1

28.02.01

Anmeldung vom 27. Februar 2001

Brille, Brillenzusatz oder brillenähnliches Gebilde

Brillen, Brillenzusätze oder brillenähnliche Gebilde sind als Sehhilfen, Lichtschutz (Sonnenbrillen), Uhrmacher-Lupenbrillen, Arbeitsschutz (Staubschutzbrillen, Schweißerbrillen, LASER-Schutzbrillen) in zahlreichen Ausführungsformen allgemein bekannt.
Auch die Kombination von Brille mit Hörgerät ist bekannt und Stand der Technik.
Bisher nicht existent sind Brillen, Brillenzusätze oder brillenähnliche Gebilde
-als Hilfsmittel zur Wahrnehmung von elektrischen und magnetischen Feldern sowie elektromagnetischen Feldern, Wellen und Impulsen, sogenanntem "Elektrosmog",
-mit Schutzfunktion gegen die vorbezeichneten Felder und Einflüsse.

Die elektromagnetische Belastung sowohl der Umwelt als auch jedes Einzelnen wird insbesondere in modernen Industriegesellschaften immer größer. Dies gilt unter anderem für Heim, Beruf, Verkehr/Reise, sogar Freizeit.
Die Auswirkungen, insbesondere Langzeitauswirkungen, werden auch in Wissenschaft und Medizin streitig diskutiert; Einigkeit besteht jedoch hinsichtlich "Vorbeugender Vermeidung". Dazu muß aber erst einmal das Vorhandensein einer elektromagnetischen Belastung erkannt werden.
Gewöhnlich wird der Körper beziehungsweise Teile desselben unterschiedlich stark beeinflußt, seine Teile und Organe sind gegen Beeinflussung unterschiedlich empfindlich.
Naturgemäß ist der Kopf für die Einwirkung von Beeinflussung als besonders empfindlich anzusehen, so daß eine Erkennung einer Belastung hier besonders wichtig ist. Eine herausgehobene Rolle spielen dabei die Augen. Zum einen sind sie wichtigster Sensor des Menschen, zum anderen sind sie elektromagnetischen Einflüssen gegenüber besonders empfindlich. Anzuführen sind hier beispielhaft
-Lichtempfindungen im Augensystem bei starken Magnetfeldern,
-die Tatsache, daß durch den Lidschlag die Augenoberfläche stets flüssigkeitsbenetzt ist und durch die hohe Dielektrizitätskonstante dieses Flüssigkeitsfilms nach dem allgemein bekannten Zusammenhang zwischen elektrischer Feldstärke und elektrischem Verschiebungsfluß dort besondere elektrische/physiologische Verhältnisse auftreten,
-die hohen Augenbelastungen im modernen Leben, etwa durch Bildschirmarbeitsplätze, Fernsehen, Verkehr u.a.

Wie erwähnt ist die Erkennung vorhandener Belastungen Grundvoraussetzung für sowohl vorbeugende Vermeidung/Verhalten als auch Schutzmaßnahmen. Die Erkennung muß auf den Durchschnittsbürger zugeschnitten sein, u.a. einfach, unauffällig, preiswert, sowie auf die vermutlich am stärksten beeinflussenden Felder abgestellt sein.

DE 201 03 525 U1

E_PA_LUX_004682

Anmeldung vom 27. Februar 2001

Aus verschiedenen Überlegungen ergibt sich daß bei Feldern, insbesondere Magnetfeldern, im Hörfrequenzbereich wahrscheinlich die stärksten Einflüsse zu erwarten sind, zumal in diesem Bereich auch die Frequenzen zahlreicher biologischer Vorgänge liegen.

Den vorgenannten Gesichtspunkten kann in geeigneter Weise Rechnung getragen werden durch eine Brille, einen Brillenzusatz oder ein brillenähnliches Gebilde, das eine oder mehrere Spulen/Induktivitäten enthält, insbesondere unter Ausbildung der Halterungen der Brillengläser als Spule(n), die mit einem akustischen Wandler, vorzugsweise einem Ohrhörer, in geeigneter Weise zusammengeschaltet sind. Damit lassen sich vor allem magnetische Wechselfelder in einem weiten Bereich akustisch wahrnehmen.
In weiterer Ausgestaltung der Erfindung läßt sich unter Zuhilfenahme zusätzlicher elektrischer Bauelemente die Induktivität/die Induktivitäten so verwenden, daß sie das beeinflussende Feld in Augennähe zumindest teilweise kompensieren oder absorbieren.
Anstelle eines elektroakustischen Wandlers kann auch eine optische Anzeige treten, integriert in die Brille, den Brillenzusatz oder das brillenähnliche Gebilde oder getrennt davon.
In weiterer Ausgestaltung der Erfindung können die Brillengläser eine metallische Beschichtung erfahren, mit Drahtnetz oder Lochfolien versehen werden oder einem Zusatz ähnlich dem bekannten "Wabenkaminfenster" (zur Dämpfung elektromagnetischer Wellen) ausgeführt werden, die ihrerseits mit dem Körper des Trägers elektrisch leitend verbunden werden; damit wird insbesondere dem Einfluß elektrischer Felder auf die Augen entgegen gewirkt.
In weiterer Ausgestaltung der Erfindung kann auch Zusammenschaltung mit weiteren am Körper getragenen passiven oder aktiven elektrischen Einrichtungen erfolgen. Diese können als um den Hals getragene Brillenhalteschnur, als Halskette, als Stirnband und dergleichen ausgeführt sein.
Ein vereinfachtes Ausführungsbeispiel, welches das in der Anmeldung ausführlich beschriebene Prinzip der erfindungsgemäßen "Brille, Brillenzusatz oder brillenähnliches Gebilde" zeigt, ist in der Zeichnung dargestellt.
Die Erfindung ist an das dargestellte Ausführungsbeispiel nicht gebunden.

28.02.01

Anmeldung vom 27. Februar 2001

Schutzansprüche

1. Brille, Brillenzusatz oder brillenähnliches Gebilde,
dadurch gekennzeichnet daß
die Fassung, insbesondere die Halterung der Brillengläser, ein oder mehrere Induktivitäten enthält oder aus diesen besteht

2. Brille, Brillenzusatz oder brillenähnliches Gebilde nach Anspruch 1.,
dadurch gekennzeichnet daß
die Induktivität(en) mit einem akustischen Wandler, etwa einem Ohrhörer, verbunden sind

3. Brille, Brillenzusatz oder brillenähnliches Gebilde nach Anspruch 1.,
dadurch gekennzeichnet daß
die Induktivität(en) unter Zuhilfenahme weiterer elektrischer Materialien und Bauelemente so verwendet werden, daß sie das beeinflussende Feld zumindest teilweise kompensieren oder absorbieren

4. Brille, Brillenzusatz oder brillenähnliches Gebilde nach Ansprüchen 1., 2. und 3.,
dadurch gekennzeichnet daß
ein beeinflussendes Feld durch optische Anzeige in der Brille oder getrennt davon auffällig gemacht wird

5. Brille, Brillenzusatz oder brillenähnliches Gebilde nach Ansprüchen 1., 2., 3., 4.,
dadurch gekennzeichnet daß
vor, hinter,auf oder in den Brillengläsern ein metallischer Zusatz angebracht ist

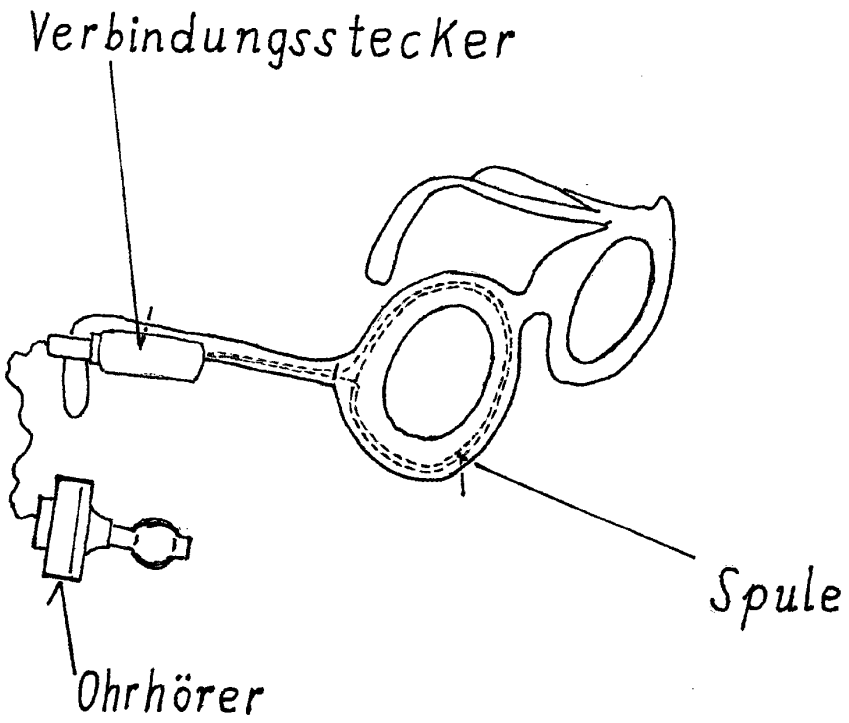
6. Brille, Brillenzusatz oder brillenähnliches Gebilde nach Ansprüchen 1., 2., 3., 4., 5.,
dadurch gekennzeichnet daß
es mit weiteren am Körper getragenen passiven oder aktiven elektrischen Einrichtungen zusammengeschaltet werden kann.

DE 201 03 525 U1

E_PA_LUX_004684

Anmeldung vom 27. Februar 2001

Zeichnung



DE 201 03 525 U1

Espacenet

Bibliographic data: DE20103525 (U1) — 2003-03-13

Spectacles or similar structure or attachment therefor for integral hearing aid

Inventor(s):

Applicant(s): ECKERT EBERHARD [DE] + (ECKERT, EBERHARD)

Classification: **- international:** ***G02C11/06;*** (IPC1-7): G02C11/00
- cooperative: **G02C11/06**; **G02C11/10**

Application number: DE2001203525U 20010228

Priority number(s): DE2001203525U 20010228

Abstract of DE20103525 (U1)

The spectacles or similar structure has a frame. The frame, particularly the part surrounding the lenses, contains or comprises one or more inductances. The inductance(s) may be connected to an acoustic transformer such as an ear plug. The inductance(s) is/are preferably adapted to at least partly compensate for or absorb electric fields. The field can be indicated by an optical display in or separate from the spectacles.

(12)UK Patent Application (19)GB (11) 2 011 640 A

(21) Application No **7847097**
(22) Date of filing
4 Dec 1978
(23) Claims filed
4 Dec 1978
(30) Priority data
(31) **864328**
(32) **27 Dec 1977**
(33) **United States of America (US)**
(43) Application published
11 Jul 1979
(51) **INT CL² G02F 1/13**
(52) Domestic classification
G2F 21X 23E 23M 24T 25F 25P1 25S CD SX
(56) Documents cited
GB 1522681
GB 1475378
GB 1468423
GB 1396828
GB 808981
GB 373196
US 4066335A
Proc. IEEE *61* (7/73) 823-8 New Scientist 2/7/70 p 7
(58) Field of search
G2F
(71) Applicant
Western Electric Company Incorporated
222 Broadway
New York
NY 10038
United States of America
(72) Inventor
Dwight Winton Berreman
(74) Agents
C M K Watts

(54) Variable focus liquid crystal optical system

(57) An electric or magnetic field switches a nematic liquid crystal body between homogeneous parallel and homotropic alignments (in either direction) to alter its refractive index and enable the focal length of an optical system to be varied. As shown, the body lies between concave substrates 13 having electrodes 14 covered by oblique evaporated layers 15 for inducing homogeneous alignment throughout the body and parallel to the preferred direction of a polariser 11. For non-polarised light or plane glass plate between substrates 13 bears aligning layers and the uniform homogeneous alignments throughout the liquid crystal layers so defined are mutually at 90°. Alternatively a uniformly thick liquid crystal layer may be subjected to a non-uniform field, or even a uniform field to provide a variable optical path length if other elements perform the actual focussing. The initial uniform orientation, alternatively imposed by a subsidiary electric or magnetic field, may be required more rapidly using liquid crystal with a frequency dependent sign of dielectric anisotropy and controlling the applied field accordingly. Uses-cameras, telescopes, binoculars, projectors, spectacles.

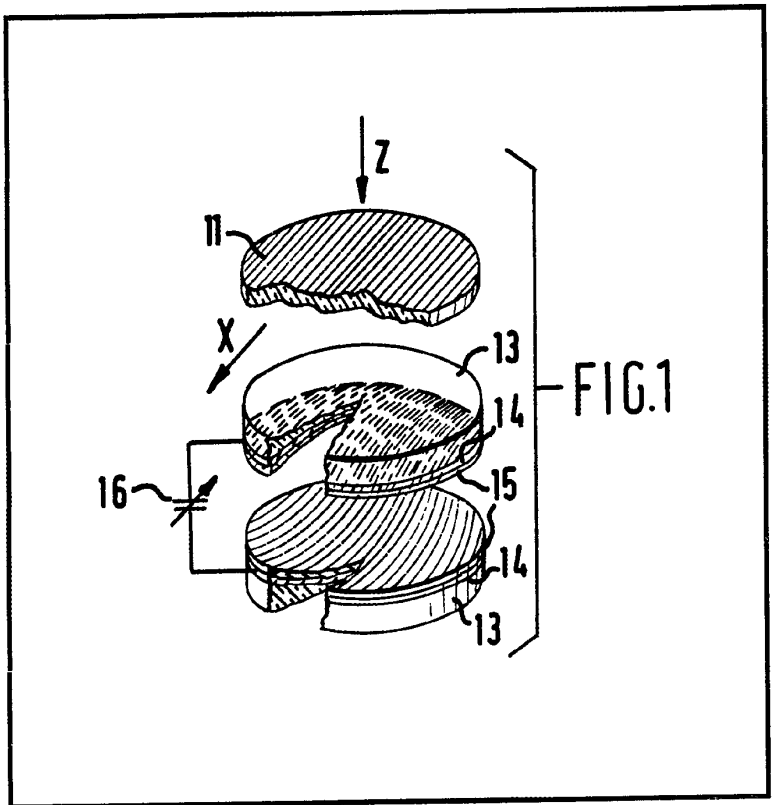


FIG.1

GB 2 011 640 A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

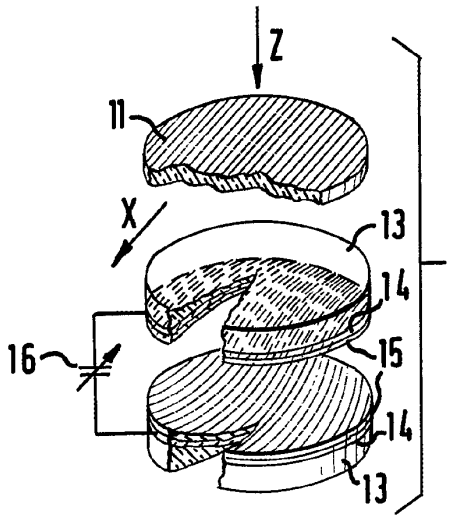


FIG.1

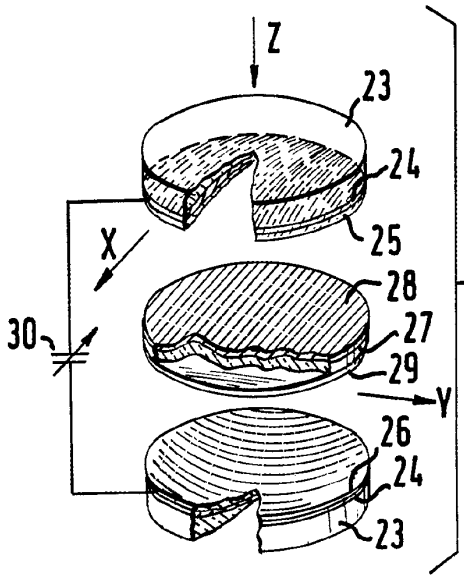


FIG.2

SPECIFICATION

Optical focusing device having a variable focal length

The invention is concerned with an optical focusing device having a variable focal length.

Optical focusing systems having variable focal length are widely used in optical imaging systems such as cameras, telescopes, binoculars, and projectors. Such systems typically comprise one or several glass or plastic lenses whose position is varied by a mechanical drive so as to effect a continuous change of focal length.

A variable focusing effect has been achieved in a system in which light-scattering particles are suspended in a fluid medium and suitable arranged in such medium by means of an applied electric or magnetic field. U.S. Patent 3,531,185, "Liquid Lens Optical Guide Employing Neutral Particles Supported in the Liquid", S. J. Buchsbaum et al., discloses a light guide in which light undergoes repeated focusing as it travels in a fluid medium doped with light-scattering particles, greater or lesser focal length being achieved depending on the strength of the applied field.

Liquid crystal materials are now well known. These materials are characterised in that they have at least one semi-ordered, mesomorphic phase in addition to a solid phase and an isoptropic liquid phase. Well known mesomorphic phases are the smectic, nematic and cholestric phases, the nematic phase being of particular importance in the context of the present application. Molecules of nematic liquid crystal materials, typically are generally rod-shaped or perhaps disk-shaped. In the former case the average direction of the long axes of molecules in a small region is designated the director of that region, in the latter case it is the direction, perpendicular to the disks which is used to define the director. In the nematic phase of a nematic liquid crystal material the directors of the material are aligned in a preferred direction.

The principal use of liquid crystal materials is in display devices. For example a paper by R. A. Soref, entitled "Electronically Scanned Analog Liquid Crystal Displays", *Applied Optics* Vol. 9, pages 1323–1329 (June 1970) discloses an optical display device comprising a thin layer of liquid crystal material sandwiched between optically transparent, electrically conducting electrodes. In response to an applied voltage, portions of the liquid crystal layer change from a transparent state to a light scattering state, thereby changing in visual appearance. A device having electrodes which may be opaque is disclosed in U.S. Patent 3,674,342, "Liquid Crystal Display Device Including Side-by-Side Electrodes on a Common Substrate", J. A. Castellano et al, which appears to be particularly suitable for the display of line figures.

The use of liquid crystal materials has also been proposed for purposes other than optical display. For example, U.S. patent 3,741,629, "Electronically Variable Iris or Stop Mechanism", F. J. Kahn, discloses the use of a layer of liquid crystal material in combination with annular electrodes to serve as an electrically controlled iris.

The device as claimed makes use of the phenomenon of birefringence in nematic liquid crystal materials. The phenomenon of birefringence itself is well known in relation to solid uniaxial crystals such as calcite and fluorspar. In a description in terms of ray optics birefringence is understood as a splitting of a light ray entering the uniaxial crystal into two rays with orthogonal polarisations, called the ordinary and the extraordinary ray. Whilst the refrative index of the crystal with respect to the ordinary ray is independent of the relative orientation of the ray and the crystal the same is not true for the extraordinary ray. Instead, the refractive index for the extraordinary ray depends on the angle between the ray and the optical axis of the crystal. Consequently by tilting the crystal whilst keeping the direction of incident light fixed an effective variation of refractive index can be obtained for the extraordinary ray. In the device as claimed the effect of tilting is obtained by controlling the orientation of the directors of the liquid crystal material by means of an applied field. Thus an effective change of refractive index can be obtained, and this change of refractive index may be used to provide a change of focal length without the necessity to mechanically move any optical elements.

Possible applications of the device include cameras, telescopes, binoculars, projectors and spectacles.

Some embodiments of the invention will now be described by way of example with reference to the accompanying drawing in which:–

Figure 1 is an exploded view of a device according to the invention, and

Figure 2 is an exploded view of an alternative form of device according to the invention.

Fig. 1 shows a polariser 11 and transparent substrates 13 having concave surfaces which face each other and which are coated with optically transparent, electrically conducting electrodes 14 which in turn, are coated with aligning layers 15. Polariser 11 is oriented in direction *x* which is also the preferred direction imposed on the directors of liquid crystal material contained in the space between aligning layers 15. Electrodes 14 are connected to voltage generator 16 whereby an electrical field is produced between electrodes 14.

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Fig. 2 shows transparent substrates 23 having concave surfaces which face each other and which are coated with optially transparent, electrically conducting electrodes 24, which, in turn, are coated with aligning layers 25 and 26. Transparent plate 27 is positioned between transparent substrate 23 and coated with aligning layers 28 and 29. Layers 25 and 28 impose a preferred direction *x* on the directors of nematic liquid crystal material contained in the space between layers 25 and 28. Layers 26 and 29 impose a preferred direction *y* perpendicular to direction *x* on the directors of liquid crystal material contained in the space between layers 26 and 29. Electrodes 24 are connected to voltage generator 30 whereby an electrical field is produced between electrodes 24.

In the device depicted in Fig. 1, polariser 11 causes light propagating in direction *z* to become polarised in direction *x*, which, in the presence of aligning layers 15, coincides with the direction of polarisation of the extraordinary ray of the nematic liquid crystal material oriented by layers 15. By increasing the strength of the electric field between electrodes 14, directors of the liquid crystal material are tilted towards direction *z* by amounts directly related to the field strength. As a consequence, the refractive index of the liquid crystal material changes with respect to the incoming polarised ray.

The device shown in Fig. 2 may be viewed as comprising two variable focus crystal lenses, each producing a variable focusing effect on perpendicularly polarised components of light incident in direction *z*. The ray which is the ordinary ray with respect to the body of liquid crystal material located between layers 25 and 28 is the extraordinary ray with respect to the body of liquid crystal material placed between layers 26 and 29 and conversely. In conjunction, these two bodies of liquid crystal material, in response to a variable electric field between electrodes 24, produce a variable focusing effect on light incident in direction *z* independent on the polarisation of such incident light.

Aligning materials may be chosen to impose initial preferred directions parallel to the aligning layer as shown in the Figures. Alternate aligning materials may impose an initial preferred direction essentially perpendicular to the aligning layers. To vary focal length, in such latter case, electric or magnetic fields may be used to tilt directors towards a direction parallel to the aligning layer.

The body of liquid crystal material may be contained between surfaces which impart a biconvex shape to said body as shown in the Figures. More generally, the body of liquid crystal material may have any desired shape and may even be simply a layer of uniform thickness. In such latter case, a field which is graded in strength from the centre towards the edge of the layer may be used to achieve a focusing effect. It is also possible to use a layer of uniform thickness with a uniform field, in which case the liquid crystal provides a variable optical path length and other optical elements provide the actual focusing. Also the field in which the body of liquid crystal material is placed may be graded to enhance or cancel all or a portion of the focusing power of such body.

Selection of specific liquid crystal materials for the purpose of the invention may be based on a number of material properties such as temperature range in which the material is in a nematic phase, ease with which directors respond to a change in field strength, threshold field strength, and, in the case of an electric field, resistivity of the material. In an electric field, high-resistivity materials are particularly suited because in such materials detrimental light scattering turbidity caused by electric current flow occurs only at elevated voltages. In this respect, materials should preferably be chosen so as to prevent turbidity at field strengths up to a value at least three times that of the critical voltage for the Friedrichs transition (the critical field strength below which there is no appreciable alignment of the directors with the field). Alternatively, turbidity may be prevented by utilising an alternating electric field having sufficiently high frequency. In general, a frequency of at least 60 cycles per second effectively prevents turbidity in nematic liquid crystal materials. Too high a frequency should be avoided, however, since the field strength required to effect a desired change of focal length is directly related to frequency.

While not required to prevent turbidity in a nematic liquid crystal material, an alternating magnetic field may also be used for the purpose of the invention. Such a field can be conveniently produced by an induction coil placed around the circumference of the body of liquid crystal material.

In order to accelerate reversion of directors to the initial preferred direction, it may be advantageous to use auxiliary electric or magnetic fields in directions *x* and *y*. In the case of liquid crystal materials having frequency dependent reversible dielectric anisotropy, reversion of directors to initial preferred directions *x* and *y* may also be enhanced by an alternating field in direction *z* having a frequency higher than that used to cause tilting of directors towards direction *z*.

Nematic liquid crystal materials in common use e.g., in digital wrist watch and calculator displays such as the materials LC099E, LC03MM, and LC04MM manufacture by Atomergic Chemetals Corp., are well suited for the purpose of the invention.

Whilst in most nematic liquid crystal materials the directors tend to align themselves parallel to an applied field nematic liquid

crystal materials in which the directors tend to align themselves perpendicular to an applied field are also suitable for the present invention, obvious changes being necessary in the illustrated devices.

Example

The nematic liquid crystal material consisting of a mixture of 20 percent $C_4H_9C_6H_4CO_2$-$C_6H_4CO_2C_6H_4C_4H_9$, 13 percent $C_4H_9C_6H_4CO_2$-$C_6H_4CO_2C_6H_4OCH_3$, and 67 percent C_6H_{13}-$OC_6H_4CO_2C_6H_4C_4H_9$, whose properties are described by C. J. Gerritsma, J. J. M. J deKlerk, and P. van Zanten in "Changes of Twist in Twisted Nematic Liquid Crystal Layers by Frequency Switching of Applied Electric Fields", *Solid State Communications*,Vol. 17, No. 9, pages 1077–1080, was successfully used at room temperature in the arrangement depicted in Fig. 2. The effective aperture of the body of liquid crystal material contained between glass substrates was approximately seven mm. Layers of indium tin oxide having a thickness of approximately 4000 Angstrom were used as electrodes and layers of silicon monoxide as aligning layers having a thickness of approximately 400 Angstrom. Silicon monoxide was deposited by evaporating at a 45° angle to the substrates and at grazing angle to the flat palte. An alternating voltage alternating at 60 cycles per second was applied to the electrodes. A change in focal length of two diopters was achieved by varying the amplitude of the voltage from zero to 75 volts. Upon reducing the applied voltage back to zero, the original focal length was realised.

CLAIMS

1. An optical focusing device including a body of birefringent nematic liquid crystal material and means for controlling the orientation of the directors of the body by means of an applied field, thereby to obtain a variable refractive index and thence a variable focal length.

2. A device as claimed in claim 1 wherein the means for controlling the orientation of the directors includes means for aligning the directors in a first orientation and means for applying an electric or magnetic field of controllably variable strength to the body to cause the directors to tilt relative to the first orientation.

3. A device as claimed in claim 2 wherein the means for aligning the directors in the first orientation includes an aligning layer in contact with the body.

4. A device as claimed in claim 2 wherein the means for aligning the directors in the first orientation includes means for applying a further electric or magnetic field to the body.

5. A device a claimed in any of the preceding claims including a polariser positioned and oriented to allow only light corresponding to extraordinary rays in the body to pass through the device.

6. A device as claimed in claim 1 including a second body of birefringent nematic liquid crystal material arranged so that the polarisation dependences of the refractive indices of the bodies are of complementary effect.

7. A device as claimed in claim 6 wherein the means for controlling the orientation of the directors comprises means for aligning the directors of the first body in a first orientation, means for aligning the directors of the second body in a second orientation perpendicular to the first and means for applying an electric or magnetic field of controllably variable strength to the bodies to cause the directors of the first and second bodies to tilt relative to the first and second orientation respectively.

8. A device as claimed in claim 7 wherein the means for aligning the directors of the bodies includes a first aligning layer in contact with the first body and a second aligning layer in contact with the second body.

9. A device as claimed in claim 8 wherein the first and second aligning layers are formed on respective opposite faces of a transparent member separating the bodies.

10. A device as claimed in any of the preceding claims wherein the or each body is shaped so as to provide a focusing effect.

11. A device as claimed in any one of the preceding claims wherein the means for controlling the orientation of the directors is arranged to apply a non-homogeneous field to the or each body thereby providing a focusing effect.

12. An optical focusing device substantially as herein described with reference to Fig. 1 or Fig. 2 of the accompanying drawings.

13. An optical focusing device substantially as in the example herein described.

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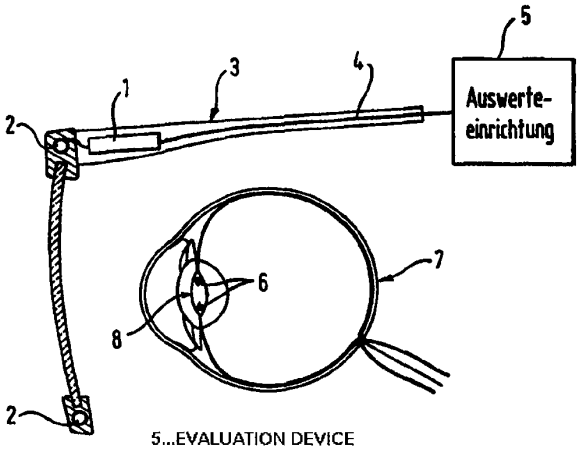
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Veröffentlicht
Mit internationalem Recherchenbericht.

(54) **Title:** DEVICE FOR MEASURING THE INTRA–OCULAR PRESSURE

(54) **Bezeichnung:** VORRICHTUNG ZUR MESSUNG DES AUGENINNENDRUCKS



5...EVALUATION DEVICE

(57) **Abstract**

Disclosed is a device for measuring the intra–ocular pressure, consisting of an eye–implanted telemetering system (6) comprising a pressure sensor (10), a unit (11) for converting sensor signals into data for wireless transmission as well as a sender (15), and an external receiver (1), which receives the information from the transmitter and is connected to an evaluator (5), in which the received information is converted into intra–ocular pressure data intended for charting.

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(57) Zusammenfassung

Eine Vorrichtung zur Messung des Augeninnendrucks mit einer im Auge implantierbaren Fernmeßeinrichtung (6), welche einen Drucksensor (10), eine die Sensorsignale in drahtlos übertragbare Informationen wandelbare Einrichtung (11) und eine Sendeeinrichtung (15) enthält, und mit einer außerhalb des Auges angeordneten Empfangseinrichtung (1), welche die von der Sendeeinrichtung (15) gesendeten Informationen empfängt und an eine Auswerteeinrichtung (5) angeschlossen ist, in welcher die empfangenen Informationen in Daten des Augeninnendruckes für eine Aufzeichnung gewandelt werden.

LEDIGLICH ZUR INFORMATION

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Vorrichtung zur Messung des Augeninnendrucks

Beschreibung

Die Erfindung betrifft eine Vorrichtung nach dem Oberbegriff des Patentanspruches 1. Eine derartige Vorrichtung ist aus der US 5 005 577 bekannt.

Messungen des Augeninnendrucks (Glaukom) werden im Normalfall während eines Besuches beim Augenarzt routinemäßig durchgeführt. Bei Patienten mit bekanntem Glaukom werden die Druckmessungen in regelmäßigen Abständen von sechs bis zwölf Wochen durchgeführt. Diese singulären Druckmessungen sind jedoch wenig aussagekräftig, da der intraokulare Druck tageszeitlichen Schwankungen unterliegt. Um eine objektive Aussage darüber zu erhalten, ob eine pathologische Drucksituation vorliegt, müssen kontinuierliche Druckmessungen über einen längeren Zeitraum durchgeführt werden, anhand deren dann erst entschieden werden kann, ob und welche Therapie einzuleiten ist. Dies ist mit den derzeit zur Verfügung stehenden Geräten zur Messung des intraokularen Druckes (Tonometer) nicht möglich.

Die zur Verfügung stehenden Tonometer (Applanations- und Impressionstonometer) ermöglichen eine genaue Bestimmung des intraokularen Druckes (Grehn F., Leydhecker W., „Augenheilkunde" 26. Auflage, Springer-Verlag, Seiten 244, 245.). Ihre Praxistauglichkeit bei der routinemäßigen Früherkennung ist jedoch eingeschränkt. Mit den bekannten Meßgeräten wird bei der Messung die schmerzempfindliche Hornhaut des Auges berührt, so daß die Druckmessung nur nach lokaler Anästhesie des Auges durchgeführt werden kann. Die bekannten Meßgeräte liefern unbrauchbare Werte bei abnormer Hornhautoberfläche durch Ödeme oder Narben sowie bei starkem Astigmatismus. Untersuchungen im Anschluß an Augenoperationen, um den Erfolg der Operation zu überwachen, sind nicht möglich. Non-contact-Tonometer, die derzeit am Markt sind, errei-

chen nicht die Meßgenauigkeit, die für eine sichere Diagnose erforderlich sind. Insbesondere im hohen Augendruckbereich, der irreversible Schädigungen der Sehnerven zur Folge hat, sind die Messungen mit den derzeit vorhandenen Non-contact-Tonometern zu ungenau und unzuverlässig. Da auch bei diesen Tonometern die Applanation der Hornhaut zur Messung benutzt wird, sind die mit dieser Applanation verbundenen Nachteile vorhanden.

Die eingangsgenannte Vorrichtung, welche aus der US 5 005 577 bekannt ist, beinhaltet eine in ein Auge mittels einer Intraokularlinse implantierbare Fernmeßeinrichtung, welche einen Durcksensor, eine die Sensorsignale in drahtlos übertragbare Informationen wandelnde Einrichtung und eine Sendeeinrichtung enthält. Mittels einer außerhalb des Auges angeordneten Empfangseinrichtung können die von der implantierten Sendeeinrichtung gesendeten Informationen empfangen werden und in Daten des Augeninnendrucks gewandelt werden, die aufgezeichnet werden können. Ferner kann die bekannte Vorrichtung eine von außen gespeiste Energiequelle, beispielsweise ein fotoelektrisches Element aufweisen, um einen aktiven Sensor und Telemetriesender für die Datenübertragung zu erreichen.

Um objektiv beurteilen zu können, ob eine pathologische Drucksituation im Auge vorliegt, müssen Druckmessungen ausgewertet werden, die über einen längeren Zeitraum hin sich erstrecken. Die Erfassung dieser länger andauernden Druckmessungen ist mit den bekannten Geräten aufwendig.

Aufgabe der Erfindung ist es daher, eine Vorrichtung zur Messung des Augeninnendruckes zu schaffen, mit welcher ein erhöhter Augeninnendruck (Glaukom) kontinuierlich überwacht und bedarfsweise abgerufen werden kann.

Diese Aufgabe wird erfindungsgemäß durch das Kennzeichen des Patentanspruches 1 gelöst.

Durch den Datalogger, der in der implantierten Fernmeßeinrichtung vorhanden ist, erreicht man eine kontinuierliche Aufzeichnung und Speicherung der Meßwerte über einen

langen Zeitraum. Diese können bedarfsweise innerhalb eines kurzen Zeitraums, beispielsweise innerhalb von Sekunden bis Minuten abgerufen werden. Nur während dieses Zeitraums muß ein Hilfsgerät, beispielsweise in Form eines Handgerätes, einer Brille oder einer Augenbinde, für den Empfang der Meßdaten zum Einsatz gebracht werden.

Die Fernmeßeinrichtung, welche in bevorzugter Weise als aktive Telemetrie ausgebildet ist, kann an einer geeigneten Stelle, beispielsweise Sulkus Kapselsack, Vorderkammer, als einsetzbares Implantat angeordnet sein. Dieses Implantat kann als Intraokularlinse ausgebildet sein, wobei die Fernmeßeinrichtung außerhalb des optischen Linsenteils bevorzugt an einem das Linsenteil umgebenden Haptikrand vorgesehen ist. Hierdurch wird eine intelligente Linse zur multifunktionalen Meßwerterfassung durch aktive Telemetrie und Intregation des Dataloggers ermöglicht, mit welcher Meßwerte gespeichert werden können.

Als Sensoren eignen sich solche, mit denen der Augeninnendruck erfaßt werden kann. Insbesondere ist der Drucksensor bzw. sind die Drucksensoren im Gegensatz zu bekannten kapazitiv messenden Sensoren (Sensors and Actuators A, 37 - 38 (1993) 93 - 105) in Oberflächenmikromechanik ausgebildet. Zusätzlich können Elektroden zur Stimulation und Ableitung von Reizpotentialen vorgesehen sein. Der Drucksensor, die zugehörige Signalverarbeitungsschaltung, der Datalogger und die sensorseitigen telemetrischen Komponenten, insbesondere Spule und Kondensatoren, sind in bevorzugter Weise monolithisch in einem Chip, beispielsweise Silicium- bzw. Siliconchip integriert. Durch induktive Signal- und Energieübertragung zwischen der implantierten Fernmeßeinrichtung und der außerhalb des Auges vorgesehenen Empfangseinrichtung erreicht man eine aktive Telemetrie, wobei die Energieversorgung der im Auge angeordneten Fernmeßeinrichtung durch induktive Energieübertragung erreicht werden kann. Hierzu besitzen sowohl die implantierte Fernmeßeinrichtung als auch die außerhalb des Auges angeordnete Empfangseinrichtung entsprechend ausgebildete Antennen in Form von Spulen (Ringspulen).

Es ist eine kontinuierliche Messung des Augeninnendruckes über mehrere Stufen möglich, ohne daß eine kontinuierliche Datenabfrage nach außen erforderlich ist. Durch den

in der aktiven Telemetrie integrierten Datalogger können Daten gespeichert werden und zeitlich begrenzt, beispielsweise jeweils in der Woche einmal, abgefragt werden. Die Kalibrierung der implantierten Sensoren ist ohne externes Gerät durch Selbstkalibrierung möglich. Zur Kalibrierung braucht keine Brille getragen zu werden. Man erreicht eine Verringerung der eingespeisten Energie bei aktiver Telemetrie. Die Störempfindlichkeit der Messung wird durch den monolithisch integrierten Aufbau verringert. Die Meßeinrichtung ist EMV-verträglicher. Durch eine bevorzugt oberflächenmikromechanische Lösung erreicht man eine geringe Bruchempfindlichkeit der Sensoren. Ferner können oberflächenmikromechanische Sensoren in den für die Implantation erforderlichen Abmessungen hergestellt werden. Durch den monolithisch integrierten Aufbau können Siliciumchips so gedünnt werden, daß sie in das Augenimplantat, insbesondere eine Intraokularlinse, passen. Die Energieversorgung kann durch die induktive Energieübertragung von außen erfolgen, so daß eine Batterie nicht erforderlich ist.

Anhand der Figuren wird an einem Ausführungsbeispiel die Erfindung noch näher erläutert. Es zeigt:

Fig. 1: in schematischer Seitenansicht ein Ausführungsbeispiel der Erfindung;

Fig. 2 ein als Linse ausgebildetes Implantat, welches die bei der Erfindung zum Einsatz kommende Fernmeßeinrichtung enthält; und

Fig. 3 ein Blockschaltbild der implantierten Fernmeßeinrichtung.

Bei dem in den Figuren dargestellten Ausführungsbeispiel ist eine Fernmeßeinrichtung 6 mittels eines als Intraokularlinse 8 ausgebildeten Augenimplantats in das Auge eingesetzt. Die Fernmeßeinrichtung 6, welche Drucksensoren 10 und sensorseitige Telemetriekomponenten, insbesondere eine Telemetrieelektronik 11 aufweist, ist im Bereich eines Haptikrandes 14, welcher einen optischen Teil 9 der Intraokularlinse umgibt, angeordnet. Die Drucksensoren 10 können in Oberflächenmikromechanik ausgebildet sein. In die Telemetrieelektronik 11 ist ein Datalogger 16 zur Speicherung der von den Drucksensoren 10 empfangenen Meßwerte angeordnet. Ferner ist die Telemetrieelektronik mit

einer als Sende- und Empfangsantenne arbeitenden Spule 15 verbunden. Die im Datalogger 16 gespeicherten Meßdaten können bedarfsweise, z.B. durch Ansteuern eines elektronischen Schalters in einer mit der Spule 15 verbundenen Sendeschaltung 18 abgerufen und gesendet werden. Die Telemetrieelektronik 11 sowie die Drucksensoren können monolithisch in einen Siliciumchip integriert sein, der so dünn ausgebildet ist, daß er in den Haptikrand 14 der Linse paßt. In bevorzugter Weise ist die Linse aus Silikonmaterial hergestellt. Der Haptikrand 14 besitzt eine Breite von ca. 1 mm. Der Linsendurchmesser kann zwischen 6,5 und 7 mm variieren. Mittels Haptikfäden 13 läßt sich die Intraokularlinse beispielsweise im Kapselsack des Auges fixieren. Die Drucksensoren 10 (Sensorkomponenten) und die Telemetrieelektronik (Lesestation) mit Transponderelektronik und der als Spule 15 ausgebildeten Mikroantenne befinden sich in dem Haptikrand 14 außerhalb der optischen Zone 9 der Intraokularlinse. Die Dicke des Linsenkörpers kann je nach Brechkraft 1 bis 2 mm aufweisen.

Für das Implantatmaterial kommt beispeilsweise ein Polydiorganosiloxan, in bevorzugter Weise Polydimethylsiloxan wegen seiner guten Bioverträglichkeit und Verformbarkeit zum Einsatz. Das Implantat kann somit im gefalteten oder auch gerolltem Zustand durch einen kleinen Operationsschnitt implantiert werden. Auch für die Verkapselung der Mikrokomponenten der Fernmeßeinrichtung kann ein Polydiorganosiloxan, insbesondere Polydimethylsiloxan, verwendet werden.

Die von den Drucksensoren 10 in Abhängigkeit vom gemessenen Augeninnendruck erzeugten Meßsignale werden von der Telemetrie- und Transponderelektronik in drahtlos übertragbare Informationen in einem Konverter 17 gewandelt und mittels der als Spule 15 ausgebildeten Mikroantenne ausgesendet und außerhalb des Auges von einer Empfangseinrichtung 1 über eine ebenfalls als Spule 2 ausgebildeten Antenne empfangen. Die Empfangseinrichtung 1 und die Spule 2 können in einem Brillengestell 3 angeordnet sein. Es eignen sich jedoch auch andere Fixierungsmittel, beispielsweise eine bequeme Augenbinde. Die Empfangseinrichtung 1 ist über ein Kabel 4 mit einer Auswerteeinrichtung 5 in einem Basisgerät verbunden. Dieses Basisgerät kann neben der Auswerte- und Schnittstellenelektronik auch eine Batterie zur Energieversorgung aufweisen. Es ist jedoch auch möglich, die Energieversorgung über ein Netzkabel zu gewährleisten. Die

Auswerteeinrichtung 5 wandelt die empfangenen Informationen in Daten um, welche aufgezeichnet werden können. Hierzu kann eine stationäre Datenauswerteeinrichtung vorgesehen sein für eine Offline-Datenaufbereitung, -speicherung, -analyse und -visualisierung auf PC-Basis.

Die Energieversorgung der im Auge implantierten Fernmeßeinrichtung 6 kann auf induktivem Wege über die beiden beim Sendeempfangsbetrieb als Antennen wirkenden Spulen 2 und 15 erfolgen.

Patentansprüche

1. Vorrichtung zur Messung eines Augeninnendrucks mit einer in ein Auge (7) implantierbaren Fernmeßeinrichtung (6), welche einen Drucksensor (10), eine die Sensorsignale in drahtlos übertragbare Informationen wandelnde Einrichtung (11) und eine Sendeeinrichtung (15) enthält, einer außerhalb des Auges angeordneten Empfangseinrichtung (1, 2), welche die von der Sendeeinrichtung gesendeten Informationen empfängt, und einer Auswerteeinrichtung (5), welche die empfangenen Informationen in Daten des Augeninnendrucks wandelt, die aufgezeichnet werden können,

   dadurch g e k e n n z e i c h n e t,

   daß die in das Auge implantierbare Fernmeßeinrichtung (6) einen Datalogger (16) aufweist, in welchem die vom Drucksenosr (10) kontinuierlich gelieferten Meßdaten speicherbar und aus welchem die Meßdaten beim Sende-Empfangsbetrieb zeitlich begrenzt abfragbar sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die insbesondere aktive Fernmeßeinrichtung (6) in oder an einem Implantat angeordnet ist.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Implantat als Intraokularlinse (8) ausgebildet ist.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Fernmeßeinrichtung (6) an einem außerhalb des optischen Linsenteils (9) liegenden Linsenteil (Haptikrand 14) angeordnet ist.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß der Drucksensor bzw. die Drucksensoren (10) in Oberflächenmikromechanik ausgebildet sind.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß zur Verkapselung der die Fernmeßeinrichtung (6) bildenden Mikrokomponenten als Material ein Polydiorganosiloxan, insbesondere Polydimethylsiloxan, verwendet wird.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das Implantat, insbesondere die Intraokularlinse, aus eime Polydiorganosiloxan, insbesondere Polydimethylsiloxan, gebildet ist.

8. Vorrichtung nach einem der Ansprüche 1 bis 7, dadurch gekennzeichned, daß die Komponenten der Fernmeßeinrichtung (Telemetrie), nämlich der bzw. die Drucksensor(en), die zugehörige Signalverarbeitung, der Datalogger und die telemetrischen Komponenten, wie Spule und Kondensatoren voll monolithisch integriert sind.

Fig. 1

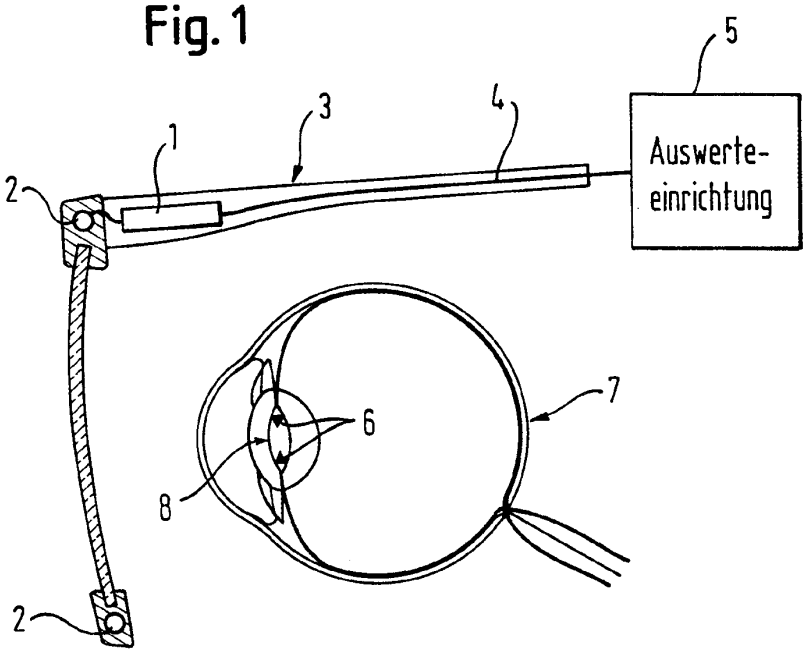


Fig. 2

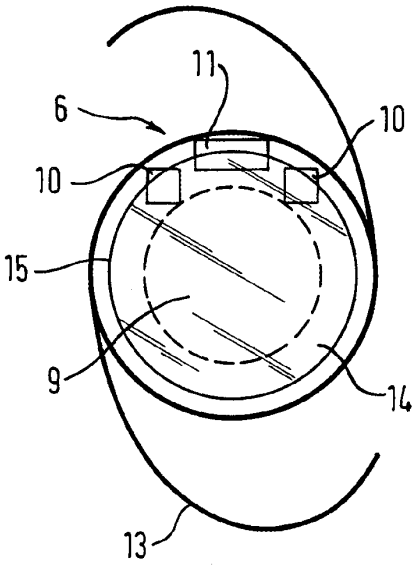
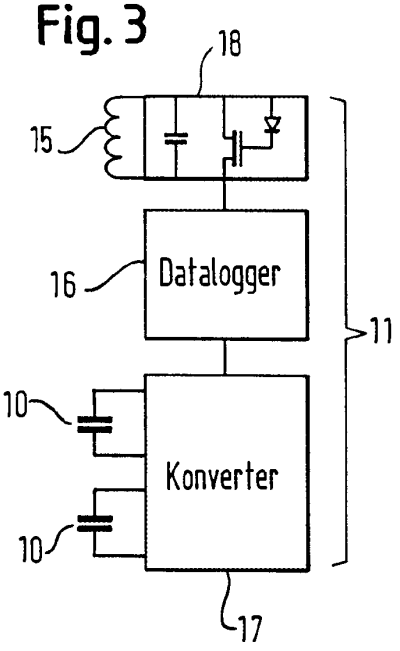


Fig. 3



INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/EP 98/04072

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61B3/16 A61B5/00

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 6 A61B

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 005 577 A (FRENKEL RONALD E P) 9 April 1991 cited in the application see column 2, line 57 - column 4, line 7; figure 1 ---	1-4
A	DE 43 41 903 A (BINDER JOSEF ET AL) 14 June 1995 see column 1, line 67 - column 2, line 1 see column 3, line 17 - line 65 -----	1,2,8

☐ 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
12 October 1998	19/10/1998

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	Martelli, L

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INTERNATIONAL SEARCH REPORT

information on patent family members

Intern. al Application No
PCT/EP 98/04072

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5005577 A	09-04-1991	NONE	
DE 4341903 A	14-06-1995	NONE	

Form PCT/ISA/210 (patent family annex) (July 1992)

INTERNATIONALER RECHERCHENBERICHT

Intern ales Aktenzeichen
PCT/EP 98/04072

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 6 A61B3/16 A61B5/00

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 6 A61B

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie°	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	US 5 005 577 A (FRENKEL RONALD E P) 9. April 1991 in der Anmeldung erwähnt siehe Spalte 2, Zeile 57 - Spalte 4, Zeile 7; Abbildung 1	1-4
A	DE 43 41 903 A (BINDER JOSEF ET AL) 14. Juni 1995 siehe Spalte 1, Zeile 67 - Spalte 2, Zeile 1 siehe Spalte 3, Zeile 17 - Zeile 65	1,2,8

☐ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

☒ Siehe Anhang Patentfamilie

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Datum des Abschlusses der internationalen Recherche	Absendedatum des internationalen Recherchenberichts
12. Oktober 1998	19/10/1998
Name und Postanschrift der Internationalen Recherchenbehörde Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	**Bevollmächtigter Bediensteter** Martelli, L

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INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Interna[illegible]les Aktenzeichen
PCT/EP 98/04072

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
US 5005577 A	09-04-1991	KEINE	
DE 4341903 A	14-06-1995	KEINE	

Formblatt PCT/ISA/210 (Anhang Patentfamilie)(Juli 1992)

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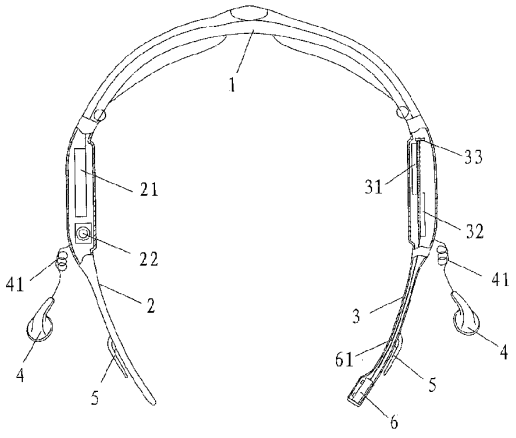
(74) 代理人: 深圳市千纳专利代理有限公司(SHENZHEN QIANNA PATENT AGENCY LTD.); 中国广东省深圳市深南中路新城大厦西座601胡竖, Guangdong 518031 (CN)。

(81) 指定国 (除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, 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, LV, LY, MA, MD, 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。

[见续页]

(54) Title: WATERPROOF MULTIFUNCTION SPECTACLE

(54) 发明名称: 防水多功能眼镜



(57) Abstract: A waterproof multifunction spectacle comprising shell bodies provided on arms of the spectacle. A shell body includes a frame and an inner cover. Multi-function device such as MP3, blue-tooth is fixed on a recess of the frame. Function keys, wires, user interfaces, earphone wire and microphone are connected with the shell body by waterproof structure. The frame and the inner cover are connected with water roof rin .

(57) 摘要:

一种防水多功能眼镜，其设有位于镜臂位置的密封壳体。该密封壳体包括壳架和内盖，在壳架的凹槽内安装有 MP3、蓝牙装置等等多功能装置。功能按键、导线、用户接口、耳机线及麦克风等均使用防水结构与壳体连接。壳架和内盖之间设有防水圈。

WO 2007/062601 A1

(84) 指定国 (除另有指明，要求每一种可提供的地区保护)：ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), 欧洲 (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, 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)。

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说 明 书

防水多功能眼镜

技术领域

本发明涉及一种眼镜，尤其是一种多功能眼镜。

背景技术

目前市场上出现了各种各样的个人娱乐消费者产品，如U盘、移动硬盘、MP3音乐播放器、蓝牙耳机等等。更有厂商将U盘或MP3播放器装入手表、眼镜等日常消费产品里，给技术及市场带来新变革、新选择。现有MP3眼镜是在镜腿安装MP3音乐播放器，这样，眼镜佩戴者即可欣赏音乐，这样的产品虽得到广大消费者的青睐，其功能还是比较单一，而且大多只是简单地将有关芯片装入眼镜内，而不作任何进一步的技术处理。然而，这些眼镜内设的MP3音乐播放器、闪存芯片等仪器极易外部环境的影响，例如使用者汗水带有碱性，会腐蚀、损坏这些精密仪器，又如，眼镜佩戴者在户外活动时突然遇到倾盆大雨，雨水渗入镜腿内部，直接浸湿、损害内设元器件，所有这些，均令眼镜及其MP3播放器频繁损坏、修理、更换乃至报废，寿命极短，从而导致社会资源严重浪费。

发明内容

本发明的目的在于，提供一种防水多功能眼镜。

本发明的目的是通过以下技术方案来实现的：

一种防水多功能眼镜，包括有带镜片的前框、镜腿，所述眼镜设有安装多功能装置的壳体，所述壳体包括有壳架、内盖，所述壳架的一侧设有凹腔，所述多功能装置位于所述空腔，所述内盖封闭所述空腔，所述壳架与所述内盖接合处设有防水装置；

所述多功能装置的接口位于所述壳体外面，所述接口与所述空腔内的多功能装置以导通连接棒连接，所述导通连接棒穿过所述壳体处的周围设有防水圈；

所述凹腔周围是其墙体，所述墙体的顶端设有第一平台，所述第一平台设有第一防水圈，所述内盖外周形成第二平台，所述第一平台接合所述第二平台；

还有螺钉依次穿过第一平台、第二平台锁紧、固定所述内盖与所述壳架，所述螺钉位于所述第一防水圈以外；

所述壳架墙体与所述第一平台形成一位于壳架另一侧的凹台，所述壳体还包括一外盖，所述外盖外端设有与所述凹台对应的凸块，所述凸块卡在所述壳架墙体的外围，所述凸块顶端对接所述凹台，所述螺钉依次锁入所述第二平台、所述第一平台、所述凸块；

所述壳架另一侧设有凹坑，所述多功能装置的接口位于所述凹坑；

所述多功能装置选自 MP3 音乐播放器、收音机、蓝牙装置中的至少一种；

所述镜腿包括左镜腿、右镜腿，所述左镜腿、所述右镜腿均设有所述壳体；其中一个镜腿的壳架一侧的凹腔设有充电电池，壳架另一侧设有凹坑安装 USB 接口；另一个镜腿的壳架一侧的凹腔设有选自 MP3 播放器主机、蓝牙装置、收音机装置的至少一种，壳架另一个侧设有凹坑安装麦克风，所述麦克风以导通连接棒连接，所述导通连接棒穿过壳架处的周围设有防水圈；还有连接导线位于所述前框，连接导线穿过左镜腿壳体、右镜腿壳体处的周围均设有防水圈；

所述镜腿均设有耳机，耳机连接线穿入壳体的周围设有防水圈，所述左镜腿、所述右镜腿中的至少一个还设有功能按键，所述功能按键采用导通连接棒连接，所述导通连接棒穿过壳体处的周围设有防水圈；

所述镜腿末端具有相互接合的底座和盖，还有外置麦克风的接口安装在所述底座上，所述外置麦克风的接口的连接导线穿入所述壳体处的周围设有防水圈；

所述镜腿末端的底座还设有凹槽，所述凹槽里安装有连接导线，所述镜腿末端的盖还设有用与所述凹槽相适配的槽盖，所述内盖压住所述槽盖的左端。

本发明的优点在于：在左镜腿和右镜腿前端由外盖、壳架和内盖组成的鼓起壳体内设有 MP3 音乐播放器主机、蓝牙装置等多功能装置，还以穿过鼓起壳体的耳机线连接有耳机，鼓起壳体还内置有麦克风，这样，佩戴本眼镜既可收听欣赏音乐，又可与外部蓝牙手机配对使用，接听、拨打电话，左镜腿和右镜腿的壳架与内盖的平台接合处、连接充电接口与左镜腿内设电路板的导通连接棒穿过壳架处、连接内置麦克风与右镜腿内设电路板的导通连接棒穿过壳架处、连接外置麦克风的接口与右镜腿内设电路板的连接导线穿过鼓起壳体处、前框设有的导线和耳机线穿过镜腿鼓起壳体处、控制按键的防水按把均依次分别设有第一防水圈、第三防水圈、第二防水圈、第四防水圈、第五防水圈、第六防水圈、第七防水圈及第八防水圈，使鼓起壳体具有很好

的密闭性，防水性强，内置的多功能装置即得以保护，保持极佳工作性能，及寿命更长、更耐用。镜腿末端设有一外置麦克风的接口，即使内置的麦克风已经损坏不能工作或拾音不清楚，也可外接另一麦克风，进行录音、通话，工作性能得以保障。

附图说明

图 1 是本发明实施例中所述防水多功能眼镜的结构示意图。

图 2 是本发明实施例中所述防水多功能眼镜的左镜腿结构示意图。

图 2a 是本发明实施例中所述防水多功能眼镜的左镜腿的充电接口安装结构示意图。

图 3 是本发明实施例中所述防水多功能眼镜的右镜腿结构示意图。

图 4 是本发明实施例中所述防水多功能眼镜的右镜腿的内侧结构示意图。

本申请说明书附图的著作权及其它任何权利均属申请人所有。

具体实施方式

现在结合附图及具体实施例对本发明作进一步的描述。

如图 1 所示，本发明所述防水多功能眼镜可以是太阳眼镜，其包括有安装有镜片的前框 1，及与前框 1 铰链连接的镜腿（即左镜腿 2、右镜腿 3）。左镜腿 2、右镜腿 3 前端位置均设计成向外胀的鼓起壳体，鼓起壳体内设有多功能装置，该多功能装置可以是包括有 MP3 芯片、闪存芯片、电池及电路板的 MP3 音乐播放器，其工作原理与现有的 MP3 音乐播放器相同，不再详细描述，该多功能装置也可以是包括有含有蓝牙芯片、天线及电路板的蓝牙装置，其工作原理与现有的蓝牙芯片（即蓝牙模块）相同，也不再详细描述。前框 1 朝人脸方向设有的凹槽里安装有导线（图中未表示出来），导线两端分别伸入左镜腿 2、右镜腿 3 内与有关电路板连接。左镜腿 2 前端鼓起壳体内设有供给 MP3 音乐播放器主机及蓝牙装置工作电源的充电电池 21，还设有充电接口 22（如 USB 接口、四芯插口）及电路板。右镜腿 3 前端鼓起壳体内设有 MP3 音乐播放器主机 31、蓝牙装置 32 及电路板，还设有用于录音功能的麦克风 33，麦克风 33 与电路板连接。左镜腿 2、右镜腿 3 还分别设有耳机 4，连接耳机 4 的耳机线分别穿入左镜腿 2、右镜腿 3 所设鼓起壳体内并与相关电路板连接，这样，使用本发明眼镜既可收听、欣赏音乐，又可与外

部蓝牙手机配对使用，以接听、拨打电话。左镜腿 2、右镜腿 3 末端均还设有所述耳机 4 的固定装置 5，所述固定装置 5 可以是一挂钩，在不使用耳机 4 时，将耳机 4 设有的长孔套在所述挂钩上，即可固定住，非常方便。右镜腿 3 末端设有外置麦克风的接口 6（如 USB 接口、四芯插口），外置麦克风的接口 6 通过安装在右镜腿 3 内侧设有的凹槽内的连接导线 61 与右镜腿 3 内设电路板连接，这样，即使内置麦克风 33 已经损坏不能工作或拾音不清楚，也可联接外置麦克风进行录音、通话。

当然，充电接口 22 也可用作外接麦克风的接口，还可用作数据传输接口，同理，外置麦克风的接口 6 也可用作充电接口，还可用作数据传输接口。

如图 2 所示，左镜腿 2 前端鼓起壳体由外盖 2A、壳架 2B 及内盖 2C 组成，并有螺钉 27 分别依次穿入内盖 2C、壳架 2B、外盖 2A 的两端，将上述三部分锁紧、固定。壳架 2B 与左镜腿 2 其它部分一体成型（可以是一体注塑成型），其内侧（眼镜佩戴时朝人脸方向）设有第一凹腔 23，第一凹腔 23 的底部容纳、安装着所述充电电池 21 及其相应的电路板。第一凹腔 23 周围是其墙体 231，墙体 231 顶端设有平台 232，平台 232 处以凹槽设有第一防水圈 81，防水圈 81 以外的壳架 2B 两端设有螺孔（该螺孔贯穿平台 232 及凹台 233），墙体 231 与平台 232 形成一位于壳架 2B 外侧的凹台 233。壳架 2B 的外侧设有作为所述凹坑的第二凹腔 24，第二凹腔 24 内以小型电路板安装所述充电接口 22。内盖 2C 内侧设有两凸块 26，凸块 26 卡在所述充电电池 21 的两端，使电池固定得更好。内盖 2C 外端形成平台 234，平台 234 贴合、连接住壳架 2B 的平台 232，两平台间则紧接有所述第一防水圈 81，使得第一凹腔 23 内的电池 21 等元器件得到密闭并起防水作用，眼镜内置元器件得到最好的保护，更耐用，性能亦更稳定。外盖 2A 外端设有两个与壳架 2B 凹台 233 对应的凸块 235，凸块 235 设有螺钉盲孔，凸块 235 刚好卡在墙体 231 外围，凸块 235 顶端则接合凹台 233。所述螺钉 27 依次穿过内盖 2C 两端平台 234 的螺孔、壳架 2B 两端平台 232 的螺孔、外盖 2A 两端凸块 235 的盲孔，再锁紧则将内盖 2C、壳架 2B、外盖 2A 固定。外盖 2A 内侧还两个凸块 25 卡住接口 22 的两端，使接口 22 定位、固定。

如图 2a 所示，左镜腿 2 前端鼓起壳体内的第二凹腔 24 所设的充电接口 22 焊接在小型电路板 28 上，导通连接棒 29 穿入壳架 2B 连接位于第一凹腔 23 的电路板，导通连接棒 29 穿过壳架 2B 处的周围设有第二防水圈 82，这样，壳架 2B 内设电路板等元器件仍然密闭、防水、防潮、防尘，外盖 2A 则

进一步地保护住充电接口 22。可用导线连接第一凹腔 23 的电路板及导通连接棒 29。

如图 3 所示，右镜腿 3 前端鼓起壳体结构与左镜腿 2 前端的鼓起壳体结构基本相同，由外盖 3A、壳架 3B 及内盖 3C 组成，并有螺钉 36 分别依次穿入内盖 3C、壳架 3B、外盖 3A 的两端，将三者固定。壳架 3B 与右镜腿 3 其它部分一体成型或以其它方式连接一体。壳架 3B 内侧（眼镜佩戴时朝人脸的那侧）设有第三凹腔 33，第三凹腔底端容纳及安装住所述 MP3 播放器主机 31 及蓝牙装置 32，MP3 音乐播放器 31 包括有 MP3 芯片 311、闪存芯片 312 及主电路板 313，蓝牙装置 32 包括有蓝牙芯片 321、天线 322 及副电路板 323。MP3 芯片 311、闪存芯片 312 分别焊接在主电路板 313 左、右两侧面板上，蓝牙芯片 321、天线 322 则焊接在副电路板 323 右侧面板上，而主电路板 313 与副电路板 323 相互平行并以板导板连接器 37（也可以是其它连接器，如扁形导线）连接固定。第三凹腔 33 周围是其墙体 331，墙体 331 顶端设有平台 332，平台 332 处以凹槽设有第三防水圈 83，防水圈 83 以外的壳架 2B 两端设有螺孔（该螺孔贯穿平台 332 及凹台 333），墙体 331 与平台 332 形成一位于壳架 3B 外侧的凹台 333。壳架 3B 的外侧前端设有作为凹坑的第四凹腔 34，第四凹腔 34 内以小型电路板安装麦克风 35，麦克风 35 位于前端，拾音效果更好。内盖 3C 外端形成平台 334，平台 334 贴合、连接住壳架 3B 的平台 332，两平台间则紧接有所述第三防水圈 83，使得第三凹腔 33 内的 MP3 播放主机 31、蓝牙装置 32、电路板等元器件得到密闭并起防水作用，眼镜内置元器件得到最好的保护，更耐用，性能亦更稳定。外盖 3A 外端设有两个与壳架 3B 凹台 333 对应的凸块 335，凸块 335 设有螺钉盲孔，凸块 335 刚好卡在墙体 331 外围，凸块 335 顶端则接合凹台 333。所述螺钉 36 依次穿过内盖 3C 两端平台 334 的螺孔、壳架 3B 两端平台 332 的螺孔、外盖 3A 两端凸块 335 的盲孔，再锁紧则将内盖 3C、壳架 3B、外盖 3A 固定。麦克风 35 焊接在小型电路板上，并以穿过壳架 3B 的导通连接棒与第三凹腔 33 内设的电路板连接，该导通连接棒穿过壳架 3B 处的周围设有第四防水圈 84，第三凹腔 33 内设的元器件仍然密闭。

如图 4 所示，右镜腿 3 末端由相互接合的底座 6A、盖 6B 组成，底座 6A 与右镜腿 3 其它部分一体成型或以其它方式连接为一体，用来连接外置麦克风的接口 6 固定在底座 6A 上。底座 6A 设有凹槽 38，盖 6B 还一体成型有与凹槽 38 相适配的槽盖 39（槽盖 39 与盖 6B 也可分开独立制作）。凹槽 38 内

固定有连接导线61，以导接接口6与右镜腿3内的电路板。连接导线61穿过右镜腿3鼓起壳体处的周围设有第五防水圈85，将一体制作的盖6B、槽盖39盖上，盖6B以销柱、销座及相互嵌合的倒扣固定在底座6A上（也可通过螺钉固定），装上后盖3C时，后盖3C压住槽盖39的左端，这样，盖6A、槽盖39即可稳稳地固定住，外置麦克风的接口6及连接导线61也得以保护。前框1设有的导线7和耳机线41穿过右镜腿3鼓起壳体处的周围也分别设有第六防水圈86和第七防水圈87，右镜腿3还设有用以完成音乐播放、音乐停止、音量增加、音量减小、接听/拨打电话等功能的控制按键30及用于表示相关操作的指示灯（图中未表示出来），控制按键30使用设有第八防水圈88的防水按把301与电路板连接。同理，前框1设有的导线7、耳机线41穿过左镜腿2鼓起壳体处的周围也设有防水圈，左镜腿2也可设有控制按键，并以设有防水圈的防水按把与内设电路板连接。这样，左镜腿2、右镜腿3内置的多功能装置的元器件、零部件完全被密闭，保护数据安全，眼镜亦经久耐用。

当然，本发明眼镜所设的充电接口22及外置麦克风的接口6还设有防尘帽，除起防尘作用外，还有一定的防水、防潮作用，使其得以保护，更耐用，工作性能更稳定。

权 利 要 求

1．一种防水多功能眼镜，包括有带镜片的前框、镜腿，其特征在于：所述眼镜设有安装多功能装置的壳体，所述壳体包括有壳架、内盖，所述壳架的一侧设有凹腔，所述多功能装置位于所述空腔，所述内盖封闭所述空腔，所述壳架与所述内盖接合处设有防水装置。

2．根据权利要求 1 所述的防水多功能眼镜，其特征在于：所述多功能装置的接口位于所述壳体外面，所述接口与所述空腔内的多功能装置以导通连接棒连接，所述导通连接棒穿过所述壳体处的周围设有防水圈。

3．根据权利要求 2 所述的防水多功能眼镜，其特征在于：所述凹腔周围是其墙体，所述墙体的顶端设有第一平台，所述第一平台设有第一防水圈，所述内盖外周形成第二平台，所述第一平台接合所述第二平台。

4．根据权利要求 3 所述的防水多功能眼镜，其特征在于：还有螺钉依次穿过第一平台、第二平台锁紧、固定所述内盖与所述壳架，所述螺钉位于所述第一防水圈以外。

5．根据权利要求 4 所述的防水多功能眼镜，其特征在于：所述壳架墙体与所述第一平台形成一位于壳架另一侧的凹台，所述壳体还包括一外盖，所述外盖外端设有与所述凹台对应的凸块，所述凸块卡在所述壳架墙体的外围，所述凸块顶端对接所述凹台，所述螺钉依次锁入所述第二平台、所述第一平台、所述凸块。

6．根据权利要求 5 所述的防水多功能眼镜，其特征在于：所述壳架另一侧设有凹坑，所述多功能装置的接口位于所述凹坑。

7．根据权利要求 5 所述的防水多功能眼镜，其特征在于：所述多功能装置选自 MP3 音乐播放器、收音机、蓝牙装置中的至少一种。

8．根据权利要求 7 所述的防水多功能眼镜，其特征在于：

所述镜腿包括左镜腿、右镜腿，所述左镜腿、所述右镜腿均设有所述壳体；

其中一个镜腿的壳架一侧的凹腔设有充电电池，壳架另一侧设有凹坑安装 USB 接口；

另一个镜腿的壳架一侧的凹腔设有选自 MP3 播放器主机、蓝牙装置、收音机装置的至少一种，壳架另一个侧设有凹坑安装麦克风，所述麦克风以导通连接棒连接，所述导通连接棒穿过壳架处的周围设有防水圈；

还有连接导线位于所述前框，连接导线穿过左镜腿壳体、右镜腿壳体处的周围均设有防水圈。

9．根据权利要求 8 所述的防水多功能眼镜，其特征在于：所述镜腿均设有耳机，耳机连接线穿入壳体的周围设有防水圈，所述左镜腿、所述右镜腿中的至少一个还设有功能按键，所述功能按键采用导通连接棒连接，所述导通连接棒穿过壳体处的周围设有防水圈。

10．根据权利要求 9 所述的防水多功能眼镜，其特征在于：所述镜腿末端具有相互接合的底座和盖，还有外置麦克风的接口安装在所述底座上，所述外置麦克风的接口的连接导线穿入所述壳体处的周围设有防水圈。

11．根据权利要求 10 所述的防水多功能眼镜，其特征在于：所述镜腿末端的底座还设有凹槽，所述凹槽里安装有连接导线，所述镜腿末端的盖还设有用与所述凹槽相适配的槽盖，所述内盖压住所述槽盖的左端。

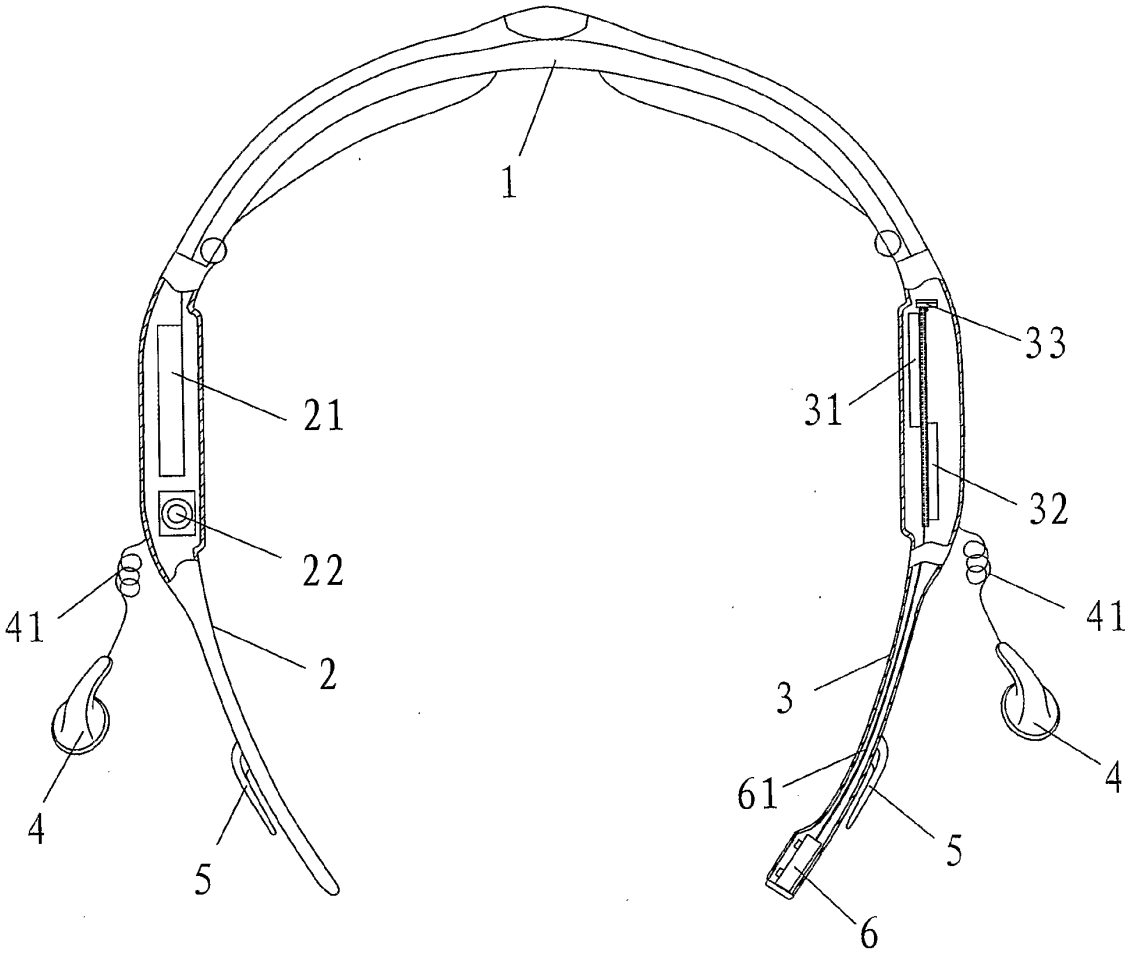


图 1

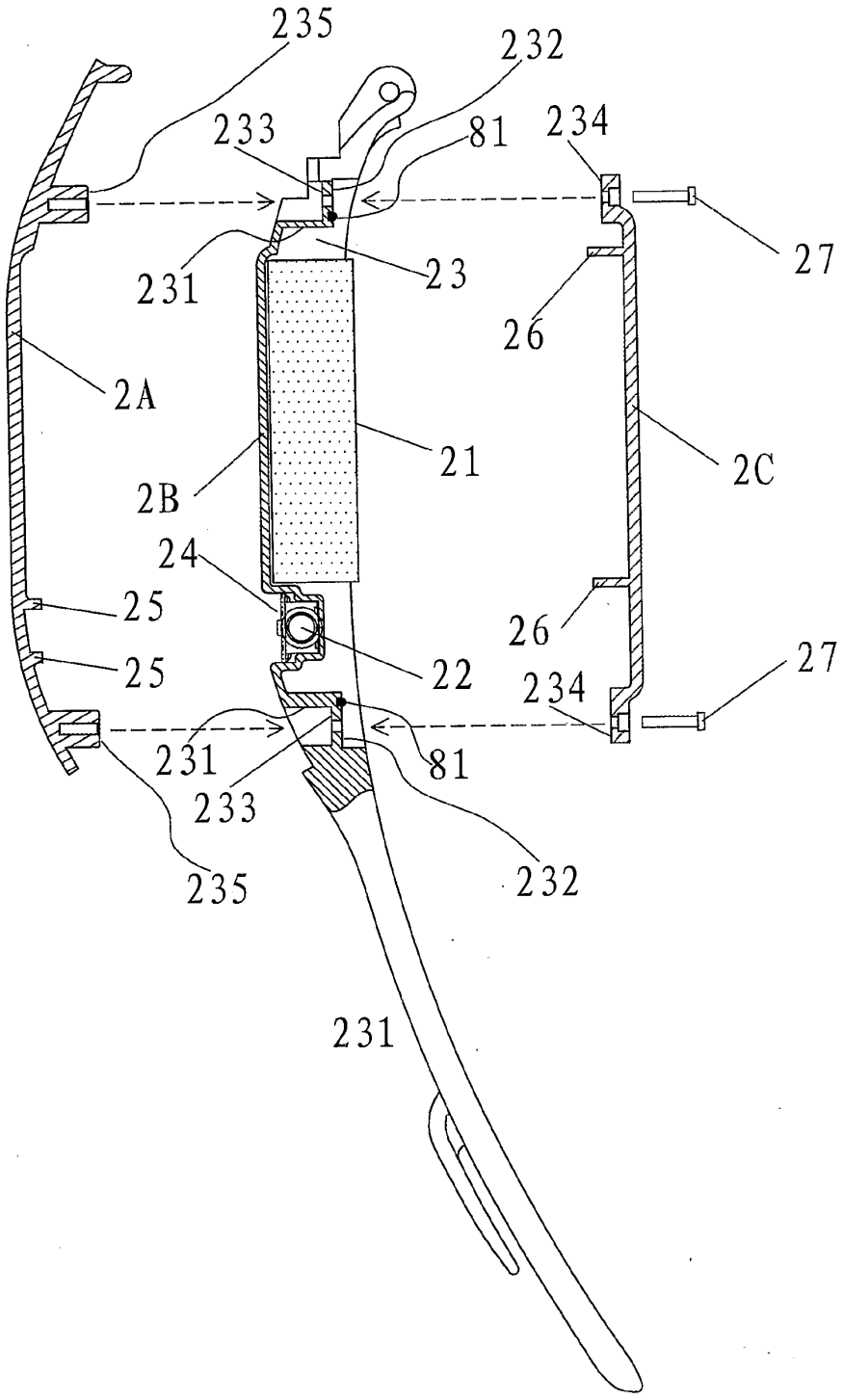

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图 2

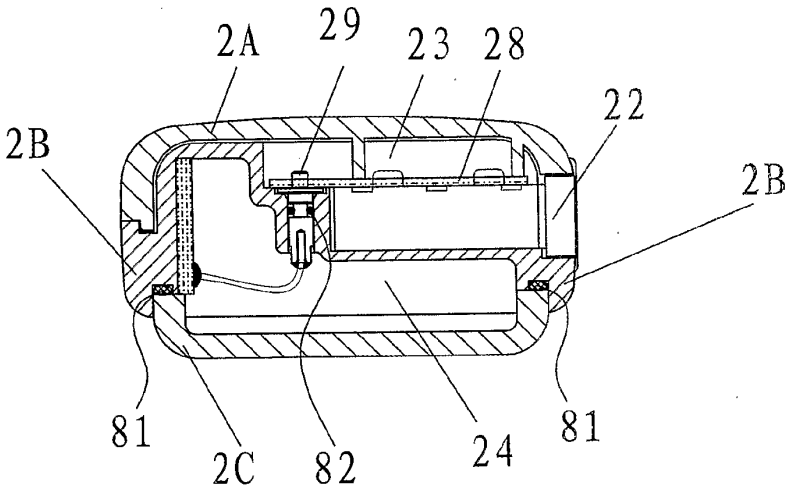


图 2a

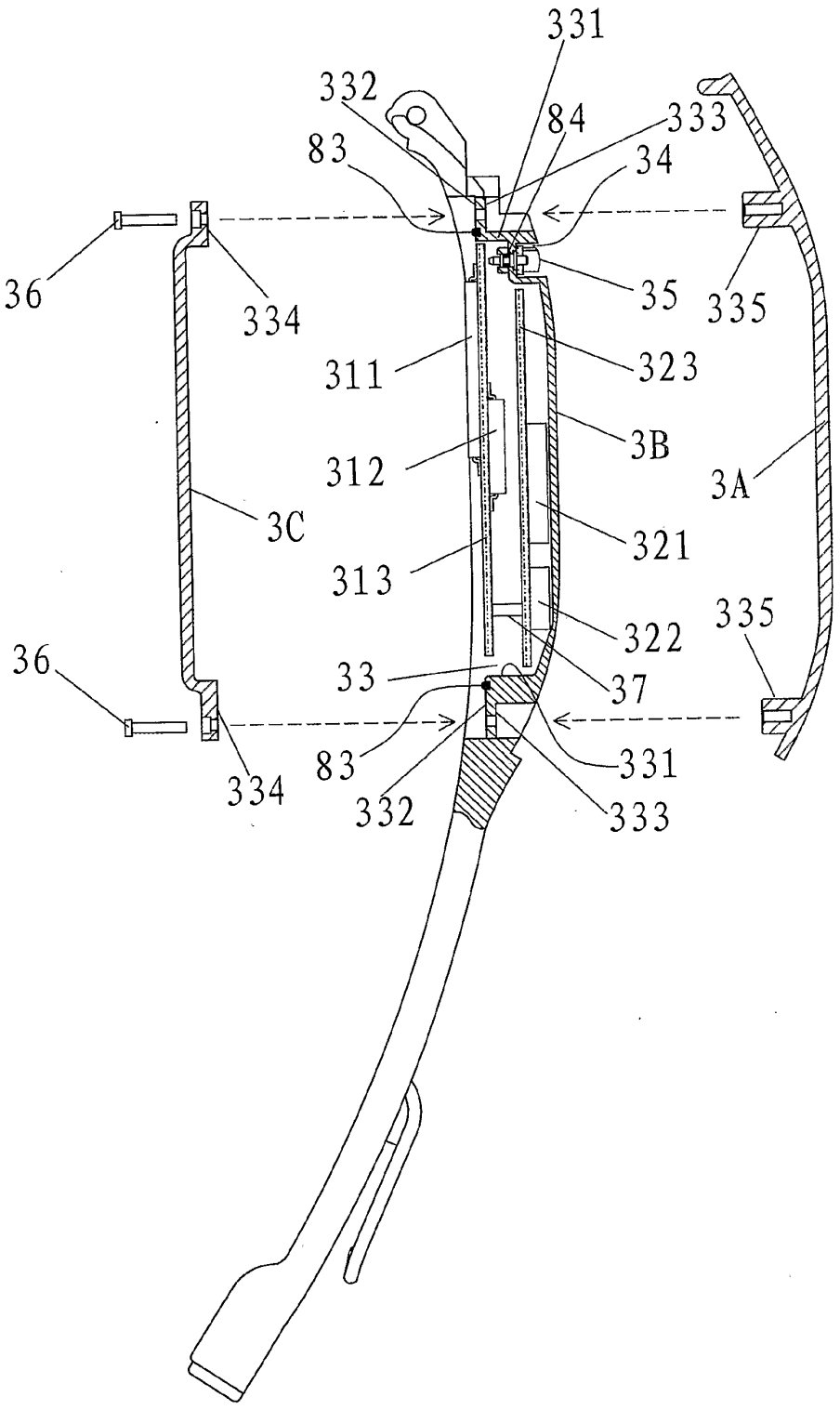

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图 3

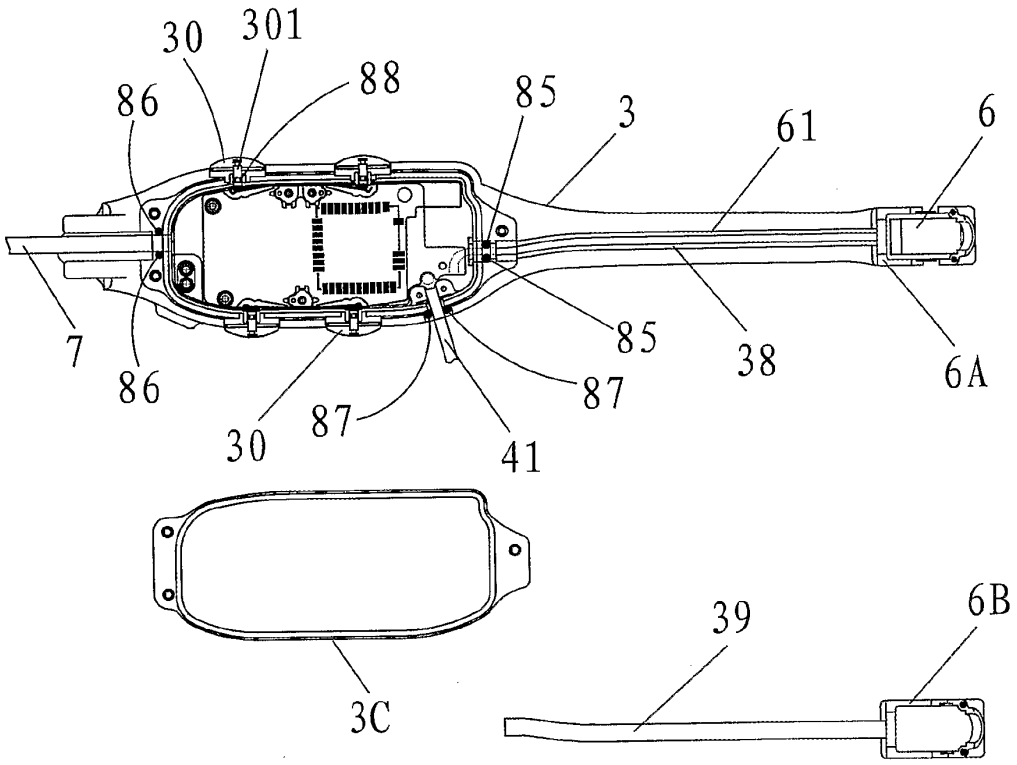


图 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2006/003252

A. CLASSIFICATION OF SUBJECT MATTER

G02C11/00 (2006.01)i

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: 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 practicable, search terms used)

WPI;EPODOC;PAJ;CPRS waterproof; water; resistant; hermetical+; seal+;

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN2769928Y (ZHUHAI JINGZHUN WATCH INDUSTRY) 05.Apr 2006(05.04.2006)whole	1-11
A	CN2739666Y (ZHUHAI JINGZHUN WATCH INDUSTRY)09.Nov 2005(09.11.2005)whole	1-11
A	CN2739667Y (ZHUHAI JINGZHUN WATCH INDUSTRY)09.Nov 2005(09.11.2005)whole	1-11
A	US20040160572A1(James Jannard et al)19.Aug 2004 (19.08.2004) whole	1-11
A	JP56042209A(MATSUSHITA ELECTRIC IND CO LTD) 20.Apr 1981(20.04.1981) whole	1-11
A	DE202005004361U(JOW TONG et al) 14.Jul 2005 (14.07.2005) whole	1-11

☐ 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

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"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
13.Mar 2007(13.03.2007)	29 · MAR 2007 (29 · 03 · 2007)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer GAO,Yiying Telephone No. (86-10)62085775

Form PCT/ISA /210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2006/003252

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN2769928Y	05.04.2006	无	
CN2739666Y	09.11.2005	无	
CN2739667Y	09.11.2005	无	
US20040160572A1	19.08.2004	WO2004012477A	05.02.2004
		CA2494661A	05.02.2004
		AU2003254210A	16.02.2004
		US2004156012A	12.08.2004
		US2004160571A	19.08.2004
		US7004582 B	28.02.2006
		US2004160573A	19.08.2004
		US7150526B	19.12.2006
		US2005046790A	03.03.2005
		US7147324B	12.12.2006
		US2005046789A	03.03.2005
		MXPA05001079A	03.06.2005
		US2005128431A	16.06.2005
		EP1547434AAA	29.06.2005
		BR0312909A	12.07.2005
		US2005201585A	15.09.2005
		JP2005534269T	10.11.2005
		CN1720763A	11.01.2006
		US2006146277A	06.07.2006
		US2006197907A	07.09.2006
		US2006203183A	14.09.2006
		US2007008484A	11.01.2007
JP56042209A	20.04.1981	JP59029843B	24.07.1984
		JP1254885C	12.03.1985
DE202005004361U	14.07.2005	无	

Form PCT/ISA /210 (patent family annex) (April 2005)

国际检索报告

国际申请号 PCT/CN2006/003252

A. 主题的分类

G02C11/00 (2006.01)i

按照国际专利分类表(IPC)或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC: G02C

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

WPI;EPODOC;PAJ;CPRS waterproof; water; resistant; hermetical+; seal+;防水；密封；密闭

C. 相关文件

类 型*	引用文件，必要时，指明相关段落	相关的权利要求
PX	CN2769928Y (珠海精准表业有限公司) 05.4 月 2006（05.04.2006）全文	1-11
A	CN2739666Y (珠海精准表业有限公司)09.11 月 2005（09.11.2005）全文	1-11
A	CN2739667Y (珠海精准表业有限公司)09.11 月 2005（09.11.2005）全文	1-11
A	US20040160572A1(James Jannard et al)19.8 月 2004 （19.08.2004）全文	1-11
A	JP56042209A(MATSUSHITA ELECTRIC IND CO LTD) 20.4 月 1981(20.04.1981) 全文	1-11
A	DE202005004361U(JOW TONG et al) 14.7 月 2005 (14.07.2005) 全文	1-11

☐ 其余文件在 C 栏的续页中列出。 ☒ 见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

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"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

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"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

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"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
13.3 月 2007（13.03.2007）	29 · 3月 2007 (29 · 03 · 2007)
中华人民共和国国家知识产权局(ISA/CN) 中国北京市海淀区蓟门桥西土城路 6 号 100088 传真号： (86-10)62019451	授权官员 高懿颖 电话号码：(86-10) 62085775

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2006/003252

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN2769928Y	05.04.2006	无	
CN2739666Y	09.11.2005	无	
CN2739667Y	09.11.2005	无	
US20040160572A1	19.08.2004	WO2004012477A	05.02.2004
		CA2494661A	05.02.2004
		AU2003254210A	16.02.2004
		US2004156012A	12.08.2004
		US2004160571A	19.08.2004
		US7004582 B	28.02.2006
		US2004160573A	19.08.2004
		US7150526B	19.12.2006
		US2005046790A	03.03.2005
		US7147324B	12.12.2006
		US2005046789A	03.03.2005
		MXPA05001079A	03.06.2005
		US2005128431A	16.06.2005
		EP1547434AAA	29.06.2005
		BR0312909A	12.07.2005
		US2005201585A	15.09.2005
		JP2005534269T	10.11.2005
		CN1720763A	11.01.2006
		US2006146277A	06.07.2006
		US2006197907A	07.09.2006
		US2006203183A	14.09.2006
		US2007008484A	11.01.2007
JP56042209A	20.04.1981	JP59029843B	24.07.1984
		JP1254885C	12.03.1985
DE202005004361U	14.07.2005	无	

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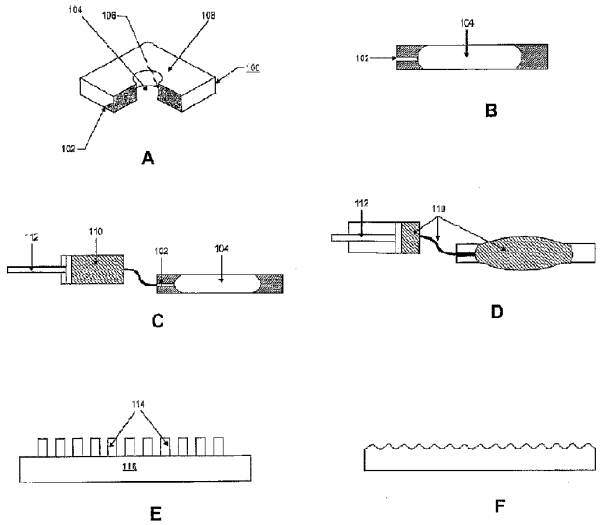
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, 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, 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:
— *with international search 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: RUGGED VARIABLE FOCUS LIQUID LENSES AND ACTUATORS FORACTUATION OF LIQUID LENSES



(57) Abstract: An optical device (100) includes a housing having a hydrophobic top surface (108), a bottom surface and a first cavity (104), wherein the cavity has inwardly curved walls. A first fluid (110) having a first meniscus is disposed within the first cavity. A first control means (112) is coupled with the first fluid for displacing fluid into and out of the first cavity.

WO 2007/142602 A1

RUGGED VARIABLE FOCUS LIQUID LENSES AND ACTUATORS FOR ACTUATION OF LIQUID LENSES

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to optical systems, and more particularly to rugged variable-focus liquid lenses.

[0002] In conventional optical imaging applications, such as optical communications systems and camera devices, manual tuning and physical positioning of a lens are typically required to focus an image onto a detector and to receive light from different directions relative to the lens. To eliminate the inefficiencies and expenses of manual tuning, tunable microlenses were developed to focus an optical signal by optimally coupling an optical source to an optical signal receiver, such as a photodetector. In some cases, the refractive index of the microlens is automatically varied to change the focus of the microlens when the incidence of a light beam upon the microlens varies from its nominal, aligned incidence, in order to maintain optimal coupling between the microlens and the photodetector.

[0003] However, tunable microlenses such as gradient index lenses have inherent limitations associated with the small electro-optic coefficients found in the majority of electro-optic materials used for such lenses. This often results in a small optical path modulation and thus requires thick lenses or high voltages. In addition, many electro-optic materials show strong birefringence causing polarization dependence of the microlens, which distorts light with certain polarization. These problems become especially severe in the case where arrays of tunable microlenses are required. For example, existing camera phones use tiny, fixed-focus lenses, which have poor light-gathering capabilities, limited focus range and limited resolution power. As a result, the image quality is low compared to conventional photo cameras.

[0004] Variable focus liquid lenses have been developed to overcome some of the above problems (see, e.g., U. S. Patent No. 5,973,852). A variable focus fluid lens is provided when the focal length is controlled by changing the contact angle or radius of curvature of a fluid meniscus, which forms the optics of the lens. The optical device also typically includes a pressure or volume control means fluidly coupled with the fluid for adjusting the pressure of the fluid and therefore also the curvature of the meniscus.

[0005] However, improvements can be made for problems particular to liquid lenses, as opposed to rigid lenses. For example, the liquid lens may be disturbed after impact or rough handling. In such an event, liquid may separate from the lens and form droplets on the cover over the lens, altering the focus of the optical device. The droplets may become trapped on the cover and affect the performance of the device during its entire operation. Additionally, unlike a rigid lens, a liquid lens is also susceptible to detrimental impact when the device is not in use. Thus, to further minimize disturbances to the liquid lens, a mechanism to retract the liquid when it is not in use and to maintain the focus of the liquid lens when in use is desirable. Applications susceptible to shock and impact range widely from small, hand-held telecommunication devices such as mobile phone cameras, portable data storage devices such as CD/DVD drivers or barcode readers, analytic instruments such as microscopes and other detection devices, surgical instruments such as endoscopes, or various laser technology instruments.

[0006] Therefore, it is desirable to provide systems and methods that overcome the above and other problems. In particular, there is a need for a low cost and rugged optical focusing system with a recovery system for small, portable, imaging applications where rough handling is anticipated. What is desired is a recovery method that retracts liquid when not in use and that controls the focus of the liquid lens when in use. Embodiments of the invention provide for these and other needs.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention provides rugged variable-focus lenses that overcome the above problems. In particular, the present invention provides systems and methods for efficiently forming liquid lenses and for recovering liquid lenses after shock-related events.

[0008] According to one embodiment of the invention, an optical device includes a housing having a hydrophobic top surface, a bottom surface and a first cavity, wherein the cavity has inwardly curved walls. A first fluid having a first meniscus is disposed within the first cavity. A first control means is coupled with the fluid for displacing fluid into and out of the first cavity. In one aspect, the hydrophobic top surface includes a layer of hydrophobic material covering a non-hydrophobic material. In another aspect, the walls are hydrophilic or include a layer of hydrophilic material covering a non-hydrophilic material.

[0009] According to another embodiment of the invention, an optical device includes a housing having a top surface, a bottom surface and a first cavity. The optical device also includes an air reservoir for holding compressed air or a gas. A fluid having a meniscus is disposed within the first cavity. A layer of hydrophobic material covers the top surface. A layer of hydrophilic material covers the walls of the first cavity. A control means is coupled with the fluid for displacing the first fluid into and out of the cavity.

[0010] According to another embodiment of the invention, a method for forming a liquid lens is provided. The method includes providing a fluid within a housing that includes a top surface, a bottom surface, and a cavity having inwardly curved walls, wherein the fluid forms a meniscus disposed within the cavity. In one aspect, a hydrophobic coating covers the top surface, and a hydrophilic coating covers the inwardly curved walls. The method also includes adjusting the curvature of the meniscus.

[0011] According to another embodiment of the invention, a method for retracting retracting a fluid in a liquid lens is provided. The method includes providing a fluid within a housing that includes a top surface, a bottom surface, and a cavity having inwardly curved walls, wherein the fluid forms a lens having a meniscus disposed within the cavity, and a hydrophobic coating covers the top surface. The method also includes retracting the fluid from the cavity.

[0012] According to another embodiment of the invention, an optical device includes a housing having a top surface, a bottom surface and a first cavity, wherein the cavity has inwardly curved walls. A first fluid having a meniscus is disposed within the first cavity, the first fluid forming a first liquid lens. A first control means is coupled with the first fluid for displacing fluid into and out of the first cavity. The optical device also includes a first non-liquid lens.

[0013] Reference to the remaining portions of the specification, including the drawings and claims, will realize other features and advantages of the present invention. Further features and advantages of the present invention, as well as the structure and operation of various embodiments of the present invention, are described in detail below with respect to the accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1A shows an isometric view of a liquid lens assembly with an inwardly curve cavity according to an embodiment of the invention.

[0015] FIG. 1B shows a side view of a liquid lens assembly with an inwardly curved cavity.

[0016] FIG. 1C shows a side view of a liquid lens assembly with an inwardly curved cavity before the liquid fills the inwardly curved cavity.

[0017] FIG. 1D shows a side view of a liquid lens assembly with an inwardly curved cavity after the liquid fills the inwardly curved cavity.

[0018] FIG. 1E shows a side view of nano- or micro-sized pillars formed on the top and bottom surfaces of an inwardly curved cavity to form hydrophobic surfaces.

[0019] FIG. 1F shows a side view of a nano- or micro-sized ridged topology on the top and bottom surfaces of an inwardly curved cavity to form hydrophilic surfaces.

[0020] FIG. 2A shows a top view of a flat cavity that is empty, according to an embodiment of the invention.

[0021] FIG. 2B shows a top view of a flat cavity with a liquid drop formed at the inlet.

[0022] FIG. 2C shows a top view of a flat cavity with a liquid drop enlarged at the inlet.

[0023] FIG. 2D shows a top view of a flat cavity with a liquid drop that has filled the cavity.

[0024] FIG. 3A shows a top view of an empty inwardly curved cavity according to an embodiment of the invention.

[0025] FIG. 3B shows a top view of an inwardly curved cavity with a liquid ring being formed.

[0026] FIG. 3C shows a top view of an inwardly curved cavity with the liquid ring merging.

[0027] FIG. 3D shows a top view of an inwardly curved cavity with a concave liquid lens formed.

[0028] FIG. 3E shows a top view of an inwardly curved cavity with a convex liquid lens formed.

[0029] FIG. 4A shows a side view of a liquid lens assembly with a housing for multiple lenses according to an embodiment of the invention.

[0030] FIG. 4B shows a side view of a liquid lens assembly with a liquid lens being formed.

[0031] FIG. 4C shows a side view of a liquid lens assembly with a liquid lens being adjusted.

[0032] FIG. 5A shows a side view of a liquid lens assembly with an enclosed air reservoir according to an embodiment of the invention.

[0033] FIG. 5B shows a side view of a liquid lens assembly with an open air reservoir according to an embodiment of the invention.

[0034] FIG. 5C shows a side view of a liquid lens assembly with an enclosed air reservoir and dome-shaped lens according to an embodiment of the invention.

[0035] FIG. 6A shows a side view of an air reservoir with curled ends, according to an embodiment of the invention.

[0036] FIG. 6B shows a side view of an air reservoir with enlarged ends, according to an embodiment of the invention.

[0037] FIG. 7A shows a side view of a liquid lens assembly with an inwardly curved cavity with a disturbed liquid lens according to an embodiment of the invention.

[0038] FIG. 7B shows a side view of a liquid lens assembly with the liquid pushed out to fill the inwardly curved cavity.

[0039] FIG. 7C shows a side view of a liquid lens assembly with the liquid pushed against the air reservoir.

[0040] FIG. 7D shows a side view of a liquid lens assembly with a retracting liquid.

[0041] FIG. 7E shows a side view of a liquid lens assembly with a re-formed liquid lens.

[0042] FIG. 8A shows a liquid lens housing with solid lens and cavities to hold liquid lenses according to an embodiment of the invention.

[0043] FIG. 8B shows a liquid lens and solid lens according to an embodiment of the invention.

[0044] FIG. 8C shows a liquid lens and a solid plano convex lens according to an embodiment of the invention.

[0045] FIG. 8D shows two liquid lenses and two solid lenses according to an embodiment of the invention.

[0046] FIG. 8E shows two liquid lenses and one solid lens sandwiched in between according to an embodiment of the invention.

[0047] FIG. 9 shows a single pump actuation method according to an embodiment of the invention.

[0048] FIG. 10 shows an actuation method according to another embodiment of the invention.

[0049] FIG. 11 shows an actuation method according to another embodiment of the invention.

[0050] FIG. 12 shows a more detailed drawing of the embodiment of FIG. 11.

[0051] FIG. 13 shows a block diagram for a liquid lens control system according to another embodiment of the invention.

[0052] FIG. 14 shows a single electrical motor used to actuate two liquid lenses according to another embodiment of the invention.

[0053] FIG. 15 shows a side view of a liquid lens-based, auto-focus lens system according to an embodiment of the invention.

[0054] FIG. 16 shows a side view of a liquid lens-based, auto-focus lens system according to another embodiment of the invention.

[0055] FIG. 17 shows a side view of liquid lens system with a zoom/focus module according to an embodiment of the system.

[0056] FIG. 18 shows a side view of a liquid lens system with a variable-focus and variable-diameter lens module according to an embodiment of the system.

[0057] FIG. 19 shows a side view of a liquid lens system with a zoom/focus module according to another embodiment of the invention.

[0058] Figure 20 shows a liquid lens system with a zoom/focus module according to another embodiment of the invention.

[0059] FIG. 21 shows a piezoelectric tube actuator according to an embodiment of the invention.

[0060] FIG. 22A shows a top view of a piezoelectric disc actuator using a piezoelectric buzzer diaphragm according to an embodiment of the invention.

[0061] FIG. 22B shows a side view of the piezoelectric disc actuator.

[0062] FIG. 22C shows a top view of a piezoelectric disc actuator using a curved piezoelectric diaphragm according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0063] FIGS. 1A-1D show a lens assembly that holds a variable-focus liquid lens within an inwardly curved lens cavity or chamber, according to one embodiment of the invention.

[0064] FIG. 1A shows an isometric view of a liquid lens assembly 100 with a lens cavity 104 that is inwardly curved. FIG. 1B shows the side view of the same lens assembly 100. As shown, the lens cavity 104 is inwardly curved, like the shape of a barrel, to provide a region where the liquid will conglomerate due to surface tension before forming a whole lens. In FIGS. 1A-1D, this region is located at the largest perimeter within lens cavity 104, and a ring is subsequently formed on this perimeter. As more liquid enters lens cavity 104, the ring will grow and eventually develop into a liquid lens. This procedure can be further improved by an additional actuation method.

[0065] One actuation system includes a pump configured to introduce a fixed volume of liquid into lens cavity 104 to form a lens and then changes the shape of the lens by controlling the small amount of liquid. For example, FIG. 1C shows a fixed volume of liquid 110 at pump 112, before liquid 110 enters lens cavity 104 through the inlet 102. Liquid 110

may be any liquid suitable for lens formation, such as water, glycerol, etc. FIG. 1D shows liquid 110 pumped into lens cavity 104 after pump 112 is displaced to the right. Actuation enhancement elements may also be used for retracting the liquid to disable the lens, as described further below.

[0066] In one embodiment, lens cavity 104 is coated with hydrophilic coating 106, and the top and bottom surfaces of the lens assembly 100 are coated with hydrophobic coating 108. The boundary at the hydrophobic regions constrains the liquid and presents a meniscus having a curvature defined in part by the static (or dynamic) contact angle of the fluid at the boundary. The hydrophobic material may be a material such as plastic, polymers, ceramics, alloys, or a fluoropolymer such as Teflon, CYTOP or zirconium oxynitride. The hydrophilic region may be made of a material such as plastic, polymer, glass, quartz, zirconium oxynitride, or fused silica. Other suitable materials include ceramics, hydrophilic metals, hydrophilic alloys or hydrophilic polymers such as, for example, hydroxylic polyacrylate or polymethacrylate, polyacrylamides, cellulosics polymers, polyvinyl alcohols. Coatings of these materials can also be used to cover the inwardly curved walls.

[0067] Alternatively, according to another embodiment of the invention, use of a hydrophobic coating on a surface may be replaced by the use of micro- or nano-structures on the surface as shown in FIG. 1E. As shown in the figure, micro- or nano-sized pillars 114 may be formed on the top and bottom surfaces of the cavity by lithography processes or by injection molding. Or, according to another embodiment of the invention, use of a hydrophilic coating on a surface may be replaced by the use of a micro- or nano-sized ridged topolology on the surface, as shown in FIG. 1F.

[0068] The static/dynamic contact angle may be varied by applying pressure to the liquid or by pumping more liquid into the cavity, which shifts the interface across the hydrophilic-hydrophobic boundary, and thus changes the curvature and contact angle of the meniscus. For example, the static contact angle may give a concave lens. However, applying pressure to the meniscus would further push it into the hydrophobic region and change the contact angle so that the lens is convex. In this manner, the curvature of the lens formed by the fluid meniscus can be tuned. Thus, an optical device according to embodiments of the invention typically includes a pressure control means fluidly coupled with the liquid for this purpose. In general, the curvature of the meniscus will have a tunability range between the

static/dynamic contact angle of the fluid with the hydrophilic surface and the static/dynamic contact angle of the fluid with the hydrophobic surface.

[0069] The pressure generating device and/or a device that alters the volume of fluid in a cavity can take a variety of forms. For example, the pressure applied to the fluid may be electrokinetic pressure generated by electro-osmosis, or pressure generated using a ratchet pump, piezoelectric diaphragm pump, piezoelectric buzzer pump, voice coil pump, piezo tube pump or by electro-wetting. In other embodiments, fluid pressure may be generated using pneumatic or magnetohydrodynamic pumps. In yet other embodiments, the pressure applied to the fluid may be generated by a mechanical device. One example of a useful mechanical pressure generating device is a screw-type pumping device or a peristaltic pump.

[0070] Inwardly Curved Cavity

[0071] The inwardly curved cavity according to embodiments of the invention ensures smooth and efficient development of the liquid lens. The liquid typically forms a droplet at inlet 102 on the left side of cavity 104 for the lens assembly of FIGS. 1A-1D. The droplet then enlarges until it covers the entire cavity.

[0072] In contrast, a cavity with flat (e.g., cylindrically shaped) walls requires higher energy for the formation of a liquid lens. For example, FIGS. 2A-2D illustrate top views of such a liquid lens cavity with flat walls. FIG. 2A shows an empty lens cavity with flat walls. In FIG. 2B, the liquid starts at the inlet located at the left side of the cavity, as shown by the droplet partially covering the cavity. FIG. 2C shows the liquid droplet enlarged from the inlet. FIG. 2D shows the liquid droplet enlarged to fill the entire cavity.

[0073] FIGS. 3A-3E show top views of a liquid lens cavity with inwardly curved (e.g., barrel shaped) walls according to one embodiment of the invention. For an inwardly curved cavity, the liquid from the inlet flows in the region with the least energy for the liquid to settle. FIG. 3A shows an inwardly curved cavity that is empty. FIG. 3B shows an inwardly curved cavity with a liquid ring formed on the largest perimeter of the cavity, as shown by the edges of the liquid droplet along the edges of the cavity's opening. FIG. 3C shows the liquid ring growing and merging inwards, as shown by the edges of the droplet converging toward the center and away from the edges of the cavity. FIG. 3D shows a top view of a concave lens formed at the cavity, as evidenced by the diminished size of the letters. Likewise, FIG. 3E shows a top view of a convex lens formed at the cavity, as evidenced by the magnified size of the letters. As described above, the concave or convex

character of the liquid lens may be tuned by a pressure control mechanism or volume control mechanism coupled with the lens assembly that changes the curvature and contact angle of the meniscus lens upon application of pressure (or reduction of pressure) or volume change of the fluid in the cavity, thus changing the curvature of the meniscus.

[0074] Forming the lens first at the surface of lowest energy, as for the largest perimeter of the inwardly curved cavity, enhances the stability of the liquid lens. Accordingly, the liquid is less likely to fall or break apart from the lens cavity, and more efficiently form a well-shaped lens.

[0075] Retraction of Liquid: Disabling the Lens

[0076] According to embodiments of the invention, the liquid for the liquid lenses may be disabled or 'turned off' by retracting the liquid into a reservoir for storage when the lens is not in use. The procedure for retracting the liquid lens is, in certain aspects, enhanced by an additional actuation method such as by using a pump that may also be used for forming the liquid lens. In this case, the pumps for actuation may also be used as the reservoirs for storing the retracted liquid.

[0077] FIGS. 4A-4C show side views of a lens assembly holding multiple lenses, according to an embodiment of the invention. In FIG. 4A, lens assembly 200 has a lens housing 220 which holds liquid lens 206 (Lens A), liquid lens 216 (Lens B), and solid lens 218. Liquid lens 206 is connected to pump 202 (Pump A) through inlet 204, and liquid lens 216 is connected to pump 212 (Pump B) through inlet 214. Lens assembly 200 also includes inwardly curved cavity 208 which preferably has a hydrophilic coating covering its walls. Hydrophobic coating 210 covers the top and bottom surfaces of each lens cavity of lens assembly 200.

[0078] FIG. 4B shows a liquid 222 filling the lens cavity to form lens 206. FIG. 4B shows pump 202 is activated to the "offset" position, in which case the displaced liquid 222 is pumped out to fill the designated cavity for lens 206. Pump 202 stops when the fixed volume of liquid to form liquid lens 206 is displaced sufficiently to form the lens within the cavity. Pumps 202 and 212 are also controlled so that magnification, focusing and zooming are effected. For example, FIG. 4C shows adjustments to the shape (radius of curvature) of lens 206 using pump 202, after pumping a fixed volume of liquid 222 to form lens 206.

[0079] When lens 206 and 216 in FIGS. 4A-4C are not in use, the respective liquids can be retracted and stored inside pumps 202 and 212, respectively. Retraction to 'turn off' the lens is particularly useful for minimizing harmful effects of high impact and shock applications to the optical device. For example, disabling the lens when it is not in use prevents disturbances such as droplets being formed on the glass during events of high impact when the lens is not in use. This prevents additional efforts to perform a recovery or corrective process to fix the liquid lens that has been disturbed while the optical device is not in use. In addition to automatically disabling the lens, the retraction method can also be used as an automatic reset for the liquid lens.

[0080] Air Reservoir

[0081] FIGS. 5A-5C show lens formation and retraction methods according to another embodiment of the invention. The lens assembly shown in FIGS. 5A-5C includes plates (e.g., glass plates) 302 and 304, a liquid channel 306, inwardly curved cavity 312 with preferably hydrophilic walls 308 (e.g., formed of a hydrophilic material or coated with a hydrophilic material), and a hydrophobic top surface of the cavity (e.g., top surface formed of a hydrophobic material or coated with a hydrophobic material). During liquid retraction, a lens may be formed or a disturbed lens may be reformed. During the process, in one aspect, the liquid fills inner cavity 312 and has complete contact with the top glass layer 304. A fluid displacing mechanism (not shown) such as a pump coupled with fluid channel 306 then retracts the liquid back until the liquid forms or reforms the lens 300.

[0082] The lens assembly according to this embodiment also includes an air reservoir 314. The air reservoir 314 can be "open" to the atmosphere or "enclosed." In an enclosed air reservoir, the air may be trapped and compressed when the liquid fills cavity 312. FIGS. 5A and 5C show examples of enclosed air reservoirs, and FIG. 5B shows an example of an open air reservoir. In FIG. 5C, plate 304 is configured with a dome cover 316, which operates as a wide-angle lens. For example, plate 304 may itself be shaped to form the dome cover, or a separate dome cover may overlay plate 304.

[0083] Air reservoir 314 is used to guide the liquid into and out of the liquid channels, and thus facilitates smooth recovery or reformation of the lens. Air is compressed in the air reservoir, and upon retraction of the liquid the compressed air assists in guiding the excess liquid back into inner cavity 312. Air reservoir 314 can also be comprised of more than one channel, with the channel or channels designed to allow the compression of air.

[0084] FIGS. 6A and 6B show top views of two possible designs for air reservoirs. The air reservoirs shown are circular but may be non-circular as well. The spiral design shown at FIG. 6A provides ends that are curled to provide extra surface area per channel within the circle. The design shown at FIG. 6B provides ends that are enlarged at their ends to allow more air for compression.

[0085] Retraction of Liquid: Recovering the Lens

[0086] FIGS. 7A-7E show the recovery process for a disturbed liquid lens in an enclosed system according to an embodiment of the invention. For example, FIG. 7A shows a liquid lens system after it has been disturbed, which has caused droplets 402 to deposit on the upper glass plate 404. In the step of FIG. 7B, a pump (not shown) pushes more liquid out, as shown at the arrow at 406, to fill inwardly curved cavity 400. The liquid completely fills cavity 400 and is pumped outward until it contacts the glass plate 404. FIG. 7C shows the liquid subsequently pushed against air reservoir 408, where the air is compressed in the reservoir. When the pump retracts the liquid back, as shown at the arrow of FIG. 7D, the air pressure pushes the liquid out of the air reservoir 408. This process clears away droplets 402 on glass plate 404 until reformed liquid lens 412 remains at the cavity, as shown in FIG. 7E.

[0087] Multiple Lenses

[0088] Alternative embodiments of the invention include liquid lens assemblies with several liquid lenses and/or solid lenses for focusing and zooming. FIGS. 8A-8E illustrate various possible arrangements. For example, FIG. 8A shows liquid lens housing 500 that includes solid lens 502 and cavities to hold several liquid lenses to the left of solid lens 502. Figure 8B shows a combination including liquid lens 504 and solid lens 502. FIG. 8C shows a combination including liquid lens 504 and a solid plano convex lens 506. FIG. 8D shows a combination of two liquid lenses and two solid lenses 506. FIG. 8E shows two liquid lenses 504 and one solid lens 508 sandwiched in between. It should be appreciated that many other assembly configurations including various arrangements of solid and/or liquid lenses are possible based on the teachings herein.

[0089] Actuation Methods

[0090] Various actuation systems and methods are useful for controlling rugged variable-focus liquid lenses with the above detailed features, according to embodiments of the invention. FIG. 9 shows a single pump actuation system according to one embodiment.

The single pump 600 is actuated by applying two components of voltage signals, the offset voltage (DC component) and the variable voltage (variable component) to pump 600. In the liquid lens-forming procedure, the offset voltage is applied to pump 600 to form a liquid lens of fixed shape at the inwardly curved lens cavity 602. The variable voltage is then applied to pump 600 to change the curvature of the lens. Pump 600 can include a variety of devices, such as a piezoelectric device or a voice coil.

[0091] FIG. 10 shows an actuation system according to another embodiment of the invention. An electric motor 604 is coupled with pump 600 to turn with a designated number of rounds in order to offset a fixed volume of liquid from pump 600 into the lens chip cavity 602. The rotary motion of electric motor 604 is converted to linear motion in lens motion controller mechanism 606 (e.g., as used in handycams), which drives pump 600 as shown by the horizontal arrow. In order to control the amount of liquid for precise focusing, electric motor 604 is controlled to turn clockwise and anti-clockwise accordingly. An advantage of the system according to this embodiment is that electrical motor 604 can be deactivated once the image is focused, thus saving energy.

[0092] FIG. 11 shows another embodiment of the invention that is particularly suitable for mobile phone technology. The liquid lens assembly of FIG. 11 incorporates an electric motor 700 as the actuator mechanism. The liquid lens assembly of FIG. 11 also includes solenoid 704 and connecting rod 702 to balance the unbalanced weight of vibrator unit 708. The actuator system shown in FIG. 11 also includes engaging chuck 710, linear translating platform 712, fine thread stud 714, and guide rod 716.

[0093] When the liquid lens of the system of FIG. 11 is not in use (e.g., during a phone call, for a mobile phone camera), solenoid 704 is in the 'disengage' mode. If the liquid lens is in use, solenoid 704 is activated and pushes the vibrator unit 708 to fit into the engaging chuck 710 at the other end of the assembly. Once the engage is complete, the rotary motion of electric motor 700 is changed to linear motion for translating platform 712. The platform pushes or pulls the bellow 718, thus controlling the amount of liquid in the lens chip 706.

[0094] FIG. 12 shows a more detailed drawing of the engaging mechanism of FIG. 11. In one aspect, the engaging chuck 710 is designed such that the vibrator element 708 (e.g., unbalanced weight) fits within the chuck well and the vibration is thus eliminated or minimized. Accordingly, the engaging mechanism that eliminates the vibration of the

electrical motor but maintains control of the liquid lens is a valuable contribution to various applications such as mobile phone technology.

[0095] FIG. 13 shows the block diagram for a liquid lens control system according to another embodiment of the invention. In FIG. 13, the user may select either manual control or automatic control. The manual control 800 can be provided in various ways. For example, manual control 800 may be provided by two buttons for pumping in or out the liquid. Alternatively, manual control 800 may be provided by a dial or wheel that changes an electrical resistance as the dial or wheel is turned. The electrical resistance in turn controls the inflow and outflow of liquid.

[0096] In one embodiment, the recovery module 804 shown in FIG. 13 is configured to automatically reform the liquid lens if there is any shock-related accident. The automatic triggering of recovery module 804 is done by a sensor 812, which can be an accelerometer, a fall sensor or an image processing algorithm that detects blur and focused zones in an image. The actuator module 806 pumps the liquid as required to the lens chip 808 and creates an image onto the CCD chip 810. The image obtained will be processed for display and if the auto-focus module 814 is operational, connected by two-way switch 802, it will generate a compensation signal to adjust the focus (e.g., radius of curvature of the meniscus).

[0097] According to another embodiment of the invention, a single electrical motor may be used to actuate two (or more) liquid lenses, as shown in FIG. 14. In this embodiment, an electrical motor is connected to, and turns, multiple gears that actuate different lenses. For example, in FIG. 14, such a motor (not shown) is connected to gear set 900, which automatically connects it to gear 910, gear 912 and gear 916. In one aspect, gear set 900 is designed such that it has limited rotation, or in other words engages either gear 914 or gear 918 at any given time. For example, FIG. 14 shows the moment at which limited rotation gear set 900 is engaged to gear 918. Gear 918 is coupled to pump 902, which injects liquid into the lens chip 906. Once the actuation for the liquid lens at 906 is completed, gear set 900 will then engage gear 914 to actuate pump 904 and inject form a liquid lens at the lens chip 908. The limited rotation can be actuated by a solenoid (not shown).

[0098] Zoom/Focus Modules for Liquid Lens Systems

[0099] The embodiments below describe various zoom/focus modules for liquid-based lens systems. The lens systems include various combinations of solid and liquid lenses, depending on the application.

[0100] FIG. 15 shows a side view of a liquid lens system with an auto-focus module according to an embodiment of the invention. Housing 1000 holds a variable-focus liquid lens 1004 between a first solid lens 1006 and a second solid lens 1008. Housing 1000 includes hydrophobic surface 1002 and channel 1012 for filling the cavity and controlling the optics (e.g., meniscus) of the liquid lens. For the auto-focus system in the embodiment, apertures 1010 are also formed (e.g., printed) on the second solid lens.

[0101] FIG. 16 shows a side view of a liquid lens system with an auto-focus module according to another embodiment of the invention. Like the embodiment shown in FIG. 15, housing 1100 holds a variable-focus liquid lens 1104, a first solid lens 1106 and a second solid lens 1108, but additionally holds a third solid lens 1110. Housing 1100 also includes hydrophobic surfaces 1102. The liquid lens 1104 fills the cavity through channel 1112 from liquid reservoir 1114, which is coupled with an actuating means or pump 1116.

[0102] FIG. 17 shows a side view of liquid lens system with a zoom/focus module according to an embodiment of the invention. Like the embodiment of FIG. 16, housing 1200, which has hydrophobic surfaces 1202, holds a first solid lens 1208, a second solid lens 1210, a third solid lens 1212, and a first variable-focus liquid lens 1204. But housing 1200 additionally holds a second variable-focus liquid lens 1206. The first liquid lens 1204 fills a first cavity from a first liquid reservoir 1214, which is coupled with actuator or pump 1216. The second liquid lens 1206 fills a second cavity from a second liquid reservoir 1218, which is coupled with actuator or pump 1220.

[0103] FIG. 18 shows a side view of a liquid lens system with a variable-focus and variable-diameter module according to an embodiment of the invention. Housing 1300, which has hydrophobic surfaces 1302, holds a solid lens 1304, a first liquid lens 1306 and a second liquid lens 1312. First liquid lens 1306 fills a first cavity from liquid reservoir 1318, which is coupled with actuator or pump 1320. Second liquid lens 1312 fills a second cavity from liquid reservoir 1322, which is coupled with actuator or pump 1324. Housing 1300 in this embodiment is stepped so that the diameter of the liquid lens may be increased when more liquid is pumped into the cavity. For example, liquid lens 1306 may be increased in diameter to the enlarged liquid lens shown at 1308, which may be further increased in size to the enlarged liquid lens shown at 1310. Likewise, the second liquid lens 1312 may be increased in diameter to form the enlarged liquid lens 1314, and further increased to form the enlarged liquid lens 1316.

[0104] FIG. 19 shows a side view of a liquid lens system with a zoom/focus module according to another embodiment of the invention. Housing 1400, which has hydrophobic surfaces 1402, holds a first solid lens 1404, a second solid lens 1406, a third solid lens 1408, and a fourth solid lens 1410. Housing 1400 also holds a first variable-focus liquid lens 1412 and a second variable-focus liquid lens 1414. First liquid lens 1412 fills a first cavity from a first liquid reservoir 1416, which is coupled with actuator or pump 1418. Second liquid lens 1414 fills a second cavity from a second liquid reservoir 1420, which is coupled with actuator or pump 1422.

[0105] Figure 20 shows a liquid lens system with a zoom/focus module according to another embodiment of the invention. In this embodiment, a retractable variable-focus liquid lens 1504 is placed proximal to a fixed focus camera lens module 1500 that includes solid lens assembly 1502 to achieve the zoom/focus functions. The retractable liquid lens 1504 may be used for selectively focusing objects in close proximity to the camera. However, when close proximity focusing is not required, liquid lens 1504 may be completely disabled by retracting all of the liquid back into its reservoir. Fixed focus module 1500 may then employ only the solid lenses in lens assembly 1502 for fixed focusing.

[0106] FIG. 21 shows a piezoelectric tube actuator according to an embodiment of the invention. The piezoelectric tube 1600 has a closed bottom 1602 and is filled with liquid 1604. The tube 1600 connects via connector 1606 to a liquid lens chip 1608. The piezoelectric tube 1600 operates as an actuator by contracting or expanding when a voltage is applied, which reduces or increases the volume of space inside the tube. As a result, excess liquid volume 1604 is pumped out of or into tube 1600 to form a liquid lens at the tube's outlet. As shown in the figure, the liquid meniscus at 1610 may be curved inward within the connecting portion 1606 before any voltage is applied. After a voltage is applied, the liquid meniscus may then be pushed out of connecting portion 1606, as shown at 1612.

[0107] FIGS. 22A-22B show a piezoelectric disc actuator using a piezoelectric buzzer diaphragm, according to an embodiment of the invention. FIG. 22A shows a top view of a piezoelectric buzzer diaphragm, which includes a metallic diaphragm 1700 and piezoelectric layer 1702. FIG. 22B shows a cross sectional view of the piezoelectric buzzer diaphragm, including diaphragm 1700 and piezoelectric layer 1702, mounted on housing 1704 of a liquid lens system. The diaphragm 1700 operates to pump liquid 1706 out of channel 1708 to form a liquid lens. FIG. 22C shows a variation to the embodiment of FIGS. 22A-22B, and

includes a piezoelectric layer 1710 and curved metallic diaphragm 1712. Instead of being placed on top of the lens housing as for the disc embodiment of FIGS. 22A-22B, the curved piezoelectric diaphragm is mounted around the lens housing.

[0108] While the invention has been described by way of example and in terms of the specific embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. To the contrary, it is intended to cover various modifications and similar arrangements as would be apparent to those skilled in the art. For example, various possible arrangements of lens assemblies with variable focus capability of the liquid lenses exist and the embodiments are not limited to the ones described herein. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

WHAT IS CLAIMED IS:

1. An optical device comprising:

a housing having a top hydrophobic surface, a bottom surface and a first cavity, wherein the cavity has inwardly curved walls;

a first fluid having a meniscus disposed within the first cavity; and

a first control means coupled with the first fluid for displacing fluid into and out of the first cavity.

2. The device of claim 1 wherein the hydrophobic top surface includes a layer of hydrophobic material covering a non-hydrophobic material.

3. The device of claim 1 wherein the walls are hydrophilic or include a layer of hydrophilic material covering a non-hydrophilic material.

4. The device of claim 1 wherein the hydrophobic top surface includes micro- or nano-sized pillars formed on the surface.

5. The device of claim 1 wherein the hydrophobic top surface includes a micro- or nano-sized ridged topology.

6. The device of claim 1 wherein the control means includes a pump for adjusting the curvature of the meniscus.

7. The device of claim 1 wherein the control means includes a pump configured to displace a fixed volume of liquid into the cavity.

8. The device of claim 1 wherein the control means includes a pump for retracting the fluid into a reservoir.

9. The device of claim 1 further comprising an electric motor coupled with the control means.

10 The device of claim 2 wherein the hydrophobic material includes a material selected from the group consisting of Teflon, CYTOP, zirconium oxynitride, polymers, ceramics, alloys or any other hydrophobic materials.

11. The device of claim 3 wherein the hydrophilic material includes a material selected from the group consisting of glass, fused silica, ceramic, hydrophilic metal, hydrophilic polymer materials, hydrophilic alloys, or any other hydrophilic materials.

12. The device of claim 1 further comprising an air or gas reservoir with compressed air or gas.

13. The device of claim 1 wherein the first fluid can form a concave or convex lens.

14. The device of claim 1 further comprising:
a second cavity;
a second fluid having a meniscus disposed within the second cavity;
a second control means coupled with the second fluid for displacing fluid into the second cavity.

15. The device of claim 14, wherein the first and second control means are coupled with a single motor.

16. The device of claim 1 wherein the housing comprises multiple lenses, including at least one solid plano convex lens.

17. The device of claim 1 wherein the housing comprises multiple lenses, including at least one solid lens.

18. An optical device comprising:
a housing having a top surface, a bottom surface, and a cavity;
an air reservoir for holding compressed air;
a fluid having a meniscus disposed within the cavity;
a layer of hydrophobic material covering the top surface;
a layer of hydrophilic material covering the walls of the cavity; and
a control means coupled with the fluid for displacing fluid into and out of the cavity.

19. The device of claim 18 wherein the cavity has inwardly curved walls.

20. The device of claim 18 wherein the control means includes a pump configured to push fluid against the air reservoir.

21. The device of claim 18 wherein the control means includes a pump configured to retract fluid into a fluid reservoir.

22. The device of claim 18 wherein the air reservoir comprises more than one channel.

23. The device of claim 18 wherein the air reservoir has a circular or non-circular cross section and a plurality of openings spiraling out from the center.

24. The device of claim 18 wherein the air reservoir has a circular or non-circular cross section and a plurality of openings with enlarged ends extending out from a center.

25. The device of claim 18 wherein the air reservoir is open to the atmosphere.

26. The device of claim 18 wherein the air reservoir is enclosed from the atmosphere.

27. The device of claim 18 wherein the top surface includes a dome shaped portion disposed proximal the cavity.

28. The device of claim 18 further comprising a solenoid configured to disengage when the device is not in use.

29. The device of claim 18 further comprising a solenoid, a vibrating element and an engaging chuck, wherein the solenoid is configured to push the vibrating element into the engaging chuck when the device is in use.

30. The device of claim 18 wherein the control means includes manually controllable buttons.

31. The device of claim 18 wherein the control means includes a manually adjustable slider, wheel or dial.

32. The device of claim 18 further comprising a sensor that triggers a recovery module when the optical device is disturbed.

33. The device of claim 18 wherein the control means includes elements that induce a rotary motion and translate the rotary motion into a linear motion that causes fluid to be displaced into the cavity.

34. The device of claim 18 wherein the control means includes a piezoelectric tube that contracts to reduce the volume inside the tube when a voltage is applied.

35. The device of claim 18 wherein the control means includes a piezoelectric layer coupled with a curved or disc-shaped metallic diaphragm.

36. A method of forming a liquid lens comprising:

providing a fluid within a housing that includes a top surface, a bottom surface, and a cavity having inwardly curved walls,

wherein the fluid forms a meniscus disposed within the cavity, wherein a hydrophobic coating covers the top surface; and

adjusting the curvature of the meniscus.

37. The method of claim 36 wherein a hydrophilic coating covers the inwardly curved walls.

38. The method of claim 36 wherein the liquid lens is formed as a ring along the walls of the cavity.

39. The method of claim 36 wherein the liquid lens is formed as a ring along the walls of the cavity, and the ring grows by converging toward the center of the cavity.

40. The method of claim 36 wherein the liquid lens first forms as a ring along a portion of the walls of the cavity having the lowest surface energy.

41. The method of claim 36 wherein adjusting the curvature of the meniscus includes applying pressure to the fluid such that the meniscus forms a concave lens.

42. The method of claim 36 wherein adjusting the curvature of the meniscus includes applying pressure to the fluid such that the meniscus forms a convex lens.

43. The method of claim 36 wherein providing a fluid includes displacing a fixed volume of fluid into the cavity.

44. The method of claim 36 further comprising providing additional fluid within the housing after a shock-related event and retracting the fluid from the cavity to reform the lens.

45. A method of retracting a fluid from a liquid lens comprising:

providing a fluid within a housing that includes a top surface, a bottom surface, and a cavity having inwardly curved walls,

wherein the fluid forms a meniscus disposed within the cavity, wherein a hydrophobic coating covers the top surface; and

retracting the fluid from the cavity.

46. The method of claim 45 wherein a hydrophilic coating covers the inwardly curved walls.

47. The method of claim 45 wherein retracting the fluid disables the lens.

48. The method of claim 45 wherein retracting the fluid resets the lens.

49. The method of claim 45 wherein retracting the fluid re-forms a lens that has been disturbed.

50. The method of claim 45 wherein retracting the fluid clears away droplets formed on an inner side of a cover over the top surface.

51. The method of claim 45 wherein providing the fluid stops after a fixed volume of fluid is displaced in the cavity.

52. The method of claim 45 further comprising providing additional fluid within the cavity so that the fluid contacts the top surface of the housing, before retracting the fluid.

53. The method of claim 45 further comprising providing additional fluid within the cavity so that the fluid contacts an air reservoir, before retracting the fluid.

54. The method of claim 45 wherein retracting the fluid occurs when air compressed in an air reservoir within the housing pushes the fluid back.

55. The method of claim 45 wherein retracting the fluid occurs after a recovery module is triggered.

56. The method of claim 45 wherein retracting the fluid occurs in response to a manual control signal.

57. An optical device comprising:

a housing having a top surface, a bottom surface and a first cavity, wherein the cavity has inwardly curved walls;

a first fluid having a meniscus disposed within the first cavity, the first fluid forming a first liquid lens;

a first control means coupled with the first fluid for displacing fluid into and out of the first cavity; and

a first non-liquid lens.

58. The device of claim 57 further comprising a second non-liquid lens.

59. The device of claim 58 further comprising a third non-liquid lens.

60. The device of claim 57 further comprising:

a second cavity with inwardly curved walls;

a second fluid having a meniscus disposed within the second cavity, the second fluid forming a second liquid lens;

a second control means coupled with the second fluid for displacing fluid into and out of the second cavity.

61. The device of claim 60 further comprising a second non-liquid lens.

62. The device of claim 60 further comprising a third non-liquid lens.

63. The device of claim 60 further comprising a fourth non-liquid lens.

64. The device of claim 57 wherein the housing further includes walls having a stepped profile.

65. The device of claim 57 wherein the liquid lens provides for focusing or zooming functions and the non-liquid lens compensates for negative effects of the fluid lens.

66. The device of claim 57 wherein the control means is configured to change the zoom or focus type of the optical device by displacing the fluid into or out of the cavity.

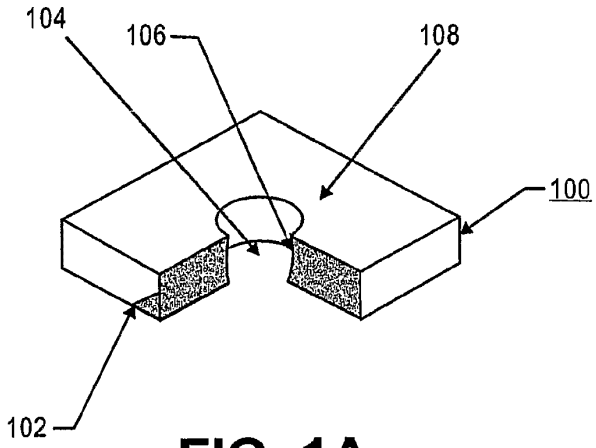


FIG. 1A

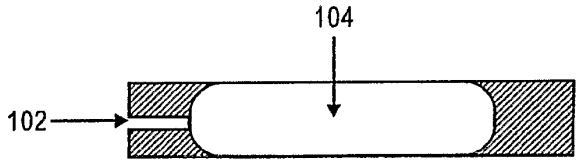


FIG. 1B

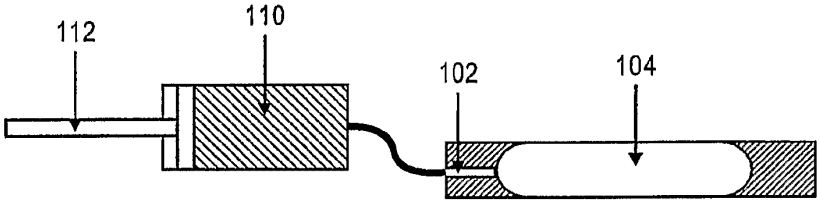


FIG. 1C

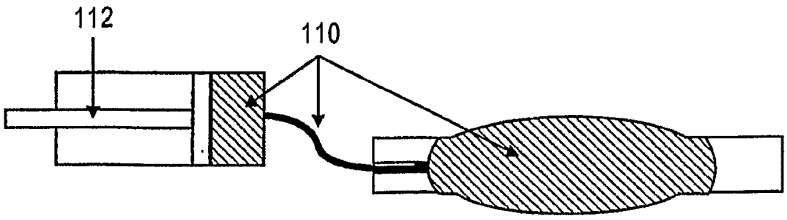


FIG. 1D

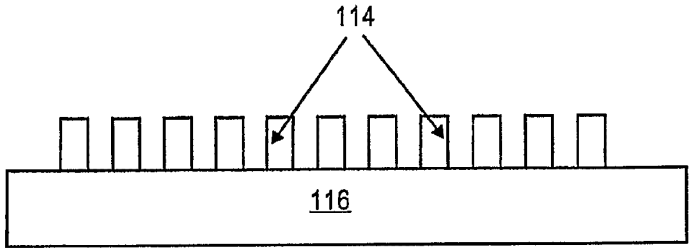


FIG. 1E

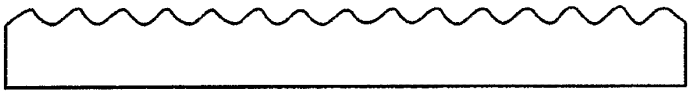


FIG. 1F

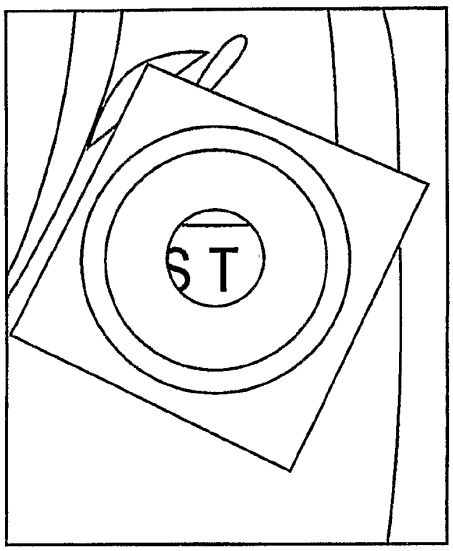


FIG. 2A

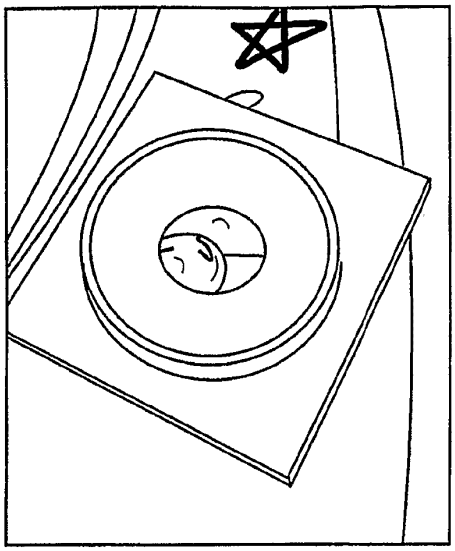


FIG. 2B

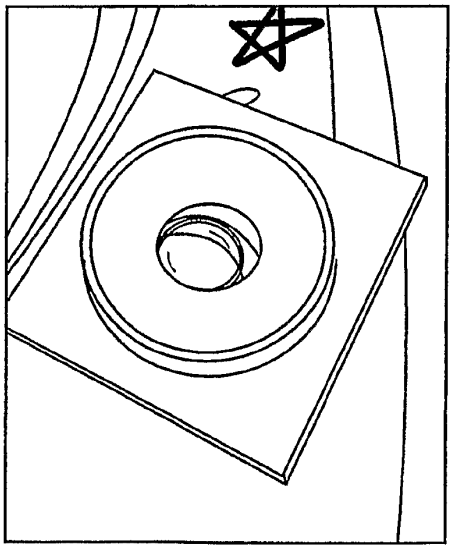


FIG. 2C

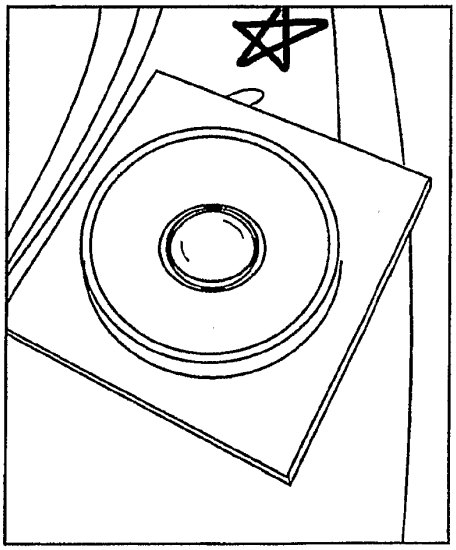


FIG. 2D

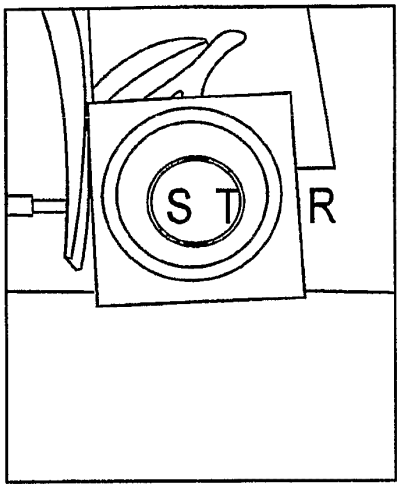


FIG. 3A

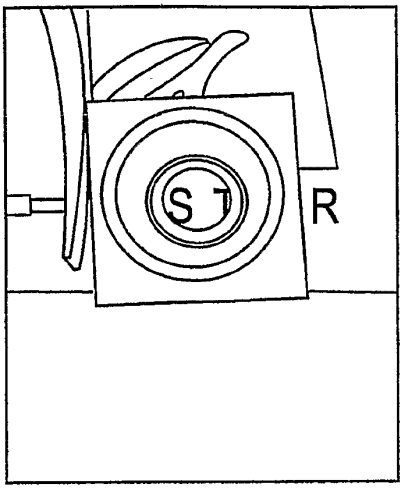


FIG. 3B

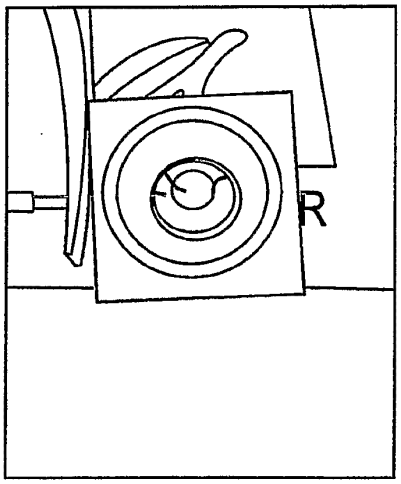


FIG. 3C

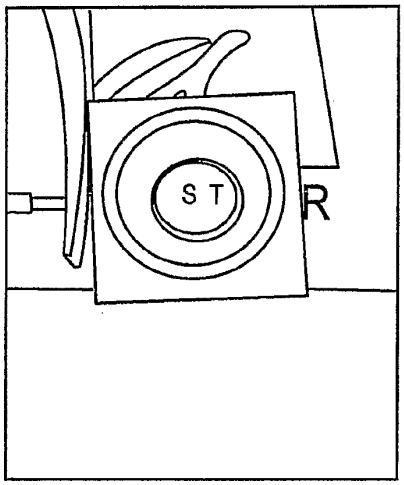


FIG. 3D

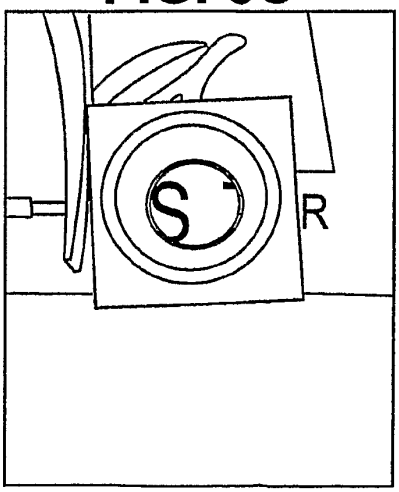


FIG. 3E

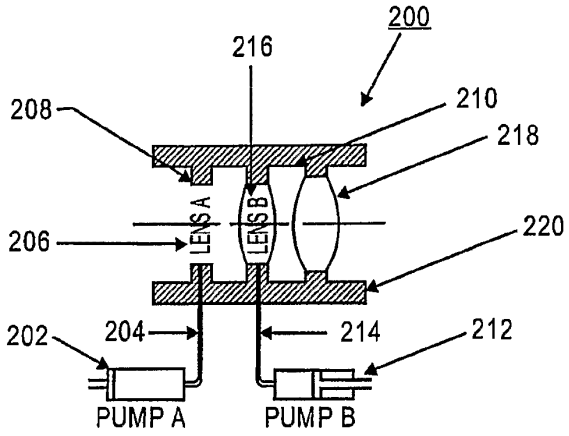


FIG. 4A

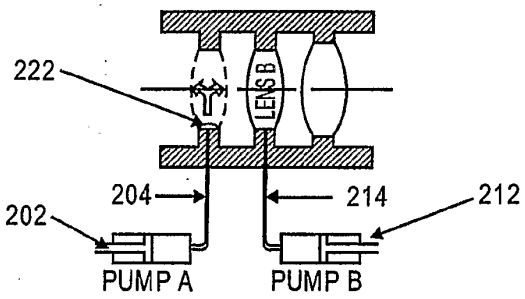


FIG. 4B

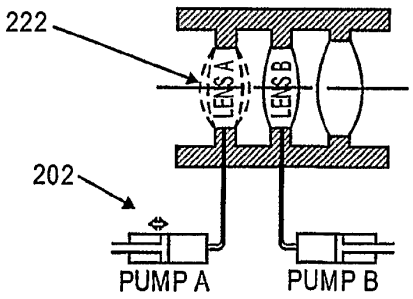


FIG. 4C

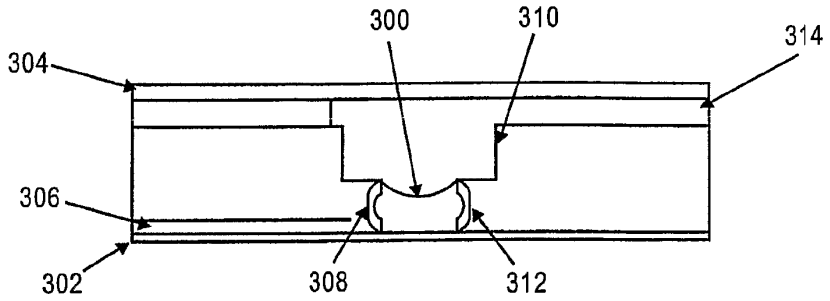


FIG. 5A

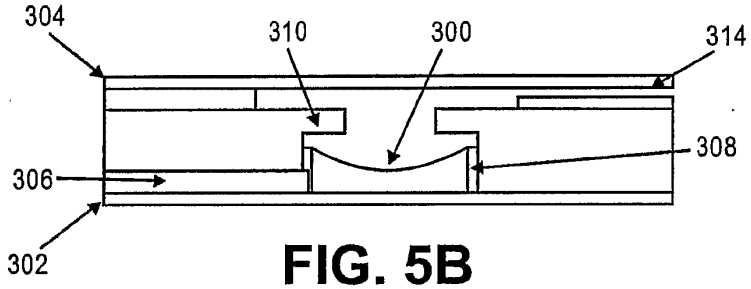


FIG. 5B

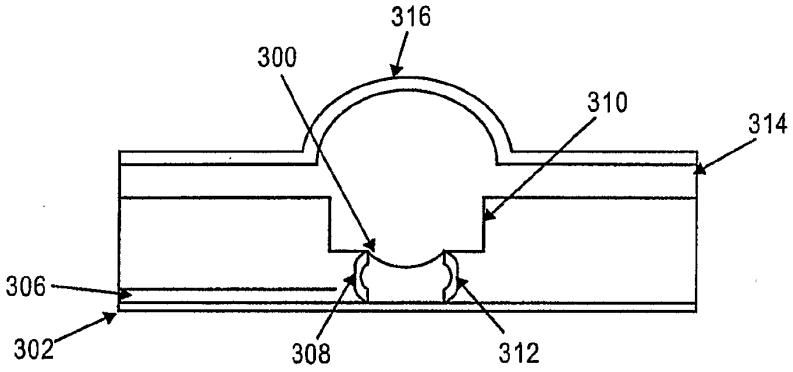


FIG. 5C

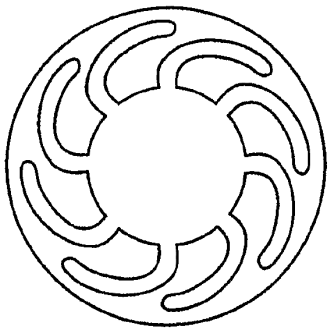


FIG. 6A

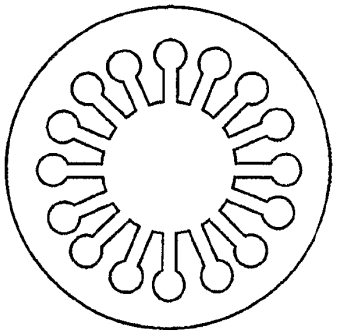


FIG. 6B

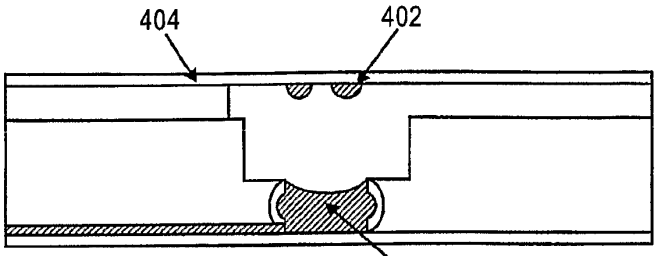


FIG. 7A

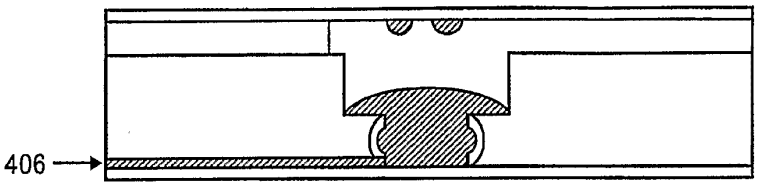


FIG. 7B

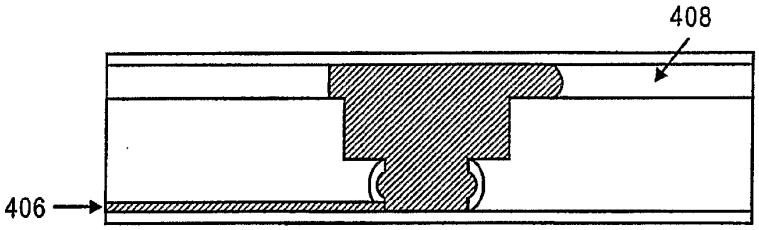


FIG. 7C

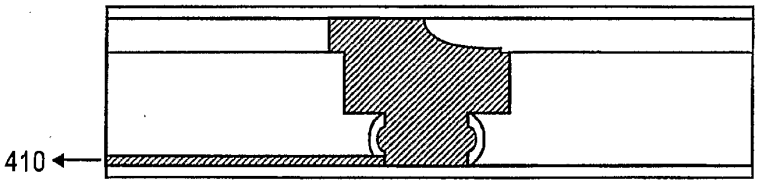


FIG. 7D

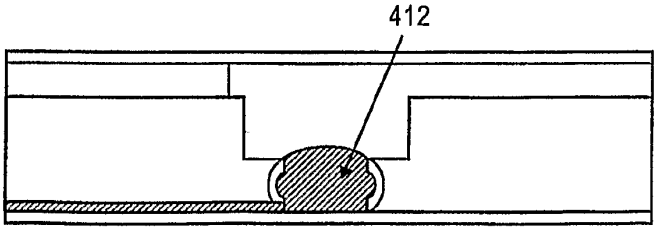


FIG. 7E

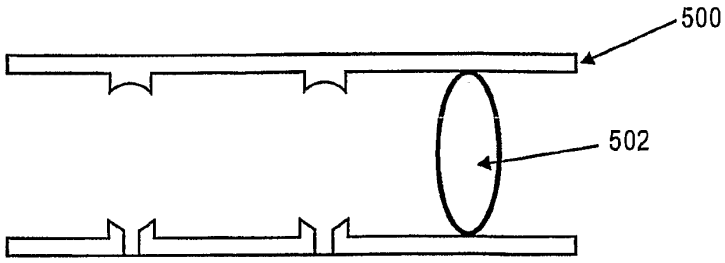


FIG. 8A

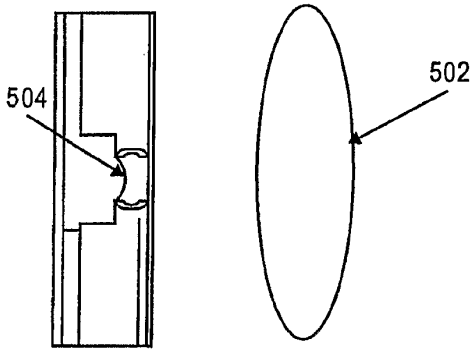


FIG. 8B

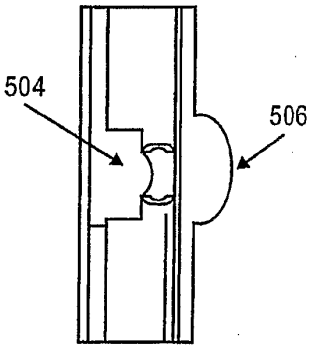


FIG. 8C

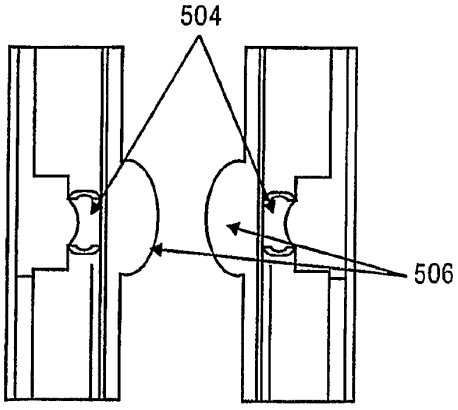


FIG. 8D

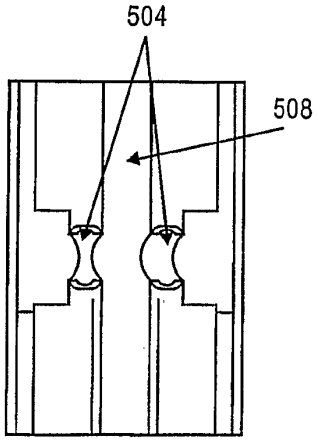


FIG. 8E

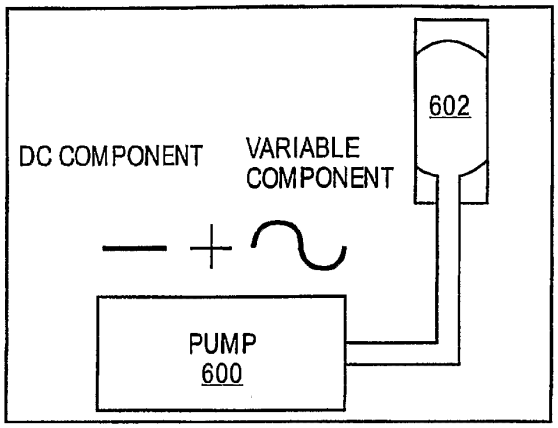

602
DC COMPONENT
VARIABLE COMPONENT
PUMP
600

FIG. 9

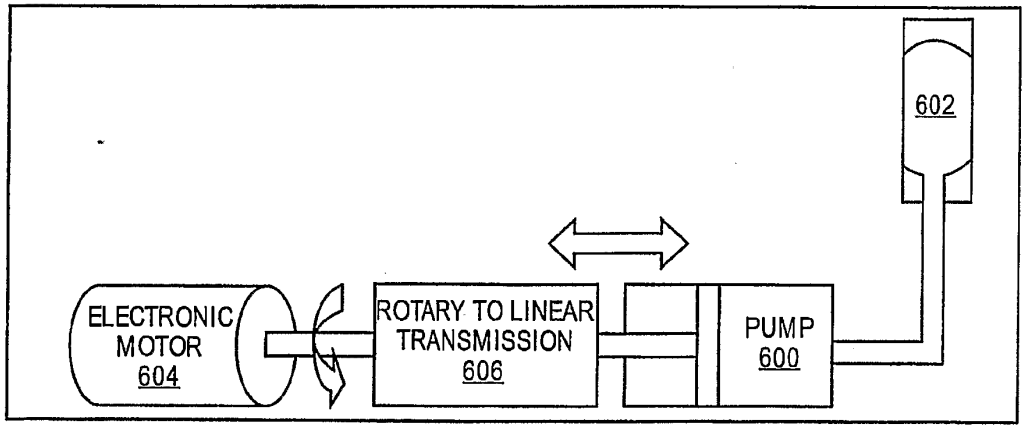

602
ELECTRONIC MOTOR
604
ROTARY TO LINEAR TRANSMISSION
606
PUMP
600

FIG. 10

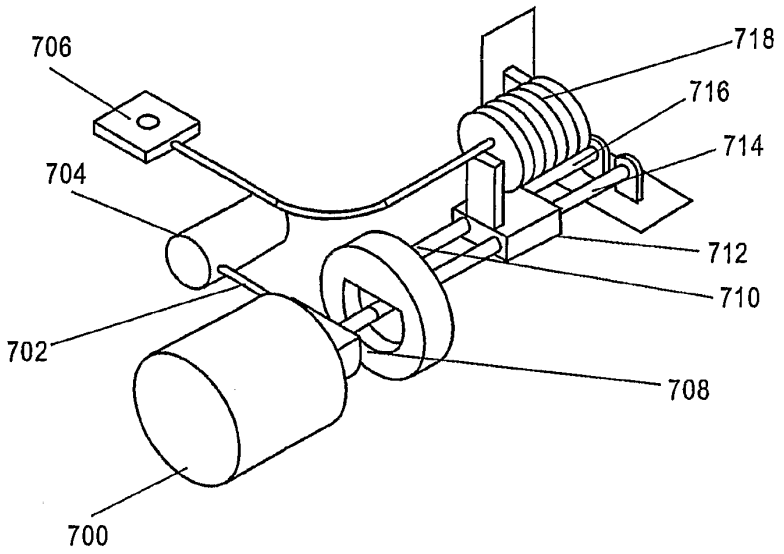


FIG. 11

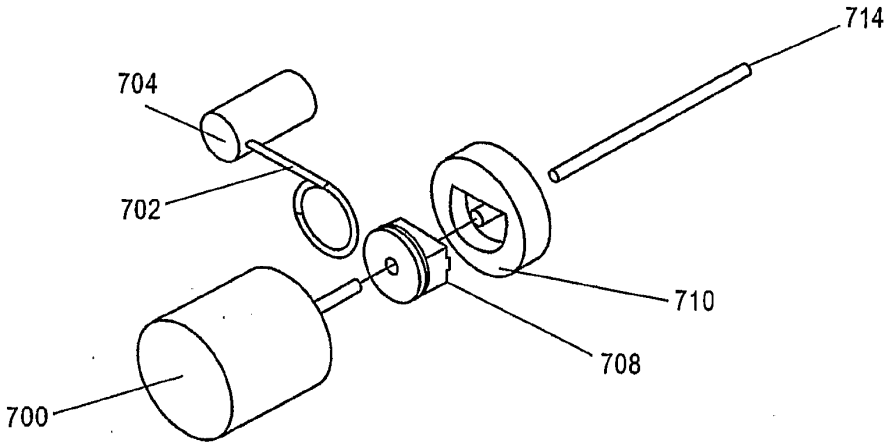


FIG. 12

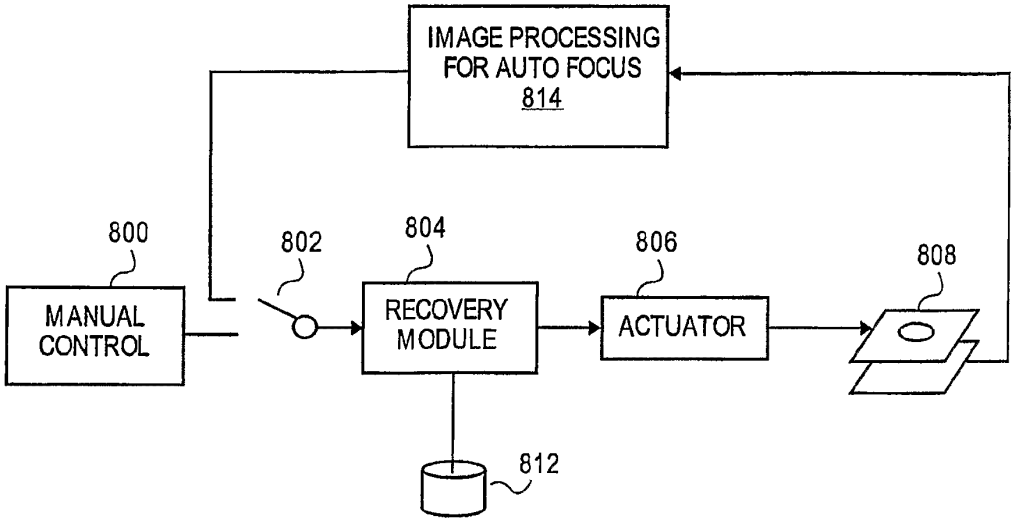

IMAGE PROCESSING FOR AUTO FOCUS 814
800
MANUAL CONTROL
802
804
RECOVERY MODULE
806
ACTUATOR
808
812

FIG. 13

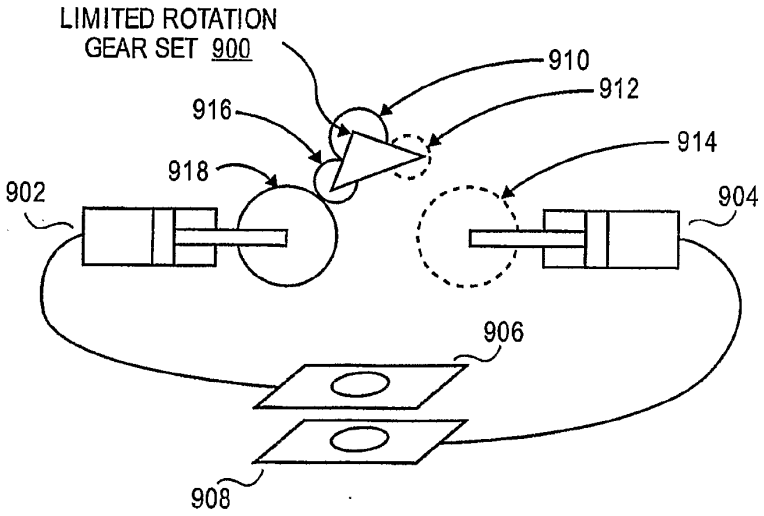

LIMITED ROTATION GEAR SET 900
910
912
916
914
918
902
904
906
908

FIG. 14

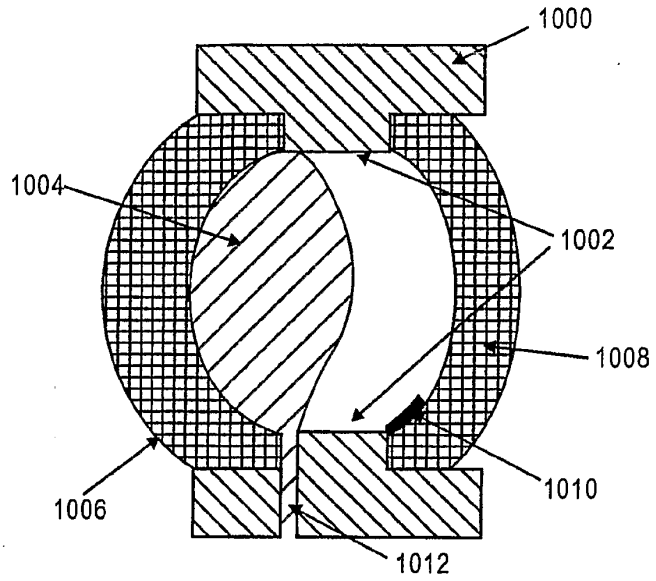

1000
1004
1002
1008
1010
1006
1012

FIG. 15

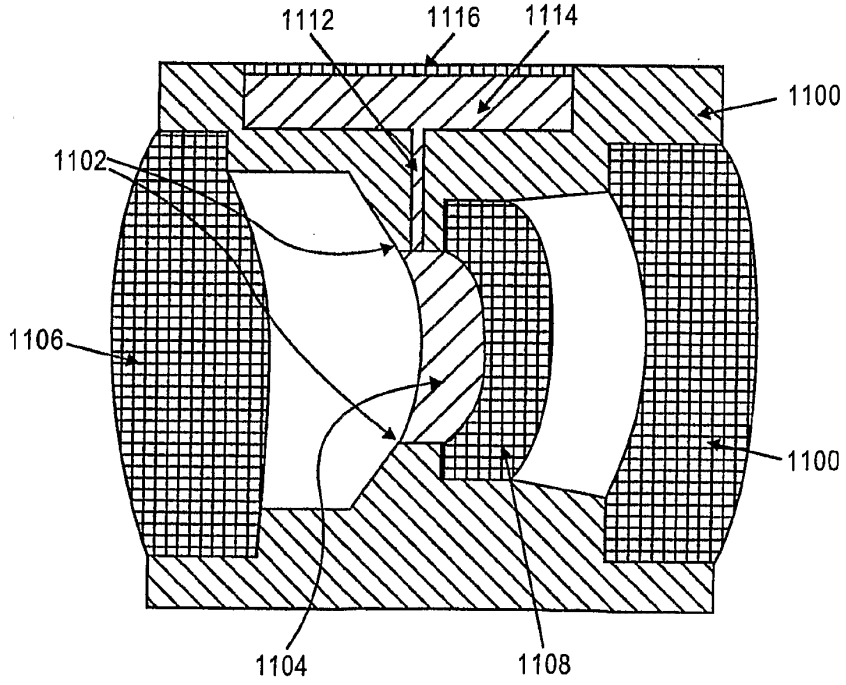

1112
1116
1114
1100
1102
1106
1100
1104
1108

FIG. 16

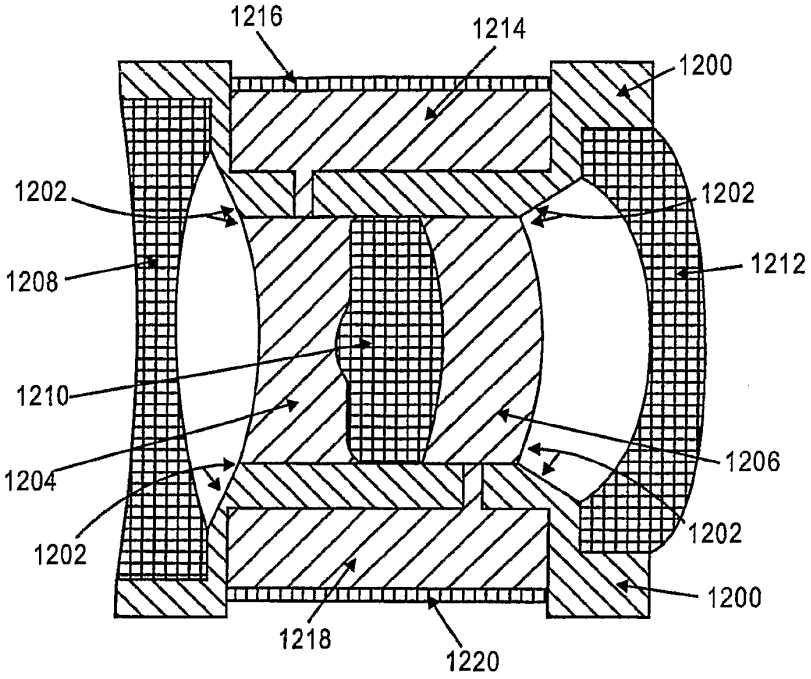

1216
1214
1200
1202
1202
1208
1212
1210
1206
1204
1202
1202
1200
1218
1220

FIG. 17

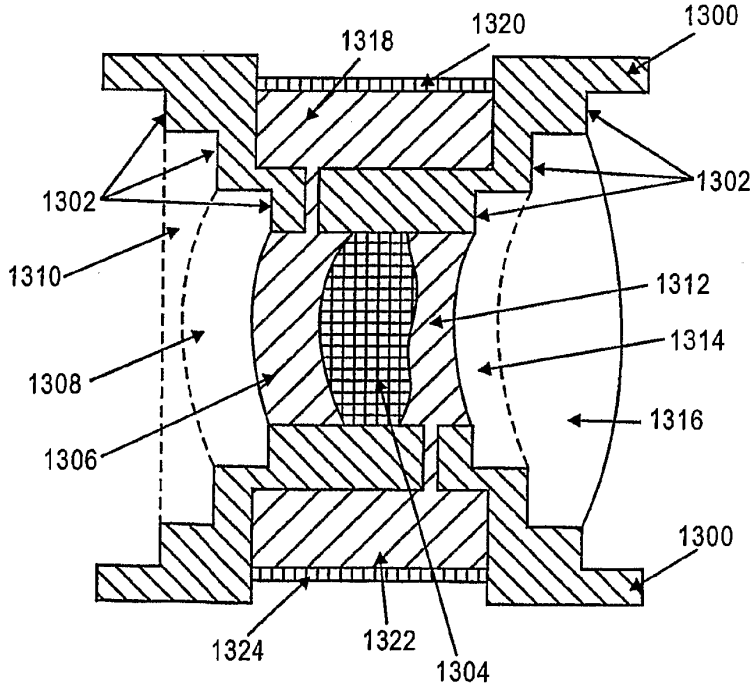

1318
1320
1300
1302
1302
1310
1312
1314
1308
1316
1306
1300
1324
1322
1304

FIG. 18

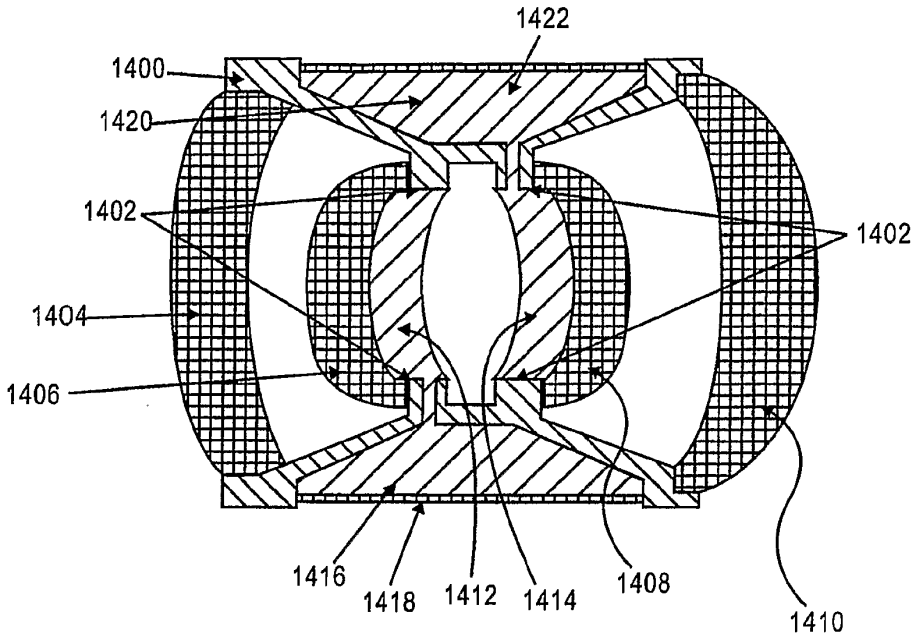

1422
1400
1420
1402
1402
1404
1406
1416
1418
1412
1414
1408
1410

FIG. 19

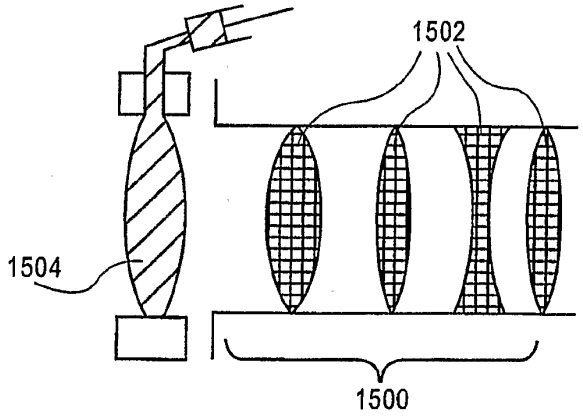

1502
1504
1500

FIG. 20

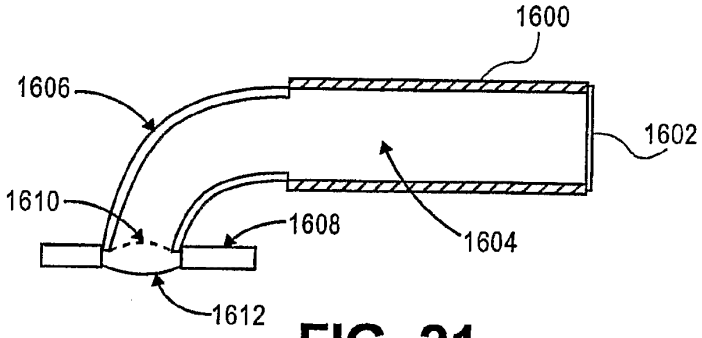


FIG. 21

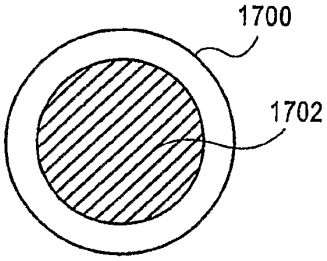


FIG. 22A

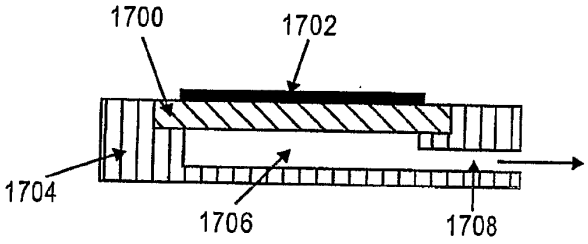


FIG. 22B

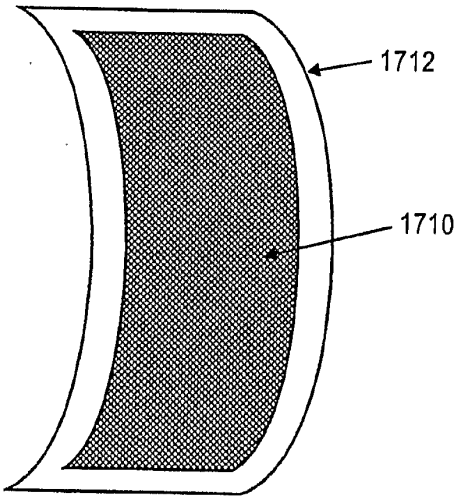


FIG. 22C

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG2006/000147

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

G02B 1/06 (2006.01) ***G02B 3/12*** (2006.01) ***G02B 3/14*** (2006.01)

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)

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)
DWPI and Keywords: fluid, liquid, lens, housing, cavity, curved, inward, hydrophobic, hydrophilic, wall, side, top, lid, cover, surface, displace, retract, remove, coating and other similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2277996 A (HSIN YI FOUNDATION) 16 November 1994 See pages 2-5 and figures 2 and 3	1, 2, 6-8, 10, 13, 17, 36, 41, 42, 43, 45, 57
Y		3, 11, 14
Y	WO 2006/009514 A1 (AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH) 26 January 2006 See page 15 lines 10-12, and figure 9	14

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

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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

"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
20 July 2006	28 JUL 2006
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized officer **Lynn Bloomfield** Telephone No : (02) 6283 2851

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG2006/000147

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Patent Abstracts of Japan, JP 2006-064947 (FUJI PHOTO FILM CO LTD FUJINON CORP) 9 March 2006 See Abstract	3, 11
A	US 5973852 A (TASK) 26 October 1999 See entire document	
A	US 5774273 A (BORNHORST) 30 June 1998 See entire document	
A	Patent Abstracts of Japan, JP 2000-081503 (DENSO CORP) 21 March 2000 See Abstract	

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/SG2006/000147

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
GB	2277996	US	5233470		
WO	2006009514	NONE			
JP	2006064947	NONE			
US	5973852	NONE			
US	5774273	AU	43353/97	WO	9913372
JP	2000081503	US	6188526		

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX

Form PCT/ISA/210 (patent family annex) (April 2005)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 January 2008 (03.01.2008)

PCT

(10) International Publication Number
WO 2008/002388 A2

(51) International Patent Classification:
G02C 7/06 (2006.01)

(21) International Application Number:
PCT/US2007/013600

(22) International Filing Date: 11 June 2007 (11.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(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

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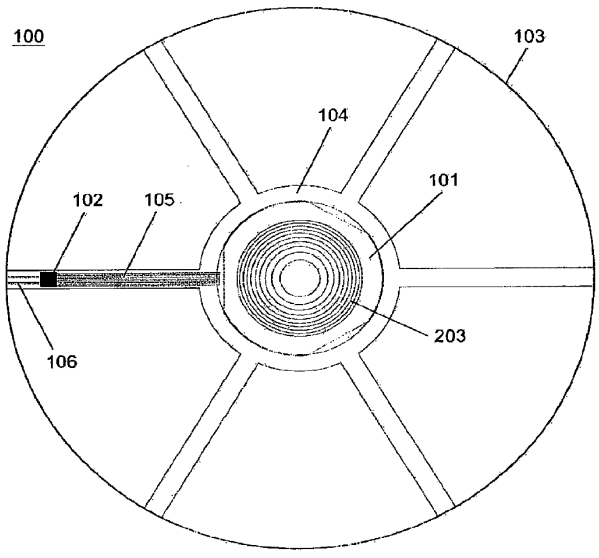
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(54) Title: ELECTRONIC ADAPTER FOR ELECTRO-ACTIVE SPECTACLE LENSES



(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.

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ELECTRONIC ADAPTER FOR ELECTRO-ACTIVE SPECTACLE LENSES

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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.

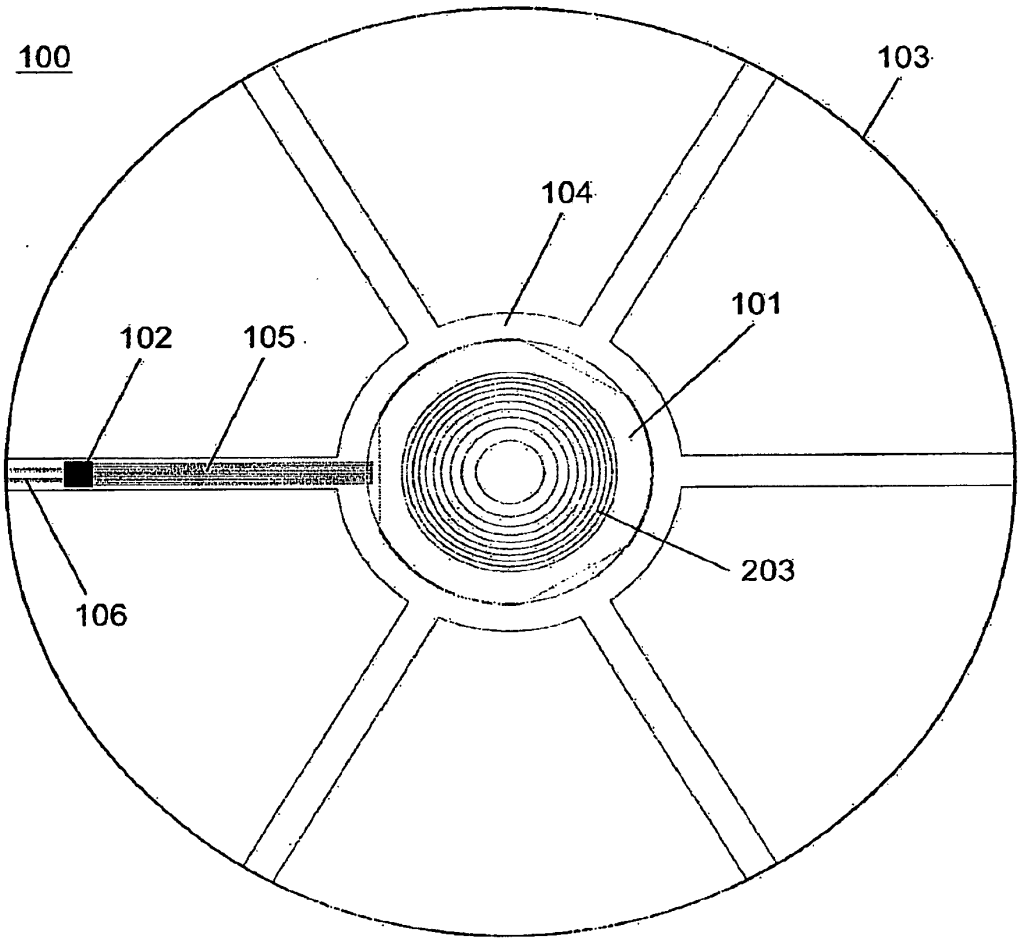


FIG. 1

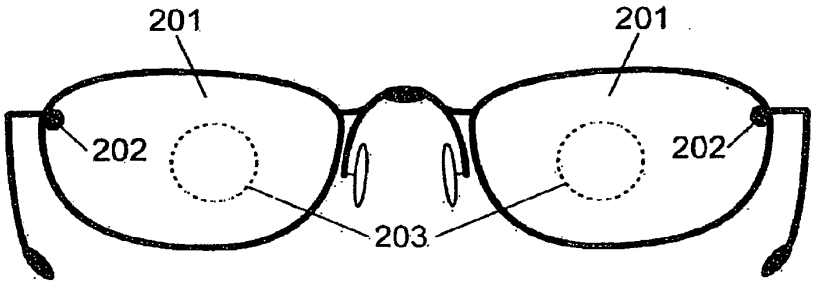


FIG. 2A

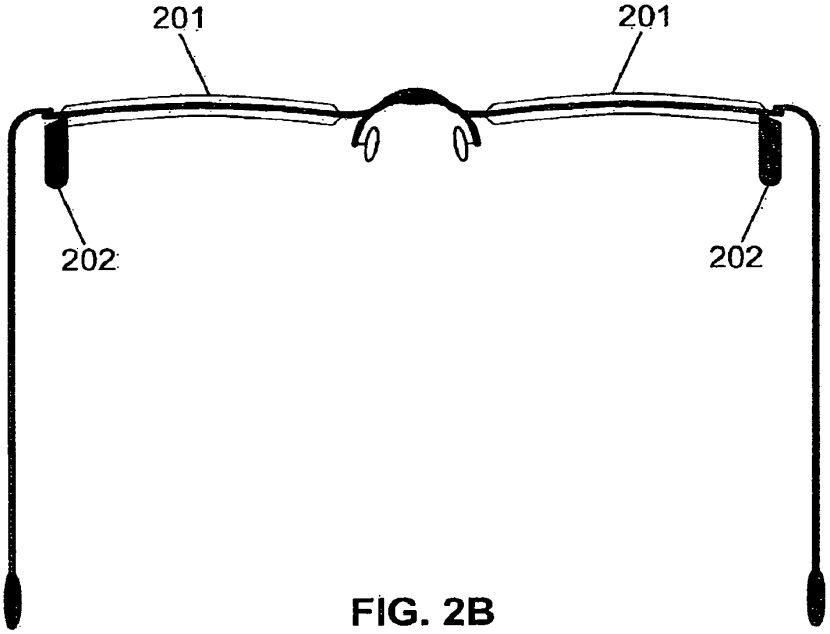
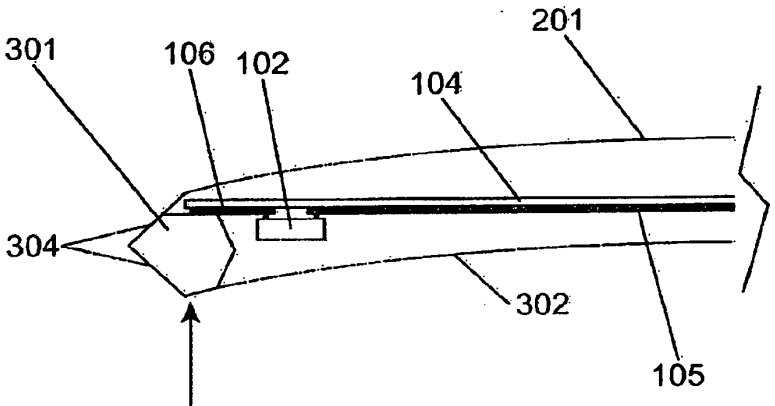


FIG. 2B

FIG. 3A



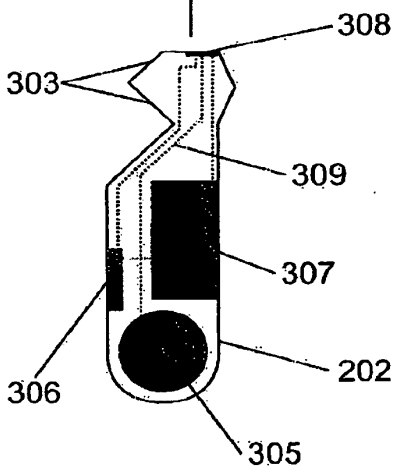
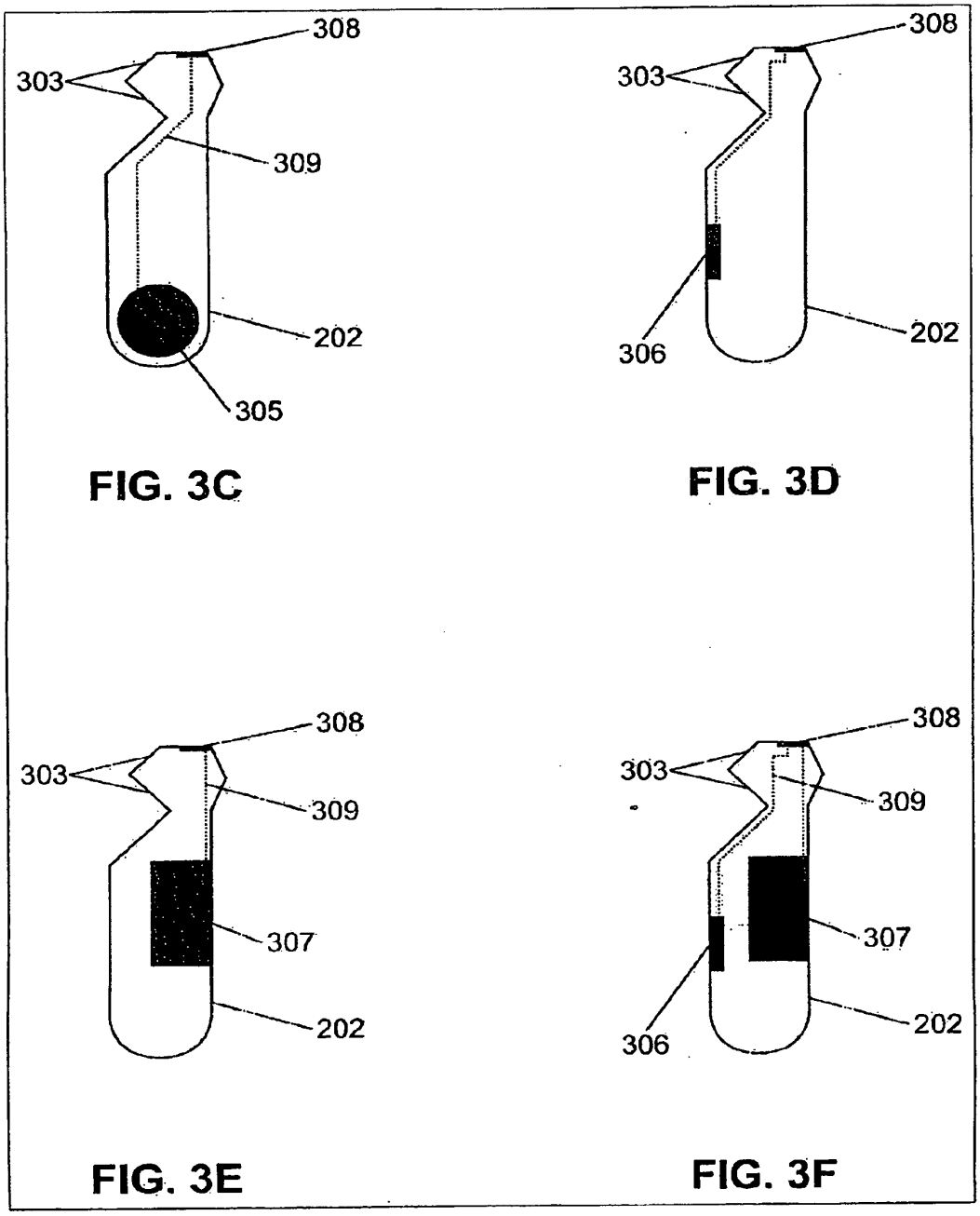


FIG. 3B


308
303
309
202
305
FIG. 3C
308
303
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FIG. 3D
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FIG. 3E
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303
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202
FIG. 3F

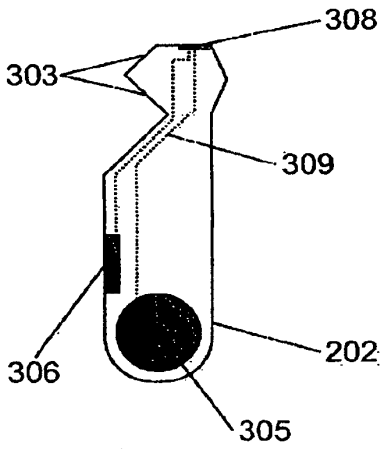


FIG. 3G

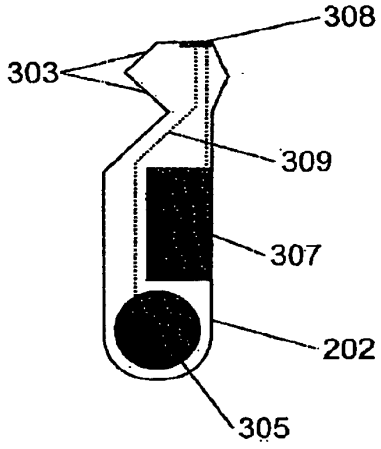


FIG. 3H

FIG. 3I

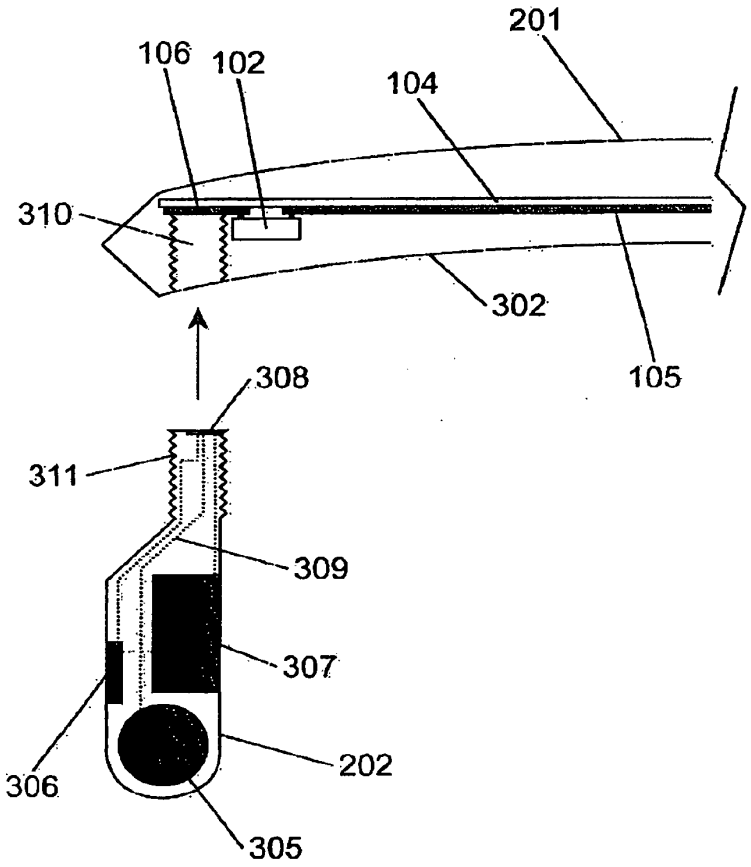


FIG. 3J

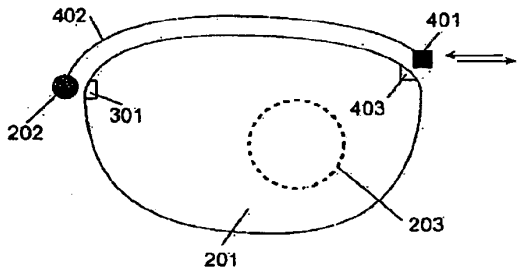


FIG. 4

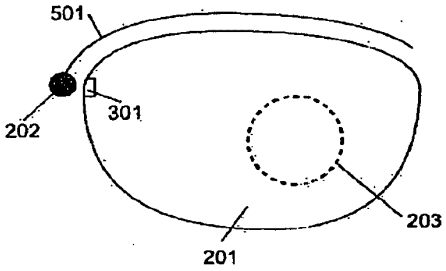


FIG. 5

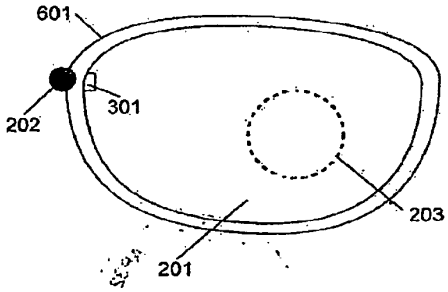


FIG. 6

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[Continued on next page]

(54) **Title**: ELECTRONIC SPECTACLE FRAMES

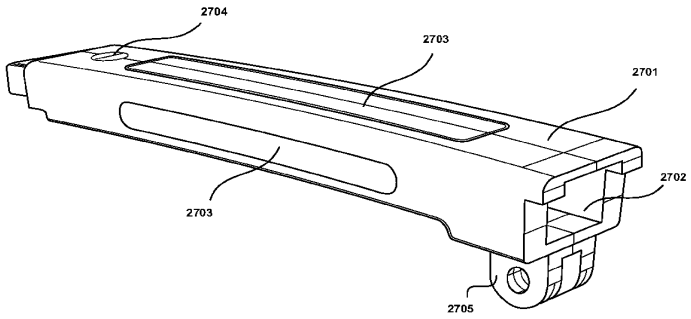


FIG. 27

(57) **Abstract**: Embodiments may provide a first device that includes a frame having a first temple and a second temple. The frame may also comprise a housing module coupled (e.g. attached) to a structural member. The first device may further include a first lens and a second lens coupled to the frame and an electronics module that may be located within the housing module. The electronics module may include at least any two of: a power source; a controller; and/or a sensing mechanism.

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ELECTRONIC SPECTACLE FRAMES

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Application No. 13/298,997 filed on November 17, 2011 and U.S. Application No. 13/298,992 filed on November 17, 2011, which are each a continuation-in-part of U.S. Application No. 13/175,633 filed on July 1, 2011 and U.S. Application No. 13/175,634 filed on July 1, 2011, 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; and are each 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.

BACKGROUND OF THE INVENTION

[0002] In today's world, spectacle eyeglass frames are very fashionable. While the trend for the eyeglass lenses is to make them thinner, lighter, and less visible, at the same time, it is the eyeglass frame that makes the fashion statement for the eyeglass wearer.

[0003] Concurrent with these trends is another concerning including electronics into spectacle eyewear. The trend of utilizing electronics in eyewear appears to be accelerating and the applications being developed by others are expanding. As theses trends continue, it is becoming important to find ways to incorporate electronics into eyewear without harming the aesthetics and functionality of the eyewear. Some of the challenges may be to not limit the fashion design of the eyeglass frame or limit the materials which the eyeglass frame can be made of, maintain as few completed eyeglass frames or eyeglass frame components (frame fronts, bridges, temples) stock keeping units (SKUs) as possible, allow for robust placement of the electronics, and in a way that can be manufactured so that it remains affordable, and aesthetically desirable.

BRIEF SUMMARY OF THE INVENTION

[0004] Embodiments may provide electronic (*i.e.* electro-active) spectacle frames that comprise a housing module that may be coupled (*e.g.* attached) to a structural component of the electronic frames and which may house (*e.g.* contain, encapsulate, surround a portion of, etc.) one or more electronic components (and/or an electronics module) of the electronic

spectacles. Some embodiments may also comprise a spring hinge and an electrical path from a temple to a lens. Some embodiments may also comprise a conductive compliant material that provides part of an electrical path between the electronic components *(e.g.* components in an electronics module) and electronics located on the electronic spectacle frames and/or electro-active lenses. Some embodiments may also comprise a single electronics module or multiple electronics module. Some embodiments may also comprise a façade coupled to the front of the electronic lens frames.

[0005] In some embodiments, a first device is provided. The first device includes a frame having a first temple and a second temple. The frame also comprises a housing module coupled (*e.g.* attached) to a structural member. The first device further includes a first lens and a second lens coupled to the frame. The first device may include an electronics module that may be located within the housing module. The electronics module may further include at least any two of: a power source; a controller; and/or a sensing mechanism.

[0006] In some embodiments, in the first device as described above, an insulating layer may be disposed between one or more electronic components located within the electronics module and the frame of the first device. In some embodiments, in the first device as describe above that comprises an insulating layer, the housing module may comprise the insulating layer. In some embodiments, the electronics module may comprise a conductive material, such as a metal.

[0007] In some embodiments, in the first device as describe above that comprises an insulating layer, the housing module may comprise a conductive material and the insulating layer may be disposed between at least a portion of the housing module and the electronics module.

[0008] In some embodiments, in the first device as describe above that comprises an insulating layer, the insulating layer may comprise a portion of the electronics module. In some embodiments, the housing module may comprise a conductive material, such as a metal.

[0009] In some embodiments, in the first device as described above, the housing module is removably coupled to the first temple. In some embodiments, in the first device as described above, the housing module is removably coupled to the first temple such that it is adapted to be removed and recoupled to the first temple.

[0010] In some embodiments, in the first device as described above, the housing module comprises a first end, a second end, and a body disposed between the first end and the second end. The first end may comprise an opening and the electronics module may be configured to be inserted into the opening. In some embodiments, the electronics module may be pressure fitted to the housing module. In some embodiments, the electronics module is located within the body of the housing module. In some embodiments, the housing module comprises nylon or carbon fiber.

[0011] In some embodiments, in the first device as described above, the structural member comprises a cavity in the first temple and the housing module is configured to be selectively placed within the cavity. In some embodiments, the housing module is coupled to the first temple using at least one of a screw or a two face adhesive tape. In some embodiments, the housing module may be selectively removed. In some embodiments, the housing module is pressure fitted to the cavity in the first temple.

[0012] In some embodiments, in the first device as described above, the first lens is electrically connected to the electronics module. In some embodiments, the controller is configured to generate a time varying signal to supply to the first lens from the power source. In some embodiments, the sensing mechanism is configured to provide an input to the controller for determining when to supply the time varying signal to the first lens. In some embodiments, the power source comprises a battery. In some embodiments, the controller comprises firmware. In some embodiments, the controller comprises a voltage multiplier. In some embodiments, the controller is configured to provide at least one of: a zero DC biased sine wave or a zero DC biased square wave to the first lens.

[0013] In some embodiments, in the first device as described above, the housing module further includes an aperture disposed on an outer side of the housing module. In some embodiments, the aperture has an area that is approximately within the range of 1 cm^2 to 5 cm^2. In some embodiments, the sensing mechanism comprises a touch sensitive switch exposed substantially through the aperture. The touch sensitive switch may, in some embodiments, include a capacitance or a membrane switch.

[0014] In some embodiments, in the first device as described above, the structural member includes the first temple. In some embodiments, the first temple includes a first portion and second portion. In some embodiments, the first portion is located closer to the first lens than the second portion and the housing module is coupled to the first portion of the first temple. In some embodiments, the housing module is the first portion of the first temple.

[0015] In some embodiments, in the first device as described above, the housing module may comprise a conductive material. In some embodiments, in the first device as described above, the housing module may comprise a non-conductive material. In some embodiments, in the first device as described above, the electronics module may comprise a non-conductive material. In some embodiments, in the first device as described above, the electronics module may comprise a conductive material.

[0016] In some embodiments, in the first device as described above, the structural member may comprise a non-conductive material. In some embodiments, the structural member may comprise any one of, or some combination of, a plastic or nylon material. In some embodiments, the structural member may comprise acetate.

[0017] In some embodiments, in the first device as described above where the housing module may comprise a non-conductive material, the structural member may comprise a conductive material. In some embodiments, the housing module may be configured or positioned so as to electrically isolate the electronics module from the structural member. In some embodiments, the structural member may comprise a metal.

[0018] In some embodiments, in the first device as described above, the first device may further include a first lens having a first electrical contact and a conductive path in electrical contact with the first electrical contact of the first lens. The electronics module may also have a first electrical contact. The conductive path may be in electrical contact with the first electrical contact of the electronics module. In some embodiments, the conductive path includes at least one pogo pin. In some embodiments, the conductive path includes a spring hinge. In some embodiments, the conductive path includes a compliant conductive element.

[0019] In some embodiments, in the first device as described above, the housing module may have a thickness that is less than or equal to approximately .7 mm. In some embodiments, the housing module may have a thickness that is less than or equal to approximately .5 mm. In some embodiments, the housing module may have a thickness that is less than or equal to approximately .3 mm.

[0020] A first method may also be provided. The first method may comprise a method of manufacturing or fabricating a device that includes a frame having a first temple and second temple, and a housing module that includes a first end; a second end, a body disposed between the first and second end, and a cavity disposed within the body. The first end may include an opening. The first method may further comprise inserting an electronics module

(or electronic components) into the opening of the housing module such that the electronics module is disposed in the cavity of the housing module.

[0021] In some embodiments, the first method as described above may further comprise removing the electronics module (*i.e.* a first electronics module) from the cavity through the opening of the housing module (and/or temple), and inserting an electronics module (*i.e.* a second electronics module) into the opening of the housing module such that the second housing module is disposed in the cavity of the housing module. In some embodiments, the first electronics module and the second electronics module are the same electronics module (*e.g.* they are the same module or they comprise the same components). In some embodiments, the first electronics module and the second electronics module are different electronics modules.

[0022] A second method may also be provided. The second method may comprise a method of manufacturing or fabricating a device that includes a frame having a first temple and second temple. The first temple may include a first end; a second end, a body disposed between the first and second end, and a cavity disposed within the body. The first end may include an opening. The first method may further comprise inserting an electronics module (or electronic components) into a housing module and inserting the housing module into the opening of the temple such that the housing module is disposed in the cavity of the first temple.

[0023] In some embodiments, the second method as described above may further comprise removing the housing module (*i.e.* a first housing module) from the first cavity through the opening of the temple, and inserting a housing module (*i.e.* second housing module) into the opening of the temple such that the second housing module is disposed in the cavity of the first temple. In some embodiments, the first housing module and the second housing module are the same housing module (*i.e.* they comprise the same materials in the same propositions). In some embodiments, the housing module and the second housing module are different housing modules. In some embodiments, the electronics module (or electronic components) may be removed with the housing module. In some embodiments, where the electronics module (or electronic components) is removed with the housing module, a second electronics module (or electronic components) may be inserted into the cavity in conjunction with the second housing module.

[0024] In some embodiments, the second method as described above may further include removing the housing module from the first cavity through the opening of the temple without removing the electronics module.

[0025] In some embodiments, in the second method as described above, the step of inserting the electronics module into the housing module comprises coupling the housing module to the electronics module. In some embodiments, in the second method as described above, the housing module may be inserted into the opening of the temple prior to the electronics module being inserted in the housing module.

[0026] In some embodiments, a first device may be provided. The first device may include a lens that comprises at least a first electrical contact and a lens housing holding the lens, where the lens housing comprises at least a second electrical contact. The first device may further include a conductive material disposed between the first and the second electrical contact, where the conductive material electrically connects the first and second electrical contacts. A barrier layer may be included that is disposed so as to cover at least a portion of the conductive material.

[0027] It should be understood that, after reading the disclosure provided herein, a person of ordinary skill in the art may understand that various combinations of the devices described above may be made such that some or all of the features described with regards to one device may be combined with some or all of the features of another device.

[0028] Embodiments may provide a housing module that houses (*e.g.* contains, surrounds, surrounds a portion, encapsulates, substantially encapsulates, and/or is coupled to) one or electronic components (and/or an electronics module) of an electronic spectacle frame. The electronics module may comprise any suitable material, which may be chosen in part based on the materials and configuration of other components of the electronic spectacles (such as the frames). In some embodiments, electronics for the electronic spectacles may be placed inside the housing module such that some or all of the components are covered by a portion of the housing module. The housing module may then be placed inside the electronic frames (such as within a cavity in one of the temples). In this manner, the electronics (*e.g.* in an electronics module) may be coupled to (*e.g.* attached to) the electronic frames. The housing module may, in some embodiments, electrically isolate the electronic components from the frame (or outside components) and/or provide structural support for the frames around the electronics of the electronic spectacles. In some embodiments, the housing module may also provide a mechanism for a user of the electronic frames to interact with the electronics

therein (for instance, through the use of a touch switch, such as a capacitive switch or a membrane switch).

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Fig. 1 is an illustration of spectacle frames.

[0030] Figs. 2(a) and (b) are cross sectional diagrams of devices in accordance with some embodiments.

[0031] Fig. 3 shows an exploded view of components of a portion of an exemplary device in accordance with some embodiments.

[0032] Fig. 4 shows an exploded view of components of a portion of an exemplary device in accordance with some embodiments.

[0033] Fig. 5 shows an exploded view of components of a portion of an exemplary device in accordance with some embodiments.

[0034] Fig. 6 shows a portion of an exemplary device in accordance with some embodiments.

[0035] Fig. 7 shows components of an exemplary device in accordance with some embodiments.

[0036] Fig. 8 shows an exemplary portion of an exemplary device with components coupled therein.

[0037] Fig. 9 shows an exemplary portion of an exemplary device with components coupled therein from a different angle.

[0038] Fig. 10 shows a close-up view of an exemplary portion of an exemplary device with components coupled therein.

[0039] Fig. 11 shows an exemplary embodiment of a device in accordance with some embodiments.

[0040] Fig. 12 shows an exemplary design mask in accordance with some embodiments.

[0041] Fig. 13 shows an exemplary temple of an electronic spectacle frame in accordance with some embodiments.

[0042] Fig. 14 shows an exemplary embodiment of a device in accordance with some embodiments.

[0043] Fig. 15 shows an exemplary embodiment of a device in accordance with some embodiments.

[0044] Fig. 16 shows an exploded view of components that may comprise an exemplary embodiment of a device in accordance with some embodiments.

[0045] Fig. 17 shows an exemplary embodiment of a device in accordance with some embodiments.

[0046] Figs. 18(a) and (b) show an exemplary embodiment of a device in accordance with some embodiments.

[0047] Figs. 19 (a) and (b) show an exemplary embodiment of a device in accordance with some embodiments.

[0048] Figs. 20 (a), (b), and (c) show exemplary embodiments of components of a device in accordance with some embodiments.

[0049] Fig. 21 shows an exemplary embodiment of a device in accordance with some embodiments.

[0050] Fig. 22 shows an exemplary embodiment of a device in accordance with some embodiments.

[0051] Figs. 23(a) – (e) show exemplary embodiments of a device in accordance with some embodiments.

[0052] Fig. 24 shows an exemplary embodiment of a device in accordance with some embodiments.

[0053] Fig. 25 shows an exemplary embodiment of a device in accordance with some embodiments.

[0054] Fig. 26 shows an exemplary embodiment of a sensing mechanism in accordance with some embodiments.

[0055] Fig. 27 shows an exemplary embodiment of an electronic frame comprising a housing module in accordance with some embodiments.

[0056] Fig. 28 shows a top view and a front view of an exemplary embodiment of an electronic frame comprising a façade in accordance with some embodiments.

[0057] Fig. 29 shows a rear view of an exemplary embodiment of an electronic frame comprising a façade in accordance with some embodiments.

[0058] Fig. 30 shows an exemplary barrier layer coupled to electronic spectacles in accordance with some embodiments.

DETAILED DESCRIPTION OF THE INVENTION

[0059] The following disclosure provides exemplary devices comprising electronic (*i.e.* electro-active) spectacles. Before discussing specific embodiments, some descriptions of some specific terms are provided below.

[0060] As used herein, a "frame" may refer to a complete wearable housing that secures both spectacle lenses and aligns them in the proper place relative to the wearer's eyes when being worn. The frame may comprise elements such as a first and second temple, as well as the lens housing that is configured to support the spectacle lenses.

[0061] As used herein, a "hinged temple" may refer to a side piece of a frame that connects to the lens housing (or directly to the lens) by way of a hinge attachment mechanism, and further provides stability by resting on the wearer's ears when worn.

[0062] As used herein, a "hinge-less temple" may refer to a side piece of a frame that connects to the lens housing (or directly to the lens) without a hinge attachment mechanism, and further provides stability by resting on the wearer's ears when worn.

[0063] As used herein, a "temple end piece" may refer to a part of the temple that is found farthest away from the lens housing. The temple end piece usually begins behind the ear of the wearer and ends at the end of the temple that is located farthest away from the lens housing, but this is not required.

[0064] As used herein, a "lens housing end piece" may refer to a part of the lens housing farthest away from the bridge and spatial to the bridge. Each frame typically has two lens housing end pieces: one on the spatial side of the right lens and one on the spatial side of the left lens.

[0065] As used herein, a "bridge" may refer to a part of the frame that fits over/superior to the wearer's nose. The bridge is usually found between the portion of the lens housing that supports the right lens and the portion of the lens housing that supports the left lens, or is between the right and left lenses themselves. In some embodiments, the bridge may comprise a portion of the lens housing.

[0066] As used herein, the term "comprising" is not intended to be limiting, but may be a transitional term synonymous with "including," "containing," or "characterized by." The term "comprising" may thereby be inclusive or open-ended and does not exclude additional, unrecited elements or method steps. For instance, in describing a method, "comprising" indicates that the claim is open-ended and allows for additional steps. In describing a device, "comprising" may mean that a named element(s) may be essential for an embodiment, but other elements may be added and still form a construct within the scope of a claim. In contrast, the transitional phrase "consisting of" excludes any element, step, or ingredient not specified in a claim.

[0067] As used herein, a "hinge" may refer to the part of the frame that allows for connecting the lens housing and the temples in such away that the lens housing and the temple can open and close against the lens housing on its posterior side when not being worn. In some embodiments, the hinge may connect directly to the lens.

[0068] As used herein, "eye-wire" may refer to the rim that surrounds the lens of a spectacle frame. Eye-wire may comprise a portion of the lens housing that holds one lens (a right or a left) in a full rimmed or semi-rimless frame. There may be two eye-wires to each lens housing. However in a completely rimless frame there are no eye wires.

[0069] As used herein, a "lens housing" may refer to a part of the frame that is configured or adapted to support or hold the first and the second lenses in place (preferably firmly in place). The lens housing may also comprise the part of the frame to which the temples attach. The lens housing may comprise any component or material adapted to support the lenses, including, for example, screws, nylon monofilament, eye-wire, etc. or any combination thereof. The lens housing may comprise any material, including metal or plastic. A lens housing may be included in any type of frame design, including fully rimmed, semi-rimless, and rimless. In some embodiments, the lens housing may also include the bridge, such as when the lens housing comprising a single component or two components that support both the first and the second lens. Moreover, as used herein, reference to a "lens" also includes any suitable optic or optical component. That is, the lens housing may hold any optical component, and need not necessarily comprise a lens that has a focal point (*e.g.* a lens could include a piece of glass or plastic that may serve any purpose). For example, a "lens" as used herein may refer to optical components that may project or maintain an imaginary image perceivably by viewer and/or be used in heads-up displays, video games, checking electronic mail, and/or any other suitable manner.

[0070] 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).

[0071] As used herein, an "electronic component" may refer to any electronic device, including a power source, a controller (such as a microprocessor), a sensing mechanism (such as a touch switch), etc. that may be coupled to an electro-active frame.

[0072] As used herein, a "rimless frame" may refer to a frame that is designed having a lens housing that does not comprise eye-wires. That is, for instance, the lens housing does not comprise eye wires but may comprise, for instance, nylon monofilament wire, screws, or other material to hold the lenses in place.

[0073] As used herein, a "semi-rimless frame" may refer to a frame that has a lens housing that comprises partial rim (*i.e.* eye-wire that does not completely encapsulate or encircle the lens) and/or may have a nylon monofilament wire or similar feature that secures the lenses to the frame.

[0074] As used herein, a "full rimmed frame" or "fully rimmed" may refer to a frame that comprises a lens housing having a complete rim that encapsulates or encircles the first and second lens (*i.e.* the lens housing comprises full eye-wires).

[0075] As used herein, a "Zyle frame" may refer to a frame that comprises mostly plastic

[0076] As used herein, a "metal frame" may refer to a frame that comprises mostly metal

[0077] As used herein, a "right spatial void" may refer to the space created where the right portion of the lens housing that is within the plane of the front of the wearers face turns back to meet the right temple. The angle formed between the right portion of the lens housing and the right temple is approximately (but not always) 90 degrees. This space is further defined as that which is bounded on three sides: On a first side by an imaginary line that is provided on the inside back surface of the right lens or inside right portion of the lens housing, on a second side by that of an imaginary line that is located in the middle of the right temple not including any electronics affixed thereto, and on a third side which is bounded by the right side of the face and/or head of the wearer.

[0078] As used herein, a "left spatial void" may refer to the space created where the left portion of the lens housing frame front that is within the plane of the front of the wearers face

turns back to meet the left temple. The angle formed between the left portion of the lens housing and the left temple is approximately 90 degrees. This space is further defined as that which is bounded on three sides: On a first side by an imaginary line that is provided on the inside back surface of the left lens or inside left portion of the lens housing, on a second side by that of an imaginary line that is located in the middle of the left temple not including any electronics affixed thereto, and on a third side which is bounded by the left side of the face and/or head of the wearer.

[0079] As used herein, "coupled" may refer to any manner of connecting two components together in any suitable manner, such as by way of example only: attaching (*e.g.* attached to a surface), disposing on, disposing within, disposing substantially within, embedding within, embedded substantially within ,etc.. "Coupled" may further comprise fixedly attaching two components (such as by using a screw or embedding a first component into a second component during a manufacturing process), but does not so require. That is, two components may be coupled temporarily simply by being in physical contact with one another. Two components are "electrically coupled" or "electrically connected" if current can flow from one component to another. That is, the two components do not have to be in direct contact such that current flows from the one component directly to the other component. There may be any number of other conductive materials and components disposed electrically between two components "electrically coupled" so long as current can flow there between.

[0080] As used herein, a "conductive path" refers to a continuous path for which electrons (*i.e.* current) may flow from one point to another. The conductive path may comprise one component, or more than one component. For instance, a conductive path may comprise portions of a lens housing, a temple, a hinge, a lens, and/or conductive material disposed between some or all of the components.

[0081] As used herein, "electro-active spectacles," "electronic spectacles," "electro-active spectacle frames," "electronic spectacle frames," "electro-active eyeglasses," "electro-active eyeglass frames," "electro-active frames," "electro-active lenses" or any permutation of "electro-active" or "electronic" may broadly refer to any eyeglass frame or lens that comprises an electronic component or components. The electrical components can be coupled to any part of the electro-active (*e.g.* electronic) frames or lenses. This may comprise, for instance, any and all uses where by the eyeglass frames house some, most, or all of the electronics and the lens comprises a component or components that may be

activated and/or deactivated by an electrical current or voltage, such as by way of example only, electronic focusing eyeglasses, electro-chromic eyeglasses, electronic tinted eyeglasses, eyeglasses comprising a micro-display allowing for viewing a digital image in space, eyeglasses comprising an electronic heads up display, eyeglasses that comprise an antistatic element to keep the eyeglass lenses clean, electronic shutter eyeglasses for viewing 3D images, electronic eyeglasses that comprise an occlusion control for vision training; electronic eyeglasses for myopia control, eyeglasses that comprise a component of a telescope or the complete telescope, eyeglasses that comprise a microscope, eyeglasses that comprise a camera, eyeglasses that comprise a directional microphone, eyeglasses that comprise a rangefinder, eyeglasses that comprise an image intensifier, eyeglasses that comprise a night vision enhancement feature, occupation eyeglasses, gaming eyeglasses; eyeglasses that may comprise electronic components to provide a user with functionality for receiving input from a wearer and performing a specific operation in response, such as providing information to the wearer – *e.g.* a virtual personal assistant (that is,. eyeglasses that may comprise electronic components such as an input device (*e.g.* a microphone) for receiving signals (*e.g.* commands or questions) from a wearer; a micro-processor that may process the input received from the wearer and determine an approiate action or response; a memory or other storage device that may store associations between input received and predetermined functions; voice recognition software for identifying the information in an input received from a wearer; an output device (*e.g.* a speaker) for communicating or signaling information to a wearer, etc.). Additional functionality and electrical components that may comprise portions of electro-active or electronic spectacles may be utilized, including those that are discussed in more detail below.

[0082] As used herein, reference to a "first" or a "second" does not limit the referenced component to a particular location unless expressly stated. For instance, reference to a "first temple" may comprise the temple located on either the left side or the right side of a wearer's head.

[0083] As used herein, the term "approximately" may refer to plus or minus 10 percent, inclusive. Thus, the phrase "approximately 10 mm" may be understood to mean from 9 mm to 11 mm, inclusive.

[0084] Electro-Active Frames Comprising a Spring Mechanism

[0085] Some embodiments of electro-active spectacle frames provided herein may include a spring mechanism. The spring mechanism may, for instance, be disposed on the frame of

the spectacles (such as on the temple, embedded within the temple, coupled to the temple and the lens housing, etc.) and may provide a force that causes the temple member to apply pressure in a direction substantially perpendicular to, and in the direction of, a wearer's head. In this manner, the spectacle frames may fit tightly on a person's head, regardless of the size or shape. This may provide for a more comfortable fit and reduce the risk that the eyeglasses could become dislodged or accidentally fall off of the wearer's head. Moreover, the use of a spring mechanism for an electro-active frame may provide the additional benefit of conserving power when the frames are not in use by severing an electrical connection between electronics located on the lens housing (or in the lens) and a power source located on the temple. That is, for instance, the spring mechanism may, by moving the temple of the frame away from the lens housing, separate two conductors such that current cannot flow from the temple to the lens housing (or any other separation).

[0086] The use of springs (*e.g.* spring hinges) for non-electro-active lenses is well known in the art. Examples of such spring hinges are provided in the following references, which are hereby incorporated by reference in their entireties:

U.S. Pat. No.: 6,336,250 to Takeda entitled "Spring hinge for Eyeglasses."

U.S. Pat. No. 5,760,869 to Mitamura entitled "Eyeglasses Frame with Spring Hinges."

U.S. Pat. No. 5,657,107 to Wagner et al. entitled "Spring Hinge for Eyewear"

U.S. Pat. No. 4,991,258 to Drlik entitled "Eyeglass Spring Hinges."

[0087] To date, there has not been a similar approach used for electro-active eyeglasses. In addition to some of the benefits provided by a spring mechanism (including those noted above, such as a tighter fit and the ability to conserve power by disconnecting components), there are additional considerations that the inventors have identified related to the use of such devices in electro-active frames. For instance, electro-active eyeglass frames may require that an electrical path be provided from a temple to the lens housing, which is not utilized on traditional (*i.e.* non-electro-active frames) frames. However, the use of spring devices (such as spring hinges) in electro-active eyeglass frames may cause the temple and lens housing to form an angle that is less than 90 degrees, even when the frames are in use. This could cause a disruption in electrical connectivity between electronics or a power source located on a temple with any electronics located on the lens housing (or in the lens itself). Fig. 1 illustrates this situation.

[0088] As shown in Fig. 1, a typical position of the temple relative to the lens housing (*e.g.* when the frames are being worn) is for the first **101** and/or the second temple **102** to form approximately a ninety degree angle with the lens housing **103**. In practice, this angle may be slightly smaller or greater (depending on factors such as the wearer's head size and shape, the size of the frame, etc.). In this position, a conductive path may connect components on the first **101** or second temple **102** to components disposed on the lens housing **103**. However, the use of a spring mechanism that applies force in the direction of a wearer's head may cause this angle **104** to be substantially less than ninety degrees (for instance, it may be 85 degrees or less), which could cause a separation in the conductive path between the first **101** or second **102** temple and the lens housing **103**. For example, if a portion of the conductive path from the first temple **101** to the lens housing **103** comprises electrical contacts located at the respective ends of each of these components (such that, for example, when the first temple **101** and lens housing **103** are worn, there is a direct connection between the electrical contacts), then this connection may be broken as the angle **104** between the components is reduced. As noted above, the use of springs or similar devices in eyeglass frames to provide continuous pressure is likely to create such angles, and therefore such springs and similar devices have not been used with electro-active frames.

[0089] Provided herein is an electro-active frame that comprises a spring mechanism. As used herein, a "spring mechanism" may refer to an elastic object that may be used to store mechanical energy. It may comprise a spring and/or other components such as conductors located within the spring or disposed alongside the spring (or within the coils of a coil spring). When compressed or stretched, the first spring mechanism may exert a force on one or more of the components of a device, such as the temple or the lens housing of an electro-active frame. The first spring mechanism may provide a continuous force (either variable or constant) in a direction substantially perpendicular to the head of a wearer when the first device (*e.g.* an electro-active frame) is worn. The first spring mechanism may, in some embodiments, also conduct electricity and thereby form a part of a conductive path using a spring (or components thereof) or a conductor coupled to or disposed therein. In some embodiments, the conductor may be embedded within the spring mechanism, be coupled to the spring mechanism, and/or encircled by the spring mechanism. As used herein, a spring mechanism may also comprise additional components, such as a hinge that may be coupled to the temple and/or the lens. The spring mechanism may comprise any suitable material, including metal, plastic, or some combination thereof. Figs. 2 (a) and (b) show two examples of electro-active frames comprising spring mechanisms.

[0090] A first device is provided that comprises a frame that includes a lens housing adapted to support a first lens and a second lens. The first device also comprises a first temple movably coupled to the lens housing, and a second temple movably coupled to the lens housing. That is, the first and second temples may be coupled to the lens housing such that each may be moved relative to the lens housing so that the angle between them (*e.g.* angle **104** in Fig. 1) may change. In this regard, the lens housing and the temples may be coupled in any suitable manner that allows for this movement, including, by way of example, through the use of a hinge or a screw.

[0091] The first device further comprises a first spring mechanism coupled to the first temple and the lens housing. As defined above, this does not require that the spring mechanism be permanently attached to both components. For example, the spring mechanism may be fixed to the first temple and apply force to the lens housing when the first temple and lens housing (or components thereof, such as the end pieces) are within a certain distance of one another (*i.e.* the angle **104** between the components is close to ninety degrees (*e.g.* within five degrees), or some other suitable value). When the first temple and the lens housing are moved sufficiently apart the spring mechanism may no longer be in physical contact with the lens housing. An example of this situation is provided in Fig. 2(b) and described in detail below. Although defined above, it is worth noting that the spring mechanism need not be in the form of a coil spring, but may take any suitable shape and may be located in any suitable location on the frame. Such locations, as will be described below, may include disposed on, or embedded within, the lens housing and/or on the first temple. An example of a spring mechanism embedded within the first temple is shown in Fig. 2(a), which will be described below.

[0092] The first device also comprises a first conductive path from the first temple to the lens housing for at least one position of the first temple relative to the frame. That is, as defined above, electrons (in the form of current) may be distributed (*i.e.* conducted), or be capable being distributed (*i.e.* conducted), from the first temple to the lens housing. In so doing, the first device may, for example, comprise an electro-active frame that has some electronic components (such as a power source, controller, sensing mechanism, etc.) located on the first temple, and other electronic components (such as those described below) disposed on the lens housing and/or on (or within) the lenses themselves.

[0093] As defined above, the first conductive path may be provided by any suitable component or components. For instance, the conductive path could comprise the first temple,

the spring mechanism, and the lens housing themselves (*i.e.* each could comprise conductive material) or some or all of these components could comprise conductive components disposed on (or embedded within) them that form a part of the conductive path. As indicated above, the conductive path need not always be present, but may be provided for at least one position of the first temple relative to the lens housing. With reference again to Fig. 1, the first temple **101** may be moved to a plurality of positions relative to the lens housing **103**, each of which may have a different angle **104**. Preferably, the first conductive path is provided when the first temple and the lens housing are in a position corresponding to when the first device is being worn by a wearer. In some embodiments, this position may have an angle corresponding to approximately ninety degrees. However, embodiments are not so limited and the angle may depend on many factors, as described above. It should also be understood that the conductive path may be provided for a plurality of positions.

[0094] In some embodiments, in the first device as described above, the first conductive path is provided by the first spring mechanism. That is, for example, the first spring mechanism may provide some (or all) of the first conductive path between the first temple and the lens housing. This may be due, in part, to the fact that the spring mechanism may be located between (or substantially between) both the first temple and the lens housing. In some embodiments, the first spring mechanism comprises a spring that provides the first conductive path. The spring of the spring mechanism need not comprise a traditional coil spring, but may comprise any elastic material that stores mechanical energy, such as when the spring is displaced. An example of a non-coil spring is provided with reference to Fig. 2 (a). As noted above, the spring may comprise any conductive material when providing at least a portion of the first conductive path. Preferable, the spring mechanism comprises metal.

[0095] By utilizing the spring mechanism to form a part of the conductive path, some embodiments may provide the advantage of reducing the number of components that are required to be coupled to the frame. Moreover, in some embodiments, the use of the spring mechanism to serve as part of the conductive path may be one way in which the conductive path can be selectively provided (*e.g.* the conductive path may be available when the first device is being worn and unavailable when the first device is not being worn). For instance, the spring mechanism may be permanently coupled (*i.e.* fixedly, such as through the use of a screw, adhesive, etc.) to only the first temple, and be selectively coupled (*i.e.* temporally, such as coming into physical contact, but not being adhered to, screwed together, etc.) to the lens housing such that the spring mechanism is in physical contact with the lens housing in some but not all positions of the first temple relative to the lens housing. In embodiments

where the first spring mechanism provides some or all of the conductive path, then in positions where the first spring mechanism is no longer contacting the lens housing, the conductive path may not be provided. This may be one way of providing a selectively available conductive path between the first temple and the lens housing.

[0096] In some embodiments, in the first device as described above, the first spring mechanism comprises a spring and a first conductor. The conductor may comprise any suitable material and may have any suitable shape. There need not be any physical contact between the spring and the conductor. For instance, in some embodiments, the spring is disposed substantially around the first conductor. By "substantially around," it is meant, for example, that the spring may encircle or surround some (but not necessarily all) of the conductor. This is illustrated in the exemplary embodiment shown in Fig. 2(a). For instance, if the spring comprises a coil spring, then the conductor may be located within the coils of the spring. In some embodiments, the conductor may be disposed within (*e.g.* embedded in) the spring, such that the spring may comprise both the conductor (or more than one conductors) and an insulating material. The insulating material may electrically insulate the conductors that are within the spring such that the a plurality of conductive paths are provided by the spring (*i.e.* through the embedded conductors). This may allow for multiple signals to be transmitted from the first temple to the lens housing, for a signal and power to be transmitted, etc. In some embodiments, the spring is coupled to the first conductor. That is, the spring may be attached or disposed on the conductor. Each of the spring and/or the conductor may comprise a part of the conductive path. In some embodiments, the spring is disposed along a side of the first conductor. By "along side," it is meant that the spring and the conductor may be substantially parallel and located no more than 3 cm apart at any given point. Preferable, the spring and the conductor are no more than 1 cm apart such that the spring mechanism may have a small profile (*i.e.* for aesthetic reasons). Again, embodiments are not so limited, and the conductor may be located in any suitable location. Thus, in some embodiments, the first conductive path or a portion thereof may be provided by the first conductor.

[0097] In some embodiments, in the first device as described above, the first conductive path further comprises pogo pins. A "pogo pin" may comprise a device that establishes a (usually temporary) connection between two components. An illustration of an embodiment that utilizes pogo pins is shown in Figs. 3-10. The pogo pins may be disposed within the first temple, but embodiments are not so limited and the pogo pins may be located in other locations, such as disposed on the first temple, on the lens housing (or embedded therein) and/or coupled to the first spring mechanism. In some embodiments, the first device further

comprises a second spring mechanism that may press the pogo pins against electrical contacts on the lens housing for a plurality of positions of the first temple. The use of the second spring mechanism may provide the ability to maintain the conductive path between the first temple and the lens housing for some or all of the positions of the first temple relative to the lens housing. That is, as the distance between the portion of the lens housing comprising the electrical contacts and the first temple increases (*i.e.* as the angle **104** in Fig. 1 decreases), the second spring mechanism may lengthen the conductive path (*i.e.* cause the pogo pins to extend) so as to maintain the electrical contact (and thereby the conductive path). When the angle **104** is then increased, the lens housing and/or first temple may apply force to the second spring mechanism such that it contracts (*i.e.* the pogo pins contract), but such that the electrical contact is still maintained. By providing a force on the pogo pins so as to press against the electrical contacts of the lens housing (or congruently, against the first temple) for some, but not all, of the position of the temple, embodiments may provide the ability to selectively provide a conductive path between the first temple and the lens housing.

[0098] In some embodiments, in the first device as described above, the first spring mechanism may include a spring hinge. That is, the spring mechanism may comprise a fixed portion that is coupled to both the lens housing and the first temple (*i.e.* the hinge) that allows for the relative movement between the two components so as to change the angle **104**. The spring may be coupled to either or both of the lens housing and the first temple, and may provide a force that may move the first temple to one of a plurality positions and/or presses the first temple against a wearer's head. In some embodiments, in the first device as described above, an electronics module is further provided. The electronics module may, for example, comprise at least one of: a power source, a controller, and a sensing module. The use of an electronics module may, in some embodiments, provide the ability to more readily fabricate electro-active spectacles, as the electronics may be manufactured separately and inserted into a plurality of frame designs. The electronics module may be coupled to the first temple or in another suitable location (note that some embodiments may dispose the electronics module or components thereof, for instance, on the lens housing). For example, the electronics module could be embedded or substantially embedded in the first temple (as is described below with reference to the exemplary embodiments shown in Figs. 3-10). In some embodiments, the first conductive path may be electrically connected to the electronics module. That is, a conductive path may be provided from the electronics module to the lens housing and may comprise a number of components, such as the first spring mechanism or components thereof.

[0099] In some embodiments, in the first device as described above, the first conductive path conducts electricity from the first temple to the lens housing when the first temple is in a first position. The first conductive path does not conduct electricity from the first temple to the lens housing when the first temple is in a second position. As was described above, the first and second positions may correspond to relative positions between the first temple and the lens housing. The first position, in which the conductive path conducts electricity, may correspond to a position of the first temple when the first device is in use (*e.g.* when the first device is worn) and the second position may correspond to a position of the first temple when the device is not in use (*i.e.* when the device is not worn). As noted above, the conductive path may be provided by any of the components of the first device, such as the first spring mechanism, lens housing, first temple, etc.. Embodiments that selectively (*i.e.* in some instances but not all) provide the conductive path from the lens housing to the first temple may provide some or all of the advantages described above, which may include power conservation and efficiency related to some or all of the electronic components of the first device not operating when the first device is not in use (*e.g.* any electronics disposed on the lens housing will not be electrically connected to electronic components on the first temple).

[0100] In some embodiments, where the first conductive path conducts electricity from the first temple to the lens housing when the first temple is in a first position and the first conductive path does not conduct electricity from the first temple to the lens housing when the first temple is in a second position, the lens housing comprises a first electrical contact and the first spring mechanism forms an electrical connection with the first electrical contact in the first position. In some embodiments, the first spring mechanism does not form an electrical connection with the first electrical contact in the second position. That is, in embodiments wherein the first conductive path or a portion thereof includes the spring mechanism (or a component thereof), the spring mechanism may directly connect to (*i.e.* physically contact) the electrical contacts disposed on the lens housing. In this manner, the conductive path provided at least in part by the spring mechanism may be selectively provided by contacting and not contacting the electrical contacts on the lens housing.

[0101] In some embodiments, in the first device as described above, the first spring mechanism is coupled to the first lens. This may be the case, for instance, when the first device comprises rimless eyeglass frames. The spring mechanism may provide some or all of the same functionality as in full rimmed or semi-rimless embodiments, such as by applying a force such that the first temple applies pressure on the wearer's head. The spring mechanism may also be coupled to the lens housing, even in rimless embodiments (such as when a screw

or hinge is coupled to the lens). In some embodiments, the lens includes a first electrical contact, and the first spring mechanism forms an electrical connection with the first electrical contact when the frame is in the first position. That is, the spring mechanism may form a portion of the conductive path that drives current to the lens (and may power and/or control any electronics therein) from the first temple. As noted above, in some embodiments, the spring mechanism may directly connect to the lens, and thereby may also form a direct electrical connection with the electrical contacts disposed thereon. The spring mechanism may itself comprise conductive components (including in some embodiments a conductive spring) that may form the connection. In such embodiments, the spring mechanism may be fixedly coupled to the lens, but the conductive components of the spring mechanism may selectively contact the electrical contacts of the lens.

[0102] In some embodiments, in the first device as described above, the first spring mechanism is housed within the first temple. As used herein, the term "housed within" may refer to when the first spring mechanism is coupled to the first temple in such a way that a portion of the first spring mechanism (such as a spring or a conductor) is within the structure of the first temple. However, the first spring mechanism may have some components exposed outside of the structure of the first temple, such as to make electrical connections with other components such as the lens housing. Embodiments that include the spring mechanism embedded within the temple may provide aesthetic value (that is, the electro-active frames may present a more favorable outward appearance), as it may provide a more finished look with components covered or contained within the overall structure of the device. In addition, embedding the first spring mechanism in the first temple (or any component, such as the lens housing) may also provide a more durable or reliable device, as the first temple may protect the spring mechanism from ambient conditions as well as physical damage that spectacle frames are typically subjected to on a regular basis.

[0103] In some embodiments, in the first device as described above, the first spring mechanism is in electrical contact with the electronics module. As defined above, electrical contact does not require direct physical contact. There may be any number of conductors located between two components that are in electrical contact. The spring mechanism may be disposed between the electronics module and the electronic components that it controls and/or provides power to, and therefore it may be efficient in some embodiments that the spring mechanism electrically connect to the electronics module. This connection may be made regardless of the position of the first temple, particularly in embodiments whereby the first spring mechanism is disposed on the first temple. In some embodiments, the first spring

mechanism is in direct electrical contact with the electronics module. That is, there are no other conductors disposed between the electronics module and the electrical connector. Some exemplary embodiments are illustrated in Figs. 3-10.

[0104] In some embodiments, where the first conductive path conducts electricity from the first temple to the lens housing when the first temple is in a first position and the first conductive path does not conduct electricity from the first temple to the lens housing when the first temple is in a second position, the first spring mechanism maintains electrical contact with the electronics module in both the first position and the second position. This may be the case, for instance, for embodiments on which the spring mechanism is disposed on the first temple. As the first temple is moved (*e.g.* by the spring mechanism) from the first position (where the spring mechanism may be electrically connected to the lens housing) to the second position, the electrical contact between the first spring mechanism and the lens housing may be severed (*e.g.* the spring mechanism and the lens housing may no longer be physically coupled). This may provide the selective conductive path discussed above. Embodiments may provide the advantage that only one electrical contact may be required to be connected/disconnected (*i.e.* only one electrical switch) so as to activate and deactivate the electronics on the lens housing.

[0105] In some embodiments, in the first device as describe above, the first spring mechanism is in a first condition when the first temple is in a first position and a second condition when the first temple is in a second position. By "condition," it is meant that any characteristic of the spring mechanism (including the position of the spring mechanism, its size, shape, or length, and/or the conductivity of the spring mechanism) may change. In some embodiments, this change in condition may provide the change in electrical connectivity. For instance, the shape of the first spring mechanism may change so as to provide (or not provide) physical contact between the spring mechanism (or components thereof) and the lens housing. In some embodiments, the spring mechanism may, for example, maintain electrical contact with the lens housing and the first temple by changing its length or shape (*e.g.* as the distance between the first temple and the lens housing increases, the spring mechanism may increase in length to maintain contact). In this regard, the first spring mechanism may have a first length when the first temple is in a first position and a second length when the first temple is in a second position. The first length and the second length are different. By "length" it is meant that the dimension of the electrical connector in a direction that is substantially parallel to the largest dimension of the temple (preferably when the first device is worn).

[0106] In some embodiments, in the first device as described above where the first conductive path conducts electricity from the first temple to the lens housing when the first temple is in a first position, and the first conductive path does not conduct electricity from the first temple to the lens housing when the first temple is in a second position, the first position is an open position. By "open position," it is meant that the first temple is in a position that is substantially perpendicular to the first and/or second lens such as when the frame is positioned on a wearer's head. However, it need not be exactly perpendicular, as in some cases there may be embodiments where the angle between the temple and the lens is less than ninety degree. The angle is shown in Fig. 1 by the angle **104**. The angle **104** may vary based on both the shape and size of the wearer's head as well as the size and shape of the frames. For instance, in some embodiments, the first position may comprise the first temple and the lens housing being positioned such that the angle **104** between them is between 60 degrees and 110 degrees. Preferably, the angle **104** between the temple and the lens housing in the first position is between 80 degrees and 90 degrees. This typically corresponds to the angle **104** for when the first device is being worn, and thereby the electronics of the first device may be used.

[0107] In some embodiments, in the first device as described above where the first conductive path conducts electricity from the first temple to the lens housing when the first temple is in a first position, and the first conductive path does not conduct electricity from the first temple to the lens housing when the first temple is in a second position, the second position is a closed position. By "closed position," what is meant which is that the temple and the lens form an angle **104** that is significantly less than ninety degrees. This may correspond, for instance, to a situation in which the device is not in a position on a wearer's head and therefore any frame electronics may not need to be activated. In some embodiments, the second position comprises the first temple and the lens housing being positioned such that there is an angle **104** between them of between 0 degrees and 60 degrees. Preferable, the second position comprises the first temple at an angle **104** between 0 degrees and 45 degrees with the lens housing. Again, these angles may correspond to when the first device is not in use.

[0108] Figs. 2(a) and 2(b) illustrate two exemplary embodiments of spring mechanisms that could be used in the first device. First, with reference to Fig. 2(a), a spring **202** is provided that is disposed between the lens housing **200** and the first temple **201**. In this exemplary embodiment, a portion of the spring **202** is shown as being embedded in the first temple **201**. The spring **202** is illustrated as a coil spring, and a conductor **203** is shown disposed within

the spring **202** (*i.e.* the spring substantially encircles the conductor). In some embodiments, the conductor and spring may comprise the spring mechanism. A hinge **204** is shown coupled to both the lens housing **200** and the first temple **201**. The hinge **204** permits the first temple to move relative to the lens housing **200**. A conductive path is shown by the dotted lines **205** (within the spring mechanism), **206** (within the lens housing **200**) and **207** (within the first temple). The conductive path could comprise an embedded conductor within these elements (*e.g.* a wire or embedded conductive material) or it could represent the components themselves (*e.g.* the lens housing **200,** spring mechanism (*i.e.* spring **202** and/or conductor **203**), and/or the first temple **201** could comprise conductive material). However, embodiments are not so limited, and the conductive path need not be provided by the spring mechanism or a component thereof. The spring **202** may apply a force to the first temple **201** such that the first temple **201** applies pressure on a wearer's head.

[0109] With reference to Fig. 2(b), another exemplary spring mechanism for use in an electro-active frame is provided. The spring **212** is not a coil spring, but may comprise elastic material such that when the first temple **211** is moved close to the lens housing **210**, the spring **212** becomes depressed. Because of the nature of the material of the spring **212**, as it becomes compressed (*i.e.* it is displaced toward the lens housing **210**) it provides an opposing force. This force may separate the lens housing **210** and the first temple and/or, for example, apply force to maintain the first device tightly on a wearer's head. The hinge **213** (which is shown as comprising conductive material) couples the lens housing **210** and the first temple **211** such that they may move relative to one another. A conductive path is shown by the dotted lines **214** (within the lens housing) and **215** (within the first temple). The conductive paths **214** and **215** may be connected (and thereby form a single conductive path) when the first temple **211** is positioned close to the lens housing **210** (*e.g.* when the spring **212** is sufficiently compressed). Although as illustrated, the conductive path is provided through the conductive hinge **213**, embodiments are not so limited. That is, a portion of the conductive path (*e.g.* between conductive paths **214** and **215**) may be provided by any suitable component, such as through the spring **212**.

[0110] For example, the lens housing **210** and the first temple **211** could comprise electrical contacts at the interface where each may contact the spring **212**. When the spring is compressed, there may be formed electrical contacts between the lens housing **210**, the spring **212** and the first temple **211**. In some embodiments, the conductive path **214** may connect directly to the spring **212** (which, for example, may itself comprise conductive material) such that an electrical contact need only be formed (selectively) with the conductive path **215** in

the first temple **211**. For instance, when the first temple is moved to contact **212**, but prior to fully compressing **212** to contact the lens housing **210**, an electrical path from the first temple **211** to the lens housing **210** may be established. This exemplary embodiment may provide the ability to have the conductive path at angles **216** that are less than ninety degrees (which may be beneficial, for instance, to prevent connection problems when the electro-active frames are worn and the pressure applied by the spring causes an angle less than ninety degrees). It should be understood that the spring could, in some embodiments, be located on the first temple and the principles discussed herein would apply equally.

[0111] With reference to Figs. 3-10, an exemplary embodiment of a first device is provided for illustration purposes only. The components that comprise the exemplary embodiment in Figs. 3-10 include: a first temple **300**; electrical connectors **301** to connect to the pogo pins; pogo pins comprising a spring **302** and conductive portion **303** (*e.g.* stainless steel cable); vertebrae **304**; an end piece **305**; a spring box cover **306**; an electronics module **307**; a cavity **308** in the first temple for housing the electronics module **307**; and electrical connectors to the electronics module **310**. It should be noted that this is for illustration purposes only, and is provided to demonstrate an exemplary embodiment in which pogo pins embedded or coupled to the first temple **300** may be used to maintain an electrical contact with the lens housing throughout a plurality of positions (*i.e.* angles) between the first temple **300** and the lens housing. Pogo pins may be used with or without a spring mechanism, but when combined with the use of a spring mechanism, embodiments may provide the benefit of maintaining the conductive path when the electro-active frames are worn despite the creation of an angle between the lens housing and the first temple that is less than ninety degrees.

[0112] Fig. 3 shows an exploded view of the components comprising a portion of an exemplary device in accordance with embodiments provided herein. The device comprises an electronics module **307** embedded in a cavity **308** of the first temple **300**. The electronics module is electrically connected to pogo pins that comprise a spring **302** and a conductor **303**. The pogo pins may be used to maintain a connection as the distance (and/or relative positions) between two electrical contacts increases or decreases, because the spring **302** applies force to maintain the electrical contact with the conductor **303**. Thus, for instance, embodiments may provide that as the first temple **300** is moved relative to the lens housing, the pogo pins may maintain electrical contact with the lens housing and thereby provide a portion of a conductive path from the first temple **300** to the lens housing. The vertebrae **304** allow the first temple **300** to move relative to the lens housing, while covering the pogo pins. The end piece **305** may comprise a hinge such that the first temple **300** and the lens housing

are coupled together, but may move relative to each other. The spring box **306** covers and protects the pogo pins and/or provides aesthetic value be given a finished look to the frames.

[0113] Fig. 4 shows the same components described above with reference to Fig. 3 from an alternative angle. It should be noted that end piece **305**, spring box cover **306**, and electronics module **307** may be coupled to the first temple **300** using any suitable method (such as adhesive, two sided tape, a screw, etc.).

[0114] Fig. 5 shows a close-up view of the first temple **300** of the exemplary device. As shown, the pogo pins (and in particular the end of the pogo pins comprising the spring **302**) may form an electrical connection with electrical connectors **301**. The electrical connectors **301** are embedded within a cavity in the first temple **300**. Also shown are connectors **310** that may form an electrical connection with the connectors **301** and the electronics module **307**. Thus, the electrical connectors **301** and **310** form a conductive path from the pogo pins to the electronics module (not shown) in the cavity **308**. In some embodiments, the connectors **301** and **310** may comprise a single electrical conductor.

[0115] Fig. 6 shows the components described above coupled together with (or disposed within) the first temple **300**. As shown, the vertebrae **304** cover a portion of the conductor **303** of the pogo pins. The electrical connector **301** is shown in physical contact with the pogo pins, and the pogo pins are embedded substantially within the first temple **300**.

[0116] Fig. 7 shows an isolated view of the connections formed between the electronics module **307** and the pogo pins. As shown, the electrical connectors **301** are coupled to the electronics module **307** and are in physical (and electrical) contact with a portion **302** of the pogo pins. In this manner, a conductive path is provided from the electronics module **307** to the pogo pins. The pogo pins (via conductor **303)** may further form an electrical connection with a portion of the lens housing. In so doing, a conductive path may be provided from the first temple **300** (*e.g.* from the electronics module **307**) to the lens housing. In this manner, the electronics module **307** may provide, for example, power and/or control signals to electronics housed on the lens housing and/or in the lens. Further, as described above, the use of the pogo pins may be beneficial, for example, with the use of a spring mechanism as they may continue to provide a portion of a conductive path between the electronics module **307** and the lens housing for a plurality of positions of the first temple **300** relative to the lens housing (*e.g.* a number of angles formed there between, as described above).

[0117] Figs. 8 and 9 show views of the first temple **300** with each of the identified components coupled together where appropriate. The exemplary embodiment may provide a

finished look (which may be aesthetically pleasing), as each of the internal components (such as the pogo pins, the electrical connectors, and even the electronics module) are relatively concealed or masked with the first temple.

[0118] Fig. 10 shows a close up of the end piece **305** of the exemplary device. As shown the conductor **303** of the pogo pins are partially exposed so as to be capable of forming an electrical connection with the lens housing. The vertebra **304** cover a portion of the pogo pins, and also provide the ability for the first temple **300** to move relative to the lens housing, while remaining coupled thereto.

[0119] The above description is illustrative and is not restrictive. Many variations of the invention will become apparent to those skilled in the art upon review of the disclosure. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the pending claims along with their full scope or equivalents.

[0120] Some embodiments provided herein may thereby convey some of the advantages of utilizing a spring mechanism on eyeglass frames to embodiments comprising electro-active frames. For example, the use of the spring mechanism may provide for a better and/or more comfortable fit for the wearer, while providing the first conductive path from the first temple to the lens housing may allow for embodiments to utilize electronic components located on either or both of the lens housing (and/or the lens) and the temple. In addition, some embodiments may also provide the advantage of conserving power (and/or the lifetime of the electronics) by providing a conductive path from the temple to the lens housing for some positions of the temple relative to the lens housing, while not providing the conductive path in one ore more other positions.

[0121] Exemplary Embodiments Comprising Separate Conductive Paths

[0122] Some embodiments disclosed herein may provide for electro-active frames comprising multiple conductive paths that are electrically isolated from one another. As more sophisticated electronics are provided on electro-active frames, it may be necessary to provide for additional electrical connections between multiple components. To function properly, these electrical connections (and the conductive paths that provide the electrical signals and current) must be separated (*i.e.* electrically isolated) to properly control multiple components (or, if an electrical component must be supplied power and control signals, this may also require multiple electrically isolated paths as well). Often times, electrical components are located in the temple of the electro-active frames (typically because there

may be more space to dispose such components therein in an aesthetically acceptable manner). Housing electronic components in the temple may require that electrical connections are made between these components in the temple and any electrical components coupled to the lens housing (which may include the lenses themselves).

[0123] Embodiments may provide that these conductive paths from the temple to the lens housing of an electro-active frame are provided by frame elements of electro-active frames. As used herein, a "frame element" is any structural component of a frame (including the frame itself) or a component embedded therein such as a wire, conductor (such as metal), or conductive rubber. Thus, for instance, a frame element may include a temple, a bridge, a lens housing (*e.g.* rim wire for full rimmed or semi-rimless frames, hinges that connect to the lens housing and the temple, and/or other lens housings such as screws, nylon monofilament, etc) or portions thereof. A frame element does not comprise exterior components attached to the frame, such as a wire that runs along an outer surface. In this manner, by providing the conductive paths in a frame element or elements, the electro-active frames may remain aesthetically pleasing by not having bulky cords or other connections running across the frames or in locations where they may be visible.

[0124] Electro-active frames, and in particular electro-active frames that have electrical components in one or both lenses, often comprise multiple electronic components such as driving and control components (*e.g.* one for each lens). This can result in expensive devices with duplicative components. The inventors have found that by, for instance, providing multiple isolated electrical paths using frame elements, is may be possible to reduce the number of duplicative electrical components and thereby significantly decrease the costs of such devices (*e.g.* by only a single electronics module that may control both of the lenses). That is, the electronic components (such as the power supply, the controller (such as a micro-processor), and the sensor mechanism (such as a switch that can activate the device) are often the components that are of the greatest expense (or are at least are relatively expensive in comparison to some of the other components of the frames). By reducing the number of components in each device, the inventors have provided the benefit of decreasing the costs associated with fabrication materials and decreasing the complexity and time of manufacture. Moreover, frame designs may be lighter and more structurally durable, as there are less components disposed thereon.

[0125] Described below are exemplary embodiments of devices comprising conductive paths provided by one or more frame elements (or components thereof) from the temple of a

device to the lens housing. The embodiments described below are for illustration purposes only and are not thereby intended to be limiting. After reading this disclosure, it may be apparent to a person of ordinary skill that various components as described below may be combined or omitted in certain embodiments, while still practicing the principles described.

[0126] A first device is provided that comprises a frame. The frame further includes a lens housing adapted to support a first lens and a second lens, a first temple coupled to the lens housing, and a second temple coupled to the lens housing. The first device further comprises a first conductive path provided by one or more frame elements from the first temple to the lens housing and a second conductive path provided by one or more frame elements from the first temple to the lens housing. That is, the first device, through the use of two conductive paths, may provide, for instance, multiple electrical connections between two devices (*e.g.* one connection that provides power and the other that provides a control input), or between a plurality of devices (*e.g.* a control module or power supply that provides a signal or current to two different components, such as to two electro-active lenses). In this regard, the first conductive path is electrically isolated from the second conductive path. Embodiments may thereby provide the ability to send separate signals (for instance, power and a control signal) from electronics that are housed in the temple to those located on the lens housing. It should be noted that an electrical component need not be located on the lens housing (for instance, an electrical component may be located in a lens of the device). The device in some embodiments need only provide a conductive path from the temple (*i.e.* any part of the temple or a component thereon) to the lens housing. The conductive path may further extend to the lenses or to another component disposed thereon (or it may even extend through the lens housing and to the other temple).

[0127] It is often desirable (and/or necessary) for electrical components to be located or disposed on the lens housing to serve their intended purposes. For instance, if an electronic component displays an image to the viewer, changes the refractive index of the lens, or otherwise provides functions related to the wearer's vision, then these components may need to be located on (or near) the lenses. However, as noted above, the lens housing (or the lenses themselves) often does not have adequate space for the additional electrical components that may be required to activate and/or utilize the electronic components located on the lens housing or lenses (such as a power source, controller, or sensing module). In addition, these components may be aesthetically unpleasing and noticeable if disposed on the lens housing (or the lenses themselves). It may therefore be desirable in some embodiments to locate some or all of these additional electrical components on (or within) the temples of

the frame. The temples typically have space available on which the additional electronic components may be disposed on and/or hidden or masked so as to remain aesthetically appealing.

[0128] However, as noted above, it may be necessary to provide a conductive path between the components in the temple and those located on the lens housing (or on the lenses). By using the frame element (*e.g.* the components themselves or conductors embedded therein), the inventors have developed embodiments of a device that may provide the necessary conductive paths to the lens housing, while maintaining the aesthetics of the device. Moreover, by electrically isolating the components so as to provide separate conductive paths, the inventors have developed embodiments of a device that may provide multiple inputs and connections to electrical components that may be coupled to the lens housing.

[0129] In some embodiments, the first device as described above further comprises at least one electrical insulator disposed between at least a portion of the first conductive path and the second conductive path. By "at least a portion" it is meant that electrical insulator need not be disposed along the entire first or second conductive paths (or along an entire interface between the two paths). Embodiments may provide different ways of electrically isolating the two conductive paths that may, for instance, combine the use of the insulator with other components or features (such as by providing an air gap between the two conductive paths in a region) and/or may utilize multiple insulating materials.

[0130] The electrical insulator may be made of any suitable material, and may in some embodiments (such as embodiments where the conductors are embedded within a frame element) comprise a part of a frame element (such as when the frame element comprises a plastic material). For instance, in some embodiments, the electrically insulating material may comprise an injection moldable or similarly formed plastic material. In some embodiments, the electrically insulating material comprises nylon. The electrical insulator may be utilized in some embodiments in which the frame element comprises conductive material, and thereby two electrical paths may utilize the insulating materials to form the two conductive paths (although as described below, other methods may also be used when the frame elements comprise conductive material to isolate two conductive paths - such as by separating the paths using an air gap). Additional exemplary embodiments related to similar embodiments are shown in Figs. 11-12. In addition, embodiments may comprise multiple electrical insulators (for instance multiple pieces of the same material or different material) and the insulating material may be located along different portions of the electrical paths (for

instance, a portion of the insulating material may be located in the temple and another portion of the insulating material may be located in the lens housing).

[0131] In this regard, in some embodiments, the first device further comprises a first hinge coupled to the first temple and the lens housing. The first hinge may connect the temple to the housing, and allow the temple to move relative to the housing. The electrical insulator may be located at least within the first hinge. For instance, in some embodiments, a portion of the electrical path or paths may comprise the hinge (that is, the hinge may comprise conductive material or conductive material may be embedded therein). The hinge may comprise a portion of the conductive paths in some embodiments because it is coupled to both the lens housing (or comprises a part of the lens housing) and the temple, and thereby may provide a conductive path between the two frame elements. An example of a hinge comprising a portion of a conductive path is shown in Figs. 2(a) (*e.g.* path **205**-**206**) and (b) (*e.g.* path **214**-**215**). The hinge may, for example comprise conductive material, and an insulator may be disposed therein so as to define two electrically isolated conductive paths. However, as noted above, the electrical insulator may be located in any suitable location, or in multiple locations, as needed. For instance, in some embodiments, the electrical insulator is located at least within the first temple. In some embodiments, the electrical insulator is located at least within the lens housing. This may be preferred, for example, in embodiments of semi-rimless frames wherein a partial eye-wire (which may be used to mask or hide an embedded conductor or conductors) is present only over one portion of the lenses (*e.g.* the top or the bottom of the lenses). The two conductive paths may be located in the partial eye wire, and the electrical insulator may be used to separate the two paths.

[0132] In some embodiments, the first device as described above further comprises an electronics module that is coupled to the first temple of the frame. As noted above, the electronics module and other components may be preferably located on the temple in some embodiments for both practical and aesthetic reasons. The electronics module may comprise, for example, a controller, a power source, and/or a sensing mechanism. Some or all of these components may be used to operate electrical components located on the lens housing, which may thereby require an electrical contact between the electronics module and the component. In this regard, the first and second conductive paths may be electrically connected to the electronics module. In this manner, the electronics module (or the components therein) may be electrically connected to components coupled to the lens housing (such as those located in the lenses for the first device). In some embodiments, the use of frame elements to provide portions of the conductive paths, in addition to the electronics module being embedded in the

first temple, results in a device that may appear to an observer to be an ordinary (non-electro-active) frame. Furthermore, in some embodiments, the electronic components (*e.g.* coupled to an embedded electronics module) and the conductive paths (comprising a fame element or elements) may be protected from the elements, and may, for example, reduce the likelihood that a short may occurs from an outside charge or force.

[0133] In some embodiments, the first device as described above further comprises a first lens having a first electrical contact and a second lens having a second electrical contact. That is, some embodiments of the first device may comprise electro-active lenses (such as lenses that perform different function when current is supplied to them or a component therein). To provide current to the electro-active lens or components therein, the lenses may comprise one or more electrical contacts. In some embodiments, the first conductive path electrically connects to the first electrical contact of the first lens and the second conductive path electrically connects to the second electrical contact of the second lens. That is, the first conductive path may electrically connect to the first lens and the second conductive path may electrically connect to the second lens. In this manner, for example, embodiments may provide that a single electrical component (or electronics module) that is coupled to both the first and the second conductive paths may provide signals and/or current to the first and second lens of the device separately. For instance, embodiments may provide for the first and second lens to be controlled separately utilizing the electrically isolated conductive paths. Rather than a single electrical component (or electronics module), the first lens and the second lens may be individually controlled by separate electrical components (*i.e.* the first and second conductive path may, but need not, electrically connect to a single component).

[0134] In some embodiments, in the first device as described above that comprises a first lens having a first electrical contact that is electrically connected to the first conductive path, and a second lens having a second electrical contact that is electrically connected to the second conductive path, the first lens may further include a second electrical contact and the second lens may further include a first electrical contact. That is, the first and the second lenses may each comprise a first and a second electrical contact such that each may receive a plurality of signals or currents from one or more electrical components. In some embodiments, the first conductive path may electrically connect to the first electrical contact of the second lens and the second conductive path may electrically connect to the second electrical contact of the first lens. In this regard, the first lens and second lens may each be electrically connected to both the first and second conductive paths. Such embodiments may, but need not, provide for simultaneously controlling both the first and the second lens using a

single electronics module or other components. Embodiments may thereby utilize, for example, a single electronics module that is electrically connected to both the first and second lenses.

[0135] As was described above, the use of a single electronics module and/or electrical components (such as those that may be coupled to the first temple of the device) to control a plurality of electrical components (such as those that are coupled to the lens housing and/or electro-active lenses of the first device) may provide several benefits. This includes, for example, removing redundant electrical components, and thereby reducing the manufacturing costs and complexity of the first device without sacrificing functionality. Such embodiments may also remove the need to synchronize the first and second lenses. That is, for example, if the first and second lenses are electro-active lenses and are controlled using two different electronics modules (or components therein), the operation of each may have to be matched with the other (otherwise, a wearer may become distorted or receive conflicting functionality from the lenses). Synchronizing the lenses could require additional electrical components and further add to the cost and the complexity of the first device.

[0136] Indeed, in some embodiments, the second temple or the second lens does not comprise an electronics module coupled thereto. In this manner, the electro-active frames may comprise less redundant features by utilizing a single electronics module (or the components therein) electrically connected to both the first and second lenses (or other components coupled to the lens housing). In some embodiments, the use of two electrical connections (*i.e.* via the first and second conductive paths) may be the minimal number of electrical contacts needed for electrical components located on the lens housing or the electro-active lenses (*e.g.* the first and second lenses) to function properly.

[0137] In some embodiments, in the first device as described above, the lens housing comprises a non-conductive material and the frame element providing the first conductive path (or a portion thereof) comprises a conductive material embedded in the lens housing. That is, the conductive path may comprise material embedded in the lens housing. This may provide the benefit that the lens housing material itself may electrically isolate the first conductive path from other components (such as the second conductive path). Also, utilizing a non-conductive material for the lens housing (rather than a conductive material) may prevent short faults with the electronic components, or false signals generated by outside sources (such as by static electricity). In some embodiments, the frame element providing the second conductive path (or a portion thereof) comprises a conductive material embedded in

the lens housing. In such embodiments, the frame elements providing the portions of the first and second conductive paths may be embedded within the lens housing such that a sufficient amount of non-conductive material (*e.g.* the material that comprises the lens housing) is disposed between the two conductive paths such that they remain electrically isolated. In some embodiments, additional electrical insulation may be provided and embedded within the lens housing as well. In some embodiments, the lens housing comprises acetate. Acetate is one of the more common materials that eyeglass frames comprise. It is non-conductive and it may therefore be preferable to use this material for some of the embodiments described above utilizing non-conductive materials.

[0138] In some embodiments, in the first device as described above where the first device comprises a first and second lens having first and second electrical contacts, where the first conductive path electrically connects to the first contact of the first and second lens, and where the second conductive path electrically connects to the second contact of the first and the second lens, the lens housing may comprise a conductive material. A first portion of the lens housing may provide at least a part of the first conductive path. That is, a portion of the lens housing that comprises a conductive material may form an electrical connection between the first electrical contact of each of the first and second lenses. An exemplary embodiment of this is shown in Figs. 11 and 12, and described in detail below. In some embodiments, at least a part of the second conductive path is provided by a second portion of the lens housing. That is, for example, the lens housing may be separated into a plurality of electrically isolated portions. This may be done in any manner, such as by having two separate conductive pieces that are shaped appropriately (*e.g.* shaped into the mold of the lens housing portions such that when coupled to the first device, the first and second portions may support the lenses) and coupling the two portions to the first device (such as by coupling the portions to hinges or the temples) so that the portions remain are physically separate (*i.e.* electrically isolated).

[0139] In this manner, some embodiments may offer some advantages over other designs for providing electrically isolated conductive paths such as, by way of example, providing a less complicated manufacturing process. That is, for embodiments where the lens housing itself comprises conductive material, there may be no need to provide conductive material embedded within the lens housing (which could be a complex and intricate process, particularly when attempting to define multiple electrically isolated conductive paths. By utilizing a more macro approach such as physically separating the large conducting components of the frame to form the conductive paths (*e.g.* a top portion **1101** and a bottom portion **1102** that are separated at the ends **1104** and **1105** where they may be coupled to the

temples (or a hinge) of the first device and in the center **1103** by an air gap or insulation), embodiments may provide a readily achievable and commercially feasible design for providing the electrically isolated conductive paths.

[0140] Continuing with these exemplary embodiments, wherein the first device comprises a first and second lens having first and second electrical contacts, where the first conductive path electrically connects to the first contact of the first and second lens, where the second conductive path electrically connects to the second contact of the first and the second lens, where the lens housing comprises a conductive material, where a first portion of the lens housing provides at least a part of the first conductive path, and where at least a part of the second conductive path is provided by a second portion of the lens housing, the first portion of the lens housing and the second portion of the lens housing may be separated by at least one of an air gap or insulating material. This may again be illustrated with reference to the exemplary embodiments in Fig. 11 and 12, where the electrical isolation between the first **1101** and the second **1102** conductive paths is an air gap at the bridge **1103**. Other points of electrical isolation are provided at the edges of the lens housing **1104** and **1105** where the first portion **1101** and second portion **1102** of the lens housing are coupled to the temples at different locations. In some embodiments, rather than an air gap at the bridge **1103**, electrical insulation may be used. This may provide an advantage over the air gap embodiments because the portions **1101** and **1102** above and below the air gap are likely to, at some point, be misshaped such that the electrical isolation may be compromised (particularly when considering the daily abuse that eyeglasses may be subject to). In contrast, if insulation is used at **1103**, even if the portions **1101** and **1102** change shape, there may still be insulation disposed between the two portions, thereby potentially maintaining the electrical isolation. As noted above, in some embodiments, the bridge **1103** includes the first portion **1101** and the second portion **1102** of the lens housing (or portions thereof) and the air gap may be formed there. In some embodiments, the air gap has a maximum distance of at least approximately 10 mm. This distance for the air gap may provide enough separation between the first **1101** and second portion **1102** that the air gap is unlikely to be compromised during everyday use. In some embodiments, the first portion of the lens housing and the second portion of the lens housing comprise metal.

[0141] Continuing further with these exemplary embodiments, in some embodiments, where the first device further comprises at least one electrical insulator disposed between at least a portion of the first conductive path and the second conductive path, the electrical insulator may include a first component and a second component. The first component of the

electrical insulator disposed between the first conductive path and the second conductive path comprises the first lens and the second lens. That is, again with reference to Fig. 11 for illustration purposes only, the first portion of the insulation may refer to the separation provide by the first **1106** and second **1107** lenses. That is, in some embodiments, the lenses are not made of a conductive material (or comprise embedded conductive materials) such that current could flow from the first portion **1101** to the second portion **1102** of the lens housing. In some embodiments, the second component of the electrical insulator disposed between the first conductive path and the second conductive path includes at least one of: an air gap and an electrically insulating material. That is, again with reference to Fig. 11, the second portion of the insulation may refer to the separation provided at the bridge **1103**. In some embodiments, the second component of the electrical insulator is disposed between the first lens and the second lens. In this manner, the second portion of the insulator may prevent current from flowing between the two components and thereby compromising the electrical isolation of the first and second portions of the lens housing.

[0142] In some embodiments, and as noted above, the electrically insulating material that electrically isolates the first portion of the lens housing from the second portion of the lens housing may comprise an injection moldable or similarly formed plastic material. This material may be preferred because of its ability to mold its shape to the particular area it is confined to. Moreover, because it is injection moldable, it may be easier to apply this material to portions of the frame, such as embedding within the lens housing or the bridge area. In some embodiments, the electrically insulating material comprises nylon.

[0143] In some embodiments, the first device as described above may comprise semi-rimless eyeglass frames. As defined above, in some embodiments, semi-rimless eyeglass frames typically have partial eye-wires around some of the first and second lenses to provide support. It may be preferred that the first and second conductive paths are provided in this portion of the semi-rimless eyeglass frames because, for instance, the eye-wire is typically the thicker portion of the lens housing (*i.e.* this portion may be better able to hide the electrical components, and may also better protect the electrical connections from damage) in comparison to the nylon monofilament or other material that may be used on the remaining sections of the lenses to hold them in place. In this regard, in some embodiments, the first conductive path and the second conductive path are each disposed within the lens housing of the semi-rimless spectacles. For semi-rimless frame design embodiments, both of the electrical conductors that comprise the first and second conductive paths, respectively, may be disposed over the top of the lens (or the bottom, depending on the style of frames and/or

where the portion of eye-wire (or the thicker portion of the lens housing) may be located). The first and second conductive paths may be separated by an electrically insulating material. That is, for instance, the lens housing in a semi-rimless design may comprise eye-wire (or any other suitable lens housing components) over the top portion of the first and second lens. This portion of the lens housing may comprise both the first and the second conductive paths, as well as an insulating material (such as nylon) disposed between the conductive paths such that the first and second conductive paths may be both electrically coupled to the first and second lens, and remain electrically isolated from the other.

[0144] In some embodiments, in the first device as described, the lens housing comprises full rimmed spectacle frames. Exemplary embodiments are shown again in Figs. 11 and 12, but embodiments art not so limited. For example and as described above, full rimmed design embodiments may also comprise the first conductive path and the second conductive path provided by materials embedded within the lens housing. That is, embodiments are not limited to using only lens housing that comprise conductive materials. The full rim embodiments may include lens housings that comprise metal or plastic (or some combination thereof). In general, full rimmed designs may be preferred from a functional standpoint as the eye-wires that many such embodiments comprise may provide a ready means, as described in examples above, of providing a first and second conductive path from the temple to the lens housings, and/or from the lens housings to the lenses.

[0145] Although embodiments may provide one or more conductive paths from a temple to the lens housing which may, in some embodiments, provide one or more advantages related to reducing the number of components used for the electro-active frames, embodiments are not so limited. Indeed, the concepts discussed and described above may be equally applicable to embodiments that comprise multiple electronics modules and/or other components located on both the first and the second temple. In general, these embodiments may present advantages over single module embodiments such as, for instance, greater flexibility in controlling the individual components (such as electro-active lenses) by having individual controls located on each temple for each (or both) components. Provided below are additional exemplary embodiments:

[0146] A first device is further provided that comprises a frame. The frame further comprises a lens housing adapted to support a first lens and a second lens, a first temple coupled to the lens housing, and a second temple coupled to the lens housing. The first device further includes a first conductive path provided by one or more frame elements from

the first temple to the lens housing, a second conductive path provided by one or more frame elements from the first temple to the lens housing, a third conductive path provided by one or more frame elements from the second temple to the lens housing, and a fourth conductive path provided by one or more frame elements from the second temple to the lens housing. As noted above, the use of frame elements provides many advantages over systems that may utilize exposed wires or other methods for establishing a conductive path between a temple of the frame and the lens housing. In the first device, each of the first, second, third, and fourth conductive paths are electrically isolated from each other. As noted above, it is generally beneficial to provide multiple electrically isolated conductive paths so as to control multiple electronic components and/or provide additional functionality, such as by providing power and signal paths to the components.

[0147] The first device as described above in some embodiments may provide the advantage that multiple electronics modules and/or electronic components may be disposed on either or both of the temples of the electro-active frame. This may, for instance, allow for more functionality than single module embodiments, based on, for instance providing for additional electronics to be included on the first device. Moreover, by providing electronics modules on both temples, embodiments may provide the advantage of not having to utilize a conductive path across the bridge of the frames to power/control electronic components on both sides of the lens housing. This may, in some embodiments, reduce the complexity of manufacturing that portion of the electro-active lens frame. In addition, in some embodiments, the conductive path across the bridge may be the location in which the electrical isolation between the various conductive paths is more likely to be compromised. Some embodiments may also provide for a more robust electro-active frame (and/or lens system), with potential backup systems and redundancy provided for the electronic components on each temple.

[0148] In some embodiments, in the first device as provided above, the first conductive path is electrically isolated from the second conductive path by an electric insulator and the third conductive path is electrically isolated from the fourth conductive path by an electric insulator. The insulator may comprise any suitable material and may be located in any suitable location, such as at least in the temple, hinge, or lens housing, as described above. In some embodiments, the first device further includes a first electronics module that may be disposed on the first temple and a second electronics module disposed on the second temple. Such embodiment, as noted above, may provide the advantages of controlling multiple

elements (such as electro-active lenses) individually, or providing a redundancy system so that the electro-active lenses may function after a failure in one of the electronics modules.

[0149] In some embodiments, the first device further includes a first lens having a first electrical contact and a second electrical contact and a second lens having a first electrical contact and a second electrical contact. In some embodiments, the first conductive path may electrically connect to the first electrical contact of the first lens, the second conductive path may electrically connect to the second electrical contact of the first lens, the third conductive path may electrically connect to the first electrical contact of the second lens, and the fourth conductive path may electrically connect to the second electrical contact of the second lens. In some embodiments, the first and second conductive paths electrically connect to the first electronics module and the third and fourth conductive paths electrically connect to the second electronics module.

[0150] That is, it may be the case that in some embodiments, the conductive paths that are provided from the first temple to the lens housing are segregated in both position and function from the conductive paths that are provided from the second temple to the lens housing (however, embodiments are not so limited). For instance, in some embodiments comprising electro-active lenses, the first and second conductive paths may be electrically connected to the first lens and the third and fourth conductive paths may be electrically connected to the second lens. In some embodiments, neither the first nor second conductive path is coupled to the second lens. Similarly, in some embodiments, neither the third nor the fourth conductive path may be electrically coupled to the first lens. In this regard, the first and second electrical paths may be electrically isolated from the third and fourth conductive paths based largely on the fact that there is no overlap in function or coverage. That is, for instance, the first and second conductive paths may be on a first side having a first lens, and the third and fourth conductive paths may be on a second side of the lens housing having the second lens. This, as noted above, in some embodiments, there may be no need to have a conductive path across the bridge. However, embodiments are not so limited, and any or all of the conductive paths may cross the bridge of the electro-active frames.

[0151] With reference to Figs. 11-13, exemplary embodiments of the first device comprising a plurality of electrically isolated conductive paths disposed on an electro-active spectacles frame are provided. With reference to Fig. 11, an exemplary embodiment of a device comprising electro-active lenses housed within an electro-active frame is provided. As described above, one or more electronic modules that can activate and deactivate one or

both of the electro-active lenses **1106** and **1107** can be positioned within either or both temples of the electro-active spectacle frame.

[0152] As shown in Fig. 11, a full rimmed electro-active spectacle frame is provided. Moreover, as shown, Fig. 11 is an example of an exemplary embodiment in which the lens housing may comprise conductive material. As was described above, embodiments are not so limited.

[0153] The exemplary device in Fig. 11 comprises an upper rim portion **1101** (*i.e.* a first portion of the lens housing) that may comprise a portion of a first conductive path. The upper rim portion **1101** can be made of metal in some embodiments, but is not so limited. The first conductive path can provide a first link (*i.e.* an electrical connection) between an electronics module and a first electronic contact or terminal (not shown) of one or both electro-active lenses or any other electronics components that may be located on the lens housing.

[0154] Continuing with the description of the exemplary embodiment shown in Fig. 11, the exemplary electro-active spectacle frame comprises a lower rim portion **1102** (*i.e.* a second portion of the lens housing) that may comprise a portion of a second conductive path. The lower rim portion **1102** may also be made of metal, but is not so limited and any conductive material may suffice. The second conductive path may provide a second link (*i.e.* electrical connection) between the electronics module and a second electronic contact or terminal (not shown) of one or both electro-active lenses or any other electronics components that may be located on the lens housing.

[0155] By providing the upper **1101** and lower **1102** rim portions, embodiments may provide separate conductive routes to both electro-active lenses **1106** and **1107**. Thus, in some embodiments and as described above, the electro-active lenses (or any other components located on the lens housing) can be controlled/powered by a single electronics module positioned on either the right or left temple portion of the electro-active frame. However, embodiments are not so limited and may provide for multiple electronics modules located on either or both of the temples.

[0156] As shown in Fig.11, the upper **1101** and lower **1102** rim portions, which may comprise a portion of the first and second conductive paths, respectively, may together form a bridge **1103** of the electro-active spectacle frames. The bridge **1103** of the electro-active spectacle frames can be formed without having the upper **1101** and lower **1102** rim portions touching (*i.e.* in physical or electrical contact), so as to ensure separate conductive paths (*i.e.* maintain the first and second conductive paths as electrically isolated from one another). In

addition, the upper **1101** and lower **1102** rim portions are physically and electrically separated at the ends **1104** and **1105**, so as to maintain electrical isolation from the other. The upper **1101** and lower **1102** rim portions may be coupled to a hinge, temple, or other frame component at the ends **1104** and **1105**, but at different locations so as to remain electrically isolated from each other. The rim portions may also be electrically connected to the other portions of the first and second conductive paths at the ends **1104** and **1105**.

[0157] With reference to Fig. 12, an exemplary illustration of an aesthetic component is provided (*e.g.* a design mask). The design mask comprises an upper snap-on element **1201** and a lower snap-on element **1202**. The upper **1201** and lower **1202** snap-on elements can be positioned on top of the upper rim portion **1101** and the lower rim portion **1102**, respectively. The upper **1201** and lower **1202** snap-on elements may comprise a non-conductive material, such as plastic, but are not so limited. The upper **1201** and lower **1202** snap-on elements can be used to alter the style or design of the electro-active spectacles.

[0158] With reference to Fig. 13, an exemplary temple **1301** is shown that may comprise a part of an electro-active spectacles frame. One or more electronic components, such as an electronics module, may be coupled to the temple **1301**.

[0159] Embodiments Comprising A Compliant Conductive Element

[0160] Previously, the inventors developed novel electro-active spectacle lenses that may be manufactured as semi-finished lens blanks capable of being surfaced and edged using methods known to those skilled in the art into finished spectacle lenses that, for instance, correct a patient's vision (or provide other beneficial functionality, such as tinting, polarizing, filtering, etc.) and fit within a spectacle frame. The inventors have also developed novel electro-active spectacle frames of various designs capable of operating and/or functioning with electro-active spectacle lenses and/or other electronic components, including, for example, the exemplary embodiments disclosed above.

[0161] As described therein with reference to exemplary lens design and manufacture, in some embodiments, the finished lenses may be processed from semi-finished lens blank using methods and equipment that may be known to those skilled in the art. In this regard, a means for making electrical connections between the frames and the lenses that is consistent with some or all of those methods and equipment may also be beneficial. In other instances (or in congruence), it may be beneficial to provide electrical connections between various components disposed on, or within, electro-active frames that may also provide flexibly, adaptability, durability, and/or more reliable electrical contacts.

[0162] As detailed below, a means for making such electrical connections (*e.g.* in a manner that may be consistent with currently used lens processing methods and/or frame designs) is provided. The means for providing the electrical connections between components of an electro-active fame (such as the connections from the lens to the frame), as described herein, may comprise a compliant conductive element. In this manner, embodiments may allow for a robust and forgiving connection consistent with the requirements related to the regular stress experienced by eyeglasses (such as when taken on and off one's face, being dropped, worn when sleeping, struck with objects, bent by small children, etc.). In addition, embodiments comprising a compliant conductive element that provides electrical connections as described herein may be utilized for any and all uses whereby the eyeglass frames houses some, most, or all of the electronics and the lens comprises a component or components that must be activated and or deactivated by an electrical current.

[0163] As used herein, a "compliant conductive element" may refer to a physically compliant and compressible material that is electrically conductive. That is, for instance, the material typically has the properties that it is physically malleable (*e.g.* capable of being deformed, at least along a surface) but is still electrically conductive such that is may comprise a portion of a conductive part. The conductive compliant element may comprise, by way of example only, conductive rubber. Conductive rubber may include, but is not limited to, an elastic hydrocarbon polymer. A particular not limiting example of material that may comprise a compliant conductive element includes a metal loaded silicone elastomer. The compliant conductive element may be preferably extruded or otherwise molded into a shape that may conform to portions of either (or both) of the lens housing and lens so as to form an electrical connection (*e.g.* an electrically conductive bridge) between the lens and lens housing. The compliant conductive element may also be used to form electrical connections between other portions of the frame and/or other electrical components.

[0164] With some or all of the above in mind, a first device may be provided. The first device may include a lens comprising at least a first electrical contact. That is, for instance, the first lens may comprise an electro-active lens such that the lens may provide a particular functionality, feature, or property when current or voltage is supplied that it may not provide when no current or voltage is supplied (or the functionality may vary based on the amount of current or voltage supplied, etc.). Examples of such lenses were provided above. The electrical contact of the first lens may be utilized to electrically couple the lens (or a portion thereof) to other electronic components (such as, for instance, a controller or power supply)

that may provide such voltage or current (*e.g.*, in the form of a control signal or power supply).

[0165] The first device may also comprise a lens housing holding the lens. The lens housing may include at least a second electrical contact. That is, for instance, the lens housing (such as was defined above) or a component therein may comprise a part of a conductive path, and the second electrical contact may be used to electrically connect the conductive path to another conductive element (which may also be embedded in the lens housing, coupled the lens housing, or comprise any other part of the first device or component thereto, such as the lens).

[0166] The first device may further comprise a compliant conductive element disposed between the first and the second electrical contact that electrically connects the first and second electrical contacts. That is, the compliant conductive element may be disposed such as to provide current between the first electrical contact and the second electrical contact (in this exemplary case, between the lens and the lens housing). In this manner, embodiments may supply current (*e.g.* power or a control signal) from a component coupled to another portion of the first device (*e.g.* on a first temple of an electro-active frame) to the lens via the lens housing.

[0167] As noted above, the use of a compliant conductive element may, in some embodiments, provide some advantages over previously used conductors and other means of connecting components in an electro-active frame, particularly when forming connections to an electro-active lens. For instance, the use of a compliant conductive element (as described above) may form better electrical connections to the surface of an electrical contact (particularly shaped surfaces, such as beveled edges) because the compliant conductive element may conform substantially to some or all of those surfaces. In this manner, the interface between the electrical contacts (*i.e.* the area of the connection) may be larger, providing increased electrical conductivity between the two.

[0168] In addition, the use of a compliant conductive element may, in some embodiments, provide for a more robust electrical connection that may withstand external forces more effectively than previously used conductors. That is, in part because the electrical connections between a compliant conductive element and the electrical contacts may comprise a larger area, if a force applied to the device or a portion thereof causes a part of the electrical connection between the compliant conductive element and one of the electrical contacts to be separated (*i.e.* no longer directly electrically connected), there may still be

sufficient contacts in other portions of the interface that may permit sufficient current to transfer between the components so as to result in little or no disruption in functionality of the device.

[0169] In addition, a compliant conductive element may, in some embodiments, conform and/or adapt to changes in the disposition of a first electrical contact in relation to a second electrical contact that it is disposed between (*e.g.* in the exemplary device described above, a compliant conductive element may adapt to changes in the disposition of the lens housing relative to the lens). For instance, if the separation between the lens and the lens housing increases at a location where an electrical contact is formed between the two components using a compliant conductive element, then in some embodiments, the compliant conductive element may expand in that location so as to maintain the electrical contact. Similarly, in some embodiments, if there is an increase in the force applied between the lens housing and the lens (for instance, an external force is applied to the lens housing causing it to be misshaped or displaced in the direction of the lens), the compliant conductive element may compress in the location between the components where the force is applied (this may include a temporary displacement, such as when the conductive compliant component absorbs some or all of the force applied by compressing and then expanding). By so doing, the compliant conductive element may, in some embodiments, absorb stress applied to the first device, and maintain the electrical connection between components.

[0170] Moreover, by absorbing some or all of the forces applied thereto, a compliant conductive element may, in some embodiments, prevent or limit damage to either of the components that comprise the first and second electrical contacts. For instance, if a force were applied to a typical device above that which causes the lens and the lens housing to directly contact, the lens may become chipped at the interface, which could threaten the integrity of the lens, the ability of the lens housing to hold the lens, and/or affect the electrical contacts between the two components. The use of conductive compliant material disposed between portions of these components may reduce or prevent this direct contact, and may serve to absorb such forces and limit damage.

[0171] The use of a compliant conductive element in a first device may, in some embodiments, provide advantages during the manufacture process as well. For instance, as noted above, many lenses are shaped and edged prior to being coupled to a lens housing of an electro-active frame. This may result in slight differences between each lens that is then coupled or housed within a lens housing. In embodiments where an electrical contact is

formed between these components, the use of a compliant conductive element that may adapt or conform to features provided on either of the surfaces of the electrical contacts, as well as the relative disposition between the two components, may reduce manufacturing costs and defects, and provide for more reliable and suitable devices.

[0172] It should be noted that these advantages are provided as examples of the advantages that some embodiments may provide, and therefore embodiments disclosed herein need not have some or all of the advantages described above.

[0173] In some embodiments, in the first device as described above that includes a lens having a first contact, a lens housing having a second contact, and a compliant conductive element disposed between, and electrically connecting, the first and second contacts, the compliant conductive element comprises conductive rubber. That is, conductive rubber is an example of a material that may comprise the compliant conductive element. Conductive rubber may have some of the characteristics, such as physical malleability while also having sufficient conductivity, to provide some or all of the advantages noted above in some embodiments.

[0174] In some embodiments, in the first device as described above that includes a lens having a first contact, a lens housing having a second contact, and a compliant conductive element disposed between, and electrically connecting, the first and second contacts, the compliant conductive element may be disposed substantially between the lens housing and the lens. That is, as noted above, in some embodiments, the compliant conductive element may be disposed between some or all of the portions of the lens and lens housing. In some embodiments, where the compliant conductive element is disposed between substantially all of the portions of the lens and lens housing, embodiments may comprise the compliant conductive element being disposed over the entire outer surface of the lens that is directly opposite to a surface of the lens housing (or only the portions of the outer surface of the lens that have a lens housing surface directly opposing the lens outer surface). In some embodiments, the compliant conductive element may be disposed between portions of the lens and lens housing where an electrical connection is not made (*e.g.* portions of the lens and lens housing not comprising an electrical contact). This may provide some of the benefits detailed above, including reducing damage caused by physical contact between the relatively rigid surfaces of the lens and lens housing, even in areas where no electrical connection is made. In some embodiments, the compliant conductive element is only disposed between portions of the lens and lens housing that comprises electrical contacts. The reduction in the

amount of the compliant conductive element may thereby reduce manufacturing costs. An exemplary embodiment is shown in Fig. 25. In addition, in such embodiments, the lens housing may be manufactured so as to comprise different portions corresponding to sections that have the compliant conductive element disposed there between, and those that do not. In so doing, the first device may utilize a more efficient lens housing design to accommodate whether there is or is not compliant conductive material disposed between sections of the lens housing and the lens. Exemplary embodiments are disclosed in Figs. 21-25.

[0175] In some embodiments, in the first device as described above, the compliant conductive element has a shape that comprises any one of, or some combination of: a triangle, a square, a "figure 8," an oval, a circle, or a rectangle. As used herein, the "shape" of the compliant conductive element may refer to the cross section of the compliant conductive element taken on a plane perpendicular to the longest dimension of the compliant conductive element. For example, in some embodiments where the compliant conductive element is extruded, the shape generally corresponds to the aperture through which the compliant conductive element was extruded. Examples of shapes of the compliant conductive element are shown in Figs. 20(a)-(c).

[0176] In some embodiments, it may be preferred that the shape of the compliant conductive element comprises a "figure 8" because, for instance, the compliant conductive element may provide structural support and assist in coupling the lens and the lens housing. A "figure 8" may refer to a compliant conductive element that has a shape that comprises two end pieces and a center piece disposed between the two end pieces. The two end pieces are thicker than the center piece. The two end pieces need not have the same thickness or the same length.

[0177] In some embodiments, it may be preferred that the compliant conductive element comprise a square or rectangle shape as opposed to a triangle shape (particularly when the lens has a beveled edge), because the square or rectangle shape may provide a greater area of electrical connectivity by conforming to more of the surface of the lens. This is due, in some embodiments, to the "triangle" shape resulting in the edge of the lens compressing the compliant conductive material against an opposing surface of the lens housing without permitting the compliant conductive element to cover the lower portions of the lens surface.

[0178] It should be noted that, in some embodiments, the shape of the compliant conductive element may not conform precisely to a corresponding shape (*e.g.* rectangle, square, etc.) at the surface of the compliant conductive element. That is, at the surface of at

least a portion of the conductive compliant element, the shape of the compliant conductive element may be slightly altered as it conforms to an opposite surface of the lens or lens housing that it is physically contacted with. Thus, the "shape" of the compliant conductive element may refer to either the shape of the compliant conductive element when disposed between the first and the second electrical contacts, or the uncompressed shape of the compliant conductive element (*i.e.* the shape of the compliant conductive element either before it is between the first and second electrical contacts, or before it have a force applied to its surface). In addition, it should be understood that in some embodiments, the compliant conductive element may not comprise any shape, or it may comprise other shapes than those expressly mentioned, including irregular shapes and shapes that vary along the length of the compliant conductive element (*i.e.* the compliant conductive element may not have a single shape, but the shape may depend on the location of that particular portion of compliant conductive element.

[0179] In some embodiments, in the first device as described above, the compliant conductive element includes a first end having a first thickness, a second end having a second thickness, and a center portion having a third thickness that is disposed between, and coupled to, the first end and the second end. The first thickness of the first end and the second thickness of the second end are each greater than the third thickness of the center portion. An exemplary embodiment of this shape is shown in Fig. 20(a). That is, embodiments so described may refer to the conductive element having a shape that corresponds to a "figure 8," which may have some or all of the advantages noted above.

[0180] In some embodiments, in the first device as described above, the compliant conductive element may comprise an extrusion. As used herein, an "extrusion" may refer to an object made by squeezing, or otherwise disposing, material through an aperture that shapes the material. It may be generally beneficial, in some embodiments, to use an extrusion for some or all of the compliant conductive element because, for instance, the use of an extrusion may be an efficient manner of disposing the compliant conductive element between the lens and the lens housing (or between any other two components). The space between the lens and the lens housing may be relatively small (on the order of a millimeter), and therefore an extrusion that may be injected into the cavity (particularly when the material may conform to the shape of the cavity) may be less complex than shaping a conductor into the correct size and shape and inserting it into the cavity. Moreover, it may be less complex to apply the compliant conductive element to portions of the lens housing that may be difficult to access based, for instance, on the design features of the first device. In addition,

embodiments that utilize an extrusions may provide the advantage that compliant conductive element may be disposed between a plurality of different designs of lenses and lens housing, without having to design a specific a component or components for each combination.

[0181] In some embodiments, in the first device as described above, the lens comprises a first surface and the lens housing comprises a first surface. The compliant conductive element substantially conforms to at least a portion of the first surface of the lens and at least a portion of the first surface of the lens housing. As was described above, the compliant conductive element may have physical properties that permit it to adapt and conform to the interfaces of the components it is disposed between based on a force applied to its surface. Thus, in some embodiments, when the conductive compliant element is disposed in the lens housing or cavity thereto (or on a surface of the lens), and when the lens and lens housing are then coupled, a force may be applied to the compliant conductive element disposed between the opposing surfaces of the lens and the lens housing such that the conformation may occur. Embodiments may thereby provide some of the benefits that were described above, including the ability to provide better electrical contacts between electrical contacts, and maintaining those contacts despite changes in the relative positions of the surfaces.

[0182] In some embodiments, the first device as described further comprises a first temple coupled to the lens housing and an electronics module coupled to the first temple. The compliant conductive element is electrically connected to the electronics module. As defined above, electrically coupled does not require that the two components be in direct physical contact. Thus, embodiments may provide that the first device comprises a conductive path from the electronics module to the compliant conductive material. The conductive path could include, for example, a conductor coupled to the electronics module, a portion of the temple itself (or a conductor embedded therein), a portion of the lens housing itself (or a conductor embedded therein), and the second electrical contact. As described above, it may be beneficial both structurally and aesthetically to locate electronic components in the temple of an electro-active frame because, for instance, the additional space provided (as compared to the lens and lens housing) as well as the ability to hide or mask those electronic components relatively out of sight of an observer (or at least not as pronounced a location as the lens housing or frame).

[0183] In some embodiments, in the first device as described above that comprises a first temple coupled to the lens housing and an electronics module coupled to the first temple, the first device further includes a conductor that is substantially embedded within the temple

and/or the lens housing. The conductor may electrically connect the electronic module to the compliant conductive element. The conductor may comprise any suitable material, including metal. Although the conductor in some embodiments may be embedded substantially within the lens housing and/or the first temple, the conductor may have portions exposed so as to make electrical contacts with other components. As was described above, a conductive path may comprise a number of electrically connected components, and therefore using a conductor embedded in either the temple and/or the housing may be a means for efficiently establishing a conductive path from the electronics module to the compliant conductive element. The compliant conductive element may then be electrically coupled to another electronic component (such as an electro-active lens). In this manner, embodiments may provide a conductive path to conduct current (*e.g.* control signals and/or power) from the temple to the compliant conductive material (and then, for instance, to the electro-active lens). As noted above, in some embodiments, a first portion of the conductor may be exposed and electrically connects the electronic module to the compliant conductive element. That is, as used herein, the first portion of the conductor may be "exposed" if it is not surrounded by a the lens housing along at least a portion of the conductor such that an electrical connection may be made to the compliant conductive element.

[0184] In some embodiments, in the first device as described above that comprises a first temple coupled to the lens housing, an electronics module coupled to the first temple, and a conductor that is substantially embedded within the temple and/or the lens housing, the lens housing comprises acetate. As noted above, acetate is a common material used in the manufacture of eyeglass frames, and is generally non-conductive. Thus, in some embodiments, so as to provide a conductive path from the electronics module coupled to the first temple, a conductor may be embedded in the lens housing comprising a non-conductive material. It may be generally preferred that a conductor is embedded within a frame element such that the frame element (or a portion thereof) may isolate a conductive path (or a portion thereof) from external forces, such as potential shorts and/or excess voltages. In contrast, in some embodiments where the lens housing comprises a conductive material, the lens housing itself (or a portion thereof) may comprise a portion of a conductive path that electrically connects the electronic module to the compliant conductive element.

[0185] In some embodiments, the first device as described above comprises semi-rimless, rimless, or fully rimmed spectacle frames. Exemplary embodiments of some of these spectacle frames are described below with reference to the figures.

[0186] In some embodiments, in the first device as described above that includes a lens having a first contact, a lens housing having a second contact, and a compliant conductive element disposed between, and electrically connecting, the first and second contacts, the lens includes a first groove, the lens housing includes a first cavity, and the compliant conductive element comprises a first and a second portion. The first portion of the compliant conductive element may be disposed substantially within the first groove of the lens. This is shown, for example in Figs. 19 and 23-24. As used herein, "disposed within" may refer to a portion of the compliant conductive element being located such that the cavity of the lens housing or the groove of the lens surrounds approximately three sides of the portion of the compliant conductive element. The second portion of the compliant conductive element may be disposed substantially within the first cavity of the lens housing. In this manner, the compliant conductive element may support the coupling of the lens and the lens housing, while at the same time completing electrical connections with electrical contacts on the surface of each of the lens and the lens housing.

[0187] In some embodiments, in the first device as described above, the first portion and the second portion of the compliant conductive element are connected by a bridge. A "bridge" in this context refers to the material that is located between the first and second portions of the compliant conductive material. With reference to Fig. 20 for example, first portions **2002** and **2003** are connected, respectively, to second portions **2005** and **2006** by a "bridge." The bridge in these exemplary embodiments happens to comprise the same material as the first and second portions. However, the bridge may comprise any shape and any suitable material.

[0188] In some embodiments, in the first device as described above where the first portion of the compliant conductive element is disposed substantially within the first groove of the lens, and the second portion of the compliant conductive element is disposed substantially within the first cavity of the lens housing, the first portion of the compliant conductive element has a first shape that comprises any one of: a triangle, a square, a circle, and a rectangle. In some embodiments, the second portion of the compliant conductive element has a second shape that comprises any one of: a triangle, a square, a circle, and a rectangle. In general, it is preferred to choose the shape and dimensions of the portions of the compliant conductive element so as to maximize the electrical contacts that the material can make on the surfaces of the lens and/or the lens housing. In this regard, it may be beneficial to choose shapes that maximize the surface area interface when the conductive compliant element is compressed (usually a shape that corresponds to the shape of either the lens housing cavity or

the lens groove. However, embodiments are not so limited. Examples of shapes are provided in Figs 20(a) – (c). In some embodiments, the lens has a first surface that is located within the first groove and at least a part of the first portion of the compliant conductive element substantially conforms to the first surface of the first groove. The "first surface" may comprise as at least a portion of the outermost surface of the groove of the lens. Again, this is typically the surface forms part of the conductive path with the compliant conductive material. In this regard, In some embodiments, the first surface of the lens is coated with a conductive paint so as to not only contacts the compliant conductive material, but may also provide of an easier and better connection to the components of the electro-active lens.

[0189] In some embodiments, in the first device as described above where the first portion of the compliant conductive element is disposed substantially within the first groove of the lens, and the second portion of the compliant conductive element is disposed substantially within the first cavity of the lens housing, the first groove of the lens has width approximately within the range of 0.4 mm and 1.0 mm and a depth approximately within the range of 0.4 mm and 1.0 mm. In some embodiments, the groove of the first lens has width of approximately 0.7 mm and a depth of approximately 0.6 mm. As described below, the specific dimensions of the components may depend on the functionality of the lens and lens housing. However, generally it is desirable to have the relative dimensions between the width and of the height cavity, the groove, and of the compliant conductive element to be relatively similar. This may permit the compliant conductive element to ser both a structural role (in coupling the lens and the lens housing, as well as serving as a protective layer of sorts between at lest a portion of the lens and the lens component. The dimensions of these components is discussed with reference to Figs. 20 and 23

[0190] In some embodiments, in the first device as described above where the first portion of the compliant conductive element is disposed substantially within the first groove of the lens, and the second portion of the compliant conductive element is disposed substantially within the first cavity of the lens housing, the lens housing has a first surface that is located within the first cavity. The "first surface" may comprise at least a portion of the outermost surface of the cavity of the lens housing. A part of the second portion of the compliant conductive element may substantially conform to the first surface of the first cavity. Similar to the connections that the compliant conductive material forms with the surface of the lens, the compliant conductive element also forms contacts with portions of the lens housing. However, in some (but certainly not all) embodiments the contacts formed with the lens housing are to embedded conductors that have portions exposed and therefore, while

beneficial, it may not be as necessary for the compliant conductive material to conform to as much of the surface of the lens housing as it is to conform with the surface of the lens.

[0191] In some embodiments, in the first device as described above where the first portion of the compliant conductive element is disposed substantially within the first groove of the lens, and the second portion of the compliant conductive element is disposed substantially within the first cavity of the lens housing, the compliant conductive element has an uncompressed height of at least the distance between the first surface of the first groove of the lens and the first surface of the first cavity of the lens housing. The "uncompressed height" of the compliant conductive element is the height of the compliant conductive element when the material is not subject to an external stress. The "height" of the compliant conductive element may refer to the dimension of the element that is substantially perpendicular to the lens housing and the lens. An example illustrating the uncompressed height is shown in Fig. 23(d). In some embodiments, the uncompressed height of the compliant conductive element is at least .75 mm. In some embodiments, the uncompressed height of the compliant conductive element is at least 1.45 mm. However, as noted above, the dimensions of the element may vary based on the other dimensions of the device. Generally, the greater the uncompressed height, the more surface covered (and more electrical connections that can be made) by the compliant conductive element when it is disposed between the lens and the lens housing. In this regard, in some embodiments, the first surface of the lens housing and the first surface of the lens compress at least a portion of the compliant conductive element when the lens housing and the lens are coupled. In this manner, the compliant conductive element can form electrical connections, while also providing ancillary benefits to the device, such as protecting the rigid components from damage from directly contacting one another.

[0192] In some embodiments, in the first device as described above, the lens comprises a first surface, the lens housing comprises a first cavity, and the compliant conductive element comprises a first surface. The compliant conductive element is disposed substantially within the first cavity of the lens housing, and the first surface of the compliant conductive element substantially conforms to the first surface of the lens. In some embodiments, the first surface of the lens comprises a first and second beveled edge. A "beveled edge" may refer to an inclination that is cut into a lens that forms an angle, including an angle equal to 90 degrees. The lens usually comprises a beveled edge (rather than a groove) in embodiments comprising full rimed frames (rather than semi-rimless frames), where the lens may be coupled to the lens housing based on the portion of the lens being disposed inside a cavity of the lens

housing. In some embodiments, the first cavity has a first width and the compliant conductive element has an uncompressed width that is greater than the first width of the cavity. The "uncompressed width" may refer to the width of the compliant conductive element when the rubber is not subject to external stress. This is illustrated in Fig. 23(e) and described below.

[0193] In some embodiments, in the first device as described above, where the compliant conductive element is disposed substantially within a first cavity of the lens housing, and where a first surface of the compliant conductive element substantially conforms to a first surface of the lens, the cavity of the lens housing has a top surface. A portion of the lens extends into the first cavity of the lens housing. The compliant conductive element has an uncompressed height that is approximately equal to or greater than a distance from the top surface of the cavity of the lens housing to the portion of the lens that extends into the first cavity. This concept is illustrated in Fig. 23(d). Generally, the compliant conductive element preferably has a height such that when the lens is disposed in the cavity of the lens housing, a portion of the lens contacts, and thereby compresses the compliant conductive element. As noted above, it is generally beneficial to have a height that is substantially greater than this minimum distance to provide more robust electrical connections. The "top surface" may refer to the surface of the lens housing that is opposite the lens.

[0194] In some embodiments, in the first device as described above, the compliant conductive element comprises metal loaded silicon elastomers. In some embodiments, the metal comprises silver and aluminum (AG-Al). However, any material that has the physical properties described above with reference to the compliant conductive material may be used.

[0195] In some embodiments, in the first device as described above, the compliant conductive element has a volume resistivity that is less than 10 Ω - cm. In some embodiments, in the first device as described above, the compliant conductive element has a volume resistivity that less than 1 Ω - cm. The "volume resistivity" may refer to the electrical resistivity, resistivity, or specific electrical resistance. Generally, it is preferable to have a low volume resistivity for a conductor because there will be less losses associated with the resistance. This may be particularly important in some embodiments, as the compliant conductive element may be compressed, which may thereby increase the density, and concurrently increase the resistivity of the element. Thus, it may be important in some embodiments to choose a material that has a low resistivity, even when uncompressed such that its volume is decreased.

[0196] In some embodiments, in the first device as described above, the compliant conductive element has a hardness on the shore durometer A scale that is greater than 50. In some embodiments, the compliant conductive element has a hardness on the shore durometer A scale that is greater than 65. The hardness of the element refers to its ability to conform to surfaces under pressure, as well as a materials general malleability. As noted above, in some embodiments, to form optimal connections, the compliant conductive element conforms to the shape of the lens and/or lens housing surfaces. In some embodiments, the compliant conductive element has a hardness on the shore durometer A scale that approximate equal to 70 and a volume resistivity of approximately .0008 Ω - cm.

[0197] Although described above with relation to a lens and a lens housing, embodiments are not so limited and may provide for the use of compliant conductive element between any two electrical contacts that may be disposed on any component or components of a first device (*e.g.* an electro-active frame).

[0198] It should be understood that, after reading the disclosure provided herein, a person of ordinary skill in the art may understand that various combination of the devices described above may be made such that some or all of the features described with regards to one device may be combined with some or all of the features of another device.

[0199] Description of Figures Related to a Compliant Conductive Element and Exemplary Embodiments

[0200] Provided below is a more detailed description of some of the figures included herein that may relate to a compliant conductive element, as well as descriptions of the exemplary embodiments disclosed. As noted, these exemplary devices are for illustration purposes and are not intended to be limiting.

[0201] With reference, to Fig. 14, an exemplary electro-active frame **1400** for use with electro-active lenses and/or other electronic components is shown. The exemplary electro-active frame **1400** can comprise lens housing **1404** (such as eye-wire) comprising any material such as, but not limited to, a plastic (*e.g.*, acetate). In some embodiments, the electro-active frame **1400** can be made by a mold or other techniques, such as injection molding. Additionally, some embodiments may provide that the electro-active frame **1400** can be made from one or more separately formed or fabricated pieces that are brought together (*i.e.* coupled) to form a complete electro-active frame.

[0202] The compliant conductive element **1401** (such as, for example, a conductive rubber) may, in some embodiments, be used to conduct an electronic signal from one side of the

electro-active frame **1400** or lens housing **1404** (or one component thereon) to another side of the electro-active frame **1400** or lens housing **1404** (or another component thereon, including a lens **1405**). In some embodiments, the compliant conductive element **1401** may be encapsulated by (*e.g.* substantially surrounded by or embedded within) an insulator (such as the lens housing **1404** that comprises a plastic material). In some embodiments, the compliant conductive element **1401** may be positioned (*e.g.* disposed) inside the electro-active frame **1400** (or the lens housing **1404**) as the electro-active frame **1400** is being fabricated (such as, for instance, during a molding process or an injection molding process). In some embodiments, the compliant conductive element **1401** may also be positioned inside cavities of the lens housing **1404** after the lens housing **1404** has been fabricated. This will be described in more detail below with reference to Figs. 18-25. In some embodiments, the compliant conductive element **1401** may be positioned between two frame halves (or between a plurality of portions of the electro-active lens frame) that are subsequently brought together and sealed.

[0203] In some embodiments, the compliant conductive element **1401** may be positioned in or near the nose bridge **1403** to provide connectivity from a first side of the electro-active frame **1400** (and/or lens housing **1404**) to a second side of the electro-active frame **1400** (and/or lens housing **1404**). The use of such material in the bridge **1403** may permit the nose bridge in such embodiments to be relatively small, which could provide a more aesthetically pleasing frame appearance. These embodiments may also be combined, for instance, with a single electronics module located on one of the temples that provides electronic signals and/or current to both a first lens and a second lens **1405** (that is, the conductive compliant material **1401** may provide a conductive path from a first part of the lens housing **1404** comprising a first lens **1405** to a second part of the lens housing **1404** comprising a second lens **1405**). In some embodiments, the compliant conductive element **1401** may be positioned on the back side of the electro-active frame **1400** (and/or lens housing **1404**) (*e.g.* on the side facing the wearer's head) or buried within (*e.g.*, embedded within) the electro-active frame **1400** (and/or lens housing **1404**).

[0204] Continuing with reference to Fig. 14, at the hinges **1402** of the electro-active frame **1400**, the compliant conductive element **1401** may form one or more electrical contacts with a temple (and/or components disposed thereon) of the electro-active frame **1400**. That is, the compliant conductive material **1401** may form a portion of a conductive path by providing electrical connections at or near the hinge **1402** with conductors disposed on (or coupled to) the temple of the electro-active frame **1400**. In some embodiments, the hinge **1402** itself may

comprise a conductive material and may electrically connect to the compliant conductive element **1401** and a conductor coupled to the temple. In some embodiments, the hinge **1402** may comprise the same material as the compliant conductive element **1401**.

[0205] With reference to Fig. 15, an assembled exemplary electro-active frame **1400** comprising compliant conductive element **1401** disposed within the lens housing **1404** is shown. When positioned (*e.g.* disposed) within the electro-active frame **1400** (and as shown, in lens housing **1404**), the compliant conductive element **1401** need not be visible (*e.g.*, at least a portion of the compliant conductive element **1401** may be disposed or positioned in the lens housing **1404** (*e.g.* the eye wire) of a fully rimmed or semi-rimless frame). Indeed, it may be preferred in some embodiments that the compliant conductive element **1401** is not visible for aesthetic reasons. In addition, embodiments comprising the compliant conductive element **1401** partially or completely embedded within one or more of the frame components may both provide electrical connections and also result in better protection for the conductive path created thereby from exterior forces and stresses, (for instance, the components may be less susceptible to short circuits and/or external electrical voltages and currents).

[0206] Figs. 14 and 15 disclose an exemplary embodiment whereby the compliant conductive element **1401** comprises four separate conductive paths (*i.e.* two on the left side of the lens housing **1404** and two on the right side of the lens housing **1404**). This may provide two separate conductive paths (and two electrical contacts) to each of the lenses **1405**. In this manner, embodiments may make available the necessary electrical connections to provide power and or control signals to electro-active lenses **1405** or other components disposed on the lens housing **1404**. In addition, in embodiments where the compliant conductive element **1401** (or other conductor) is also located in the bridge **1403**, the lens housing **1404** may comprise two conductive paths – a first that electrically connects to a first electrical contact on each of the lenses **1405**, and a second conductive path that is electrically isolated from the first conductive path and that electrically connects to a second electrical contact of each of the lenses **1405**. Similar embodiments were discussed with reference to Single Electronics Module embodiments disclosed above.

[0207] Figs. 16 and 17 illustrate the assembly of a portion of an electro-active frame. In some embodiments, the frame may comprise core **1601** that may comprise, for example, a steel wire. The exemplary components as shown are similar to those discussed with reference to Figs. 3-10. Specifically, the components as shown for the exemplary electro-active frame include: A core element **1601**, which may in some embodiments comprise a

conductive material and may be coupled to or disposed within the temple **1602** so as to provide a portion of a conductive path from one component to another. As shown, the core element **1601** may, for instance, provide a conductive path from the temple end (which may comprise, *e.g.*, a power source) to the electronics module **1605**. A housing module **1603** is shown, which may house the electronics module **1605** and be coupled to the temple **1602**. In some embodiments, the housing module **1603** may comprise a portion of the temple **1602**. A switch **1604** (such as a capacitance or "cap" switch) is shown, which may be coupled to the electronics module **1605** and/or the housing module **1603** to provide a switch or control for the electronics module **1605**. For instance, and as shown in Fig. 16, the housing module **1603** may have an opening that may allow a wearer to interact with switch **1604** so as to turn a function on or off, or to otherwise vary the functions provided by an electro-active spectacle. The electronics module **1605**, the switch **1604**, and the housing module **1603** may be coupled using any suitable manner, including one or more screws (as shown in Fig. 16) and/or two sided adhesive tape. One or more conductors **1606** may also be included to provide one or more electrical contacts (*e.g.* conductive paths) from the electronics module **1605** to the lens housing. The conductors **1606** could, for instance, electrically connect to the one or more conductive paths provided by compliant conductive element **1401** shown in Figs. 14 and 15. A hinge **1607** is also shown, which may be coupled to the temple **1602** or a component thereof (such as the housing module **1603**) and also to the lens housing. The hinge **1607** may provide the capability for each of these components to move relative to the other while remaining coupled. In some embodiments, the hinge **1607** may comprise one or more conductors, or may itself comprise conductive material so as to form a conductive path or portion thereof.

[0208] Fig. 17 illustrates the components shown in Fig. 16 coupled together in an exemplary embodiment. As can be seen, the core element **1601** is no longer visible as it is embedded within the temple **1602**. Similarly, the electronics module **1605** is housed within the housing module **1603** and covered (and likely coupled to) on one side by the switch **1604**. The hinge **1607** is coupled to the housing module **1603**. The conductors **1606** may be embedded substantially within portions of the hinge **1607** and/or housing module **1603** so as to form a portion of a conductive path between the electronics module **1604** and the lens housing.

[0209] With reference to Figs. 18 and 19, exemplary embodiments of semi-rimless spectacle frame designs will be described. It should be noted that although many of these concepts will be described therefore in the context of semi-rimless frames, many of the

features and principles may also be used with (or applicable to) other frames, such as full rimmed and rimless. Moreover, these embodiments are for illustration purposes, and are thereby not intended to be limiting.

[0210] Figs. 18 (a) and (b) illustrate a typical exemplary semi-rimless frame **1800**. Fig. 18(a) shows a frontal view of the semi-rimless lenses, and Fig. 18(b) shows the cross-section from the points **X** to **X'** of the electro-active frames **1800**. As shown, the lenses **1803** are supported along their upper edge by a rigid portion of the frame **1802** (*e.g.* eye-wire, which may comprise a material such as metal) and supported along their lower edge by a section of clear plastic monofilament **1804** (typically nylon) that is connected to the rigid upper portion **1802** of the lens housing. The monofilament **1804** is shown as being disposed within a groove **1807** in the edge of the lens **1803**. The length of the monofilament **1804** may be such that it is under tension when the lens **1803** is mounted in the frame and may thereby hold the lens in place.

[0211] With reference to Fig. 18(b), a close-up of the cross section **X - X'** of Fig. 18(a) is shown so as to better illustrate an exemplary means by which the lens may be secured in a semi-rimless frame. As shown in this exemplary embodiment, the eye-wire **1802** may contain a cavity **1805** that secures a portion of an extrusion of a semi-rigid plastic **1801** (typically nylon) with a "figure-8" cross section. The remaining portion of the extrusion **1801** is disposed in the groove of the lens **1806** and keeps the lens **1803** from moving back and forth. In those portions of the outer surface of the lens **1803** that do not come into contact with the "figure-8" extrusion **1801** (*e.g.* along groove **1807**), the nylon monofilament **1804** may essentially take the place of the extrusion **1801** as shown in this exemplary embodiment. As the monofilament **1804** may be colorless and may be disposed completely (or substantially) within the lens groove **1807**, it may be nearly invisible except under close inspection.

[0212] It should be noted that construction of an electro-active capable semi-rimless frame design has been disclosed by the inventors in U.S. Pat. Pub. No. 2010/0177277 Al. Embodiments of frames disclosed therein may be similar in appearance to the exemplary embodiment of a frame shown in Fig. 18(b). Some of the differences that may enable the electro-active functionality of the frames disclosed therein may be related to the particular details of how the frame is constructed and the use of other novel conductive structures, which are described in detail in U.S. Pat. Pub. No. 2010/0177277 Al, which is hereby incorporated by reference in its entirety.

[0213] Figs. 19(a) and (b) illustrate a comparison between an exemplary semi-rimless frame that is not electro-active, and an exemplary embodiment of an electro-active frame comprising electro-active lenses **1913**. That is, Fig. 19(a) shows a cross-section of a conventional semi-rimless frame, while Fig. 19(b) illustrates a cross section of a frame that is essentially the electro-active counterpart of the frame shown in Fig. 19(a). In both Figs 19(a) and 19(b), a monofilament **1904** is used along the lower portion of the lens (**1903** or **1913**) disposed within groove **1907** so as to keep the lens (**1903** or **1913**) secure within the frame. In some embodiments of the electro-active frame shown in Fig. 19(b), the eye-wire **1902** may be made of an electrically conductive material. However, this need not be the case, as a conductive path may be established within the eye-wire **1902** (and/or other components of the lens housing) using any suitable method, such as by, for instance, embedding a conductor within a non-conductive material. During the manufacturing process, in embodiments where the eye-wire **1902** comprises a conductive material, care may be taken to ensure that no coatings or finishes are applied to the inside of the eye-wire **1902** such that an electrically conductive surface is maintained (*e.g.* within the cavity **1905**).

[0214] With reference to Fig. 19(b), in some embodiments (and for the purposes of illustration only), an electro-active lens may comprise an interface **1908** between two substrates that contains internal electrodes for activating the lens **1913**. This has been previously described by the inventors, such as in U.S. Pat. Pub. No. 2010/0177277 Al., which is hereby incorporated by reference. However, as noted above, embodiments are not so limited and the methods, devices, and means disclosed herein may have applicability to any electro-active frame and/or components therein (*e.g.* any type of electro-active lens). During an exemplary manufacturing process comprising edging the exemplary electro-active lens **1913**, the groove **1906** may be placed such that it straddles this interface **1908** (which may, for example, comprise a liquid crystal layer between two electrodes).

[0215] Continuing with the exemplary manufacturing process, the lens **1913** may be edged and grooved, and one or more electrically conductive inks or paints **1909** may be applied to the locations where the electrodes are exposed within the groove **1906**. The inks and paints may be used so as to provide a conductive path to the electrodes of the lens **1913** without substantially impairing the visual properties of the lens **1913**, or being visible by an observer. In some embodiments, the groove **1906** may be between 0.4 mm and 1.0 mm wide (*i.e.* the horizontal distance shown in Fig. 19(b)) and between 0.4 mm and 1.0 mm deep (*i.e.* the vertical distance in Fig. 19(b)). The inventors have found that, in some embodiments, it may be preferred that the groove **1906** may be approximately 0.7 mm wide and 0.6 mm deep.

Generally, the groove should be such that the extrusion or other material **1911** (or a portion thereof) may be disposed within the groove and assist in coupling the lens to the lens housing. However, it is generally not preferred that the groove be too large, as it may become visible and affect the aesthetics of the device.

[0216] In some embodiments comprising an electro-active lens, to provide a lens **1913** that functions properly, a conductive pathway is made between the inner surface of the eye-wire **1902** and the conductive paint **1909** applied to the groove **1906** of the lens **1913** (*i.e.* the surface of the lens **1913** that comprises the groove **1906**). This may be accomplished with the use of a compliant conductive element **1911**. The compliant conductive element may be a physically compliant yet electrically conductive material that may, in some embodiments, be extruded in a shape that fits substantially within the eye-wire **1902** and the groove **1906** of the lens **1913**. Such a design may provide some or all of the advantages that were detailed above, including providing a conductive path between the lens housing and the lens, providing structural support for the device, preventing or minimizing damage to the rigid surfaces of the lens **1913** and lens housing **1902**, etc.

[0217] As was described above, the compliant conductive element may take any shape and have any suitable dimensions. In this regard, Fig. 20 (a) shows a cross section of an exemplary conventional extrusion (*i.e.* non-conductive) **2000** and its exemplary dimensions (in mm), while Figs. (b) and (c) show a cross section and dimensions (in mm) of two exemplary compliant conductive elements **2010** that may be used, for instance, in semi-rimless electro-active frames. Fig. 20(a) discloses a typical "figure 8" shape of a non-conducive element **2000**, while Figs. 20(b) and (c) disclose shapes that vary slightly from the non-conductive component. The upper portions (*i.e.* first portions) **2001**, **2002**, and **2003** of each of these elements are similar, as they may each, for example, be designed to fit within the same lens frame component (*e.g.* an eye-wire). As depicted, each of the compliant conductive elements **2010** have a different shaped lower portion (*i.e.* second portion) **2005** and **2006** from that of the non-conductive extrusion lower portion **2004**. This may be due to the fact that the compliant conductive elements **2010** may be designed to come into contact with the conductive painted regions within the lens groove, and form electrical connections thereto.

[0218] As can also be seen in Figs. 20 (a), (b), and (c), as depicted, the overall vertical dimensions of the conductive compliant elements **2010** are larger than the traditional non-conductive "figure 8" extrusion **2000**. This may be done in some embodiments to ensure that

when the lens is mounted in the frame (*i.e.* within the cavity of the frame) the bottom of the lens groove comes into contact with the bottom (*i.e.* second portion) **2005** and **2006** of the compliant conductive elements, such that the lens may compress it slightly. With the compliant conductive element **2010** under compression, it will likely maintain the physical (and hence electrical) connection between the lens, the compliant conductive element **2010**, and eye-wire at substantially all times, particularly as the frame flexes during donning and doffing the eye wear.

[0219] One of the important dimensions to ensure compression of the conductive compliant element is the "height," of the second portion of the conductive compliant element, which is shown as 0.75 mm for one of the compliant conductive elements **2010** by way of example only. The total height of this exemplary compliant conductive element is shown as 1.45 mm (.75mm + .7mm). As noted, the compliant conductive element **2010** could be made available in different heights to, for example, accommodate variations in lens processing (lens size and groove depth). While the design of the compliant conductive elements **2010** in Figs. 20(c) will likely function to form an electrical contact with portions of the surface of the lens (based on the height as shown), the width (horizontal dimension) is shown as not being optimized for the exemplary width of the groove of the lens and therefore its performance in conducting electricity may not be ideal. That is, the width of the bottom portion **2006** shown in Fig. 20(c) is not as wide as the groove in the lens. In contrast, the compliant conductive element **2010** in Fig. 20(b) is depicted as having a width that has been optimized – *i.e.* the width is larger, making it more likely that this configuration will make more robust electrical contacts. It should be noted that compliant conductive element **2010** made to the exact (or similar) shape as the "figure 8" design used for the non-conductive extrusion **2000** are, in some embodiments, the least preferred design as there may be no means to guarantee that the conductive compliant element **2010** will be compressed against the edge of the lens and hence provide a robust electrical connection.

[0220] It should be understood that the dimensions provided on Figs. 20(a)-(c) are provided for illustration only, and are by no means limiting. Indeed, the dimensions of these components may vary based on the dimensions of the lens (and the lens groove) and the lens housing (and any cavity provided therein).

[0221] In general, from the standpoint of aesthetics, the electro-active semi-rimless frame design is may be particularly useful. For instance, through the use of appliques, facades and various lens shapes the basic semi-rimless frame shown, for example, in U.S. Pat. Pub. No.

2010/0177277 Al can take on the look of many different styles while retaining its electro-active functionality.

[0222] Exemplary Embodiments Related to Full Rim Spectacle Frame Deigns

[0223] A typical full rim plastic frame (also referred to as zyl or acetate) known to those skilled in the art is shown in Fig. 21, where the lenses **2101** are supported along their entire circumference by a rigid plastic frame **2102**. While an electro-active capable plastic frame was discussed with reference to Figs. 14-17, additional embodiments are shown with reference to Fig. 22. As shown in Fig. 22, a physically continuous conductive pathway (*e.g.* an embedded conductor, such as a wire) is used to apply the driving voltage (*e.g.* the waveform) to the lenses and route synchronization signals from the master **2207** to the slave module **2208**. That is, for instance as shown in Fig. 22, the embedded conductor **2201** may provide a conductive path across the lens housing from the master electronics module **2207** to the slave electronics module **2208**. As noted above, embodiments that utilize a single electronics may also be used. Furthermore, Fig. 22 also shows openings in the metal casings **2206** that may hold modules or other components that allow the electronics modules **2207** and **2208** to be charged inductively. This may be beneficial in that such embodiments may provide power without the use of batteries (or may supplement the use of batteries to provide longer lifetime).

[0224] Continuing with reference to the embodiments shown in Fig. 22, a top conductor **2201** is shown embedded within the lens housing (that may comprise, *e.g.* acetate) and may carry a driving electronic signal from the right lens to the left lens. In addition, in some embodiments, the embedded conductor **2201** may also carry the power signal between the two lenses so as to synchronize the functionality between both lenses. Embedded conductor **2202** may carry the reference electronic signal to the lenses (*e.g.* ground). Fig. 22 also designates locations **2203** where special square (or any other appropriate shape) beveling into the lens housing (*e.g.* into the acetate frame front) may occur so as to (1) expose portions of the embedded conductors **2201** and **2202**; (2) embed compliant conductive material; and/or (3) allow for an electrical connection between the exposed portions of the embedded conductors **2201** and **2202** to the compliant conductive element. That is, in the exemplary embodiment, the portions designated by **2203** may be the locations in which the conductive compliant material may be disposed within the lens housing, and where the conductive path from the lens housing to the lens may be created. Fig. 22 also indicates where the use of conductors **2204** (such as pogo pins) may be located so as to provide a conductive path from

the temple to the lens housing (*e.g.* to the embedded conductors **2201** and **2202**). Fig. 22 also shows an exemplary location of a hinge **2205** to couple the temple to the lens housing.

[0225] With initial reference to Fig. 21, Fig. 23 shows a cross section view of the sections **X - X'** and **Y - Y'** for a conventional full rim design (Fig. 23(a)) and of an exemplary electro-active full rim design comprising a compliant conductive element (Figs. 23(b)-(e)).

[0226] As noted, Fig. 23(a) shows the cross-section **X – X'** of a conventional full rim (*i.e.* non-conductive) plastic frame with a lens **2302** possessing a beveled edge that sits (*i.e.* is disposed) within a similarly beveled region of an eye wire **2301**. That is, the lens **2302** is designed to have a top surface that substantially matches a bottom surface of the lens housing *(i.e.* the eye rim). This is one way in which traditional lens design coupled the lens to the lens housing.

[0227] Fig. 23(b) shows the section **X - X'** of an electro-active capable plastic frame in a region where no electrical contact is required. The basic construction is similar to that of the conventional frame design except that there is an embedded conductive pathway **2304** (*e.g.* metal wire or similar). As the conductive pathway **2304** is completely encased within the insulating material of the eye wire **2301** at this location**,** there is no electrical contact between the lens **2302** and lens housing **2301** (or a conductive path **2304** embedded therein).

[0228] Fig. 23(c) shows the section **Y - Y'** of an electro-active capable plastic frame in a region where electrical contact between lens housing **2301** and lens **2302** is required. In this region a square cavity **2305** is machined into the eye-wire **2301** that exposes the embedded conductive pathway **2304** (*e.g.* metal wire or similar). The cavity **2305** may also accept a compliant conductive element **2307** that may, in some embodiments, be extruded or otherwise configured into a rectangular shape. As also shown in Fig. 23(c), the top surface of the lens **2302** may be configured to be disposed within a portion of the cavity **2305** as well.

[0229] Fig. 23(d) shows the cavity **2305** and the compliant conductive element **2307** in detail. As with the semi-rimless electro-active frame, it may be desirable to have the edge of the lens **2302** that is coated with the conductive paint **2306** come into physical contact with the compliant conductive element **2307** and compress it (as shown by compression region **2308**) before the remainder of the circumference (*i.e.* the top surface) of the lens **2302** comes into contact with the conventionally beveled sections of the eye-wire **2301** (*e.g.* in the section defined by **X - X'** in Fig. 21, where no electrical contacts are made). As described above, with the compliant conductive element **2307** under compression (*i.e.* based on the force applied by the surface in the cavity **2305** of the lens housing **2301** and the top surface of the

lens **2302**), it will maintain the physical (and hence electrical) connection between the lens **2302**, complaint conductive element **2307**, and conductive pathway **2304**, even as the frame flexes during donning and doffing the eye wear.

[0230] The dimensions of the compliant conductive element **2307** are generally determined by the dimensions of the cavity **2305** and the position of the cavity **2305** relative to the conventional lens bevel. The minimum height (H_{min}) of compliant conductive element **2307** may be the distance between the apex of the conventional lens bevel **2306** and the bottom of the cavity **2305** as shown in Fig. 23(d). Generally, as values of the uncompressed height ($H_{uncompressed}$) increase above H_{min}, the more robust the electrical connection between the compliant conductive element **2307**, the lens **2302**, and the lens housing **2301** (and/or the embedded conductive pathway **2304**). Maximum values of the height H may be determined empirically based on how compressible the compliant conductive element material is such that lens **2302** (or a portion thereof) can still be mounted into the lens housing **2301** using methods known in the art. That is, the maximum height may be the height at which the compliant conductive element **2307** will still compress sufficiently that the lens **2302** is adequately disposed within the cavity **2305** and thereby coupled to the lens housing **2301**.

[0231] With reference to Fig. 23(e), the width of the conductive compliant element **2307** is preferably a small amount (δ) larger than the width of the groove W such that the compliant conductive element **2307**, once inserted into the cavity **2305**, remains in place without the need for adhesives while the lens **2302** is mounted. The inventors have found that a δ value within the range of approximately 1 mm to 0.5 mm was preferred and functioned well for this purpose. In an exemplary embodiment, a rectangular compliant conductive element approximately 2.1 mm wide (for a 2.0 mm wide cavity) and 1.2 mm tall enabled a robust electrical connection between lens **2302** and a lens housing with a δ value of approximately 0.1 mm (100 μm).

[0232] Exemplary Embodiments Comprising Full Rim Metal Spectacle Frame Designs

[0233] As noted above, the specific embodiments discussed herein are exemplary only, and other embodiments may exist that utilize the same or similar principles. For instance, in some embodiments, it may be desirable to have an electro-active capable frame with a full metal rim manufactured from a conductive material. A cross section for such a frame is shown in Fig. 24. In this exemplary embodiment, the eye-wire **2401** contains a square cavity **2402** to which preferably no coatings or finishes have been applied such that the conductive

surface of the eye-wire **2402** material is easily contacted. Into the cavity **2402** another conductive compliant material **2403** may be mounted (*e.g.* disposed within) that may make the electrical connection between the lens **2404** and frame (*e.g.* the lens housing **2401**). In areas where the electrical connection need not be made, then the compliant conductive element **2403** may be omitted and the edges of the square cavity **2402** in the eye-wire **2401** support the bevel of the electro-active lens **2404**. In other embodiments the conductive compliant element **2403** may be mounted (*i.e.* disposed within) in all parts of the eye-wire cavity **2402** and only those areas of the lens **2404** to which conductive paint is applied make electrical contact. The shape of the conductive compliant element may be any shape, including rectangular (similar to the exemplary embodiments described above with respect to the exemplary full-rim plastic rim) or embodiments may have a slight bevel. The conductive compliant element **2405** shown with the slight bevel in Fig. 24 may also be suitable for full rim plastic frames in other embodiments.

[0234] As with the previously described frame designs, it is preferred to have the edge of the lens that is coated with the conductive paint come into physical contact with the compliant conductive material and compress it before the remainder of the circumference of the lens comes into contact with the remainder of the eye-wire. As described above, with the compliant conductive element under compression, it will maintain the physical and hence electrical connection between lens, compliant conductive element, and lens housing (*e.g.* conductive pathway), particularly as the frame flexes during donning and doffing the eye wear.

[0235] Fig. 25 illustrates an exemplary embodiment comprising a conductive compliant element **2501** providing a conductive path from the lens housing **2500** to an electro-active lens **2507**. The illustration on the left of Fig. 25 shows a close up of an exemplary electro-active frame. The frame comprises a lens housing **2500** that could, for instance comprise a non-conductive material such as a plastic (*e.g.* acetate). Embedded within the lens housing **2500** is a conductor **2503**. As shown in this exemplary embodiment, conductor **2503** is electrically connected to the temple at **2506**, which could for instance comprise another conductor, such as a pogo pin. Conductor **2503** is also connected to compliant conductive element **2501** in cavity **2502** (for instance, the conductor **2503** may be exposed at some portions along the cavity **2502**. As shown, conductive compliant material **2501** is located within a portion of cavity **2502**. A second conductive path is also shown, comprising a second embedded conductor **2504**, which also connects to a compliant conductive element **2501** disposed within a cavity **2502** in the lens housing **2500**. The second embedded

conductors 2504 electrically connects to a temple at a point **2506**. Thus, as shown, Fig. 25 illustrates an electro-active frame that comprises two separate conductive paths from a temple to the lens **2507** via compliant conductive elements **2501**. In portions of the lens housing **2500** where the conductive compliant element **2501** is not located, the lens housing **2500** comprises a cavity **2508** that may be of a traditional shape (*e.g.* not square) in which a portion of the lens **2507** (*e.g.* a beveled edge) may be disposed within. A hinge **2505** that couples a temple to the lens housing 2500 is shown as well.

[0236] On the right of Fig. 25 are shown closes up of the cross sections shown as **A-A** and **B-B** on the illustration on the left of Fig. 25. As shown, in section **A-A**, an electrical connection is formed between conductor **2503**, compliant conductive element **2501**, and lens **2507**. The cavity **2502** is shown as comprising a rectangular shape, and the compliant conductive element **2501**is shown as having dimensions such that it is substantially disposed within the cavity **2501** (dimensions in mm). At location **B-B**, there is no electrical contact made as the electro-active frame does not comprise a compliant conductive element **2501** in this location. The cavity **2508** is shown in this section, and the lens housing **2500** is shown as encapsulating the conductor **2503** such that no contact is made with the lens at this location. The last illustration is a cross section showing an overlap of the sections **A-A** and **B-B**, where the different between cavity **2508** and **2502** (comprising conductive element **2501**) can be seen.

[0237] Material Composition of the Conductive Complaint Element and Inks

[0238] As discussed above, the conductive compliant element, regardless of the frame design, may, for example, comprise a physically compliant yet electrically conductive material that is extruded or otherwise molded into a shape that conforms to both the frame and lens for the purpose of forming an electrically conductive path (*i.e.* bridge) between lens and frame. While many different classes of material are suitable, good results have been obtained by the inventors when metal loaded silicone elastomers are used with volume resistivities of less than 10 Ω-cm and preferred results are obtained with volume resistivities of less than 1 Ω -cm. It has also been found that a material having values greater than 50 on the shore durometer A scale are suitable, but that values greater than 65 are preferred. The inventors have achieved good results with extruded silver and aluminum (Ag-AI) loaded silicone elastomer with a volume resistivity of 0.008 Ω -cm and a Shore A hardness of 70. However, embodiments are not so limited.

[0239] While such materials are typically manufactured to final shape prior to assembly into the electro-active frames, in certain embodiments, it may also be possible to apply uncured material in liquid or gel form immediately prior to assembling the eye wear such that upon cure the material conforms to both the lens and frame (*e.g.* the lens housing) simultaneously and thus forms an electrically conductive path (*e.g.* bridge) in that manner. This may be preferred in some embodiments, as the compliant conductive material may thereby contact the greatest amount of the surface of both the lens and the lens housing, and may thereby maximize the electrical connections thereon.

[0240] In some emobdiments comprising an electro-active lens, the conductive paint(s) or ink(s) applied to the edge of the lens to establish an electrical connection may be dependent upon the conductive materials used to make the internal electrodes of the lens itself. As these electrodes will typically be in the line of sight to both the wearer and viewer of the lenses, it is preferred to have a transparent conductive material such as ITO ink mixture X-806CN27S which is commercially available from Sumitomo Metal Mining of Japan, by way of example only. For lenses manufactured with this ink formulation, once edged and grooved, an additional amount of the X-806CN27S may be applied to the edge of the lens and cured. To establish a more robust electrical connection, a second conductive ink or paint may be applied over the cured X-806CN27S. While many conductive metal inks (silver and/or nickel based) are available, conductive carbon based inks are preferred for cosmetic reasons. Carbon based conductive inks are preferred as they do not oxidize (*i.e.* change color) with age and are not as bright in appearance as metal based inks. By way of example only, a conductive carbon ink such as mixture 122-49, commercially available from Creative Materials Incorporated may be preferred.

[0241] Electronic Frames Comprising a Housing Module

[0242] When designing and fabricating spectacles that comprise one or more electronic components, the manner in which these components are incorporated with the spectacle frames may also be considered. In some instances, the electronic components may be inserted or coupled to the frames of the electronic spectacles (for instance in a cavity of the temple or the lens housing). The electronic component or components may be inserted during fabrication or included thereafter. For example, in some embodiments in which the frame comprises a plastic material (such as acetate), the frame may be molded around the electronics during fabrication (such as during molding or injection molding of the plastic). However, this may limit access to the electronics, and may prevent repair or replacement.

Moreover, the plastic material may expand and contract during the fabrication process, which may result in the frame components also changing size and/or shape. Molding the frames around the electronic components (such as around an electronics module) may result in spectacle frames that are not uniform, that have defects around the electronic components, are not structurally sound, do not provide access to the components therein, etc.

[0243] In some embodiments, a cavity may be formed in one of the components of the frame (such as one of the temples) during the fabrication process in which the electronics may be disposed either during fabrication or thereafter. Examples of such embodiments are illustrated in Figs. 3-10, where the electronics module **307** is shown as being inserted into (or placed within) the cavity **308** and coupled thereto with a fastener (such as a screw, adhesive, etc.)**.** Further examples are shown in Figs. 16-17, where the electronic frames comprise a housing module **1603** that is attached to one of the temples and houses an electronics module **1605** (*i.e.* the electronics module is disposed therein). Figs. 16 and 17 are described in more detail below. In some instances, when the frame (or a component thereof) comprises a plastic material (such as acetate) then, as noted above, the plastic material may expand and contract with heat, creating pressure on the electronics within the cavity and/or causing portions of the frame to deform around the components. Therefore, in some embodiments, it may be desirable to utilize a component (*e.g.* a housing module) that may be used to support the electronics and/or electronics module within (or coupled to) a structural element of the frame (such as the temple of the frame or the lens housing). In this regard, in some embodiments, such housing modules may be used to both couple (*e.g.* attach) the electronics to the electronic frame, as well as to maintain the shape and structural integrity (and thereby the aesthetics) of the electronic frames or a component thereof.

[0244] In some embodiments, electronic spectacle frames provided herein may include a housing module that may be coupled to (*e.g.* attached to and/or disposed within) a structural member of the electronic frames. As used herein, a "housing module" may refer to a component that may house (*e.g.* contain, substantially contain, surround, surround a portion of, encircle, etc.) of the electronics (and/or an electronics module) of the electronic spectacles. It should be noted that the housing module need not fully encapsulate the electronics or electronics module in some embodiments. That is, there could be area in which the housing module does not cover the electronics module. Such openings or apertures may allow for interaction with the electronics module, such as by allowing the wearer to turn electro-active lenses (or other electronic components disposed on the spectacle frames) "on" and "off" (*e.g.* through a capacitive or membrane switch). In some embodiments, an opening

in the housing module may allow for the electronics module to be selectively placed into (and/or removed from) the housing module. For instance, in some embodiments an electronics module may be pressure fitted so as to be inserted into an opening (*e.g.* "slid in" or otherwise disposed into) and coupled to the housing module. The shape, size, and material of the housing module may vary based on the specific purpose of the component, as well as based on other factors such as the size, shape, and material of other components of the frame and/or the electronics module. For instance, the housing module may comprise a conductive material (*e.g.* a metal) or non-conductive material (*e.g.* plastic, carbon fiber, or nylon), and may be shaped to fit particular styles of frames. In general, it may be preferred that the material and size of the housing module may be chosen such that during typical use, the electronics module may not be inadvertently removed or decoupled from the housing module.

[0245] The inventors have found that an inadvertent voltage or current that may be applied to the electronic components disposed within an electronics module may create unpredictable and/or unwanted behavior by those electronic components, or any electronic components that may be electrically coupled to those electronic components (such as components that are supplied with power and/or control signals from the electronic components disposed within the electronics module). In this regard, the use of conductive materials coupled to the electronics (or an electronics module that comprises the electronic components) may create such electrical conductivity issues including shorting of the components and/or capacitance issues (*e.g.* electrical charge storage and dissipation). This may, for instance, cause the electronic components to activate when they are not intended to, or it may cause electrical damage to the electronic components (for example, if excess current is inadvertently supplied). Therefore, it may be preferred in some embodiments that the electronic components disposed within (or substantially within) the electronics module may be electrically insulated from the electronic frames and/or the outside environment. That is, for instance, in some embodiments, an insulating material may be disposed between (or substantially between) the electronic components disposed with an electronics module and the frame of the electronic eyeglasses and/or the outside environment. However, there may still be one or more conductive paths between the electronic components disposed within the electronic module and one or more electronic components disposed on the frame and/or within one or more electro-active lenses such that the electronic component may provide power and/or control signals to these components.

[0246] For example, in some embodiments, a housing module may comprise a conductive component such as a metal. Such materials may be preferred in some embodiments because

they may have structural properties that prevent or inhibit deformation of the frames and thereby serve to house and protect the electronic components (and the electronics module), while maintaining the aesthetic shape and appearance of the frames. However, the conductivity of the housing module may cause the electronic components to be inadvertently grounded, or may produce or supply additional charge to one or more of the electrical components when such charge is not required or desired. Therefore, in this example, it may be desirable in some embodiments to include an insulating material located between the housing module and the electronic components so as to prevent or reduce the risk of such shorting issues and/or stray electrical charges from an external source. In some embodiments, the insulating material may comprise a portion of the electronics module (such as a layer of material disposed on the outer surface of the electronics module, or the electronics module itself may comprise an insulating material), such that the electronics module may substantially electrically insulate the electronic components disposed therein from the conductive housing module (and/or other conductive components, such as a portion of the frame).

[0247] In general, the housing module may comprise any suitable material, including non-conductive materials (*e.g.* an insulating material). Thus, in some embodiments, the electronics module may comprise a conductive material, but may be electrically insulated (or substantially electrically insulated) from the frames and/or the outside environment by a housing module that comprises a non-conductive material. Indeed, the inventors have found that in some embodiments, the use of non-conductive materials for the housing module may reduce inadvertent charge dissipation in the electronics module, and thereby may increase the performance of the electro-active lenses (and/or reduce failures or undesired behaviors) in some instances. Moreover, in some embodiments that may comprise a sensing mechanism (such as a capacitive touch switch), the use of an insulating material (*e.g.* layer) may prevent charge storage from an interaction with user, which may prevent or reduce the occurrence of a second electrical charge incorrectly indicating a second interaction with the user.

[0248] In some embodiments, an insulating material may be disposed within the housing module and may be located between the housing module and the electronics module (or a portion thereof). For instance, both the housing module and the electronics module could comprise a conductive material, but could be electrically insulated by a material disposed there between. However, as used herein, any insulating material or layer that does not comprise a portion of the electronics module (including a layer disposed on an outer surface),

but that is disposed between the housing module and the electronics module (or a portion thereof) may be considered a part of the housing module.

[0249] In general, the insulating material may comprise any suitable electrical insulator, including plastics and/or rubber, or any other material or composition having suitably high resistivity. In some embodiments, it may be preferred that the insulator is chosen so as to effectively isolate the electronic components in a relatively short distance for voltages of at least approximately 5 volts (but it may be preferable in some embodiments to be at least approximately 20 volts), which may correspond to the typical amount of external (and internal) voltage applied to the frames. In some embodiments, the thickness of the insulator may be less than approximately 10 mm (and preferably in some embodiments of less than approximately 5 mm). In general, the thickness of the insulator may be preferred to be as small as possible, as the available space within the electronic frames may be limited, while still providing adequate electrical insulation. Therefore, in some embodiments, it may be preferred that the thickness of the insulating material may be less than 1mm.

[0250] As noted above, the housing module may be located in any suitable location on (or coupled to) the electronic frames. For instance, the housing module may be located on (or within or attached to) the lens housing or on (or within or attached to) one or both of the temples. That is, for instance, in some embodiments the housing module may be inserted into a component of the lens frame (such as into a cavity within the component) and provide support to maintain the shape and aesthetics of the frame, while also providing a means of coupling one or more electronic components to the electronic spectacle frame. In some embodiments, the housing module may comprise a separate section of the frame. That is, for instance, in some embodiments, the housing module may be disposed between a temple of the frame and the lens housing, such that the housing module is coupled to both the lens housing and the temple. An example of this is shown in Figs. 16 and 17 and described in detail below. In such embodiments, the lens housing may be coupled to the temple using any suitable means, such as an adhesive, one or more fasteners (such as a screw), and/or the two components could be designed such that a portion of the housing module may be inserted into (or otherwise structurally fitted into or coupled to) the temple and/or the lens housing (or vice versa). In some embodiments, the lens housing and the temple may share a similar structural component (such as a similar core, such as the core **1601** shown in Figs. 16 and 17). The lens housing or temple and the electronics module may, in some embodiments, be connected by using one or more hinges.

[0251] Embodiments may thereby provide a housing module that contains, surrounds, encapsulates, is coupled to, or otherwise houses one or more electronic components (or portions thereof) and/or an electronics module that comprises one or more electronic components of an electronic spectacle frame. As noted above, in some embodiments, the housing module may provide structural support to the frame (or a component thereof) that prevents or reduces deformation of the frame during the fabrication process or during subsequent use of the frames, or may itself provide a portion of the frame consistent with the aesthetic style of the frames.

[0252] In some embodiments, it may be desirable to provide the ability to selectively couple (*e.g.* attach) or decouple (*e.g.* remove) the housing module and/or the electronics (or an electronics module) from the electronic spectacle frames. For instance, it may be desirable that the housing module be selectively coupled to the frames so that the housing module may be manufactured in a separate process from the other portions of the electronic frames. That is, for example, in some embodiments the electronic frames may be fabricated with a cavity to which the electronic housing module may be inserted into after the electronic spectacle frame, or a portion thereof, is fabricated. The housing module may then be disposed into the cavity, and an electronics module may thereafter be coupled to the housing module. In some embodiments, the electronics module may be coupled to the housing module in advance of inserting the housing module into such a cavity. In some exemplary embodiments, the housing module may serve to provide support to the frame (or a component thereof) and prevent or reduce deformation of the frame (*e.g.* if the frame comprises a plastic material such as acetate or nylon). Similarly, it may also be desirable that the electronics (*e.g.* an electronics module) be selectively coupled to and/or decoupled to (*e.g.* removable) from the housing module. This may permit replacement of defective, obsolete, or exhausted components (such as an old or frequently used power source). Moreover, the ability to selectively insert and remove electronic components or an electronic module may provide the ability to customize the use of the electronic spectacle frames. For instance, the same electronic spectacle frames (or components thereof) may be used for different purposes, but may be manufactured in the same manner (thereby allowing for less expensive fabrication). The customization may be provided by coupling (and thereby utilizing) different electronic components (that may be comprised for instance in separate electronic modules) with the same or similar standard frames.

[0253] Although the housing module may be secured to the frame in any suitable manner (such as by using an adhesive, screws, etc.) as noted above, it may be preferred in some

embodiments to provide a manner in which the housing module and/or the electronics may be readily coupled (and/or decoupled) to the frames. The inventors have found that an example of a relatively efficient manner may be to shape the housing module (or the electronics module) so as to be pressure fitted. That is, for instance, the housing module may be coupled to the frame by "snapping" the housing module into place. In this regard, the shape and/or size of the components may be such that if a force is applied in a particular direction of the housing module (or the electronics module), the component may contract in that direction. When a force is not applied in that direction, the component may expand. If the receiving component (*e.g.* the electronic frame or a cavity therein) is designed so as to accept the expansion of the housing module, the housing module could be inserted into place and be readily coupled thereto (or alternatively, with the application of a similar force, decoupled and removed). Similarly, an electronics module may be designed to be pressure fitted into the housing module. In this manner, either the housing module or an electronics module may be readily coupled (or decoupled) to the electronic frame (*e.g.* without the need for tools - such as screw driver) in a manner in which they may be inserted or removed without damaging the structure of the frames.

[0254] As noted above, the inventors have found that in some embodiments it may be preferred to have a housing module or an electronics module that may be pressure fitted. In some embodiments, the electronic spectacle frames may comprise a temple that has an opening in one end that allows for either the housing module or the electronics module (or both) to be inserted into the opening and thereby be disposed within the temple (*e.g.* within a cavity). An example of such a design is shown in Fig. 27 and described in detail below. In this way, in some embodiments, the housing module and/or the electronics module may be coupled/decoupled to the frames in a relatively efficient manner by applying pressure in a perpendicular direction (typically to deform the component to decrease a cross-sectional area) and inserting/removing the housing module or electronics module from the receiving component. In some embodiments, the housing module may comprise a component of the frame (*i.e.* as described above with reference to Fig. 16, the housing module may be coupled to the temple and/or the lens housing, but not necessarily be disposed within either) and an electronics module may be inserted into an opening in the end of the housing module and pressure fitted thereto. Some embodiments that comprise a pressure fitted component may provide several advantages, including, in some instances, providing an increase in the ease with which components may be coupled and decoupled.

[0255] For example, when an electronic component or components is chosen for use in an electronic frame, the electronics may be disposed in an electronics module that may be inserted into the opening in an end of the housing module or a frame component (*e.g.* by compressing an electronic module in one dimension). In some embodiments, the electronics module may be "slid" into place (*e.g.* inserted into the opening and thereby disposed in the housing module). The housing module (and/or the temple of the frames) may be configured so as to have an area, cavity, or opening that allows the electronics module to expand into and thereby the module may be coupled therein. An example of this is illustrated in Fig. 27. In addition, in some embodiments, the inventors have found that it may be more effective to compress the dimension of the electronics module that is perpendicular to the direction that it is inserted into the housing module (*i.e.* to decrease the dimension of the electronics module in a direction that is perpendicular to the axis of the temple (*e.g.* the axis on which the temple typically has its largest dimension)) because this may not, in some instances, effect the conductive path or the electronic components. This may be preferred in some embodiments to compressing the electronics module in a direction that is parallel to the axis that the temple extends along because such embodiments may cause the electronic components and/or the conductive path to be compressed – which may require additional components to maintain such conductive paths and/or specific materials (such as conductive rubber) to comprise some of the components, and may also increase the risk of potential failures in electrical contacts in some embodiments. For instance, the electronics module may in some embodiments comprise electronic components (such as a power source) that are not easily compressible. In addition, in some embodiments, locating an opening in the end of the temple (or the housing module) may provide advantages over utilizing an opening in another location (such as along the body of the temple) such as increasing the durability of the electronic spectacles when in use (which is generally when the most force may be applied to the frames) because the opening may be blocked and/or protected by the other components of the electronic spectacles (*e.g.* a hinge or the lens housing). This may prevent the electronics module (and/or the housing module) from inadvertently being removed from the device. Again, an exemplary illustration of such embodiments is shown in Fig. 27 and described below.

[0256] As noted above, some embodiments may provide advantages over electronic spectacles that do not comprise a housing module in which electronics and/or an electronics module may be located within. For instance, some embodiments comprising a housing module may provide additional structural support to a frame or component thereof (*e.g.* to a plastic frame, which may otherwise deform around components contained in a cavity

therein). The housing module may provide for removable access to an electronics module because the frame components may not be molded or formed directly around the electronic components. Some embodiments may also provide benefits in the manufacturing process. For instance, the housing module and/or electronics module may be manufactured in a separate fabrication process (and may comprise a different material) and be later assembled with other components of the frames. In some embodiments, providing an electronic module and/or housing module that may be selectively coupled and/or decoupled to the frame components and/or to each other, may increase the flexibility and utility of the electronic spectacle frames by allowing a single base frame to serve multiple purposes (*e.g.* by using multiple and/or different electronics that may be coupled and/decoupled as required) and may further provide a more robust design (because, for instance, defective or used components may be more readily replaced). Moreover, the use of pressure fitted components in some embodiments may permit quick coupling and uncoupling of the components, without the need for tools and or risk of damaging the components of the device.

[0257] Exemplary Embodiments of Electronic Spectacle Frames Comprising a Housing Module

[0258] Provided below are further exemplary embodiments of electronic frames. These examples are provided for illustration purposes only. In addition, a person of ordinary skill in the art after reading this disclosure may understand that various combinations of components discussed above or below may be made. In this regard, embodiments may provide electronic frames that comprise a housing module for electronics (and/or an electronics module) in electronic spectacles. Some embodiments, may comprise of the components and features described above in combination with a housing module. For example, some embodiments may also comprise a spring hinge and an electrical path from a temple to a lens. Some embodiments may also comprise a conductive compliant material that provides part of an electrical path between two or more components. Some embodiments may also comprise a single electronic module, or multiple electronics module. Some embodiments may also comprise a facade.

[0259] In some embodiments, a first device may be provided. The first device may include a frame having a first temple and a second temple. 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.. In some embodiments, the structural member and the housing module may be structurally configured so that they couple without the use of another component or device. For example, the housing module may be configured to be "pressure fitted" to a cavity within a structural member of the frame, or there may be one or more connectors or common components that may be used to couple (*e.g.* attach) the components.

[0260] In general, it may be preferred in some embodiments that the housing module is coupled to and/or configured so as to not detract from the aesthetic features of the structural member and/or the frame of the electronic spectacles. For example, the housing module may be designed so as to appear as part of the frame, or may be designed such that it adds to the stylistic design and appearance. In some embodiments, the housing module may be designed or configured to provide support to the structural member and also contain one or more electronic components (or an electronics module that comprises one or more electronic components) of the device. It may be preferred, in some embodiments, that the support provided by the housing module prevents or reduces the deformity of a structural member, particularly where the structural member comprises a plastic (such as acetate), nylon, or any other material which may have their shape altered by the application of force, such as heat or physical force applied during fabrication and/or during typical use. The structural components may thereby be more susceptible to physical damage if not structurally reinforced (*e.g.* if electronics or an electronic module are to be located in a cavity). Thus, in some embodiments where the structural component of the electronic frames may comprise a material that may have its shape changed and deformed in a manner that affects the performance of the device and/or the structural aesthetics of the frames, it may be preferred to include a housing module that provides support. However, embodiments are not so limited, and the housing module may be attached or coupled to structural components (such as temples) that comprise any suitable material, including conductive materials such as metals, which may not require additional support to prevent deformation during use or subsequent to fabrication. In addition, as described below, the housing module may itself comprise a separate component such that it may not be disposed within the structural member (and thereby does not provide support for the structural member) or it may be coupled to a structural member or members. An example of such an embodiment is shown in Fig. 16.

[0261] In some embodiments, the first device as described above may include a first lens and a second lens coupled to the frame, and an electronics module. The electronics module

may be located (*e.g.* disposed) within the housing module. That is, for instance, the electronics module may be disposed such that some or all of its components are contained within the periphery of the housing module. However, as noted above, in some embodiments, portions of the electronics module may not be covered (*e.g.* encapsulated or surrounded) by the housing module. Moreover, in some embodiments, portions of the electronics module may protrude through, or be disposed outside of, the housing module. One such example provided for illustration purposes may be a touch sensitive switch, such as a capacitive switch or a membrane switch, that has at least a portion that is exposed such that it may interact with a user (such as a user's finger). The electronics module may further include at least any two of: a power source; a controller; and a sensing mechanism (*i.e.* the electronics module may comprise more than one electronic component). For instance, the electronics module may comprise a power source and a controller; a power source and a sensing mechanism; a controller and a sensing mechanism; or only one of these components.

[0262] In some embodiments, the first device may be self sufficient – that is, it may comprise a power source and one or more electronic components that are driven by the power source. It should be understood that the first device (*e.g.* an electronic spectacle frame) may comprise other electronic components disposed on (or within) different parts of the device (*e.g.* coupled to different parts of the frame such as the temples, the lens housing, or the lenses). Each of the electronic components may be electrically connected together (via one or more conductive paths) or each may be electrically isolated from one or more of the other electrical components and/or modules.

[0263] In some embodiments, in the first device as described above, an insulating layer may be disposed between one or more electronic components (that may themselves be disposed within the electronics module) and the frame of the first device. The term "disposed between" may refer to when an insulating material (*e.g.* an insulating layer) may be located so as to electrically isolate one or more of the electronic components from at least a portion of the frame. The insulating layer may also isolate some or all of the electronic components from the external environment. In general, the insulating layer may be designed or configured to electrically isolate the electronic components that may be disposed within the electronics module from external sources of current or voltage. As explained above, the less electrical contact the electronic components have to external sources of current and/or voltage, the less likely it is that an occurrence of a short current or external electrical charge or voltage may affect the performance of the electronic frames or components thereof. For example, in some embodiments, the insulating layer may be utilized so that inadvertent or

unwanted voltages or currents are not applied to the electronic components disposed within the electronics module. For instance, in some embodiments where the electronics module may include a sensing mechanism, the sensing mechanism may not function properly if unwanted voltage or current is applied thereto (such as through a conductive housing module), or if a charge that was generated based on a user's "touch" is not effectively dissipated because of the conductive material. However, it should be noted that a conductive path may still be established to the components within the housing module (*e.g.* through the use of a conductor inserted into an opening of the electronics module). For instance, in some embodiments a sensing module that may be disposed on the outside of the electronics module may have a conductive path to, for instance, a controller located inside the electronics module. In addition, a power source or controller may be electrically coupled to other components on the electronic frame. In some embodiments, these conductive paths may also be electrically isolated from the frames or a housing module that may comprise a conductive material.

[0264] In some embodiments, where an insulating layer may be disposed between one or more electronic components (which may be disposed within the electronics module) and the frame, the housing module may comprise the insulating layer. That is, for example, the housing module (or a portion thereof) may comprise an insulating material. The housing module may in some embodiments substantially surround and/or be coupled to the electronics module and thereby if the housing module comprises an insulating material, then a substantial portion of the electronics module (and thereby the electronic components disposed within the module) may be electrically isolated from the frame and/or the external environment. Indeed, in some instances, the electronics module may comprise a conductive material, and may thereby be electrically isolated (or portions thereof may be electrically isolated) by the housing module. This may permit some embodiments to include an electronics module that could comprise a conductive material (such as a metal). This material may offer advantages over other types of materials, such as with regard to increased manufacturing efficiencies, and/or may also comprise a material that is better able to protect the electronic components disposed therein such as, for instance, during manufacture, assembly, transportation, and/or during use of the first device.

[0265] In some embodiments, in the first device as described, where an insulating layer may be disposed between one or more electronic components that may be disposed within the electronics module and the frame of electronic spectacles, the housing module may comprise a conductive material and the insulating layer may be disposed between at least a portion of

the housing module and the electronics module. By "at least a portion" it is generally meant that at least 25% of the electronics module may be isolated from the housing module by the insulating layer. For example, in some embodiments the housing module may not be adjacent to (or electrically coupled to) the entire surface of the electronics module, and thereby the insulating layer may need not electrically isolate the entire electronics module from a conductive housing module. For instance, the housing module may have one or more openings that may provide access to the electronics module (or components therein, such as a sensing mechanism). In some embodiments, the insulating layer may isolate more of the electronics module (such as, for instance at least 50% or, preferably, at least 95%), which may depend on the design and functionality provided by the electronic spectacles.

[0266] In some embodiments, in the first device as described, where an insulating layer may be disposed between one or more electronic components that may be disposed within the electronics module and the frame of electronic spectacles, the insulating material may comprise a portion of the electronics module. That is, for instance, in some embodiments, the electronics module may have an insulating material disposed (*e.g.* attached or deposited) on its outer surface (or the outer surface or casing of the electronics module may comprise an insulating material) and thereby the electronics module may serve to electrically isolate some or all of the electronic components from the frame, the housing module, and/or external environment. Thus, as used herein, in some embodiments where an electronics module comprises an exterior wall (*e.g.* an outer wall, container, shell, etc.) that is made of, or includes, an insulating material, the exterior wall may be considered as the insulating layer disposed between the electronic components (that are disposed within the electronics module) and the frame. For example, in some embodiments, the outer wall (or the container) of the electronics module (or an insulating layer disposed thereon) may also serve to electrically isolate the electronic components that may be disposed within the electronics module from a housing module that comprises a conductive material (or any other component of the electronic spectacles, such as the frames). As noted above, the inventors have found that, in some embodiments such as when the housing module includes a conductive material, it may be preferred to electrically isolate the electronic components disposed therein from the housing module because, for instance, electrical charge may be stored or applied to the housing module (particularly where a sensing mechanism may be exposed between a portion of the housing module) that may thereby affect the performance of the electronics.

[0267] The insulating material that may be used in some embodiments may be of any suitable material, such as a plastic, nylon, rubber, carbon fiber, etc. In general, given the

relatively small area typically available within a spectacle frame, it may be preferred to minimize the size of components and layers (including the insulating layer). That is, for instance, in some embodiments it may not be considered aesthetically pleasing if the portion of the electronic spectacle frame that comprises the electronics is readily perceivable (such as if the components extend out of the frame). In some embodiments, the insulating layer may be less than 5 mm thick, and may preferably be less than 2 mm thick. In some embodiments, as was described in detail above, the insulating layer may comprise a part of the electronics module. That is, for instance, in some embodiments the insulating layer may comprise the exterior wall of the electronics module, or some other internal component that isolates the electronics disposed within from current or voltage that may be applied to (or retained on) the housing module. In some embodiments, the insulating layer may be disposed only between the portions of the housing module and the electronics module that may be coupled or physically connected (or electrically coupled to in the absence of the insulating material disposed between). This may reduce the size of the insulating layer while still electrically insulating the electronic components from any undesired external electrical charge.

[0268] In some embodiments, in the first device as described above, the housing module may be removably coupled to the first temple. That is, the structural member may comprise one of the temples of the frame. As used herein, "removably coupled" may refer to when the housing module (or another component) is not permanently coupled to the temple such that its removal would require altering the structure of the frame. For example, if the frame was molded around the housing module, then in some embodiments, the only way to remove the housing module may be to damage or permanently alter the structural component. As noted above, the housing module may be attached or coupled to the structural member in any suitable manner; however, it may be preferred that the housing module is removably coupled so as to provide greater flexibility in the fabrication process as well as adaptability in the field (*i.e.* in everyday use). In addition to the benefits noted above regarding the potential for increased efficiency in the fabrication process provided by manufacturing the housing module and the structural member (*e.g.* a temple) in a separate process (each of which may comprise a different material), embodiments may also provide the ability to exchange defective or obsolete electronics for new electronics (or electronics that provide a different functionality). For example, in some embodiments, the electronics module may be coupled to the housing module so that one need only coupled the housing module to the electronic frames to provide the electronic functionality (*i.e.* to couple the electronics to the frames).

Similarly, the electronics may be removed by decoupling (*i.e.* removing) the housing module from the frames).

[0269] In this regard, in some embodiments, in the first device as described above, the housing module may be removably coupled to the first temple such that it is adapted to be removed and recoupled to the first temple. For instance, in some embodiments, it may be desirable to be able to remove the housing module, replace or adjust the electronic module that may be disposed therein, and then recouple the housing module to the structural member. By allowing for the housing module to be removed, this may provide a user with easier access to the electronics module, without the risk of damaging other portions of the electronic frames (such as the lenses) when removing (or adjusting) the electronics module from the housing module. In some embodiments, as noted above, the housing module may be removed and replaced with another housing module (which may or may not comprise a new electronics module).

[0270] In some embodiments, in the first device as described above, the electronics module may be removably coupled to the housing module. That is, similar to embodiments wherein the housing module is removably coupled to the structural member, the electronics module may be removably coupled to the housing module such that it may be removed without permanently altering the structure of the housing module and/or the structural member (*e.g.* a temple of the frames). This may allow for a replacement electronic module to be used (such as if one or more electronic components fail or otherwise does not function as desired) without requiring the purchase of a new device. In addition, embodiments may provide for a single device (*e.g.* a single model electronic spectacles or frames) to be used for multiple purposes, such as those described in detail below with regard to the various electronic components that such devices may comprise. That is, for example, in one instance the electronics module may comprise the components to function as a Fall Down Monitor. The electronics module may be removed and a new module may be coupled to the housing module such that in another instance the same electronic spectacles may function as a Step Counter and Timer (or may provide any other suitable function). Indeed, any electronic component (which may be contained within an electronics module) may be coupled or removed in this manner.

[0271] In this regard, in some embodiments, the electronics module may be adapted to be removed and recoupled to the housing module. In this manner, for instance, the components that are disposed within the electronics module may be replaced (for instance, the power

source may be replaced, *e.g.* if the power source comprises used batteries, etc.), without purchasing an entire new electronics module (or otherwise replacing the other electronic components that may still function properly). A user may simply remove the electronics module, replace an electronic component (*e.g.* the power source such as one or more batteries) and recouple the electronics module to the housing module (that may, for instance, be still coupled to the electronic frames).

[0272] In some embodiments, in the first device as described above, the housing module may have a first end, a second end, and a body disposed between the first end and the second end. The first end may comprise an opening. The electronics module may be configured to be inserted into the opening. In some embodiments, the electronics module may have dimensions such that it is smaller than the opening, and therefore once inserted, it may be coupled to the housing module using a fastener such as an adhesive, a screw, or any other suitable means. In some embodiments the electronics module may be configured to be compressible in at least one direction (typically in the direction perpendicular to the direction the module may be inserted into the housing module). In this regard, the electronics module (or a portion thereof) may comprise a flexible material that may be deformed by the application of a force but may return to an original shape.

[0273] In some embodiments, the electronics module may be pressure fitted to the housing module. That is, for instance, the electronics module (or a component thereof) may expand into a section or portion of the housing module such that it locks into place (and may thereby be coupled to the housing module). In this regard, the housing module may comprise an opening for receiving the expanding portion of the electronics module. The electronics module may be removed by application of a similar force in the same direction on the expanding portion of the electronics module. An example of such an embodiment is illustrated and described with reference to Figs. 26 and 27 herein. However, embodiments are not so limited and in some instances, the electronics module may be inserted into the opening in the end of the housing module with or without compression of a dimension (*e.g.* the electronics module may be inserted into the opening and coupled to the housing module using a fastener).

[0274] In some embodiments, the electronics module may be located within the body of the housing module. That is, for instance, the electronics module may be inserted through an opening of the housing module and then be disposed inside the housing module and may thereby be coupled to the frame. The housing module may serve to both couple the

electronics module to the frame and to provide protection/electrical isolation of the electronics module (and/or components therein) from external forces. In this regard, in some embodiments, the housing module may comprise a non-conductive material such as nylon or carbon fiber. As noted above, this may prevent or inhibit an external electrical charge from affecting the operation of the electronics. In addition, the use of carbon fiber, plastics, etc. may be lighter than some other materials (such as some metals) – which may be another factor that may be considered given that the electronic spectacle frames may be worn by a user for extensive periods of time. However, embodiments are not so limited and the housing module may comprise a conductive material such as metal – which may provide in some instances greater protection from a physical force, additional support for other structural components, and/or may be less susceptible to deformation or damage.

[0275] In some embodiments, in the first device as described above, the structural member may comprise a cavity in the first temple and the housing module may be configured to be selectively placed within the cavity. As used herein "selectively placed" may refer to when the housing module is provided as a separate component (and thereby the electronics module may also be provided separately and disposed within the housing module) that may be later added to the temple, such as by "snapping" the housing module into the temple. In some embodiments, this may provide the advantage that the housing module may be designed and/or manufactured separately, and may be later placed within the temples of different style frames. However, "selective placement" may also involve a process by which the housing module may not be removably coupled (*i.e.* the housing module may be coupled to the structural member such that it may not be removed without damaging or permanently altering).

[0276] However, embodiments are not so limited, and the housing module may be selectively placed within a cavity so as to be removed there from. For instance, in some embodiments, the housing module may be coupled to the first temple using at least one of a fastening device (such as a screw) or an adhesive (such as a two face adhesive tape. In some embodiments, the housing module may be selectively removed. However, any suitable manner of coupling the housing module to the cavity in the temple may be used. In some embodiments, the housing module is pressure fitted to the cavity in the first temple. As used herein, "pressure fitted" may refer to, for example, when the housing module is snapped into the cavity. That is, the housing module may comprise a portion that may be reduced in size upon insertion, but may expand into a portion of the cavity of the temple such that it cannot be removed with a similar reduction in size. In this manner, the housing module may be

removably coupled such that it may then be snapped in and out (*i.e.* coupled and uncoupled) by applying a similar force.

[0277] In addition, some embodiments in which the housing module is disposed within a cavity of the temple may provide some advantages. For instance, in some embodiments, the temple may comprise a plastic or nylon material. If the electronics module is directly inserted into the cavity, then material that comprises the temple may deform so as to conform to the shape of the electronics module. By utilizing a housing module, embodiments may provide additional support to the cavity so as to prevent the cavity from deforming. In some embodiments, where the temple comprises a conductive material such as a metal, the housing module may be inserted into the cavity so as to electrically isolate some, or all, of the electronics module from the temple. That is, for instance, the housing module may comprise an insulating material so as to limit the amount of current that may flow from the temple to the electronics module, which could affect the performance of such components and/or damage the components.

[0278] In some embodiments, in the first device as described above, the first lens may be electrically connected to the electronics module. That is, for instance, the first device may comprise a conductive path from the electronics module to the lens that is coupled to the lens housing. As noted above, the housing module (and thereby the electronics module that is housed therein) may be attached to any structural member of the device (*e.g.* a temple, the lens housing, etc,). In embodiments where the lens housing is attached to one of the temples, the conductive path may comprise an embedded conductor (such as conductive compliant material) and/or a conductive path through a hinge to the lens housing). The lens may comprise any additional electronic components needed to provide a given functionality (such as varying the focal length of the electro-active lens, changing the tint of the lens, etc.).

[0279] 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. That is, for instance, in some embodiments it may be preferred to supply an AC signal to one or more of the electronic components. This may, for instance, create a large peak to peak voltage (*e.g.* 20 volts) which, when coupled to an electro-active lens, may in turn provide for increased clarity (while potentially increasing power consumption and cost). In some embodiments, the sensing mechanism may be configured to provide an input to the controller for determining when to supply the time varying signal to the first lens. That

is, for instance, the sensing module may be configured to receive an input (*e.g.* from user, such as by tilting the head or touching a switch), which then may be used to trigger the controller to supply the signal (such as an "on" - "off" switch) or to adjust the signal (*e.g.* adjusting the voltage, etc). In some embodiments, the power source comprises a battery. Generally, it may be preferred to use a simple power source given the relatively small area that may be available within the structural member (such as within the temple) and/or the housing module. However, it should be understood that any power source may be used. 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. The voltage multiplier may be used in conjunction with a simpler (*e.g.* smaller) power source to provide a higher voltage while minimizing the space needed within the electronics module. However, embodiments need not utilize a voltage multiplier where the voltage (or the current) supplied by the power supply is sufficient. In some embodiments, the controller is configured to provide at least one of: a zero DC biased sine wave or a zero DC biased square wave to the first lens.

[0280] In some embodiments, in the first device as described above, the housing module may further include an aperture disposed on an outer side of the housing module. The "outer side" may refer to a side of the housing module that does not face toward a wearer's head (*e.g.* the side that faces away from the wearer's head). In this manner, and as noted above, the housing module need not fully encapsulate the entire electronic module. The aperture may provide an avenue in which a wearer may interact with the electronics module disposed therein. For instance, in some embodiments, the aperture may have an area that is approximately within the range of 1 cm^2 to 5 cm^2. While the size may vary based on the application and the use, this area is typically suitable to allow for a wearer to manually interact with the sensing mechanism. For instance, the sensing mechanism may comprise a touch sensitive switch exposed substantially through the aperture. As used herein, "touch sensitive" may including any switch that may be turned on or off by a wearer's touch. This may include, for example, a capacitance switch or a membrane switch. As used herein the touch switch may still be considered "exposed" even if a thin insulator layer is deposed over the touch sensitive component - it is still exposed to the extent that a wearer may interact with the touch sensitive switch. That is, the term "exposed" is used to refer to a configuration in which the touch sensitive switch is sufficiently not covered that it can respond to a user's

touch. In this regard, in some embodiments, the use of a capacitance switch generally requires that the electrical charge generated by the interaction with the wearer be dissipated. Otherwise such devices may create a short situation, or may activate the electro-active lenses incorrectly. Therefore, embodiments may require the use of an insulator, particularly when the housing module and/or the structural member of the frame comprise a conductive material.

[0281] In some embodiments, in the first device as described above, the structural member includes the first temple of an electronic spectacle frame. That is, for instance, the housing module may be coupled to (*e.g.* attached to) the first temple or a portion thereof. This may for instance comprise embodiments where the housing module may be disposed in a cavity of the first temple, embodiments where the housing module may be attached to a portion of the temple (*e.g.* as an extension of the temple or attached to one of the surfaces of the temple), embodiments where the housing module may be coupled to the temple and may also be coupled to the lens housing, etc. As noted above, however, it may be preferred in some embodiments that the housing module coincides with the style (*e.g.* the aesthetics) of the frame (*e.g.* or a portion thereof, such as the appearance of a temple).

[0282] In some embodiments, the first temple of an electronic spectacle frame may include a first portion and a second portion. The first portion may be located closer to the first lens than the second portion, and the housing module may be attached to the first portion of the first temple. This may be preferred in some embodiments, as it may utilize a shorter conductive path from the electronics module to any electronics (including electro-active lenses) that may be located on the lens housing. In some embodiments, the housing module may be the first portion of the first temple. That is, for instance and as noted above, the housing module may be disposed between the lens housing and a portion of the temple, but may not be disposed within the temple (or within a cavity in the temple). The lens housing may be coupled to the temple in any suitable manner including, for instance, the use of a fastener (such as a screw) or adhesive. In addition, in some embodiments, each of the lens housing and the temple may comprise a structural component or components such that the two components may be connected to one another. Some embodiments may provide advantages such as, for instance, allowing the manufacture of the electronics module separate from the temple and/or the lens housing (because the housing module may be subsequently coupled to these components). In addition, some embodiments may permit the fabrication of the temple without the creation of a cavity (or other components for disposing the housing

module and/or electronics module there within), which may result in more structural stability for the frame component.

[0283] In some embodiments, in the first device as described above, the housing module may comprise a conductive material such as, for instance, a metal or a compliant conductive material. As noted above, in some embodiments when the housing module comprises a conductive material, the first device may further include an insulating material disposed between the housing module and the electronics module. As noted above, "disposed between" may refer to a configuration in which the insulating layer electrically isolates the housing module from the electronics module (and/or the electronic components disposed within the electronics module). As noted above, in some embodiments, when the housing module comprises a conductive material, there may be an increased risk of shorting to the electronic components. In addition, in some embodiments that may use a sensing mechanism such as a touch switch (*e.g.* a capacitive switch), a charge may be generated by the user when activating the switch that may not dissipate if the housing module comprises a conductive material (*e.g.* the charge could be stored on the housing module). This could result in the sensing module (or other component) receiving signals that the wearer does not intend, which may alter the functionality of the electronic components of the device.

[0284] In some embodiments, in the first device as described above, the housing module may comprise a non-conductive material. For instance, the housing module may comprise a plastic (such as acetate) or nylon. This may be preferred in some embodiments because it may not require an additional insulator between the electronics module and the housing module. In some embodiments, the structural member may also comprise a non-conductive material. That is, for instance, both the housing module and the structural member may both comprise a non-conductive material. This may be preferred in some embodiments because it may be more readily achievable to electrically isolate one or more conductive paths from the electronics module to one or more other electronic components disposed on the frame of the electronic spectacles. In some embodiments, the structural member may comprise any one of, or some combination of: a plastic or nylon. In some embodiments, the structural member comprises acetate. Acetate may be preferred in some embodiments as it is a common material used in the manufacture of frames. However, as noted above, embedding electronics within an acetate frame without the additional support provided by a housing module may result in deformation of the structural member. It should be understood that any suitable non-conductive material may be used for either the structural member and or the housing module.

[0285] In some embodiments, in the first device as described above where the housing module may comprise a non-conductive material, the structural member may comprise a conductive material. That is, the housing module may comprise a material such as plastic (*e.g.* acetate), nylon, etc., and the structural member that is coupled to the housing module may comprise a material such as a metal. The housing module may be configured or positioned so as to electrically isolate the electronics module (and/or the electronic components disposed within the electronics module) from the structural member (and the frame). That is, for instance, the housing module may be disposed within a cavity of the structural member, and the electronics module may be disposed within the housing module. The housing module may substantially house or encapsulate the electronics module (or at least the portions of the electronics module that could be electrically connected to the structural member or another portion of the frame) so as to electrically isolate the two components from one another. In some embodiments, the housing module and/or the structural member may have one or more apertures such that a wearer may interact with the electronics module (*e.g.* through a sensing mechanism such as a touch sensitive switch). In some embodiments, the housing module may not be disposed with the structural member, but may, for instance, be coupled thereto (*e.g.* to a portion thereof). The electronics module may be disposed with the housing module such that it is electrically isolated from the structural member by the housing module that comprises a non-conductive material. In this manner, embodiments may reduce the risk of shorting issues for the electronics module, and potentially increase the performance and responsiveness of the electronics module (including embodiments where, for instance, a touch sensitive switch that may produce a charge is to be dissipated).

[0286] In some embodiments, in the first device as described above where the housing module may comprise a non-conductive material, the electronics module may comprise a conductive material. As noted above, it may be beneficial in some embodiments to use a conductive material for the electronics module for manufacturing and/or durability purposes. However, embodiments are not so limited and in some instances, both the housing module and the electronics module may comprise a non-conductive material (such as an insulating material).

[0287] In some embodiments, in the first device as described above where the housing module comprises non-conductive material, the first device may further include a first lens having a first electrical contact and a conductive path in electrical contact with the first electrical contact of the first lens (*e.g.* electrically coupled). The electronics module may also

have a first electrical contact. The conductive path may be electrically coupled to the first electrical contact of the electronics module. In this manner, embodiments may provide a conductive path between the electronics module and an electro-active lens. The electronics module may comprise electronic components for controlling some of the functionality of the lens (*e.g.* by varying the focal length, the tint, providing shutter effects, etc.) and may be controlled by the sensing module (such as by using the touch of a wearer or the tilt of his head, etc.). In some embodiments, the conductive path may include at least one pogo pin. A pogo pin may be used to maintain the electrical path, even if, for instance, the temple does not form a right angle with the housing, or if some other factor causes the conductive path between the lens housing and the electronics module to increase in size. In some embodiments, the conductive path may include a spring hinge. A spring hinge may be preferred in some embodiments because it may be used to hold electronic frames tight against a wearer's head. By utilizing a conductive path through the spring hinge, embodiments may provide for a conductive path despite the changing angle between the lens housing and the temple. In some embodiments, the conductive path may include a compliant conductive element. As noted above, the compliant conductive element may be used to form robust electrical connections with the electro-active lenses. Moreover, it may be readily applied within small areas and in prefabricated designs, as necessary.

[0288] In some embodiments, in the first device as described above, the housing module may have a thickness that is less than or equal to approximately 0.7 mm. As used herein, the "thickness" of the housing module may refer to the dimension of one of the sides of the housing module in a direction that is perpendicular to the electronics module. The inventors have found that generally, the performance of many sensing mechanisms (such as touch switches) begins to degrade at thicknesses of the housing module that are greater than 0.7 mm. For example, the thickness of the capacitance switch may be partly predicated on the thickness of the lens housing, as it may protrude out of the housing module so as to be available to a wearer to swipe. In addition, the smaller the thickness of the housing module, the greater the area potentially available for the electronics module. This may allow for more advanced electronics to be provided, and/or more electronic components (*e.g.* a bigger electronics housing module). However, the decreased thickness may weaken the structural support of the housing module and/or decrease its insulation properties (when it does not comprise a conductive material). The inventors have found that, in some embodiments, the housing module may have a thickness that is less than or equal to approximately 0.5 mm. In

some embodiments, the housing module may have a thickness that is less than or equal to approximately 0.3 mm.

[0289] In some embodiments, a first method of fabricating a device may also be provided. The method may include fabricating or manufacturing a frame having a first temple, a second temple, and a housing module that includes a first end, a second end, a body disposed between the first and second end, and a cavity disposed within the body. That is, for instance, the method may be applied to electronic spectacles that may comprise a housing module that has an area in which the electronics module may be located in (*e.g.* a cavity). An example of such embodiments is shown in Fig. 16. The first end may include an opening. The first method may further comprise inserting an electronics module (or electronic components) into the opening of the housing module such that the electronics module may be disposed in the cavity of the housing module. As noted above, utilizing such a method of fabricating a device by inserting the electronics module through an opening in the end of the housing module may be both an efficient manner of disposing the electronics module into the housing module (and thereby coupling the electronics to the frame), and may also serve to protect the electronics as, for example, less of the electronics module may be exposed to direct physical force – particularly when the frames are in use as the opening may be covered by other components (such as the lens housing).

[0290] In some embodiments, the first method as described above may further comprise removing the electronics module (*i.e.* a first electronics module) from the cavity through the opening of the housing module (and/or temple), and inserting an electronics module (*i.e.* a second electronics module) into the opening of the housing module such that the second housing module is disposed in the cavity of the housing module. In this manner, in some embodiments, the electronics module may be removed and replaced with a new electronics module that may comprise electronics that provide different functionality (thereby providing increased flexibility and functionality for the same electronic frames) or may be used to replace defective or depleted electronics (such as when a power source is drained). In this regard, in some embodiments, the first electronics module and the second electronics module may be different electronics modules. However, embodiments are not so limited, and in some instances, the first electronics module and the second electronics module may be the same electronics module (*e.g.* they are the same module or they comprise the same components). As noted above, some embodiments may provide the advantage of being able to replace components within an electronics module, without replacing the entire module. Moreover, by using a method of removing and inserting the module thought the opening in

the end of the housing module, embodiments may provide a fast and easier way of accessing and changing the electronic components as opposed to embodiments that may require applying an adhesive and/or fastener to the electronics module.

[0291] A second method may also be provided. The second method may comprise a method of manufacturing (*e.g.* fabricating) a device that includes a frame having a first temple and second temple. The first temple may include a first end; a second end, a body disposed between the first and second end; and a cavity disposed within the body. The first end may include an opening. The first method may further comprise the steps of inserting an electronics module into a housing module and inserting the housing module into the opening of the temple such that the housing module is disposed in the cavity of the first temple. As noted above, inserting the housing module into the cavity through an opening may be an efficient manner of coupling the housing module and/or the electronics module to the structural member (in this case the temple), particularly when the housing module may be pressure fitted so as to snap into place when it is inserted in one end of the temple. This provides the advantage of not necessarily requiring a fastener (such as a screw) or adhesive to couple the housing module to the temple (which may make removal of the housing module and/or recoupling more readily achievable). In addition, sliding the housing module into the temple through an end (rather than directly into the body) may be more efficient because it allows for the housing module and/or the electronics module to compress as necessary in the vertical direction (*i.e.* the direction perpendicular to the body of the temple). In addition, inserting the housing module into one end of the structural member may provide an efficient manner of replacing the housing module (and/or an electronics module that may be disposed within the housing module) in an electronic spectacle frame.

[0292] In some embodiments, the first method as described above may further comprise removing the housing module from the first cavity through the opening of the temple, and inserting a second housing module into the opening of the temple such that the housing module is disposed in the cavity of the first temple. Removing the housing module may provide ready access to the electronics module disposed therein. It may also provide for efficient replacement of the components. In some embodiments, the housing module and the second housing module are the same housing module. That is, as noted above in some embodiments, this method may be used to simply replace some of the electronics components that may comprise the electronics module or may replace the electronics module itself. The housing module may thereby not need to be replaced, and may be reattached to the structural member (*e.g.* a temple or cavity therein) and include a new or revised electronics module

located therein. Thus, in some embodiments, where the electronics module (or electronic components) is removed with the housing module, a second electronics module (or electronic components) may be inserted into the cavity in conjunction with the second housing module. However, embodiments are not so limited, and thereby in some embodiments, the housing module and the second housing module may be different housing modules. This exemplary method may be used in some situations where the housing module may be required to be replaced (*e.g.* if it was damaged or defective) or for instances when the electronics module and the housing module are coupled in such a way that they may not be readily coupled and recoupled, and the electronics module is to be replaced. In this regard, in some embodiments, the electronics module (or electronic components) may be removed with the housing module.

[0293] In some embodiments, the first method as described above may further include removing the housing module from the first cavity through the opening of the temple without removing the electronics module. That is, for instance, the electrics module may be disposed (*e.g.* located) within the housing module, but need not be coupled thereto. The housing module may provide structural support to the portions of the structural member located near or around the electronics module. The housing module may be removed and replaced if, for instance, it is damaged. In some instances, it may be removed and replaced for aesthetic regions (*e.g.* the wearer changes the style of the frames and/or other components of the frame).

[0294] In some embodiments, in the first method as described above, the step of inserting the electronics module into the housing module may include coupling the housing module to the electronics module. In some embodiments, in the first method as described above, the housing module may be inserted into the opening of the temple prior to the electronics module being inserted in the housing module. An electronics module may then be inserted into the housing module. In this manner, each component may be manufactured and assembled in different stages.

[0295] Although described above, Figs. 16 and 17 will now be described in more detail. Fig. 16 illustrates an exemplary embodiment of an electronic frame that comprises a housing module **1603**. A core element **1601** may be provided, which may in some embodiments comprise a conductive material (such as steel) and may be coupled to or disposed within the temple **1602** so as to provide a portion of a conductive path from one component to another and/or structural support for the temple. As shown, the core element **1601** may, for instance, provide a conductive path from the temple end (which may comprise, *e.g.*, a power source) to

the electronics module **1605**. A housing module **1603** is shown, which may house (*e.g.* contain) the electronics module **1605** and be coupled to the temple **1602**. In some embodiments, the housing module **1603** may comprise a conductive material (*e.g.* metal). However, as noted above in some instances, the inventors have found that the use of a conductive material for the housing module **1603** may affect (or interfere with) the electronic components (*e.g.* in the electronics module **1605**) and/or the functioning of a sensing component or mechanism (such as a switch **1604,** which may comprise a capacitive switch). Therefore, in some embodiments, an insulating material may be disposed between the housing module **1603** and any electronic components of the electronic frames (*e.g.* the electronics module **1605**). In addition, in some embodiments, an insulating material may be disposed between the housing module **1603** and sensing component (*e.g.* a capacitive touch switch **1604**) so as to dissipate any electrical charge that may be generated and/or stored therein (or otherwise insulate the electronics from the charge). This may prevent an electrical charge from affecting the electronics, which could lead to unpredictable behavior (*e.g.* activation/deactivation of the electronics when not desired or signaled) or damage to the components.

[0296] 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,

[0297] A switch **1604** (such as a capacitance or "cap" switch) is shown, which may be coupled to the electronics module **1605** and/or the electronics module housing **1603** to provide a switch or control for the electronics module **1605**. For instance, and as shown in Fig. 16, the electronics module housing **1603** may have an opening that may allow a wearer to interact with switch **1604** so as to turn a function on or off, or to otherwise vary the functions provided by an electronic spectacle. The electronics module **1605**, the switch **1604**, and the electronics module housing **1603** may be coupled using any suitable manner, including one or more screws as shown in Fig. 16. As noted above, other methods may also be used, such as pressure fitting one or more components as described with reference to Figs.

26 and 27 below. One or more conductors **1606** may also be included to provide one or more electrical contacts (*e.g.* conductive paths) from the electronics module **1605** to the lens housing. The conductors **1606** could, for instance, electrically connect to the one or more conductive paths provided by compliant conductive element **1401** shown in Figs. 14 and 15. A hinge **1607** is also shown, which may be coupled to the temple **1602** or a component thereof (such as the housing module **1603**) and also to the lens housing. The hinge **1607** may provide the capability for each of these components to move relative to the other while remaining coupled. In some embodiments, the hinge **1607** may comprise one or more conductors, or may itself comprise conductive material so as to form a conductive path or portion thereof.

[0298] Fig. 17 illustrates the components shown in Fig. 16 coupled together in an exemplary embodiment. As can be seen, the conductive compliant element **1601** is no longer visible as it is embedded within the temple **1602**. Similarly, the electronics module **1605** is housed within the housing module **1603** and covered (and likely coupled to) on one side by the switch **1604**. In this regard, the housing module may be considered to comprise the switch, even though it may not be contained within the module itself. The hinge **1607** is coupled to the electronics module housing **1603**. The conductors **1606** may be embedded substantially within portions of the hinge **1607** and/or electronics module housing **1603** so as to form a portion of a conductive path between the electronics module **1604** and the lens housing.

[0299] With reference to Fig. 26 an exemplary embodiment of a touch switch **2600** is show in accordance with some embodiments. As shown, the touch switch **2600** may comprise one or more sections (**2601** and **2603**) that are raised or elevated (*i.e.* extend out from) the remaining structure of the touch switch **2602**. These portions **2601** and **2603** may extend out of one or more apertures in the housing module so that a wearer may interact with the touch switch to send a control signal to the electronics therein. As noted above, in some embodiments the thickness of the housing module may be preferably less than 0.7 mm thick, so that the touch switch may protrude out of the aperture and still effectively react to signals provided by the swipe of a wearer's finger. In some embodiments, the touch switch may comprise the portions labeled as **2601** and **2603**, and the electronics module may comprise the portions **2602** (*i.e.* the touch switch may form one or more surfaces of the electronics module, or be directly coupled thereto). In addition, in some embodiments, the touch switch **2600** may form a portion of a pressure fitted electronics module that may be inserted into the housing module (*e.g.* through an opening in one of the ends) by being compressed in one

more dimensions. When the electronics module is then inserted so as to be disposed within the housing module, the portions of the electronics module that were compressed may expand and "snap" into place (*i.e.* the portions be structurally coupled to the housing module). For instance, when the electronics module comprising the touch switch **2600** is inserted into a housing module, the portions **2601** and/or **2603** may extend into one or more apertures of the housing module. Once this occurs, the electronics module may be coupled to the housing module such that an inward force is applied to the portions **2601** and **2603** prior to removing the electronics module.

[0300] With reference to Fig. 27, an exemplary housing module **2701** is shown comprising an electronics module disposed therein. The exemplary housing module **2701** is shown as having an opening **2702** in one end in which the electronics module may be selectively inserted. That is, for instance, the electronics module may be inserted in the opening **2702** and slid into the housing module **2701** so as to be disposed with the body of the housing module **2701** (*e.g.* within a cavity). In some embodiments, the electronics module may be pressure fitted, such that when the electronics module is inserted into the opening **2702** and is sufficiently disposed in the housing module **2701**, the portions **2703** of the electronics module may extend into the apertures of the housing module **2701** and snap into place. The portions **2703** of the electronics module may in some embodiments comprise a touch sensitive switch (such as a capacitive or membrane switch), but embodiments are not so limited. For instance, portions **2703** may comprise any portion of the electronics module. In addition, an optional screw **2704** or other fastener may be used to couple the housing module **2701** to another structural member of the electronic spectacle frames (*e.g.* to a temple). In some embodiments, a fastener (such as screw **2704**) may be used to couple the electronics module to the housing module **2701** (that is, for instance, a portion of the electronics module may extend into the housing module **2701** such that the screw **2704** could couple the two components together). In some embodiments, the use of a fastener may be in addition to a pressure fitted component (although it may be preferred to use a fastener when the electronics module is not pressure fitted so to prevent the electronics module form being removed from the housing module **2701** inadvertently. In addition, Fig. 27 shows an embodiment whereby a hinge **2705** is coupled to the housing module **2701** which may be used to couple the housing module **2701** to another structural member of the frame, such as the lens housing.

[0301] In some embodiments, a housing module as defined above may be used to cover or encapsulate portions of the electronics module. Some embodiments may serve several purposes, including for example, electrically isolating the electronics module from the