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Waters

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(54) **LIGHTED READING GLASSES**

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(52) **U.S. Cl.** **351/158**; 362/105
(58) **Field of Search** 351/158, 121, 351/111, 41; 362/105

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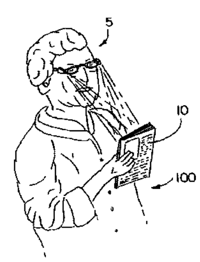
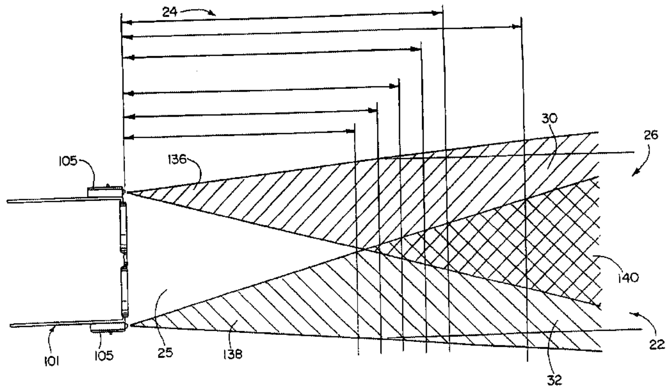
(57) **ABSTRACT**

Lighted reading glasses are provided to enable clear reading of normal sized text to occur when the reading material is held at usual distances from the reader in dimly lit or dark locations. The lighted glasses have high intensity lights, such as in the form of LEDs that generate narrow light beam cones and which are oriented via light mounts as by inward canting of the light beam cones to meet and overlap so high brightness light is generated in a conical overlap area of light which is maximized in size in the range of normal reading distances. The light mounts include housings that are very compactly sized via the use of small coin cell batteries for powering the LEDs they hold. The housings are tapered from their maximum width sized to be slightly larger than the diameter of the disc-shaped cell batteries to either end thereof along their length, and have a depth sized to accommodate two of the stacked very thin, e.g., one-eighth of an inch each, coin cell batteries. In this manner, a very small and compact light module is provided that, while especially well-suited for reading glasses due to the preferred inward cant provided by light mounting surfaces of the housing to tailor the location of the overlap lighted area to the reading area, can also be used with other types of head gear, such as caps or other types of hats.

16 Claims, 6 Drawing Sheets





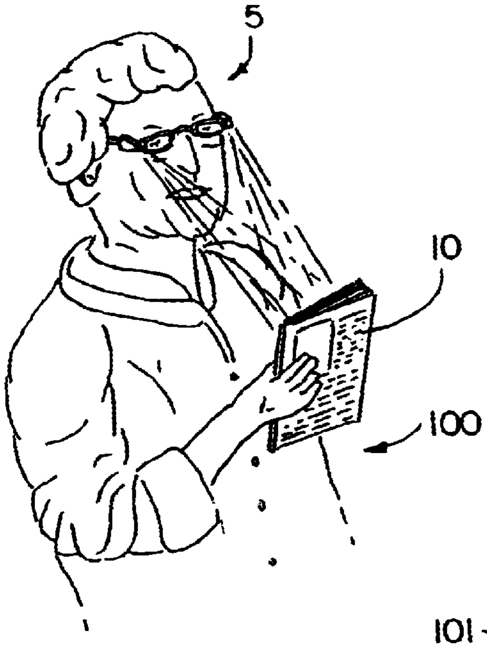


FIG. 1

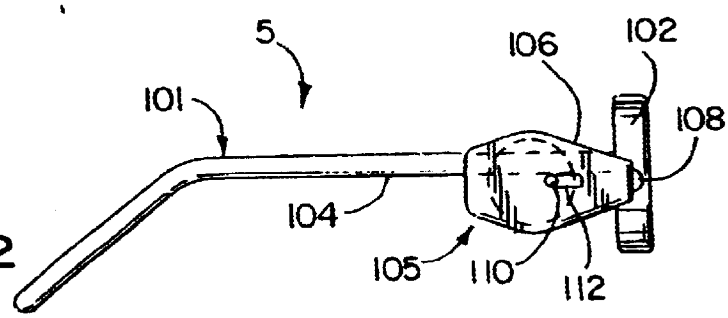


FIG. 2

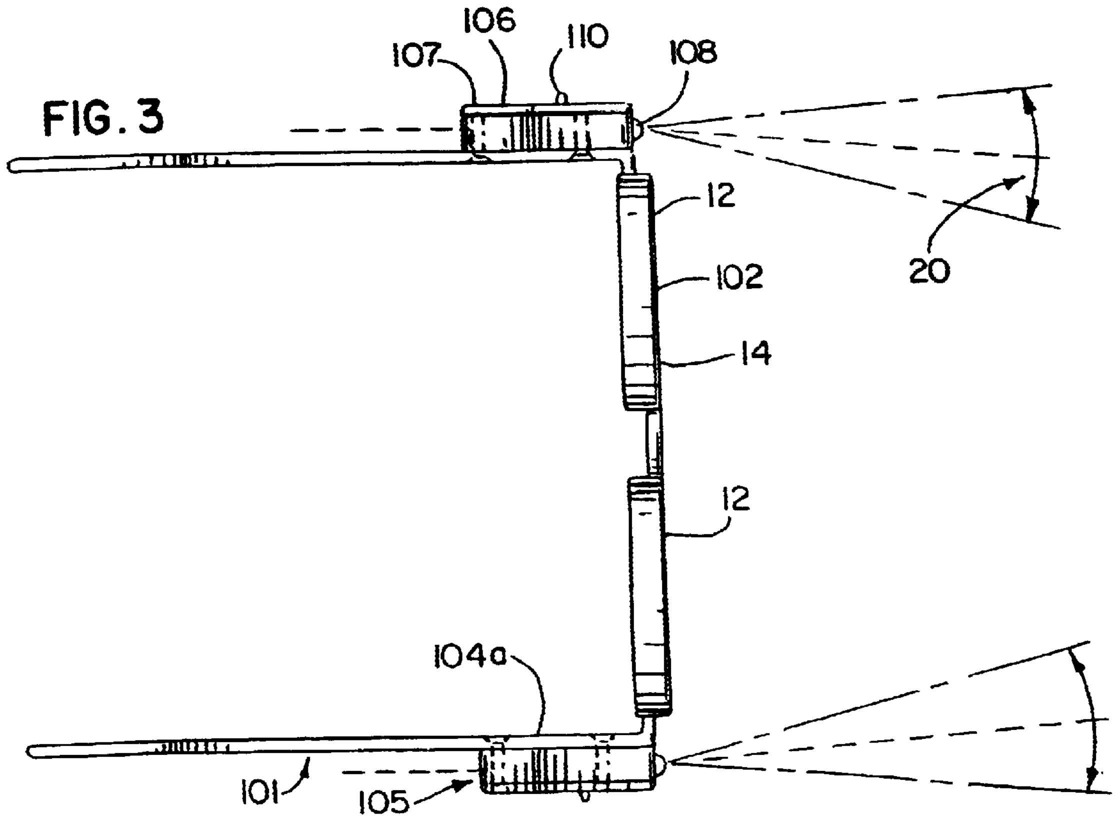
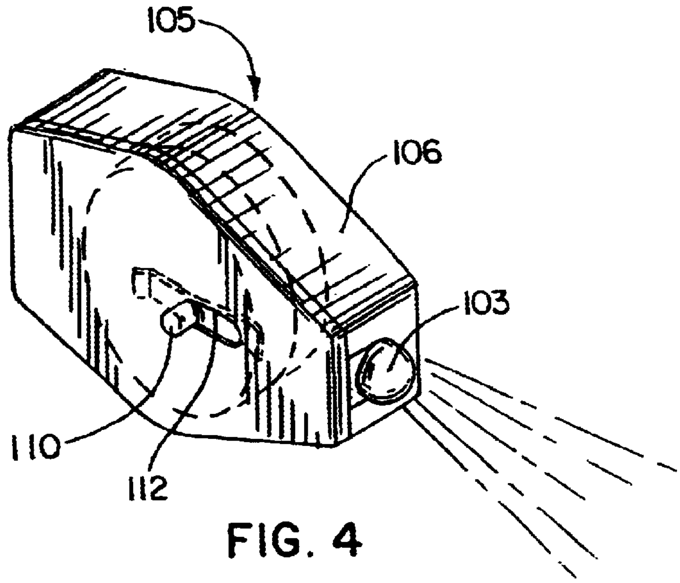


FIG. 3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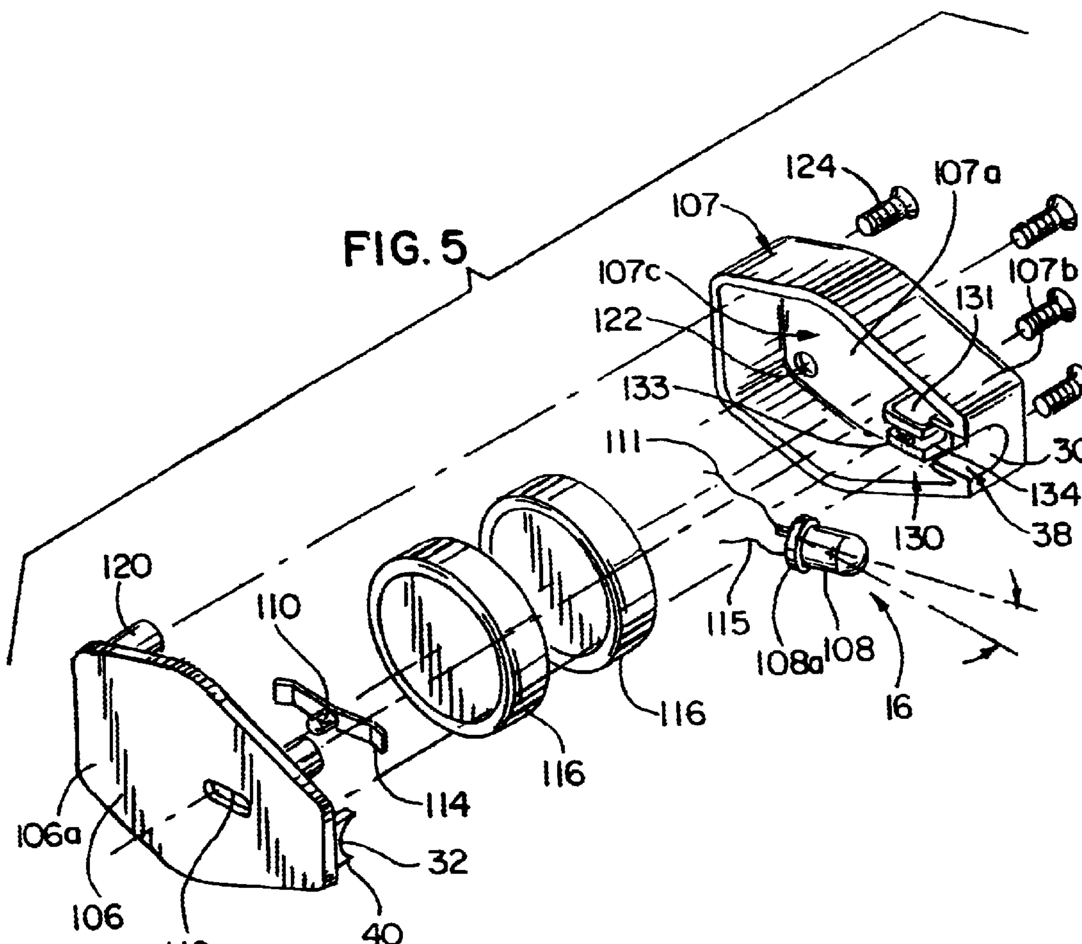
106
103
110
112

FIG. 4

FIG. 5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107c
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107b
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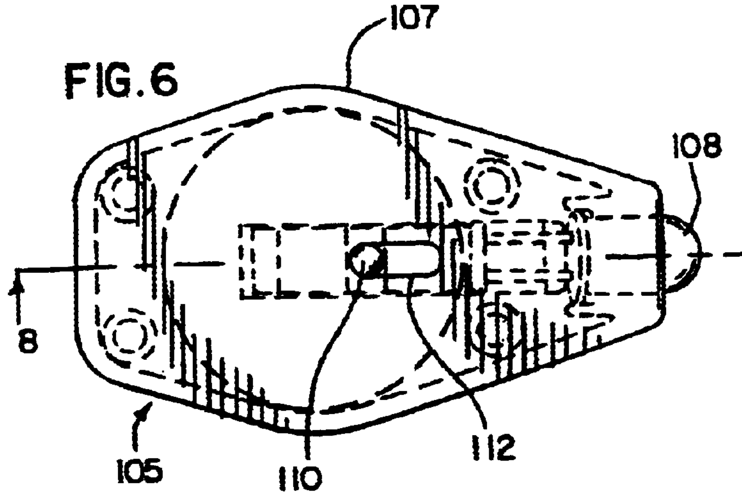

FIG. 6

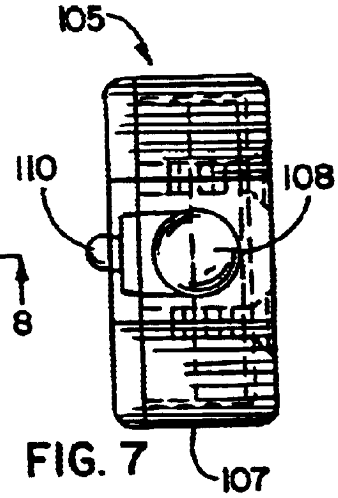

FIG. 7

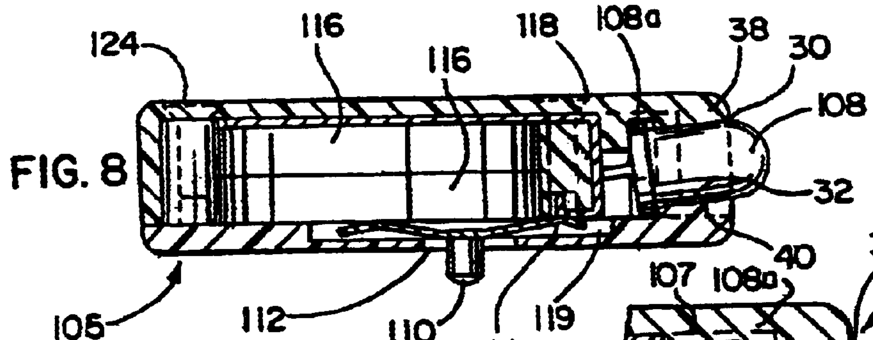

FIG. 8

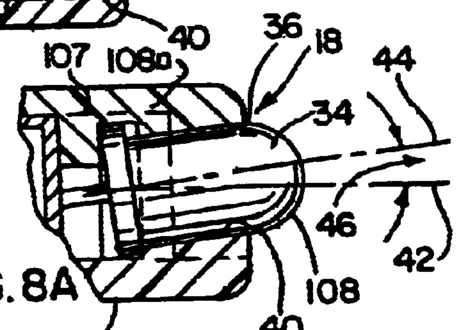

FIG. 8A

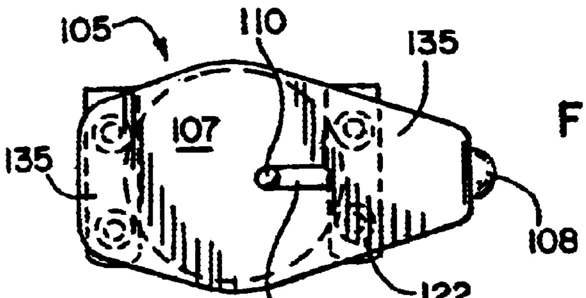

FIG. 10

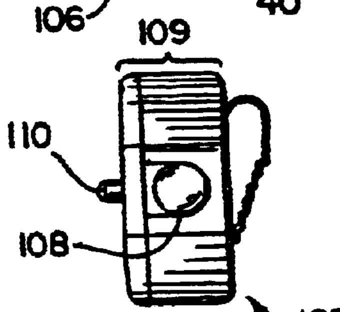

FIG. 11

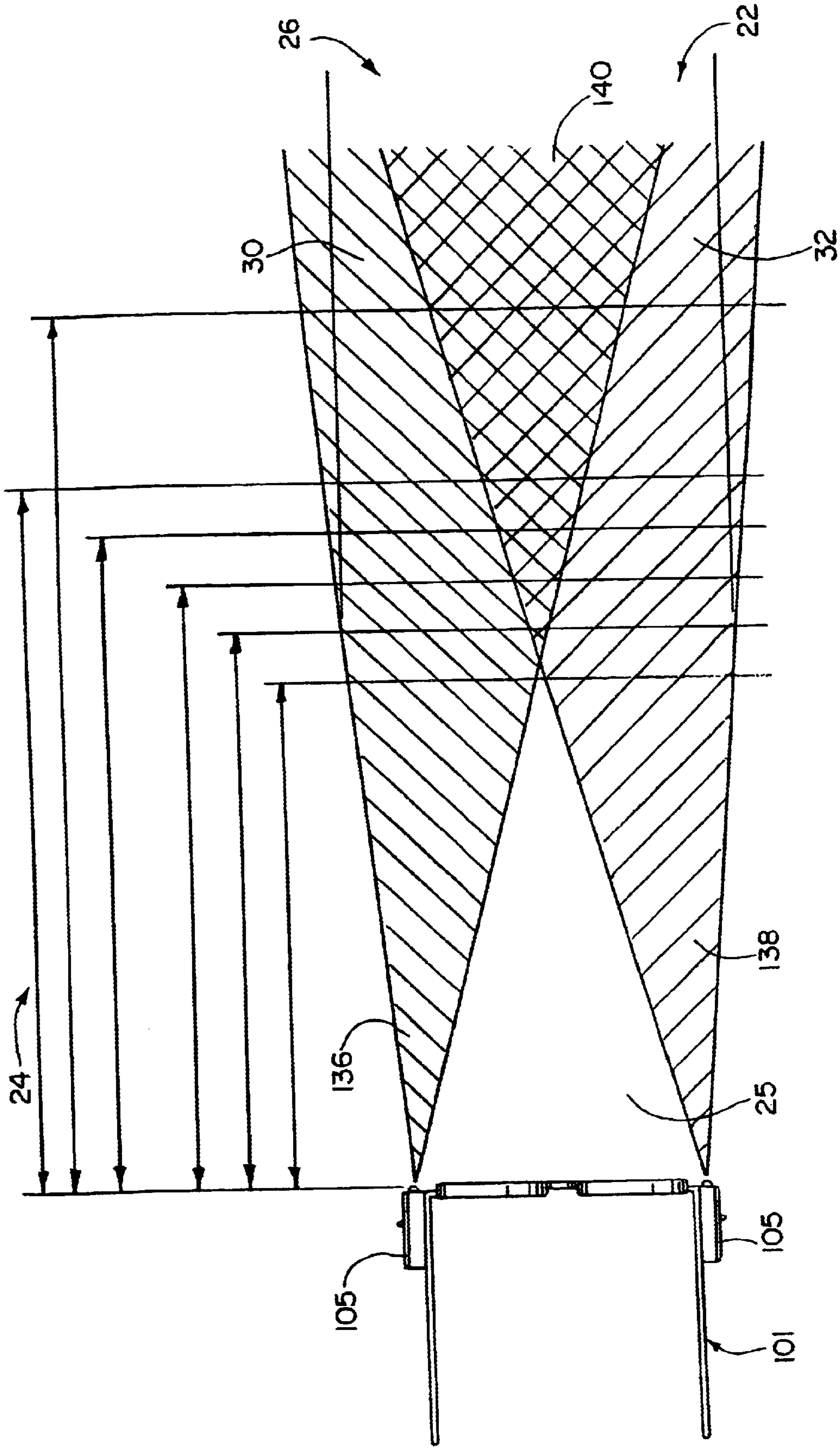

FIG. 9

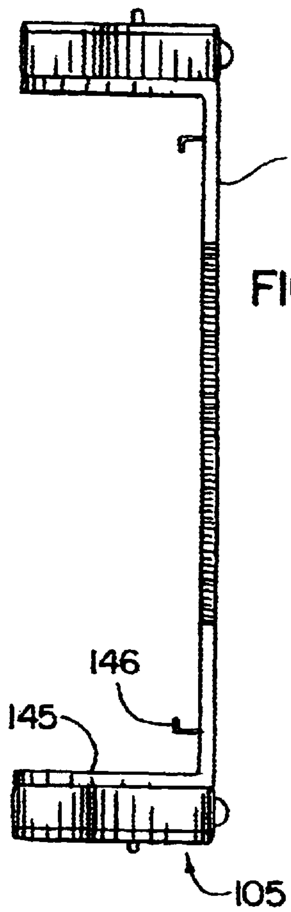

FIG. 12

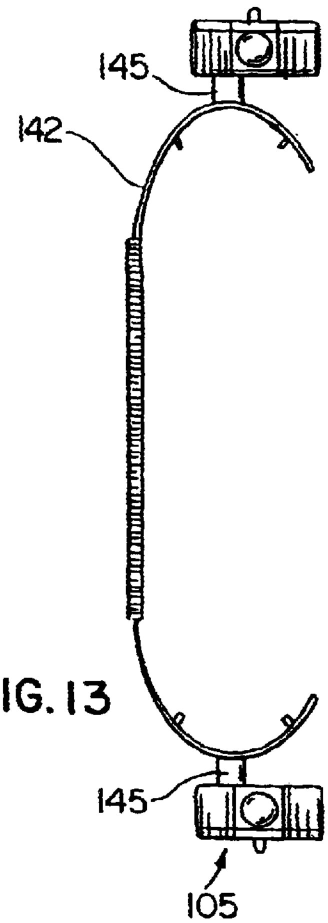

FIG. 13

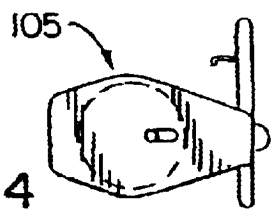

FIG. 14

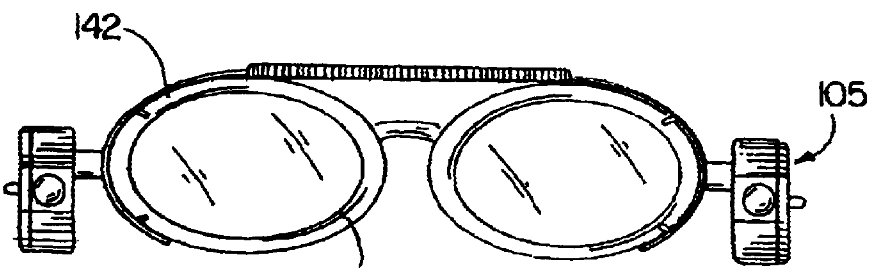

FIG. 15

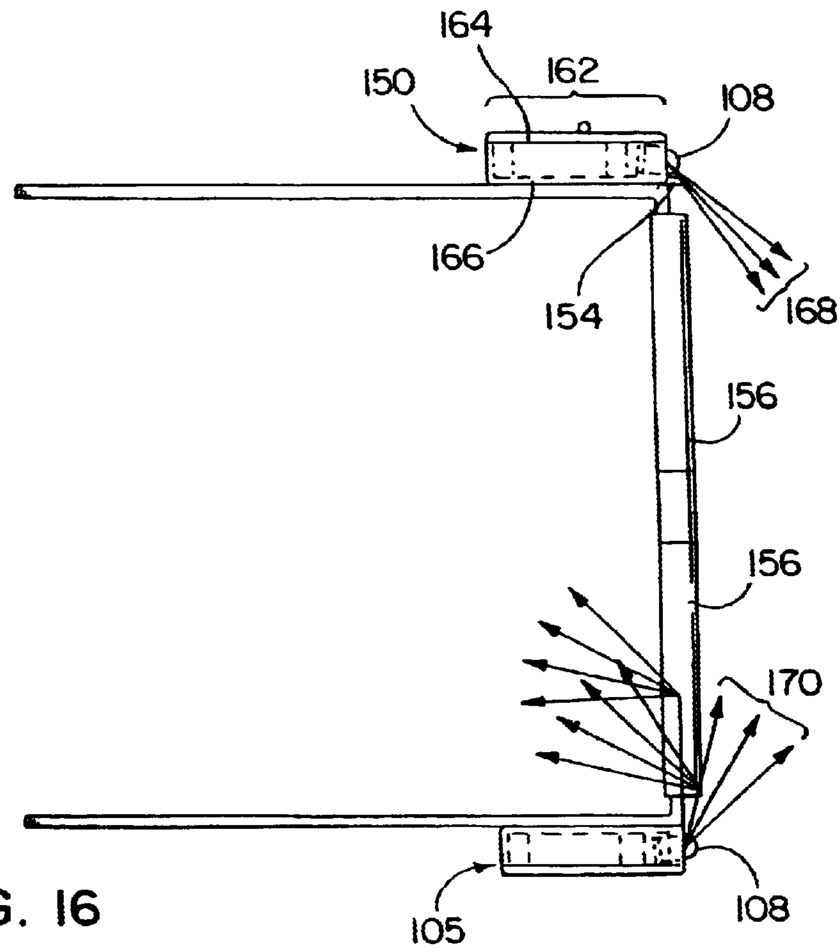
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FIG. 16

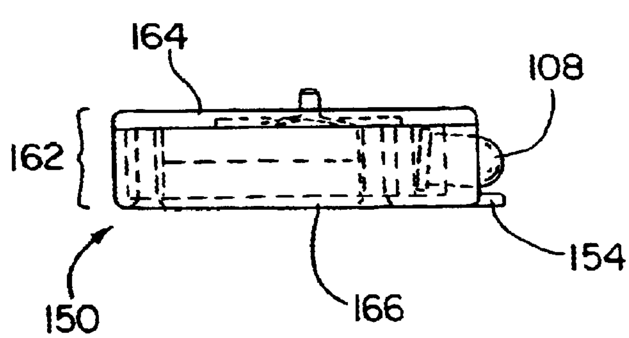
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FIG. 17

LIGHTED READING GLASSES

FIELD OF THE INVENTION

The present invention relates generally to lighted glasses and, more particularly, to eyeglasses that are especially well-suited for reading in poorly lit areas.

BACKGROUND

The use of lights and other illuminating devices with glasses is known. Generally, however, they have not been very well adapted for use with reading glasses. As is known, these types of glasses typically are not worn all the time, and are subject to being frequently taken off and put back on. On the other hand, when reading glasses are worn, they should be comfortable enough to encourage their use so that people are not avoiding their glasses and instead straining their eyes to read.

Incandescent light bulbs commonly have been proposed for use with lighted glasses. Unfortunately, such lighting devices generate a significant amount of heat. Smaller, less powerful incandescent lights still may make the wearer feel quite uncomfortable after even a short while due to the proximity of the light source and the wearer's face. Further decreasing the size of the incandescent lights, to the point where the wearer is comfortable, may cause light output to be very dim and therefore unusable for illuminating reading material that are held at distances optimal for reading.

For example, if reading distance after using corrective lenses for those in need of vision correction of ordinary size text, e.g. 10 or 12 point font, is optimally ten to eighteen inches from the eyes, a light that is capable of brightly illuminating the pages within that range of distances is necessary for ensuring comfort in reading in dimly lighted areas. However, a lower intensity light bulb, which may be preferable to reduce heat or increase battery life, may result in less than optimal lighting at the optimal reading distance, causing eye-strain and discomfort. In other words, the lower intensity of the light source will result in a decrease in the brightness of the light on the page so that the text to be read is only dimly lit.

The use fiber optic lighting devices instead of incandescent light bulbs is known. In such devices, optical fibers are bundled together to create a light producing device. The nature of fiber optics is such that there is no heat generated at the point where the light is typically transmitted; that is, adjacent the user's temple. Unfortunately, such devices suffer from a rather major limitation. Namely, a very intense and powerful light source must be available to provide light to the optical fibers. As such, head gear such as worn by surgeons having a fiber optic lighting device must at all times stay tethered to a fiber optic light source, which severely restricts the mobility of the user and thus the ease of use of the headgear. A portable light source that stays connected to the fiber optic light head via electrical cables is less than desirable in terms of the need to be able to conveniently carry the light source, and the inconveniences associated with dangling connecting lines.

An additional problem that exists with fiber optic devices, as well as incandescent lighting devices, is rapid battery consumption. Incandescent light bulbs are known to consume large amounts of power. Similarly, a fiber optic device, since it requires a strong lighting source, also requires a large amount of power. As a result, the user is be forced to change batteries often or stay tethered to a constant power source or light source.

Another disadvantage in prior art lighting devices is the manner in which surfaces are illuminated. Lighting devices used in the medical field generally produce a single fixed narrow beam of light to brightly illuminate the particular stationary body area on which the doctor may be operating. However, such a single narrow beam would not be particularly helpful in reading textual material as the beam would have to be continually shifted across the page being read. On the other hand, lights used with glasses generally tend to be very inefficient in their use of the light they generate as large amounts of light are cast beyond the field of view of the glasses. Adjustable lights are less than desirable as they require a user to make sure the lights are properly positioned each time the glasses are used.

Accordingly, there is a need for lighted glasses that are optimized for use in poorly lit or dim areas. More particularly, reading glasses having lights that are arranged to direct an optimum amount of light to the area where it is required most, i.e. the reading area, is needed. Further, lights that are very compact and lightweight, while still providing the necessary lighting strength and having a sufficiently long life for the power source that power these lights would be desirable.

SUMMARY OF THE INVENTION

In accordance with the present invention, lighted glasses, and preferably those adapted for reading which include corrective lenses, e.g. magnifiers, are provided to enable conventional sized text to be clearly read in dimly lit areas when held at a normal range of reading distances at which a user typically reads such material, such as between ten inches and eighteen inches from the lenses. High strength lights and light mounts therefor cooperate to light the reading area with a maximum amount of light provided in the reading distance range. More particularly, highly efficient and high intensity light emitting diodes (LEDs) are mounted in housings configured to fix narrow beams of light to be directed slightly inward toward each other so that the beams overlap in the reading distance range thus providing double the amount of light for reading over that provided by a single one of the lights. To this end, the housings are attached adjacent outer portions of the lenses so that the inwardly directed light beams light up the areas generally in front of the glasses, i.e. in its field of view, and which begins spaced forwardly therefrom, i.e. generally coinciding with the start of the reading distance range. Further, the small size and efficient nature of the preferred solid-state material, i.e. InGaN (indium gallium nitride), for the LEDs, allows very small power supplies to be used such as disc-shaped coin cell batteries for powering the LEDs which, in turn, allows both the light source and power source herein to be self-contained in a highly compact housing therefor. In this regard, the present invention also contemplates the provision of compactly sized lighting modules as described above that can be attached to reading or other glasses either removably or fixed in a more permanent fashion as described hereinafter, or to other items typically worn as headgear such as hats or the like.

The beams of light from the LEDs generate conical-shaped lighted areas such that upon intersection they cooperate to form a conical overlapping lighted area in which the brightness of the light is effectively doubled over that provided by a single LED. The conical overlapping lighted area increases in size as distances increase from the lenses. As is known, light tends to dissipate the further it is from its source. The overlapping conical lighted area is such that the peripheral areas in the field of view of the lenses that do not receive the double light strength of the overlapping light beams are closest to the lenses where light dissipation has its least effect in the reading distance range, whereas the overlapping lighted area increases in size further from the lenses with a corresponding decrease in the single light strength peripheral areas on either side of the cone of overlapping light. Thus, as light dissipates and distances increase from the lenses, the lighting provided will not suffer as the double light strength of the overlapping conical region of light will more than make up for the effects of light dissipation in the reading distance range.

To achieve the optimum amount of light flooding in the reading area, the light housings have surfaces configured to orient the central axis of the conical light beams in a direction that is canted slightly inward with the beams directed toward each other. The preferred canting of the narrow light beams which in the preferred and illustrated form are cones forming angles of twenty degrees is such that the cone axis has a fifteen degree angle with a reference line extending straight forwardly from the lenses. The lenses are preferably magnifiers of a predetermined diopter rating selected by a user so that conventionally sized text such as ten or twelve point font can be clearly read at distances ranging from between approximately ten and eighteen inches forwardly of the user. And it is in this distance range where the overlapping cone of light is formed by the conical light beams canted inward toward each other, as described. In this way, the present lighted reading glasses are provided with lights whose light beams are directed in a carefully coordinated manner with the vision correction provided by the corrective reading lenses so that the amount of light is maximized where it is needed most, i.e. in the field of view of the lenses and within the range of distances at which conventional sized printed text is most commonly read.

In a preferred form, the glasses include temple arms that extend rearwardly from the outer portions of the lenses with the housings attached to the arms toward the forward ends thereof. The temple arms can be opened for use or folded when not in use. With the temple arms opened, the housings are each oriented to project light therefrom forwardly inwardly and toward the light emanating from the housing attached on the other arm. The temple arms toward their forward ends typically will extend substantially straight rearwardly generally normal to the lens frame portions so that the longitudinal axis of the housing is likewise in a normal orientation to the lens frame with the mounting surfaces of the housing configured to be canted inwardly therefrom to direct the light beams as earlier described. Should the configuration of the temple arms and/or housings vary from that described herein, the mounting surfaces can be configured to adapt accordingly such that the light beams are inwardly directed as desired.

The preferred LEDs herein are a small lightweight device that provide a very bright light, while consuming very little power. As such, the batteries enclosed in the housing are small and do not need to be changed as frequently as devices that utilize incandescent lights or fiber optics, which require large batteries. The LEDs provide a relatively narrow beam of light that can be well focused in a particular direction. For example, if two light modules are mounted on a pair of glasses, the LEDs in each module are positioned such that the cones of light produced by the LEDs in the light modules begin intersecting at a point closely adjacent to or coinciding with the start of the range of ideal reading distances. As such, the illuminated reading portion receives the brightest light possible since the intersection of both cones of light are trained on that area. Another advantage of using the high intensity LEDs is that because they consume such a small amount of power, virtually no heat is dissipated. Therefore, a user is able to wear eyeglasses having the light modules mounted thereon, for longer periods of time without suffering from heat and without being bothered by the weight of the devices.

In another form, the light modules are provided with spring clips that are attached to the light module housing. The spring clips are preferably a resilient material such as metal or sturdy plastic. The spring clips enable the light module to be removably attached to any pair of eyeglasses. In still another form of the invention, the light modules are fixedly mounted on clip-on glasses. In particular, the light modules are mounted in the temple area of the clip-on glasses to enable the LEDs in the light modules to project light in the manner described above.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of lighted reading glasses in accordance with the present invention showing the glasses used to read material held at a normal reading distance range;

FIG. **2** is a side elevational view of the reading glasses of FIG. **1** showing a lighting module attached to a forward end portion of one of the temple arms of the glasses;

FIG. **3** is a plan view of the glasses of FIG. **2** showing a light switch shifted to activate the lights to generate cones of light emanating therefrom;

FIG. **4** is a perspective view of the light module showing the compact configuration of a housing of the module with a slot opening for the switch and a forward opening for the light in the form of an LED;

FIG. **5** is an exploded view of the light module of FIG. **4** showing a pair of coin cell batteries used to power the LED;

FIG. **6** is a side elevational view of the light module showing the coin cells in phantom and the tapered configuration of the housing from the widest diameter to hold the coin cells therein;

FIG. **7** is a front elevational view of the light module showing the thin configuration of the housing;

FIG. **8** is a cross-sectional view taken along line **8—8** of FIG. **6** showing light mounting surfaces for orienting the LED to project light at an oblique angle to a longitudinal axis of the housing;

FIG. **8**A is an enlarged fragmentary view of the forward portion of the module to show more clearly the preferred angle at which the LEDs are mounted in the housing;

FIG. **9** is a diagramatic view of the lighted glasses showing the respective inwardly directed cones of light produced by each of the light modules and the overlapping lighted area they create in the reading distance range;

FIG. **10** is a side elevational view of the light module having spring-clips for being removable attached to the glasses;

FIG. **11** is a front elevational view of the light module of FIG. **10** showing a ridged surface on a resilient arm of one of the clips;

FIG. **12** is a plan view of the light module fixed to a frame to be clipped onto glasses;

FIG. **13** is a front elevational view of the lighted clip-on frame of FIG. **12**;

FIG. **14** is a side elevational view of the lighted clip-on frame of FIG. **12**;

FIG. **15** is a front elevational view of the lighted clip-on frame removable attached to a pair of spectacles;

FIG. **16** is a plan view of the lighting modules modified so that each include a blinder extension integral with the extension disposed between the LEDs and the adjacent lenses; and

FIG. **17** is an enlarged elevational view of the lighting module of FIG. **16**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in drawings for purposes of illustration, the invention is embodied in lighted reading glasses **5** which enable a user wearing the glasses **5** as shown in FIG. **1** to clearly read conventionally sized printed text **10**, e.g. ten or twelve point font, held in a range of distances suitable for reading such text sizes where the reading is occurring in poorly or dimly lit areas. In this regard, the present lighted reading glasses **5** are ideally suited for use in areas that normally require a user to turn on a light before reading can occur but where doing so is less than desirable, such as in-a car or when reading in bed with another present who is trying to sleep while you read.

The lighted glasses **5** which as stated above are preferably reading glasses **5** will include lenses **12** of light transmissive material configured to refract light to correct for defects in vision which is due to errors of refraction in the human eye and thus, at least one of the lens surfaces **14** will be curved to precisely correct for the defect being addressed in a particular individual that wishes to use the lighted reading glasses **5** herein. A variety of lens types may be utilized including concave, convex, plano-convex, cylindrical, compound lenses and/or bi, tri, or tetrofocal lenses, although the reading glasses **5** are preferably adapted for use by those who are farsighted so that convexly configured lenses **12** will typically be employed. Further, although the reading glasses **5** can be provided with prescription lenses **12**, from a cost standpoint the lighted glasses **5** are preferred for use with lower cost magnifier lenses **12** that have a well-defined diopter rating. In this regard, the lenses **12** can be offered with nine different diopter ratings from 1.00 up to 3.00 in intervals of 0.25 therebetween. Alternatively, the lenses **12** can be non-refractive for people who do not need vision correction but still want to read in the dark via the lighting provided by the glasses **5** herein.

With the reading glasses **5** on, the user will be able to read in dark or dimly lit areas via lights **16** that are on the glasses **5** attached by way of respective light mounts **18** therefor. The light mounts **18** fix the predetermined lighted areas **20** to be oriented so that they overlap and create an overlapping lighted area **22** which has double the amount of light and thus significantly increased brightness over that provided by a single one of the lights **16**. As best shown in FIG. **9**, the overlapping lighted area **22** is disposed in the predetermined reading distance range generally designated **24** by the direction afforded to the lights **16** via their light mounts **18**. This range for a normal functioning eye or using an appropriate corrective lens for those requiring vision correction for reading ten or twelve point font with a sufficiently large or wide field of view will be approximately ten to eighteen inches in front of the lenses **12**.

The lights **16** are preferably high intensity lights or LEDs **108** that form their lighted areas **20** as narrow light beams in the shape of respective cones **136** and **138** of light directed inwardly toward each other, as shown in FIGS. **3** and **9**. In this manner, the point of intersection **48** will be closely adjacent or substantially coincident with the start of the reading distance range **24** and the overlapping area **22** will likewise take on a conical shape **140** and be maximized in size in the range **24**. There is also a proximate conical area **25** right in front of the glasses **5** that does not receive light. However, this unlighted area **25** is of little consequence as it substantial falls before the start of the reading distance range **24**.

By canting the light beams **136** and **138** inwardly, little light is wasted on areas that are outside the effective field of view, generally designated **26**, of the glasses **5**. Further, the conical overlap area **140** that receives double the amount of light increases in size with increasing distances from the lenses **12**. By contrast, the peripheral areas **30** and **32** on either side of the double-lit overlap area **140** become smaller with increasing distance from the lenses **12**. Since light dissipation can become an issue as distances increase from the light source, the increasing size of the double-lit area **22** in comparison to the decreasing size of the single-lit areas **30** and **32** provides a significant advantage in having a very well-lit reading area with an efficient use of the light generated by the LEDs **108** herein. Further, the fixed canting of the beams **136** and **138** allows a user to put on the glasses **5** and know that they will be able to begin reading even in dimly-lit areas by simply turning on the lights **16** without requiring that they be adjusted for focusing them on the material to be read.

The light mounts **18** are preferable compactly sized housings **109** for containing the high intensity LEDs **108** and at least one, and preferably two, small disc-shaped battery power supplies **116** in a space savings manner therein. The housings **109** can be constructed of two halves or cover members **106** and **107** each with mounting surfaces generally designated **30** and **32** configured to orient the LED dome lens **34** in forward opening **36** of the housing **109** such that the light beam cones **136**,**138** emanate in the desired inward direction. As best seen in FIGS. **7**, **8** and **8A**, the surfaces **30** and **32** can be formed integrally with their respective housing portions **106** and **107** such as on raised ribs **38** and **40**. As shown, the surfaces **30** and **32** are each inclined to extend in the same direction relative to longitudinal axis **42** of the housing **109** such that they extend transversely and at an oblique angle thereto. In this manner, when the housing portions **106** and **107** are attached, the ribs **38** and **40** cooperate to capture the LED dome lens **34** in a canted orientation thereof relative to housing axis **42**. Accordingly, with the LEDs **108** switched on, the axis **44** extending centrally through or bisecting the light beam cones **136** and **138** will generally extend parallel to the housing mounting surfaces **30** and **32** and at an oblique angle to the axis **42**.

In the preferred and illustrated form, the eyeglasses **5** including temple arms **104** are constructed such that with the arms **104** opened, their forward end portions **104***a* will extend substantially normal to the general plane of the eyeglass lenses **12** and to any frame portions that may be included thereabout. Further, the housings **109** are constructed so that when attached flush to the arm forward end portion **104***a* as shown in FIG. **3**, the housing axis **42** will extend parallel to the forward end portion **104***a* and straight forwardly from the glasses **5**. With the preferred solid state material for the LEDs **108** as described hererinafter, they will generate a narrow light beam cone **136**, **138** of twenty degrees. For this narrow cone **136**, **138**, the oblique inward cant angle **46** is preferably approximately fifteen degrees so that the point **48** of intersection where the overlap lighted area **22** begins is centrally disposed between the lenses **12** and spaced forwardly therefrom approximately at the start of the reading distance range **24**. This inward canting of the light beam cones **136** and **138** also minimizes the amount of light that is projected to lateral areas outside the field of view **26** forwardly of the glasses **5**.

The LEDs **108** are preferably high-intensity white LED, such as manufactured by Chicago Miniature Lamp, Inc., of Hackensack, N.J., part number CMD333UWC-ND. Similar types of LEDs are available from a variety of manufacturers and such LEDs would also be acceptable for use in the light module **105**. A particular advantage of using the described high-intensity LEDs is the ability of the LEDs to provide large amounts of bright light while consuming significantly less power than incandescent light sources and fiber optic devices. In particular, the LED **108** provides a typical 2300 mcd light output using only 20 mA of power. This allows for significantly extended battery life using inexpensive and lightweight batteries. A further advantage of this type of LED is the relatively narrow viewing angle of approximately 20 degrees. This allows the light output to be directed in a very precise manner, making it ideally suited for use in the present invention. Referring in particular to FIG. **3**, it can be seen that the angle of the LED **108** causes the cone of light to be emitted at a specific angle so that the light is directed slightly inward toward the portion being read and thereby avoiding scattering of light outwards and particularly outside the field of view of the glasses **5**.

Turning now to FIG. **4**, the light module **105** is shown in isolation from the eyeglasses. As can be seen in greater detail, the light module **105** houses a switch **114** having an actuator projecting portion **110**. The projecting portion **110** is designed such that a user's thumb or finger can quickly and easily engage the projecting portion **110** to push the switch **114** for sliding in either one of two directions to turn the light module off and on. The elongated slot **112** is sized such that the switch **114** can be moved only a preset distance, thereby enabling the on and off functions to be accomplished with a minimum of motion. When the switch **114** is moved to the "on" position, a set of batteries **116** energize the LED **108**. Similarly, when the switch **114** is moved to the "off" position, the connection between the batteries **116** and the LED **108** is broken and the LED **108** is turned off.

Referring to FIG. **5**, an exploded perspective view of the light module **105** is shown. The light module **105** comprises a housing **109** that is preferably constructed of a lightweight material, such as plastic, to provide the greatest amount of comfort to the wearer, while still being a cost-effective product. The housing **109** includes a first cover member **106** and a second cover member **107**. The second cover member **107** is formed with a main flat wall **107*a*** from which upstanding walls **107*b*** extend from the periphery thereof to form an interior space **107*c*** in which the switch **114**, the batteries **116** and the LED **108** are disposed. The fastening devices **124**, which may be self tapping screws among others, are used to fasten the first cover member **106** as a lid onto the second cover member **107**.

The first cover member **106** is formed with an elongated slot **112** cut out of the main flat wall **106*a***, several integral projecting bosses **120** that can be internally threaded for receiving fastening members or screws **124** and an integral LED positioning member or raised rib **40**. The LED positioning member **40** extends toward the cover **107** and has a concave surface **32** that cooperates with curved surface **30** of the cover member **107** for capturing the LED dome lens **35** at the desired angle **46** to axis **42** (FIG. **8*a***). As described above, the elongated slot **112** is designed to receive the projecting portion **110** of a switch **114** such that the projecting portion **110** extends slightly outside the first cover member **106** and is accessible by a user's finger or thumb. The cover member **106** also is formed having a slot **119** (FIG. **8**) to form a housing for the switch **114** when the light module is fully assembled.

The LED **108** includes anode **111** and cathode **115** leads that are used to energize the LED **108**. In addition, the anode **111** and cathode **115** leads are physically configured to also enable the LED **108** to be securely held in position within the light module **105**. The cathode **115** lead, which is generally the shorter of the two leads, is trimmed further to a size suitable for engaging an aperture **113** in a box shaped member **130**. The trimmed cathode **115** lead is bent into a curved hook configuration to behave as a resilient spring clip when mounted into the light module **105**; and the anode lead is left in its original form and engages a second aperture in the box shaped member **130**, which enables the anode **111** lead to extend into the open portion of the second cover member **107**, as further discussed below.

The second cover member **107** includes a LED positioning member or rib **38** having curved surface **30** formed thereon for cooperating with surface **32** to capture the LED dome lens **34**, as previously described. A lead guide assembly **130** is disposed within cover member **107**. The guide assembly **130** channels or guides the anode **111** lead and the cathode **115** lead into their respective appropriate positions for conducting and switching functions. The guide assembly **130** includes an extending sidewall **131** and an extending support structure **132**. The support structure **132** includes first **133** and second **134** indents and a block **135** oriented between the first **133** and second **134** indents. When the LED **108** is placed into position in the guide assembly **130**, the anode **111** lead is placed into the channel between the extending sidewall **131** and extending support structure **132**. A large portion of the anode **111** lead extends beyond the sidewall **131** and into the cover member **107** opening. The cathode **115** lead, which is in a bent hook configuration is placed into the support structure **132** such that the portion of the cathode that is connected to the LED **108** is situated in the second **134** indent and the hooked portion engages the first **133** indent. The block **135** forces part of the cathode **115** lead to extend beyond the support structure **132** to enable contact between the batteries **116** and the cathode **115** via the switch **114**.

The second cover member **107** also includes several apertures **122** for receiving the fastening devices **124**. The fastening devices **124** are inserted into apertures **122** and engage the fastening receiving members **120** of cover member **106**. The apertures **122** in the second cover member **107** are preferably countersunk such that the heads of the fastening devices **124** sit flush with the surface of the second cover member **107**. Furthermore, by providing a standard phillips or slot headed fastening device, a user is able to gain access to the interior of the light module using a simply, commonly found household screwdriver. Once inside, the user self-services the light module **105** and, in particular, replaces the batteries **116** when they are exhausted.

The batteries **116**, because of the low power consumption of the high-intensity LEDs **108**, may be any commonly found small form factor batteries, such as three volt coin cells manufactured by Panasonic Corporation of Japan, part no. P189D. To this end, the disc-shaped batteries preferably have a diameter of slightly greater than three-fourths of an inch and a width of approximately one-eighth of an inch so that two batteries **116** can be stacked in a compact fashion. Accordingly, with the small LED **108** and the small and thin batteries **116**, the housings **109** can be constructed in a very compact fashion. By way of example and not limitation, the main housing walls **106*a*** and **107*a*** have a maximum width of less than approximately one-inch. Since neither the batteries **116** or the LED **108** is particularly long, and the stroke of the switch **110** in minimized as previously described, the length of the housing **109** can be minimized to be on the order of approximately one and one-half inches. Finally, since the batteries **116** are so thin, the depth of the housing **109** can be sized to be slightly greater than the thickness of the two stacked disc batteries **116** or less than approximately one-half inch.

When assembled, the batteries **116** make contact with the anode or elongated portion **111** of the LED **108**. The batteries **116** are stacked together such that the negative terminal of the first battery is an electrical contact with the positive terminal of the second battery. The positive terminal of the first battery **116** is then placed in electrical contact with the elongated portion **111** of the LED **18**. The switch **114** which is constructed of an electrically conductive light-weight metal strip rests solely on the negative terminal of the second battery when the light module is not producing light, resulting in an open circuit. When the switch **114** is placed in its "on" position, an electrical connection is created between the negative terminal of the battery **116** and the depending hooked portion **115** of the LED **108**. Thus the circuit from the positive terminal of the battery **116** to the LED **108** is completed using the switch **114**, and the LED **108** illuminates. The projecting portion **110** may be integrally formed as part of the metal strip or may be a plastic or metal projection that is fastened at an appropriate position in the body of the switch **114**. The body of the switch **114** is constructed such that the metal strip includes one or more inclines formed by bends in the metal strip of the switch. The inclines are sized to cause the switch **114** to fit relatively tightly between the battery and the housing much like a spring, thereby enabling the switch to maintain its on or off position into which it has been placed.

Referring to FIGS. **8** and **8**A, the light module is shown in its assembled form. The LED positioning member **40** of the cover member **106** presses against the body of the LED **108** and pushed the LED **108** into a canted position within the housing **105**. A particular advantage in such a configuration is that the LED is able to project light at a precise pre-determined angle. Referring in particular to FIG. **8**A, it can be clearly seen that the base **109** of the LED **108** helps to hold the LED **108** in place within the housing **105**. Furthermore, it also clearly can be seen that the LED positioning member **40** is angled to a degree such that the top of the LED **108** is pushed against the second cover member **107** and particularly the positioning rib **38** thereof.

Turning now to FIG. **9**, the eyeglasses **101** having the light modules **105** mounted thereon are shown in operation. The canted positioning of the LEDs **108** in each of the light modules **105** cooperate to create an overlapping zone **140** of their respective cones of light **136**, **138** in the desired reading range. In particular, because of the twenty degree viewing angle of the LEDs **108**, and their precise cant within the housing **107**, the overlap area **140** occurs within a range of distances that is ideally suited for reading after the use of corrective lenses in the eyeglasses for those in need of vision correction. As a result, the incidence of stray light is reduced and the amount of light illuminating the reading surface is maximized, as previously described. The eyeglasses themselves may be of any configuration. For example, the lenses of the eyeglasses may or may not have frames surrounding the exterior edges of the lenses. Furthermore, the eyeglasses may have bridges for interconnecting the inner portions of the lenses of for interconnecting the inner portions of the lens frames, depending on whether the eyeglasses have frames.

Referring to FIG. **11**, the light module **105** is shown with a pair of spring clips **134** attached to the second cover member **107**. The spring clips **134** may be manufactured of any strong resilient materials such as a high impact ABS plastic or metal, such as stainless steel. The spring clips may **134** be formed having slight ridges **135** to more securely hold the light modules **105** in place. The spring clips **134** enable the light module **105** to be retrofitted or removably attached to any eyeglasses. Therefore, the present invention is not limited to eyeglasses having premounted light modules that are more perfectly fixed to eyeglasses as by fasteners or the like requiring tools for their removal. Rather, any existing eyeglass frames maybe fitted with the light modules. Referring to FIG. **10**, it can be seen that the spring clips **124** are fastened onto the housing **109** using the same apertures **120** and fastening devices **124** as described above. Therefore, a manufacturer of the light module obtains a cost benefit by using the same light module **105** platform, but easily configuring it in a number of different ways, depending on the type and configuration of the lighted eyeglasses.

Turning now to FIGS. **12**, **13**, **14**, and **15**, the lighted eyeglasses of the present invention is shown in another aspect. The light module **105** is carried by clip-on glasses **142** having module mounts **145**. Referring in particular to FIG. **12**, the module mount **145** runs along the length of the light module **105** to provide stability and support to the light module **105**. The module mount **145** is attached to the frame at the outer ends of the clip-on glasses and extends rearwardly therefrom. The light modules **105** are mounted on the light mounts **145** such that the respective LEDs **108** project light in a generally forward angled direction. As shown in greater detail in FIG. **13**, the module mount **145**, although running the entire length of the light module **105**, is a relatively narrow strip. This ensures that the device remains light weight and retains its aesthetically pleasing design. As shown in FIG. **14**, each of the light modules **105** is attached to a module mount in the temple area of the clip-on glasses **142** and is oriented such that the module mount can not be seen from the side. FIG. **15** shows a representative appearance of the clip-on glasses, having the light modules **105** mounted thereon, attached to a pair of standard eyeglasses **148**.

Referring now to FIGS. **16** and **17**, a light module is shown having an integrally formed blinder extension to eliminate glare. An advantage of such a light module is that reducing glare also reduces eye-fatigue that a wearer may suffer when wearing eyeglasses with the light modules for extended periods of use. Although both types of light modules work equally well, individuals with sensitive eyes may prefer the light module with the blinder extensions. By way of example only, and to illustrate the difference between the two light modules, eyeglasses are shown mounted with a first light module **150** with an integrally formed blinder extension **154** on one temple area of the eyeglasses and a second light module **105** (as generally described above) mounted on the other temple area of the eyeglasses.

Lighted eyeglasses having the light module **105**, mounted in the manner described above may, in certain instances, create glare that is perceivable by the wearer. As shown, stray or incident light rays **170** that are emitted by the LED **108** may project towards the lens **156** of the pair of eyeglasses **158**. The rays **170** are then reflected or refracted by the lenses **156** into the eyes of the wearer. In contrast, the glare reducing light module **152** includes an integral projecting portion or blinder extension **154** for reducing potential glare that may be generated as a result of the light **160** emitted by the LED **108** as it is reflected or refracted off the lenses **156** in the glasses **158**. The light module **150** is comprised of a housing **162** that includes a first cover member **164** and a second cover member **166**. The second cover member **166** includes the blinder extension **154**, which is situated between the LED dome and the lens **156** when the light module is mounted to eyeglasses. The blinder extension **154** is configured such that it extends outwards in the direction of the LED **108** and is optimally sized such that the blinder extension **154** blocks the incident rays of light without distracting the wearer or interfering with the light projected for illuminating a reading surface.

While there have been illustrated and described particular embodiments of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications that fall within the true sprit and scope of the present invention.

What is claimed is:

1. Lighted reading glasses that provide enhanced viewing of text of a predetermined conventional size in a predetermined distance range from the glasses in poorly lit areas, the lighted reading glasses comprising:

a pair of lenses having outer portions and inner portions that are adjacent to and laterally spaced from each other and providing a predetermined field of view for a user;

light transmissive material of the lenses having a predetermined configuration for refracting light to provide the user with vision correction of a predetermined character to allow the predetermined size of text disposed in the predetermined distance range within the field of view to be substantially clearly read;

a pair of lights associated with the lenses each having a predetermined high light strength rating and a predetermined lighted area in which light emanating therefrom is projected;

a pair of light mounts adjacent the outer portions of the lenses that cooperate with the lights to fix the predetermined lighted areas relative to the lenses to be oriented for overlap to provide an overlapping lighted area that is maximized in size in the predetermined distance range; and

support surfaces of the light mounts having a predetermined configuration which capture the lights in a predetermined orientation to be fixed against movement in any direction such that the predetermined lighted areas emanating therefrom are directed inwardly toward each other to avoid the need to adjust the lights for maximizing the size of the overlapping lighted area in the field of view at the predetermined distance range.

2. The lighted reading glasses of claim **1** wherein the light mounts are housings that include the support surfaces.

3. The lighted reading glasses of claim **1** wherein the predetermined lighted areas each have a conical shape with the conical areas intersecting at a predetermined distance within the predetermined distance range so that the overlapping lighted area increases in size with increasing distance from the lenses to minimize effects of light dissipation in the predetermined distance range.

4. The lighted reading glasses of claim **1** wherein the lights are high intensity light-emitting diodes of a predetermined material so that the predetermined lighted area is generated by a narrow light beam.

5. The lighted reading glasses of claim **1** wherein the predetermined lighted areas are narrow cones so that there is an unlighted area proximate to the lenses which does not substantially fall within the predetermined distance range.

6. The lighted reading glasses of claim **1** wherein the light mounts are housings, the lights are light emitting diodes of a predetermined material, and

at least one small disc-shaped battery power supply for the light-emitting diodes to allow the housings to be compactly sized with each of the light-emitting diodes and the battery power supply therefor self-contained in respective ones of the housings.

7. The lighted reading glasses of claim **1** wherein the light mounts are housings, and

a small power source in the housings for each of the lights to allow the housings to be compactly-sized, self-contained lighting modules for the glasses.

8. The lighted reading glasses of claim **7** including a frame, and the lighting modules are one of removably carried on the frame and fixed to the frame.

9. The lighted reading glasses of claim **8** wherein the removably carried modules include resilient clips for being removably attached to the frame.

10. The lighted reading glasses of claim **8** wherein the removably carried light modules are fixed onto an adjustable light-carrying frame configured for being releasably secured to the frame of the reading glasses.

11. The lighted reading glasses of claim **8** wherein the frames include lens portions that extend about the light transmissive material of the lenses and an interconnecting bridge portion that extends between the frame lens portions.

12. The lighted reading glasses of claim **1** including elongate temple arms having forward and rearward ends with the arms extending rearwardly from adjacent the outer portions of the lenses with the light mounts being fixed to the temple arms adjacent the forward ends thereof.

13. The lighted reading glasses of claim **12** wherein the light mounts include blinder extensions that project between the lights and the lenses to minimize refraction or reflection of light emanating from the lights through the lenses.

14. The lighted reading glasses of claim **1** wherein the lenses have a convex configuration with a predetermined diopter rating to magnify the text to be read.

15. The lighted reading glasses of claim **1** wherein the predetermined high light strength rating of the lights is approximately 2300 milli candles (mcd) to generate high brightness light so that light dissipation is minimized at distances in the predetermined reading distance range where the overlapping lighted area is absent.

16. The lighted reading glasses of claim **1** wherein the predetermined lighted areas are cones of light increasing in size further from the glasses so that the overlapping lighted area has a conical shape leaving only peripheral areas in the field of view of the lenses that are lit by a single one of the lights with the peripheral areas becoming progressively smaller as distances from the lenses increase.

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