

EYEWEAR WITH ELECTRICAL COMPONENTS

[0001] The following disclosure describes various inventions as well aspects and implementations thereof. The disclosure is organized into four sections. The sections are as follows:

- A. EYEWEAR WITH ULTRAVIOLET DETECTION SYSTEM
- B. EVENT EYEGLASSES
- C. EYEWEAR SUPPORTING AFTER-MARKET ELECTRICAL COMPONENTS
- D. EYEGLASSES WITH A CLOCK OR OTHER ELECTRICAL COMPONENT

[0002] The inventions, aspects, or implementations discussed in these sections can be used separately or in any combination.

[0003] This application is related to U.S. Provisional Application No. _____ (Docket No. IPVCP001P6), filed concurrently herewith, and entitled "EYEGLASSES WITH A HEART RATE MONITOR," which is hereby incorporated herein by reference.

[0004] The application is also related to: (i) U.S. Provisional Patent Application No. 60/562,798, filed April 15, 2004, entitled "EYEWEAR WITH ULTRAVIOLET DETECTION SYSTEM," and which is hereby incorporated herein by reference; (ii) U.S. Provisional Patent Application No. 60/583,169, filed June 26, 2004, entitled "ELECTRICAL COMPONENTS FOR USE WITH EYEWEAR, AND METHODS THEREFOR," and which is hereby incorporated herein by reference; (iii) U.S. Provisional Patent Application No. 60/592,045, filed July 28, 2004, entitled "EYEGLASSES WITH A CLOCK OR OTHER ELECTRICAL COMPONENT," and which is hereby incorporated herein by reference; (iv) U.S. Provisional Patent Application No. 60/605,191, filed August 28, 2004, entitled "ELECTRICAL COMPONENTS FOR USE WITH EYEWEAR, AND METHODS THEREFOR," and which is hereby incorporated herein by reference; and (v) U.S. Provisional Patent Application No. 60/620,238, filed October 18, 2004, entitled "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES," and which is hereby incorporated herein by reference.

[0005] In addition, this application is related to: (i) U.S. Provisional Patent Application No. 60/462,591, filed April 15, 2003, and entitled "EYEGLASSES FOR WIRELESS COMMUNICATION," which is hereby incorporated herein by reference; (ii) U.S. Provisional Patent Application No. 60/509,631, filed October 9, 2003, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; (iii) U.S. Provisional Patent Application No. 60/527,565, filed December 8, 2003, and entitled "ADAPTABLE COMMUNICATION TECHNIQUES FOR ELECTRONIC DEVICES," which is hereby incorporated herein by reference; (iv) U.S. Patent Application 10/822,218, filed April 12, 2004, and entitled "EYEGLASSES FOR WIRELESS COMMUNICATIONS," which is hereby incorporated herein by reference; and (v) U.S. Patent Application No. 10/964,011, filed October 12, 2004, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference.

A. EYEWEAR WITH ULTRAVIOLET DETECTION SYSTEM

FIELD OF THE INVENTION

[0006] The present invention relates to eyewear and, more particularly, to eyewear with detection capability.

BACKGROUND OF THE INVENTION

[0007] It is common for people to be exposed to various types of radiation. Often excessive exposure to radiation can be hazardous to one's health. One type of radiation that frequently raises a health concern is ultraviolet (UV) radiation. UV radiation is subdivided into three types: UV-A, UV-B, and UV-C. UV-C radiation has wavelengths in the range of 200 to 285 nanometers (nm) and is totally absorbed by the earth's atmosphere. UV-B, from about 285 to 318 nm, is known to cause skin cancer in humans. UV-A, from about 315 to 400 nm, is mostly responsible for tanning. However, UV-A has also been found to play some role in skin cancer and is the cause of eye cataracts, solar retinitis, and corneal dystrophies.

[0008] Although several UV radiation measuring and warning instruments have been developed and made commercially available, these instruments are disadvantageous for various reasons. One disadvantage is that the instruments are often a stand alone, special purpose device. As a result, a user must separately wear the special purpose device, which can be intrusive and often inconvenient. Another disadvantage is that those instruments, even if separate but attachable to other devices, hinder or impede the design for the devices.

[0009] Thus, there is a need for improved approaches to measure and inform persons of UV radiation levels.

SUMMARY OF THE INVENTION

[0010] In one embodiment, the invention pertains to eyewear having radiation monitoring capability. Radiation, such as ultraviolet (UV) radiation, infrared (IR) radiation or light, can be measured by a detector. The measured radiation can then be used in providing radiation-related information to a user of the eyewear. Advantageously, the user of the eyewear is able to easily monitor their exposure to radiation.

[0011] In one embodiment, all components for monitoring radiation can be integrated with the eyewear, such as the frame (e.g., a temple of the frame) of the eyewear. Since any of the components provided can be integrated with the

eyewear, the disturbance to design features of the eyewear can be reduced. As an example, the eyewear normally includes a pair of temples, and the components for monitoring radiation can be embedded within one or both of the temples. In one implementation, all components for monitoring radiation are integrated into a temple of the frame of the eyewear. As an example, these components can be formed together on a substrate as a module.

[0012] In one embodiment, the eyewear includes a detector, electrical circuitry and an output device. The eyewear can also include one or both of a battery and a solar cell to provide power to the electrical circuitry and possibly other components. Further, the eyewear can also include one or more additional sensors. Still further, the eyewear can also include communication capabilities.

[0013] The invention can be implemented in numerous ways, including as a system, device, apparatus, and method. Several embodiments of the invention are discussed below.

[0014] Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

[0016] FIG. 1 is a perspective view of UV monitoring glasses according to one embodiment of the invention.

[0017] FIGs. 2A and 2B are diagrams of a circuit board according to one embodiment of the invention.

[0018] FIG. 3 is a block diagram of a UV monitoring system according to one embodiment of the invention.

[0019] FIG. 4A is a block diagram of a UV monitoring system according to another embodiment of the invention.

[0020] FIG. 4B is a block diagram of a UV monitoring system according to still another embodiment of the invention.

[0021] FIG. 4C is a block diagram of a UV monitoring system according to yet another embodiment of the invention.

[0022] FIG. 4D is a block diagram of a UV monitoring system according to yet another embodiment of the invention.

[0023] FIG. 5 is a chart that depicts examples of auxiliary sensors that can be utilized as the one or more auxiliary sensors shown in FIGs. 4A – 4D.

[0024] FIG. 6 is a block diagram of a UV monitoring system according to one embodiment of the invention.

[0025] FIG. 7A is a schematic diagram of a UV monitoring circuit according to one embodiment of the invention.

[0026] FIG. 7B is a schematic diagram of a UV monitoring circuit according to another embodiment of the invention.

[0027] FIG. 7C is a schematic diagram of a UV monitoring circuit according to yet another embodiment of the invention.

[0028] FIG. 7D is a schematic diagram of a UV monitoring circuit according to still yet another embodiment of the invention.

[0029] FIG. 8 is a flow diagram of a UV monitoring process according to one embodiment of the invention.

[0030] FIG. 9 is a flow diagram of a UV monitoring process according to another embodiment of the invention.

[0031] FIG. 10 is a flow diagram of a UV monitoring process according to yet another embodiment of the invention.

[0032] FIG. 11 is a flow diagram of a UV monitoring process according to still yet another embodiment of the invention.

[0033] FIG. 12 is a block diagram of electronic circuitry according to one embodiment of the invention.

[0034] FIG. 13A is a schematic diagram of an electronic circuit for a UV detection system according to one embodiment of the invention.

[0035] FIG. 13B is a schematic diagram of a periodic supply voltage circuit according to one embodiment of the invention.

[0036] FIG. 14A is a block diagram of a radiation monitoring system according to one embodiment of the invention.

[0037] FIG. 14B is a block diagram of a radiation monitoring system according to another embodiment of the invention.

[0038] FIG. 14C is a schematic diagram of a radiation-to-frequency converter according to one embodiment of the invention.

[0039] FIG. 14D is a schematic diagram of a latch according to one embodiment of the invention.

[0040] FIG. 14E is a schematic diagram of a LCD driver according to one embodiment of the invention.

[0041] FIG. 14F is a schematic diagram of a power supply according to one embodiment of the invention.

[0042] FIG. 14G is a cross-sectional view of a UV detector arrangement according to one embodiment of the invention.

[0043] FIG. 14H is a cross-sectional view of a UV detector arrangement according to one embodiment of the invention.

[0044] FIG. 14I is a cross-sectional view of a UV detector arrangement according to one embodiment of the invention.

[0045] FIG. 14J is a partial block diagram of a radiation monitoring system according to one embodiment of the invention.

[0046] FIG. 14K is a schematic diagram of a radiation-to-frequency converter and a sensor according to one embodiment of the invention.

[0047] FIG. 14L is a diagram of a representative waveform of a low duty cycle signal V_D .

[0048] FIG. 14M is a schematic diagram of a power supply another according to one embodiment of the invention.

[0049] FIG. 14N is a diagram of a binary counter according to one embodiment of the invention.

[0050] FIG. 14O is a block diagram of latch-driver circuitry according to one embodiment of the invention.

[0051] FIG. 14P is a block diagram of driver circuitry according to one embodiment of the invention.

[0052] FIG. 14Q is a block diagram of driver circuitry according to another embodiment of the invention.

[0053] FIGs. 15A-15C are cross-sectional diagrams of a radiation detection systems according to different embodiments of the invention.

[0054] FIG. 16A is a cross-sectional view of an eyewear housing containing a radiation detection system according to one embodiment of the invention.

[0055] FIG. 16B is a cross-sectional view of an eyewear housing containing a radiation detection system according to another embodiment of the invention.

[0056] FIG. 16C is a cross-sectional view of an eyewear housing containing a radiation detection system according to still another embodiment of the invention.

[0057] FIG. 16D is a cross-sectional view of an eyewear housing containing a UV detection system according to yet still embodiment of the invention.

[0058] FIG. 17A is a cross-sectional view of a module housing according to one embodiment of the invention.

[0059] FIG. 17B is a cross-sectional view of an eyewear housing according to one embodiment of the invention.

[0060] FIG. 18 is a cross-sectional view of an eyewear housing having a reflective-type filter according to one embodiment of the invention.

[0061] FIG. 19 is a side view of a temple for an eyeglass frame according to one embodiment of the invention.

[0062] FIGs. 20A and 20B are top view diagrams of a portion of an eyeglass frame according to one embodiment of the invention.

[0063] FIG. 21 is a side view of a temple for an eyeglass frame according to one embodiment of the invention.

[0064] FIG. 22 is a side view of a temple for an eyeglass frame according to another embodiment of the invention.

[0065] FIGs. 23A-23G illustrate examples of various end products having radiation monitoring capability.

DETAILED DESCRIPTION OF THE INVENTION.

[0066] In one embodiment, the invention pertains to eyewear having radiation monitoring capability. Radiation, such as ultraviolet (UV) radiation, infrared (IR) radiation or light, can be measured by a detector. The measured radiation can then be used in providing radiation-related information to a user of the eyewear. Advantageously, the user of the eyewear is able to easily monitor their exposure to radiation.

[0067] In one embodiment, the eyewear includes a detector, electrical circuitry and an output device. The eyewear can also include one or both of a battery and a solar cell to provide power to the electrical circuitry and possibly other components. Further, the eyewear can also include one or more additional sensors. Still further, the eyewear can also include communication capabilities.

[0068] In one embodiment, all components for monitoring radiation can be integrated with the eyewear, such as the frame (e.g., a temple of the frame) of the

eyewear. Since any of the components provided can be integrated with the eyewear, the disturbance to design features of the eyewear can be reduced. As an example, the eyewear normally includes a pair of temples, and the components for monitoring radiation can be embedded within one or both of the temples. In one implementation, all components for monitoring radiation are integrated into a temple of the frame of the eyewear. As an example, these components can be formed together on a substrate as a module.

[0069] In another embodiment, some or all of the components for monitoring radiation can be partially or completely tethered to the eyewear. In still another embodiment, some or all of one or more auxiliary sensors used therewith could be partially or completely tethered to the eyewear. Tethering components allows for increased design freedom with the eyewear as well as additional area with which to house the components.

[0070] The eyewear can contain lenses, either vision corrective lenses or non-corrective lenses. Examples of eyewear using corrective lenses include, for example, prescription glasses, bi-focal glasses, reading glasses, driving glasses, and progressive glasses. Examples of eyewear, using corrective or non-corrective lenses, are sunglasses, fit-over glasses, safety glasses, sports glasses, swim masks or goggles and ski goggles. The eyewear can also include wrap-around glasses (with wrap-around lenses), fit-over glasses, or auxiliary frames (which attach to existing frames). Still further, the eyewear can include a strap for glasses, such as a strap to hold glasses on one's head. The strap can include some or all of the components for monitoring radiation, such components can be attached or at least partially embedded in the strap.

[0071] Embodiments of the invention are discussed below with reference to FIGs. 1 – 22. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments. Although much of the discussion below pertains to monitoring of UV radiation, it should be understood that the invention is also applicable to other types of radiation (infrared, x-rays, etc.).

[0072] FIG. 1 is a perspective view of UV monitoring glasses 100 according to one embodiment of the invention. The UV monitoring glasses 100 include a frame and a pair of lenses 102. The frame has lens holders 104 that hold the lenses 102 in position. The frame also has a bridge 106. The UV monitoring glasses 100 also

include a pair of temples (or arms) 108. The temples 108 are considered part of the frame. As shown in FIG. 1, each of the temples 108 is coupled to the frame by a hinge 109. In one embodiment, the temples 108 can be removed from the frame. At least one of the temples 108 includes an internal cavity 110. Within the internal cavity 110 is a circuit board 112. The circuit board 112 can serve as a substrate. The circuit board 112 can have or couple to a solar cell 114 and UV detector 116 which are also at least primarily provided within the internal cavity 110. The circuit board 112 could include a battery (not shown) in addition to or alternative to the solar cell 114. The temple 108 having the cavity region 110 includes an opening 118 for the solar cell 114 (if provided) and an opening 120 for the UV detector 116. In addition, the circuit board 112 can further include or couple to circuitry 122 and a display device 124. For example, the display device 124 can be either a liquid-crystal display (LCD) or a Light-Emitting Diode (LED) display having one or more LED components, either of which can be controlled by the circuitry 122. The solar cell 114 can receive light via the opening 118 so as to provide power to the circuit board 112. The UV detector 116 can receive light via the opening 120. The UV detector 116 is used to provide an indication of UV radiation. The indication of UV radiation detected by the UV detector 116 can be processed by the circuitry 122 to produce an output at the display device 124.

[0073] FIGs. 2A and 2B are diagrams of the circuit board 112 according to one embodiment of the invention. In one embodiment, the circuit board includes at least one electronic component.

[0074] FIG. 2A shows a first side of the circuit board 112. Typically, the first side would be positioned adjacent a top side or outer side of the temple 108. As shown in FIG. 2A, the first side of the circuit board 112 has the solar cell 114 and the UV detector 116 attached thereto. The first side of the circuit board 112 should be exposed at least partially to external light (e.g., sunlight). Hence, the openings 118 and/or 120 of the temple 108 shown in FIG. 1 can provide openings so that light can impinge upon the solar cell 114 and the UV detector 116.

[0075] FIG. 2B shows a second side of the circuit board 112. The second side of the circuit board 112 can be a bottom side or inner side of the temple 108. As shown in FIG. 2B, the second side of the circuit board 112 can have the circuitry 122 and the display device 124 attached thereto. As previously noted, the display device 124 can be a LED or LCD display. As depicted in FIG. 2B, the display device 124 can be a multi-character display. Alternatively, the display device 124 can be a

multi-color display, such as provided by a color LCD or a plurality of different color LEDs (e.g., a red LED, yellow LED and green LED). The display device 124 can also be a multi-symbol display. Although not shown in FIG. 1, the UV monitoring glasses 100 can further include an opening or transparent portion at the temple 108 proximate to the display device 124 so that an output from the display device 124 can be visible to a user of the UV monitoring glasses 100.

[0076] FIG. 3 is a block diagram of a UV monitoring system 300 according to one embodiment of the invention. The UV monitoring system 300 can be embedded within (i.e., internal to) the housing (i.e., frame) of a pair of glasses. Glasses refer to eyewear.

[0077] The UV monitoring system 300 includes electrical circuitry 302. The electrical circuitry 302 can be one or more electrical components, such as integrated circuits, analog components, and/or digital components. One or more solar cells 304 provide power to the electrical circuitry 302. In other words, when light impinges upon the one or more solar cells 304, power is produced and supplied to the electrical circuitry 302. The electrical circuitry 302 receives a UV level indication from a UV detector 306. In one embodiment, the UV detector 306 includes a photodetector 305 and an optical filter 308. The optical filter 308 can be integral with or positioned proximate to the photodetector 305 so that the optical filter 308 passes radiation associated with the ultraviolet wavelength range, and such radiation is supplied to the photodetector 305. As a result, the UV level indication produced by the UV detector 306 is an indication of the UV radiation impinging upon glasses or the user thereof. The electrical circuitry 302 receives the UV level indication from the UV detector 306 and determines whether an output should be signaled by an output device 310. The output device 310 can take a variety of different forms. For example, the output device 310 can be a display device, such as a LED or LCD display. A display device can produce a visual output. The output device 310 can also be a speaker or a vibration device. The speaker can produce an audio output. For example, the audio output can be a buzzing sound, a beep or a synthesized voice message.

[0078] FIG. 4A is a block diagram of a UV monitoring system 400 according to another embodiment of the invention. The UV monitoring system 400 includes the electrical circuitry 302, the one or more solar cells 304, the UV detector 306, and the output device 310 shown in FIG. 3. In addition, the UV monitoring system 400 further includes or makes use of one or more auxiliary sensors 402. The one or

more auxiliary sensors 402 can provide additional sensor information to the electrical circuitry 302. This additional sensor information can affect the output being provided at the output device 310. For example, the additional sensor information could be used to provide additional output data or could be used to modify the output data associated with the UV level indication provided by the UV detector 306.

[0079] FIG. 4B is a block diagram of a UV monitoring system 450 according to still another embodiment of the invention. The UV monitoring system 450 is generally similar to the UV monitoring system 400 shown in FIG. 4, but further includes or makes use of a "being worn" detector 452. The UV monitoring system 450 can be embedded within (i.e., internal to) the housing (i.e., frame) of a pair of glasses. The "being worn" detector 452 would indicate whether the glasses are being worn by its user. For example, the "being worn" detector 452 can be performed using a thermal sensor, a motion detector, a stress sensor or a switch. Although the "being worn" detector 452 is shown separate from the auxiliary sensors 402, it should be understood that the "being worn" detector 452 can be considered one type of auxiliary sensor.

[0080] FIG. 4C is a block diagram of a UV monitoring system 460 according to yet another embodiment of the invention. The UV monitoring system 460 is generally similar to the UV monitoring system 400 shown in FIG. 4A, but further includes a photodetector 462. Also, in this embodiment, the optical filter 308' blocks UV light and passes other light through to the photodetector 305'. As an example, the optical filter 308' can be a thin sheet or coating of polycarbonate. In this embodiment, the photodetector 305' provides an indication of non-UV light, and the photodetector 462 provides an indication of total light. The electrical circuitry 302' receives the indication of non-UV light and the indication of total light. By subtracting the indication of non-UV light from the indication of total light, the electrical circuitry 302' determines an indication of UV light. In one embodiment, the photodetectors 305' and 462 can be Silicon (Si) photodetectors. The electrical circuitry 302' determines whether an output should be signaled by an output device 310 based on the UV level indication. As previously noted, the output device 310 can take a variety of different forms.

[0081] FIG. 4D is a block diagram of a UV monitoring system 470 according to still yet another embodiment of the invention. The UV monitoring system 470 includes the electrical circuitry 302, the one or more solar cells 304, the UV detector 306 and the output device 310 shown in FIG. 3. In this embodiment, the UV

detector 306 measures the UV level indication directly, without the need for an additional optical filter. For example, the UV detector 306 can be a Gallium Nitride (GaN) photodetector since such has a sensitivity to UV radiation. As another example, the UV detector 306 can be a Silicon Carbide (SiC) photodetector since such also has a sensitivity to UV radiation. Silicon Carbide (SiC) detectors may also be suitable for use to detect other types of radiation besides UV. The electrical circuitry 302 receives the UV level indication from the UV detector 306 and determines whether an output should be signaled by the output device 310. As noted above, the output device 310 can take a variety of different forms.

[0082] The one or more auxiliary sensors 402 utilized in the UV monitoring system 400 shown in FIGs. 4A – 4D can vary depending upon application. FIG. 5 is a chart 500 that depicts examples of auxiliary sensors that can be utilized as the one or more auxiliary sensors 402 shown in FIGs. 4A and 4D.

[0083] The chart 500 indicates that one type of auxiliary sensor is a “being worn” sensor. The “being worn” sensor would indicate whether the glasses are being worn by its user. The “being worn” sensor can be performed using, for example, a thermal sensor, a motion detector, a stress sensor or a switch.

[0084] In one embodiment, a motion detector is used as a “being worn” sensor. A threshold can be set, such that if the amount of motion detected exceeds the threshold, the eyewear is assumed to be worn. The motion detector can, for example, be achieved by a mechanical means or an accelerometer.

[0085] In another embodiment, the “being worn” sensor includes one or more thermal sensors. In the case where two sensors are used, one sensor can be at approximately the middle of a temple, such as in a region that touches the head of the user wearing the glasses, and the other sensor can be positioned at the end of the same temple close to the hinge. If the temperature differential between the two sensors is beyond a certain preset value, the eyewear would be assumed to be worn.

[0086] In yet another embodiment, the “being worn” sensor includes a stress sensor at the hinge of the temple. The assumption is that when the eyewear is worn, the hinge is typically slightly stretched because typically the width of the head of the user is slightly wider than the width between the temples when the two temples are in the extended positions. If the value of the stress sensor is beyond a certain preset value, the glasses would be assumed to be worn.

[0087] In still yet another embodiment, the “being worn” sensor can be implemented as a switch. For example, the switch can utilize optical, magnetic or mechanical means. In one embodiment, the switch can be positioned at the temple of the eyewear, such as a forward end of the temple proximate to a corresponding lens holder. Different embodiments of such sensors is also described in U.S. Provisional Patent Application No. 60/583,169, filed June 26, 2004, entitled “ELECTRICAL COMPONENTS FOR USE WITH EYEWEAR, AND METHODS THEREFOR,” which has been incorporated herein by reference, see, e.g., section entitled “EYEGLASSES WITH USER INPUT CAPABILITY.”

[0088] Another type of auxiliary sensor is an environmental sensor. The environmental sensor can sense environmental conditions, such as one or more of temperature (e.g., ambient temperature), pressure, humidity and toxins (e.g., chemicals, radiation, etc.).

[0089] Still another type of auxiliary sensor is a physical sensor. The physical sensor can sense physical conditions of the user of the glasses. Examples of physical sensors include sensing one or more of distance traveled, location, speed, calories consumed, temperature, alertness, and vital signs (e.g., heart rate, blood pressure, etc.) associated with the user of the glasses. The distance traveled could represent the horizontal distance traveled or the vertical distance (i.e. elevation) traveled. As one example, a pedometer can provide an estimate of distance traveled. The speed can be acquired or determined, such as the rate of movement along the horizontal distance traveled and/or the vertical distance. As another example, calories consumed can be determined (e.g., estimated) based on various physical and/or environmental conditions that can be measured or determined. Still other physical sensors can sense emotions of the user. For example, the physical sensor could sense whether the user is calm, excited, happy, sad, angry, etc. The physical sensor can also more generally sense user activity level. As an example, the user activity level can be used to provide a lifestyle indication. For example, a lifestyle indication might show that the user was active today or, alternatively, lazy today. Such a lifestyle indication can be displayed as a text or graphic symbol to let the user or others aware of the activity level.

[0090] In one embodiment, one particular type of physical sensor is a heart-beat sensor. The heart-beat sensor measures the heart beat of the wearer of the eyewear. One implementation for the heart-beat sensor utilizes an infrared emitter and an infrared detector as a component. The infrared emitter can be a LED and

the infrared detector can be a photodiode with an infrared filter. The component can be located at a temple of the eyewear, with both the emitter and the detector both facing the user when the eyewear is worn. In operation, the infrared emitter shines infrared radiation towards the user, and the detector captures the infrared signals reflected back by the skin of the user. The magnitude of the reflected signals depends on the amount of blood flowing below the skin, which, in turn, depends on the heart beat. The rate of emission by the emitter and reception by the detector can be in a frequency range much higher than the heart beat, such as three thousands cycles per second. And the signals from the detector can be low-pass filtered before they are measured to identify the heart beat of the user. For example, the low-pass filter can be centered at 1 Hz.

[0091] In should be understood that the sensors might rely on more than one measured criteria. The one or more measured criteria might be used to determine the sensor output. The determination of the sensor output can involve estimation or prediction.

[0092] The auxiliary sensors can be provided in a redundant or fault-tolerant manner. For example, sensors can be provided in pairs. When one sensor of a pair malfunctions, the other one can replace it. In another embodiment, any of the auxiliary sensor information can be processed in a differential manner to examine changes to the auxiliary sensor information. The auxiliary sensors can be powered by a battery, solar energy, or kinetic energy. For reduced power consumption, the auxiliary sensors can remain in a low-power state unless data is being acquired by the auxiliary sensors. In yet another embodiment, two or more of the auxiliary sensors can communicate with one another (wired or wirelessly) to exchange data or control information.

[0093] In general, the auxiliary sensors can be fully or partially embedded in the eyewear or a base tethered to the eyewear. Alternatively, one or more of the auxiliary sensors can be separate from the eyewear, or any base tethered thereto, and wirelessly communicate with the eyewear or base.

[0094] FIG. 6 is a block diagram of a UV monitoring system 600 according to one embodiment of the invention. The UV monitoring system 600 is generally similar to the UV monitoring systems illustrated in FIGs. 3 – 4D. However, in the UV monitoring system 600, a battery 602 provides power to the electrical circuitry 302. In other words, in this embodiment, the one or more solar cells 304 are optional. The UV monitoring system 600 can operate without the need for any light to impinge

upon the one or more solar cells 304. If the UV monitoring system 600 does include the one or more solar cells 304, the power produced by the one or more solar cells 304 can be coupled to the battery 602 so as to recharge the battery. The battery 602 also allows the electrical circuitry 302 to maintain data even while no light is present (e.g., if a volatile memory is used to store data). The ability to maintain data (such as in a memory device) can be advantageous. For example, the UV monitoring system 600 may desire to output information over longer durations of time, or may desire to process data in a differential manner. The UV monitoring system 600 can also further include one or more auxiliary sensors.

[0095] FIG. 7A is a schematic diagram of a UV monitoring circuit 700 according to one embodiment of the invention. The UV monitoring circuit 700 includes a phototransistor 702. Although the phototransistor 702 may itself serve as a UV detector, in some implementations, an optical filter (not shown) would limit the radiation that impinges on the phototransistor 702, in which case the phototransistor 702 together with the optical filter serves as the UV detector. A collector terminal of the phototransistor 702 is coupled to a power source Vcc. The power source Vcc can be provided by a battery or solar cell(s). An emitter terminal of the phototransistor 702 is coupled to a first end of a resistor 704, a first end of the capacitor 706 and a gate terminal of a transistor 708. As an example, the transistor 708 can be an n-channel metal-oxide-semiconductor, enhancement-mode, field-effect transistor (MOSFET). A second end of the resistor 704, a second end of the capacitor 706 and a source terminal of the transistor 708 are coupled to ground. An output device 710 couples between the power source Vcc and a drain terminal of the transistor 708. As sufficient radiation, such as UV radiation, impinges on the phototransistor 702, the phototransistor 702 conducts so that the emitter terminal of the phototransistor 702 outputs the voltage V1 by coupling to the power source Vcc through the phototransistor 702. The voltage V1 is dependent on the amount of UV radiation that impinges on the phototransistor 702. The capacitor 706 then charges up in accordance with a time constant determined by the capacitance of the capacitor 706 and the resistance of the resistor 704. When the voltage V1 exceeds a turn-on voltage for the transistor 708, the transistor 708 conducts and the output device 710 is activated. For example, the output device 710 can indicate that the UV monitoring circuit has detected exposure to a large amount of UV radiation. The amount of UV radiation exposure being detected can vary depending on the capacitance of the capacitor 706 and the resistance of the resistor 704.

[0096] FIG. 7B is a schematic diagram of a UV monitoring circuit 750 according to another embodiment of the invention. The UV monitoring circuit 750 includes a phototransistor 752. Although the phototransistor 752 may itself serve as a UV detector, in some implementations, an optical filter (not shown) would limit the radiation that impinges on the phototransistor 752 in which case the phototransistor 752 together with the optical filter serves as the UV detector. A collector terminal of the phototransistor 752 is coupled to a power source Vcc. The power source Vcc can be a battery or solar cell(s). An emitter terminal of the phototransistor 752 is coupled to a first end of a resistor 754 as well as to an input to an analog-to-digital (A/D) converter 756. The second end of the resistor 754 couples to ground. The A/D converter 756 converts the voltage level at the emitter terminal of the phototransistor 752 to a digital voltage value having n bits. The digital voltage value represents the UV radiation impinging on the phototransistor 752. The digital voltage value is supplied to a controller 758. The controller 758 can, for example, be a microcontroller. In one embodiment, the microcontroller is a microprocessor. An output device 760 couples between the power source Vcc and ground. The output device 760 also couples to an output terminal of the controller 758. As sufficient radiation, such as UV radiation, impinges on the phototransistor 752, the phototransistor 752 conducts so that a voltage is supplied to the A/D converter 756 which produces the corresponding digital voltage value. The digital voltage value is dependent on the amount of UV radiation that impinges on the phototransistor 752. The controller 758 can then determine whether to activate the output device 760. For example, controller 758 can activate the output device 760 to indicate that the UV monitoring circuit 750 has detected (i) current exposure to a substantial (e.g., large) amount of UV radiation (e.g., amount of UV radiation greater than a threshold amount), and/or (ii) exposure to a substantial (e.g., large) amount of UV radiation accumulated over a time period (e.g., accumulated amount of UV radiation greater than a threshold amount). Although not shown, the controller 758 can also receive sensor information from one or more other auxiliary sensors and signal other types of outputs via the output device 760.

[0097] FIG. 7C is a schematic diagram of a UV monitoring circuit 770 according to yet another embodiment of the invention. The UV monitoring circuit 770 includes a phototransistor 772. Although the phototransistor 772 may itself serve as a UV detector, in some implementations, an optical filter (not shown) would limit the radiation that impinges on the phototransistor 772 in which case the

phototransistor 772 together with the optical filter serves as the UV detector. A collector terminal of the phototransistor 772 is coupled to a power source Vcc. An emitter terminal of the phototransistor 772 is coupled to a first end of a resistor 774, a first end of a capacitor 776 and a gate terminal of a transistor 778. An output device 780 couples between the power source Vcc and a drain terminal of the transistor 778. A second end of the resistor 774, a second end of a capacitor 776 and a source terminal of the transistor 778 are coupled to a drain terminal of a transistor 784. As an example, the transistors 778 and 784 can be n-channel metal-oxide-semiconductor, enhancement-mode, field-effect transistors (MOSFETs). As one example, MOSFETs can be 2N7008 MOSFETs. The source terminal of the transistor 784 is coupled to ground. The gate terminal of the transistor 784 is coupled to a first end of a resistor 786 and a first end of a capacitor 788. A second end of the resistor 786 and the second end of the capacitor 788 are coupled to ground. The gate terminal of the transistor 784 is also coupled to the power source Vcc through a being-worn switch 782. A battery 790 can supply power to the UV monitoring circuit 770. As one example, the battery 790 can be a three (3) Volt lithium battery. The size and configuration of the battery 790 can also vary. In one example, the battery 790 can be a coin battery. In another example, the battery 790 can be a triple-A (AAA) battery. As sufficient radiation, such as UV radiation, impinges on the phototransistor 772, the phototransistor 772 conducts so that the emitter terminal of the phototransistor 772 outputs the voltage V1 by coupling to the power source Vcc through the phototransistor 772. The capacitor 776 then charges up in accordance with a time constant determined by the capacitance of the capacitor 776 and the resistance of the resistor 774. When the voltage V1 exceeds a turn-on voltage for the transistor 778, the transistor 778 conducts. However, in this embodiment, the transistor 784 also must conduct in order for the output device 770 to be activated. The transistor 784 conducts when the "being worn" switch 782 is closed. The "being worn" switch 782 indicates whether the eyewear (including the UV monitoring circuit 770) is being worn by its user. The sensitivity of the "being worn" switch 782 can be controlled by the capacitance of the capacitor 788 and the resistance of the resistor 786. For example, the output device 780 can indicate that the UV monitoring circuit 770 has detected exposure to a large amount of UV radiation while the eyewear is being worn. The amount of UV radiation exposure being detected can vary depending on the capacitance of the capacitor 776 and the resistance of the resistor 774.

[0098] The UV monitoring circuits according to the invention can also include switches, such as a “being-worn” switch, skin type, reset switch and/or an on/off switch. A “being-worn” switch was, for example, discussed above with reference to FIG. 7C. The on/off switch can also provide a reset capability. A reset switch and an/on switch are further discussed below with reference to FIG. 7D.

[0099] FIG. 7D is a schematic diagram of a UV monitoring circuit 770' according to still yet another embodiment of the invention. The UV monitoring circuit 770' is generally similar to the UV monitoring circuit 770 of FIG. 7C, except that a reset switch 792, an on switch 794 and an off switch 796 are provided. Additionally, the resistor 786 shown in FIG. 7C is removed from the UV monitoring circuit 770'. The reset switch 792 can be a push button, such that when pressed, causes any charge on the capacitor 776 to be discharged. As a result, assuming the transistor 778 is conducting (i.e., on) when the reset switch is pushed, the transistor 778 stops conducting (i.e., off) because the voltage V1 is effectively zeroed and thus does not exceed the turn-on voltage for the transistor 778. Consequently, the output device 780 stops providing any output (e.g., display device cleared or off, audio stopped, etc.). Once the reset switch 792 is released, the capacitor 776 can again begin to accumulate charge representing UV radiation. The on switch 794 and the off switch 796 can also be implemented as push button switches. When the on switch 794 is pressed, the capacitor 788 is charged so that the transistor 784 conducts (i.e., turns-on) and then remains on until the off switch 796 is pressed. In this embodiment, the on switch 794 and the off switch 796 should not both be pressed at the same time. Although the reset switch 792, the on switch 794 and the off switch 796 are implemented as push button switches in FIG. 7D, other types of switches can be used.

[00100] FIG. 8 is a flow diagram of a UV monitoring process 800 according to one embodiment of the invention. The UV monitoring process 800 is, for example, performed by a UV monitoring system embedded within and/or tethered to a pair of glasses. The UV monitoring system can, for example, represent any of the UV monitoring systems 300, 400, 450, 460, 470, 600, 700, 750, 770 or 770' discussed above with reference to FIGs. 3, 4A – 4D, 6 and 7A-7D.

[00101] The UV monitoring process 800 begins with a decision 802 that determines whether the glasses are being worn. As noted above, the determination of whether the glasses are being worn can be done in a variety of ways. In any case, when the decision 802 determines that the glasses are not being worn, then

the UV monitoring process 800 waits until the glasses are being worn. In other words, when the glasses are not being worn, the UV monitoring process 800 can stop, block (pause or wait) or deactivate until it is determined that the glasses are being worn.

[00102] On the other hand, when the decision 802 determines that the glasses are being worn, a UV radiation level is acquired 804. For example, the UV radiation level can be acquired 804 from electronic circuitry which can include a UV detector. Next, UV information is determined 806 based on the UV radiation level (radiation data). For example, the UV information can pertain to normalized or calibrated radiation data, accumulated radiation data, or processed radiation data. Hence, although the UV radiation level (radiation data) could be output to the user, by outputting the UV information to the user of the glasses, more useful information (e.g., easier to comprehend) can be presented to the user. Other examples of UV information are referenced elsewhere, such as the UV radiation information discussed below in FIG. 9.

[00103] Next, the UV information can be output 808 to the output device. The UV information need not always be output 808 to the output device. For example, the UV information could be output 808 to the output device depending upon whether it signals a particular condition to the user. As another example, the UV information could be output to the output device on request by the user. As still another example, the UV information could be output to the output device based on a sensed condition or event. Next, a decision 810 can determine whether the UV monitoring process 800 should continue. When the decision 810 determines that the UV monitoring process 800 should not continue, then the UV monitoring process 800 waits until it is time to be continued. This allows the UV monitoring process 800 to be performed periodically or as needed, which can lead to reduced power consumption and/or more meaningful output information to the user. While the UV monitoring process 800 is waiting, some or all of the UV monitoring system can be in a reduced power consumption state. Nevertheless, when the decision 810 determines that the UV monitoring process 800 should continue, the UV monitoring process 800 returns to repeat the decision 802 and subsequent operations.

[00104] FIG. 9 is a flow diagram of a UV monitoring process 900 according to another embodiment of the invention. The UV monitoring process 900 is, for example, performed by a UV monitoring system embedded within and/or tethered to a pair of glasses. The UV monitoring system can, for example, represent any of the

UV monitoring systems 300, 400, 450, 460, 470, 600, 700, 750, 770 or 770' discussed above with reference to FIGs. 3, 4A – 4D, 6 and 7A-7D. However, the UV monitoring process 900 is particularly suitable for UV monitoring systems having “being worn” detection capability, such as the UV monitoring systems 450 and 770.

[00105] The UV monitoring process 900 begins with a decision 902 that determines whether adequate solar energy is present. In this embodiment, solar cells provide adequate solar energy for the UV monitoring process 900 to be performed. In other words, the UV monitoring system (and thus the glasses) operate in the presence of light. When the decision 902 determines that adequate solar energy (e.g., sunlight or artificial light) is not present, then the UV monitoring process 900 awaits adequate solar energy. In one implementation, the UV monitoring system performing the UV monitoring process 900 can automatically turn-off or deactivate when inadequate solar energy is present. Such operation facilitates passive UV monitoring with minimal user participation.

[00106] On the other hand, when the decision 902 determines that adequate solar energy is present, a decision 904 determines whether the glasses are being worn. When the decision 904 determines that the glasses are not being worn, then the UV monitoring process 900 returns to repeat the decision 902 and subsequent operations. In effect, the UV monitoring process 900 is not performed when the decision 904 determines that the glasses are not being worn by the user. As noted above, the determination of whether the glasses are being worn can be done in a variety of ways.

[00107] Optionally, a delay can be inserted when the decision 904 determines that the glasses are not being worn so as to save power consumption. Such a delay would allow the UV monitoring process 900 to stop, halt, inactivate or otherwise wait for the period of the delay prior to returning to the decision 902 and subsequent operations. While the UV monitoring process 900 is stopped, halted, inactivated or otherwise waiting, some or all of the UV monitoring system can be in a reduced power consumption state.

[00108] Alternatively, when the decision 904 determines that the glasses are being worn, a decision 906 can determine whether an interval timer has expired. The interval timer can determine how frequently the UV radiation level is checked and/or how frequently radiation information is output to a display. The interval timer can also thus lead to reduced power consumption (i.e., low-power mode for the electronic circuitry). When the decision 906 determines that the interval timer has

not expired, the UV monitoring process 900 waits for the interval timer to expire. During this period of waiting, the UV monitoring process 900 can place some or all of the UV monitoring system in a low-power mode. Alternatively, during this period of waiting, the UV monitoring process 900 can perform processing of other auxiliary sensors that can produce other sensor data which can be processed in conjunction with UV radiation levels.

[00109] Once the decision 906 determines that the interval timer has expired, a UV radiation level is acquired 908. Then, UV radiation information is output 910 to the user of the glasses based on the UV radiation level. For example, the UV radiation information can pertain to an instantaneous radiation level, an accumulated radiation level, or some reference radiation indication. An example of a reference radiation indication can be a numerical value, text or a graphic indication. One example of a numerical value implementation is a value representing a percentage of recommended daily dosage. Another example of a numerical value implementation is a value representing UV intensity. One example of a text implementation would be a word (e.g., "ok", "Burnt", etc.). One example of a graphic implementation would be a bar-type graph. Another example of a graphic implementation would be a graphic symbol (e.g., a lobster symbol, a fire flames symbol, a picture of a sun, or a smiley face).

[00110] Next, the interval timer can be reset 912 and the UV monitoring process 900 can thereafter return to repeat the decision 902 and subsequent operations. As a result, the UV monitoring provided by the UV monitoring process 900 can be continuously performed so long as adequate solar energy is present and the glasses are being worn.

[00111] FIG. 10 is a flow diagram of a UV monitoring process 1000 according to yet another embodiment of the invention. The UV monitoring process 1000 is, for example, performed by a UV monitoring system embedded within and/or tethered to a pair of glasses. The UV monitoring system can, for example, represent any of the UV monitoring systems 300, 400, 450, 460, 470, 600, 700, 750, 770 or 770' discussed above with reference to FIGs. 3, 4A – 4D, 6 and 7A-7D.

[00112] The UV monitoring process 1000 begins with a decision 1002 that determines whether adequate solar energy (e.g., sunlight or artificial light) is available. When the decision 1002 determines that adequate solar energy is not available, then the UV monitoring process 1000 is deactivated, blocked or effectively not invoked. In this embodiment, solar cells provide adequate solar energy for the

UV monitoring process 1000 to be performed. In other words, the glasses operate in the presence of sufficient light. When the decision 1002 determines that adequate solar energy is not present, then the UV monitoring process 1000 awaits adequate solar energy.

[00113] Once the decision 1002 determines that adequate solar energy is available, then the UV monitoring process 1000 proceeds. Here, the UV monitoring process 1000 can optionally determine whether the glasses are being worn. In any case, as shown in FIG. 10, when the decision 1002 determines that adequate solar energy is available, a UV radiation level is acquired 1004. For example, the UV radiation level can be acquired by a UV detector.

[00114] Next, the UV radiation level is accumulated 1006 during a time period. Here, the UV radiation levels acquired over a predetermined period of time are accumulated 1006 so that the radiation information is based on an accumulation of radiation that has been acquired over the predetermined period of time. For example, the predetermined period of time can be one hour, four hours, eight hours, twelve hours, twenty-four hours, two days, four days, one week, one month or one year.

[00115] Thereafter, a decision 1008 determines whether a UV radiation warning is needed. Here, the accumulated UV radiation level can be compared with a threshold to determine whether the accumulated UV radiation is excessive. In one implementation, the threshold can vary with, or be personalized to, different users, such as based on skin type, age, or skin condition. A user of the glasses can input data (e.g., skin type) by way of at least one switch or button. In another implementation, a plurality of threshold levels can be used, e.g., to provide a progression of UV radiation levels (and notifications). Alternatively, the glasses can use predetermined settings and offer several versions (e.g., different glasses for different skin types).

[00116] When the decision 1008 determines that the UV radiation warning is not needed, then the UV monitoring process 1000 returns to repeat the decision 1002 and subsequent operations so that the UV radiation level can continuously or periodically be monitored. In one embodiment, the UV monitoring process 1000 can reset the accumulated UV radiation after the period of time has been exceeded. In another embodiment, the accumulated UV radiation can be reset after no significant UV radiation is present for a period of time (e.g., 6-12 hours), after no significant solar energy is present for a period of time (e.g., 6-12 hours), or after not being worn

for a period of time (e.g., 6-12 hours), whereby each evening, for example, the reset can automatically occur. In another embodiment, the UV monitoring system, and thus the UV monitoring process 1000, can be automatically turned off (which also resets) after the period of time has been exceeded or after no significant UV radiation is present for a period of time.

[00117] On the other hand, when the decision 1008 determines that a UV radiation warning is needed, then a UV radiation warning is output 1010 to the user. The warning can be varied or personalized to the user, and/or can vary depending on the user, user preference, UV radiation level, or auxiliary sensor data. In one implementation, the warning can pertain to a recommendation (e.g., SPF recommendation, get out of sun, high exposure warning, etc.). The radiation warning can be output 1010 via the output device. For example, as noted above, the output device can be a display, a speaker or a vibration device. Hence, the warning can be output to the user by displaying text or graphics, audio sounds, or physical actions. Following the output 1010 of the UV radiation warning, the UV monitoring process 1000 can return to repeat the decision 1002 and subsequent operations so that UV monitoring can continue.

[00118] Although the circuitry in FIGs. 7A-7D and the processing in FIGs. 8-10 have been described in the context of monitoring UV radiation, it should be understood that such circuitry and processing are also applicable to monitoring other types of radiation.

[00119] FIG. 11 is a flow diagram of a monitoring process 1100 according to still yet another embodiment of the invention. The monitoring process 1100 is, for example, performed by a monitoring system embedded within and/or tethered to a pair of glasses. The monitoring system can, for example, represent any of the UV monitoring systems 300, 400, 450, 460, 470, 600, 700, 750, 770 or 770' discussed above with reference to FIGs. 3, 4A – 4D, 6 and 7A-7D.

[00120] The monitoring process 1100 begins with a decision 1002 that determines whether adequate solar energy (e.g., light) is available. In one implementation, the monitoring system performing the monitoring process 1100 includes at least one solar cell or at least one phototransistor, and the solar cell or phototransistor can be used to determine whether there is adequate solar energy available. Hence, when the decision 1102 determines that adequate solar energy is not available, then the monitoring process 1100 is deactivated, blocked or effectively not invoked. In this embodiment, solar cells can provide adequate solar energy for

the monitoring process 1000 to be performed. In another embodiment, a phototransistor can detect whether adequate solar energy is available. In other words, the glasses operate in the presence of sufficient light. When the decision 1102 determines that adequate solar energy is not present, then the monitoring process 1100 awaits adequate solar energy. In this condition, the monitoring system can be in a low power condition (e.g., essentially disabled).

[00121] Once the decision 1102 determines that adequate solar energy is available, then the monitoring process 1100 proceeds. Here, the monitoring process 1100 can optionally determine whether the glasses are being worn. In any case, as shown in FIG. 11, when the decision 1102 determines that adequate solar energy is available, a decision 1104 determines whether the glasses are being worn by a user. When the decision 1104 determines that the glasses are not being worn or when the decision 1102 determines that adequate solar energy is not present, then a radiation level previously acquired through accumulation (described below) can be slowly dispersed 1106. In one embodiment, the rate of dispersal is substantially slower than the rate of accumulation of the UV radiation level. For example, in a case where the radiation being monitored is UV radiation, the UV radiation level might accumulate to cause a UV radiation warning after 1-2 hours of extensive UV or sunlight exposure, but might take 6-12 hours to disperse the previously accumulated radiation level after the UV radiation is removed. Hence, the accumulation of radiation can gracefully tolerate interruption of radiation, such as when going indoors (e.g., within a building) for a period of time (e.g., 15 minutes, 1 hour, 4 hours, etc.) when UV radiation is being monitored. Following the block 1106, the monitoring process 1100 returns to repeat the decision 1102 and subsequent blocks.

[00122] On the other hand, when the decision 1104 determines that the glasses are being worn, a radiation level is acquired 1108. For example, the radiation level can be acquired by a detector (e.g., UV detector). Next, the radiation level is accumulated 1110. Here, the radiation levels acquired can be accumulated so that radiation information can be based on an accumulation of radiation that has been acquired while the glasses are being worn.

[00123] Thereafter, a decision 1112 determines whether a radiation warning is needed. Here, the accumulated radiation level can be compared with a threshold to determine whether the accumulated radiation is excessive. In one implementation, the threshold can vary with, or be personalized to, different users, such as based on skin type, age or skin condition. In another implementation, a plurality of threshold

levels can be used, e.g., to provide a progression of radiation levels (and notifications). A user of the glasses can input data (e.g., skin type, preferences) by way of at least one switch or button. Alternatively, the glasses can use predetermined settings and offer several versions (e.g., different glasses for different skin types).

[00124] When the decision 1112 determines that the radiation warning is not needed, then the monitoring process 1100 deactivates 1114 the radiation warning. Alternatively, when the decision 1112 determines that the radiation warning is needed, then the monitoring process 1100 activates 1116 the radiation warning. The warning can be varied or personalized to the user, and/or can vary depending on the user, user preference, radiation level, or auxiliary sensor data. The radiation warning can be produced at an output device. For example, as noted above, the output device can be a display, a speaker or a vibration device. In one implementation, the warning is a graphical symbol or text that signals the user of the glasses that they have received a significant amount of radiation. Following the deactivation 1114 and the activation 1116, the monitoring process 1100 can return to repeat the decision 1102 and subsequent operations so that monitoring can continue.

[00125] The radiation warning can remain active anywhere from a brief period to continuously depending on the type of warning being provided, user preference or manufacturer setting. For example, an audio alert might sound for a few seconds, while a displayed alert might remain on for a longer duration. The radiation warning can be output differently depending on the power situation of the monitoring system. If the monitoring system is being solar powered, then the radiation warning can remain active until deactivated. However, when the monitoring system is being battery powered, the radiation warning might be active for only a brief period.

[00126] FIG. 12 is a block diagram of electronic circuitry 1200 according to one embodiment of the invention. The electronic circuitry 1200 can, for example, be used for at least a part of the electronic circuitry 302 shown in FIGs. 3, 4A, 4B, 4D and 6. The electronic circuitry 1200 includes a radiation detector 1202 that outputs a radiation level signal dependent on an amount of radiation impinging on the radiation detector 1202. For example, in the case where radiation from sunlight is being monitored, the radiation detector 1202 can principally detect ultraviolet or infrared radiation. In another example, in the case where radiation from x-ray machines or nuclear materials is being monitored, the radiation detector can principally detect

gamma radiation. A radiation accumulator 1204 receives the radiation signal level and accumulates the radiation signal level to produce an accumulated radiation level. A level comparator 1206 can then compare the accumulated radiation level to a threshold level (TH). The threshold level can be fixed, selected or determined. When the accumulated radiation level exceeds the threshold level, then an output driver 1208 operates to output one or more signals to cause an output device to produce an output. The output can be visual, audio, and/or physical. The threshold can be varied or personalized to the user, and/or can vary depending on the user. The threshold can also depend on or vary in view of one or more of user preferences, position (e.g., closer equator), intensity level of radiation, user characteristics (e.g., skin color or type), or auxiliary sensor data, etc. The level comparator 1206 can also use one or more threshold levels.

[00127] In one embodiment, the threshold used by the level comparator 1206 can correspond to a recommended daily dosage of such radiation. For example, if the radiation detector 1202 is primarily detecting UV radiation, the recommended daily dosage would pertain to UV radiation.

[00128] FIG. 13A is a schematic diagram of an electronic circuit 1300 for a radiation detection system according to one embodiment of the invention. The electronic circuit 1300 is, for example, suitable for use as the electronic circuitry 1200 shown in FIG. 12.

[00129] The electronic circuit 1300 includes a phototransistor 1302 and a resistor (R1) 1304 coupled in series between a supply voltage (Vs) and ground. In this embodiment, the phototransistor 1302 implements a radiation detector. As radiation (of an appropriate frequency range) strikes the phototransistor 1302, a voltage V1 appears at a first node connecting the phototransistor 1302 to the resistor (R1) 1304. The voltage V1 induces a current I1 that passes through a diode 1305 and a resistor (R2) 1306. A voltage V2 at a second node then begins to rise from ground level to the level of V1 by the charging of a capacitor (C1) 1308 at a rate dependent on the amount of the current I1 and the capacitance of the capacitor (C1) 1308 and the resistances of the resistors (R2 and R3) 1306 and 1310, respectively. A Schmitt trigger inverter 1312 couples to the second node and receives the voltage V2 at its input. When the voltage V2 exceeds the turn-on voltage for the inverter 1312, the output of the inverter 1312 goes low and couples to a third node via a diode 1314. At this point, the low voltage (V3) at the third node couples to an input of a Schmitt trigger inverter 1316, which outputs a high voltage (V4) at a fourth node

which charges a resistor (R4) 1318 and capacitor (C2) 1320. The resistor (R4) 1318 couples between the third and fourth nodes. The capacitor (C2) couples between the third node and ground. Once the voltage V3 has risen sufficiently, the inverter 1316 switches to output a low voltage (V4), thereby discharging the capacitor (C2) 1320. Hence, the inverter 1316, the resistor (R4) 1318 and the capacitor (C2) 1320 form an oscillator. The outputs for the electronic circuit 1300 are complementary, a positive output from the fourth node and a negative output from an inverter 1322 coupled to the fourth node. These complementary outputs are applicable for driving a LCD type display device.

[00130] Although not shown in FIG. 13A, the electronic circuit 1300 can optionally further include a reset switch. For example, if provided, the reset switch can be coupled between the second node and ground. While the reset switch is normally open, when closed the reset switch discharges the capacitor (C1) 1308. As an example, the reset switch can be implemented by a push button switch. Although the electronic circuit 1300 can automatically reset after no significant UV radiation is present for a period of time (such as noted above), the reset switch permits a user to manually reset the electronic circuit 1300 so as to clear and restart monitoring (e.g., accumulation) of radiation.

[00131] The electronic circuit 1300 can facilitate low power operation. In one implementation, the resistor (R1) 1304 can be made large. In another implementation, power dissipated by resistor (R1) can be conserved by using a radiation detector, such as a phototransistor, that is responsive to the radiation of interest but with very low sensitivity to the radiation of interest. In the case of a phototransistor, sensitivity can be reduced by covering the phototransistor with a layer of aluminized Mylar. Aluminized Mylar can attenuate light passing through it by a factor of approximately one-thousand (1000). In still another implementation, the supply voltage (Vs) supplied to the phototransistor 1302 can be periodic, so that power consumed by the resistor (R1), which, in this case, need not be a high resistance, is substantially reduced, yet the phototransistor 1302 has an extended dynamic range. The sensitivity of the radiation measurement can also be adjusted by changing the duty-cycle of the periodic supply voltage (Vs). These various implementations for low power operation can be used singly or in combination.

[00132] FIG. 13B is a schematic diagram of a periodic supply voltage circuit 1350 according to one embodiment of the invention. The periodic supply voltage circuit 1350 is, for example, suitable for use to provide a supply voltage (Vs) to the

electronic circuit 1300 for a radiation detection system. In this embodiment the supply voltage (V_s) is periodic. In this example, the supply voltage (V_s) uses pulse-width modulation. The periodic supply voltage circuit 1350 includes a Schmitt trigger inverter 1352 that is powered by a power supply (V_{cc}) when the radiation detection system is operating (i.e., turned-on). At this point, the voltage (V_5) at an input node is assumed low and couples to an input of the Schmitt trigger inverter 1352, which outputs a high voltage (V_6) at an output node which charges a capacitor (C3) 1360 via resistor (R5) 1354 and resistor (R6) 1358. A diode 1356 conducts during charging, but blocks during discharging. The resistor (R5) 1354 couples between the input and output nodes. The diode 1356 and the resistor (R6) 1358 are coupled in series between the input and output nodes. The capacitor (C3) 1360 couples between the input node and ground. Once the voltage (V_5) at the input node has risen sufficiently, the inverter 1352 switches to output a low voltage (V_6) at the output node, thereby discharging the capacitor (C3) 1360 via the resistor (R5) 1354. Hence, the periodic supply voltage circuit 1350 forms an oscillator. The output for the periodic supply voltage circuit 1350 at the output node (V_6) can be the supply voltage (V_s) for the radiation detection system. Given the diode 1356, the supply voltage (V_s) is in the high state for a short time and in the low state for a longer period of time.

[00133] Although the resistance and capacitance values for the electronic circuit 1300 and the periodic supply voltage circuit 1350 can vary widely with implementation and application, some exemplary values are as follows. For example, for the electronic circuit 1300, the resistor (R1) 1304 can be 22k ohms, the resistor (R4) 1318 can be 330k ohms, and the capacitor (C2) 1320 can be 0.1 microfarads (μf). The resistor (R2) 1306 and the resistor (R3) 1310 can, for example, be in the range of 1 - 50M ohms. The capacitor (C1) 1308 can, for example, be in the range of 1 – 100 μf . For example, for the periodic supply voltage circuit 1350, the resistor (R5) 1354 can be 10M ohms, the resistor (R6) 1358 can be 200k ohms, and the capacitor (C3) 1360 can be 0.01 μf .

[00134] FIG. 14A is a block diagram of a radiation monitoring system 1400 according to one embodiment of the invention. The radiation monitoring system 1400 can, for example, be used for the electronic circuitry 302 shown in FIGs. 3, 4A, 4B, 4D and 6. The radiation monitoring system 1400 includes a radiation detector 1402 that detects impinging radiation, such as ultraviolet radiation, infrared radiation or light, and outputs a radiation indication to a radiation-to-frequency converter 1404.

The radiation indication can represent an amount of radiation impinging on the radiation detector 1402. The radiation-to-frequency converter 1404 converts the radiation indication into a frequency signal. The frequency signal is supplied to an output manager 1406. The output manager 1406 coordinates when an output is to be provided for the radiation monitoring system 1400. In one embodiment, the output manager 1406 determines that an output indication should be provided based on a count or a division with respect to the frequency signal. For example, the greater the amount of radiation being detected by the radiation detector 1402, the greater the frequency of the frequency signal. Hence, when greater levels of radiation are detected, the output manager 1406 can more quickly provide an output indication (e.g., signaling substantial radiation exposure) as compared to a situation in which the amount of radiation being detected by the radiation detector 1402 is substantially less.

[00135] In any case, when the output manager 1406 determines that an output indication is to be provided, the output manager 1406 provides an output signal to an output driver 1408. The output driver 1408 controls an output device so as to produce an output indication. The output indication can be textual (including numerical) and/or graphical. For example, as a numerical output, the output could indicate a percentage of acceptable radiation for a day that has been already detected. As another example, the output could be a graphical output that pertains a symbol or a graph. In one embodiment, the output provided by the output device is a visual output on a display device. However, in general, the output can be visual and/or audio. For example, examples of audio outputs are beeping sounds, synthesized speech, or prerecorded audio messages.

[00136] The output manager 1406 receives the frequency signal from the radiation-to-frequency converter 1404 and can determine when an output indication should be provided. In one implementation, the output manager 1406 can include a divider that divides down the frequency signal from the radiation-to-frequency converter 1404 such that the output manager 1406 causes the output driver 1408 to produce an output indication based on an amount of radiation that has effectively been detected. As an example, a predetermined amount of radiation to be effectively detected can be controlled by altering the amount of division provided by the divider. Hence, the amount of division utilized by the output manager 1406 can correspond to a radiation threshold amount, such as a recommended daily dosage of ultraviolet radiation. The amount of division provided by the divider can also

depend on or vary in view of one or more of user preferences, position (e.g., proximity to equator), intensity level of radiation, user characteristics (e.g., skin color or type), or auxiliary sensor data, etc. Alternatively, the output manager 1406 can include a counter that counts based on the frequency signal from the radiation-to-frequency converter 1404, wherein the amount of count utilized by the output manager 1406 can also correspond to a radiation threshold amount.

[00137] FIG. 14B is a block diagram of a radiation monitoring system 1420 according to another embodiment of the invention. The radiation monitoring system 1420 is, for example, a detailed embodiment of the radiation monitoring system 1400 illustrated in FIG. 14A.

[00138] The radiation monitoring system 1420 includes a sensor 1422. The sensor 1422 senses radiation, such as ultraviolet radiation or infrared radiation. The sensor 1422 outputs a radiation indication to a radiation-to-frequency converter 1424. The radiation-to-frequency converter 1424 outputs a frequency signal ϕ_1 to a divider 1426. The divider 1426 divides the frequency signal ϕ_1 and outputs a divided frequency signal Q_N . The divided frequency signal Q_N is supplied to a latch 1428. As shown in FIG. 14B, in one embodiment, the latch 1428 can be a set-reset type of latch. The output of the latch 1428 is an output signal (OUT). The output signal (OUT) is supplied to a LCD driver 1430. When the output signal (OUT) is high, the LCD driver 1430 causes an output indication to be provided on a LCD display 1432.

[00139] Still further, the radiation monitoring system 1420 includes a power supply 1434 that supplies power to various components under the radiation monitoring system 1420. The power supply 1434 outputs a positive voltage (V+), a ground signal (GND), and a negative voltage (B-). The signals provided by the power supply 1434 are supplied to various components of the radiation monitoring system 1420 as shown in FIG. 14B. In addition, the radiation monitoring system 1420 includes a first switch (S1) and a second switch (S2). The first switch (S1) is a reset switch that is coupled to the divider 1426 and the latch 1428. When the first switch (S1) is closed a reset operation occurs so that the divider 1426 and the latch 1428 are reset. Hence, any accumulated data in these components is cleared. As a result, radiation monitoring can be cleared and restarted by closing and then opening the first switch (S1). The second switch (S2) is coupled to the power supply 1434 and serves as an on-off switch. When the second switch (S2) is closed (i.e., "switched on"), the power supply 1434 outputs various voltage signals. On the other

hand, when the second switch (S2) is open (i.e., "switched off"), the power supply 1434 does not output the voltage levels.

[00140] As noted above, the radiation monitoring system 1420 is an example of a more detailed embodiment of the radiation monitoring system 1400 illustrated in FIG. 14A. As such, the divider 1426 and the latch 1428 together can correspond to the output manager 1406 in one embodiment, and the LCD driver 1430 can corresponds to the output driver 1408 in one embodiment.

[00141] FIG. 14C is a schematic diagram of a radiation-to-frequency converter 1440 and a sensor according to one embodiment of the invention. The radiation-to-frequency converter 1440 represents a detailed embodiment for the radiation-to-frequency converter 1424 illustrated in FIG. 14B. As shown in FIG. 14C, the sensor includes a phototransistor 1442 that serves as a radiation sensor. In particular, the phototransistor 1442 can be sensitive to a particular wavelengths of radiation, such as ultraviolet radiation or infrared radiation. As radiation impinges on the phototransistor 1442, a voltage dependent upon the amount of radiation impinging on the phototransistor 1442 is produced at a first node 1444. The first node 1444 is coupled to ground by a capacitor 1446. A Schmitt trigger inverter 1448 couples between the first node 1444 and a second node 1450. The output of the radiation-to-frequency converter 1440 is provided at the second node 1450 and pertains to the frequency signal ϕ_1 . The phototransistor 1442 is also coupled between the first node 1444 and the second node 1450. In addition, a series combination of a resistor 1452 and a diode 1454 are also coupled between the first node 1444 and the second node 1450. The frequency signal ϕ_1 being produced at the second node 1450 has a frequency that is dependent upon the resistance of the resistor 1452, the capacitance of the capacitor 1446, the sensitivity of the phototransistor 1442, and the amount of radiation impinging upon the phototransistor 1442. If the first node 1444 is low, the second node 1452 is high. In such a situation, radiation impinging upon the phototransistor 1442 causes the first node 1444 to transition to a "high" level, which then in turn causes the second node 1450 to transition to a "low" level. Subsequently, from such a state, the first node 1444 is discharged to a "low" state in accordance with a time constant set by the resistor 1452 and the capacitor 1446. The cycling continues so that the resulting frequency signal ϕ_1 is produced. As an example, the resistance of the resistor 1452 can be 10k ohms, and the capacitance of the capacitor 1446 can be 0.1 microfarads, and the resulting frequency for the resulting frequency signal ϕ_1 is then about in a range of about 0 - 400 Hertz. The

Schmitt trigger inverter 1448 can be implemented by a CD74HC14 chip, for example. Hence, the radiation-to-frequency converter 1440 can produce a digital output which has a frequency dependent on the amount of impinging radiation. The digital output is also produced in a power-efficient manner. In one embodiment, power-efficiency results because the Schmitt trigger inverter 1448 is power efficient, the capacitor 1446 is rather small, and the resulting frequency signal ϕ_1 is low. Power consumption can be further reduced by only periodically supplying power to some or all of the components of the radiation-to-frequency converter 1440, or more generally, the radiation monitoring system 1400.

[00142] FIG. 14D is a schematic diagram of a latch 1450 according to one embodiment of the invention. The latch 1450 represents a detailed embodiment for the latch 1428 shown in FIG. 14B. The latch 1450 includes a first NAND gate 1452 and a second NAND gate 1454. These NAND gates 1452 and 1454 are connected as shown in FIG. 14D.

[00143] FIG. 14E is a schematic diagram of a LCD driver 1460 according to one embodiment of the invention. The LCD driver 1460 represents a detailed embodiment for the LCD driver 1430 illustrated in FIG. 14B. The LCD driver 1460 includes a diode 1462 having a cathode terminal that receives the enable signal (EN) from the latch 1450, and an anode terminal that couples to a first node 1464. The LCD driver 1460 also includes a capacitor 1466 that couples between the first node 1464 and ground. Additionally, the LCD driver 1460 includes a first Schmitt trigger inverter 1468 coupled between the first node 1464 and a second node 1470, and a second Schmitt trigger inverter 1472 connected to the second node 1470. In addition, a resistor 1474 couples the first node 1464 and the second node 1470. The output of the LCD driver 1460 is provided from the second node 1470 and from the output of the second Schmitt trigger inverter 1472. These outputs are the designed to excite the appropriate one or more LCD elements of the LCD display 1432 so as to produce the desired output indication. As an example, the resistance of the resistor 1474 can be 330k ohms, and the capacitance of the capacitor 1446 can be 0.1 microfarads, and the resulting frequency for the outputs (when enabled) is then about 200 Hertz. The Schmitt trigger inverters can be implemented by a CD74HC14 chip, for example. It should be noted that LCD driver 1460 is designed to excite a single LCD element or a single group of LCD elements. Hence, in cases in which the output indication is to excite multiple LCD elements at different times, additional circuitry would be required.

[00144] FIG. 14F is a schematic diagram of a power supply 1475 according to one embodiment of the invention. The power supply 1475 represents a detailed embodiment of the power supply 1434 illustrated in FIG. 14B.

The power supply 1475 includes a battery 1476 that is coupled between a positive voltage terminal (V+) then a negative voltage terminal (B-). The power supply 1475 also includes a transistor 1477. In one embodiment, the transistor 1477 is an enhancement type n-channel MOSFET. The drain terminal of the transistor 1477 is coupled to the ground terminal of the power supply 1475, and a source terminal of the transistor 1477 is coupled to the negative voltage terminal (B-). A gate terminal of the transistor 1477 couples to a first node 1478. The first node 1478 is coupled to the negative voltage terminal (B-) by a capacitor 1479-1, and is coupled to the positive voltage terminal (V+) by a resistor 1479-2 and a switch S2a. The switch S2a is closed when the power supply 1475 is "on." The power supply 1475 also includes a switch S2b that is closed when the power supply 1475 is "off." Hence, only one of the switches S2a and S2b are closed at any one point. When the switch S2b is closed, the first node 1478 is coupled to the negative voltage terminal (B-) so that the transistor 1477 is "off." On the other hand, when the switch S2a is closed, the first node 1478 is able to hold a positive voltage which activates the transistor 1477. When the transistor 1477 is activated, the negative voltage provided on the negative voltage terminal (B-) is provided at the ground (GND) terminal. As an example, the resistance of the resistor 1479-2 can be 100k ohms, and the capacitance of the capacitor 1479-1 can be 0.01 microfarads, and the battery can provide 3 Volts (e.g., 35 mA-H). The transistor 1477 can be implemented by a 2N708 chip, for example.

[00145] In one embodiment, a radiation detector can be mounted on a substrate and couple to other circuitry so that radiation monitoring can be performed. The manner in which the radiation detector is mounted to the substrate can vary with implementation. In one implementation, the substrate is a printed circuit board (PCB) that supports not only the radiation detector but also the other circuitry. FIGs. 14G – 14I illustrate examples of a few possible implementations in the case where the radiation detector is a UV detector; however, other implementations can be utilized.

[00146] FIG. 14G is a cross-sectional view of a UV detector arrangement 1480 according to one embodiment of the invention. The UV detector arrangement 1480 is formed on a printed circuit board 1481 that contains a hole (or opening) 1482. A

phototransistor 1483 is placed in the hole 1482. A base 1484 for the phototransistor 1483 is used to electrically connect the phototransistor 1483 to the printed circuit board 1481 via solder 1485. A film of aluminized Mylar 1486 is attached to the top of the printed circuit board 1481 at the hole 1482. The aluminized Mylar 1486 serves as a sensitivity reducer since it generally attenuates the radiation (e.g., UV or IR radiation) that impinges on the phototransistor 1483. The aluminized Mylar 1486 can be attached to the printed circuit board 1481 by an adhesive, such as epoxy. Attached to the top of the aluminized Mylar 1486 is an aluminum sheet 1487 with an opening 1488. The opening 1488 corresponds to, but has a substantially smaller diameter than the hole 1482. Hence, the aluminum sheet 1487 further restricts radiation (i.e., restricts volume of radiation) impinging on the phototransistor 1483. An optical filter 1489 is placed over the aluminum sheet 1487 at the vicinity of the hole 1482. As an example, the optical filter 1489 primarily passes UV radiation. The UV radiation then is limited by the opening 1488 in the aluminum sheet 1487, attenuated by the aluminized Mylar 1486, and then the attenuated UV radiation is sensed by the phototransistor 1483. The aluminum sheet 1487 and the optical filter 1489 can be attached with an adhesive, such as epoxy.

[00147] Optionally, the back side of the printed circuit board 1481 at the vicinity of the phototransistor 1483 can attenuate or block radiation that might otherwise impinge on and be sensed by the phototransistor 1483. As shown in FIG. 14G, an aluminum sheet 1491 can be attached to the back side of the printed circuit board 1481 behind the phototransistor 1483. The aluminum sheet 1491 can be attached with an adhesive, such as epoxy.

[00148] Finally, the top of the UV detector arrangement 1480, except for the optical filter 1489, can be encapsulated by a top encapsulant 1490. For example, the top encapsulant 1490 can be epoxy. The bottom of the UV detector arrangement 1480 can be encapsulated by a bottom encapsulant 1492. For example, the bottom encapsulant 1492 can be epoxy. The epoxy used for the encapsulant 1490 or 1492 can be opaque (e.g., block epoxy) to further assist in blocking radiation.

[00149] FIG. 14H is a cross-sectional view of a UV detector arrangement 1480' according to one embodiment of the invention. The UV detector arrangement 1480' is formed on a printed circuit board 1481 that contains a hole (or opening) 1482. A phototransistor 1483 is placed in the hole 1482. A base 1484 for the phototransistor 1483 is used to electrically connect the phototransistor 1483 to the printed circuit

board 1481 via solder 1485. A film of aluminized Mylar 1486 is attached to the top of the printed circuit board 1481 at the hole 1482. The aluminized Mylar 1486 serves as a sensitivity reducer since it generally attenuates the radiation that impinges on the phototransistor 1483. The aluminized Mylar 1486 can be attached to the printed circuit board 1481 by foil tape 1493 (that uses an adhesive). The foil tape 1493 does not cover the region of the aluminized Mylar 1486 above the phototransistor 1483. The foil tape 1493 further restricts radiation (i.e., restricts volume of radiation) impinging on the phototransistor 1483. Attached to the top of the foil tape 1493 is an optical filter 1489 at the vicinity of the hole 1482. Foil tape 1494 (that uses an adhesive) can be used to hold the optical filter 1489 in position. The foil tape 1494 may also serve to restrict radiation impinging on the phototransistor 1483. As an example, the optical filter 1489 primarily passes UV radiation. The UV radiation can then be limited by the opening in the foil tapes 1493 and 1494 as well as the aluminized Mylar 1486. A cavity 1497 in the hole 1482 above the phototransistor 1483 can be filled with an epoxy, such as clear epoxy.

[00150] Optionally, the back side of the printed circuit board 1481 at the vicinity of the phototransistor 1483 can attenuate or block radiation that might otherwise impinge on and be sensed by the phototransistor 1483. As shown in FIG. 14H, a foil tape 1496 can be attached to the back side of the printed circuit board 1481 behind the phototransistor 1483. A bottom cavity 1498 between the back side of the printed circuit board 1481 and the foil tape 1496 can be filled with an opaque substance, e.g., block epoxy, to further assist in attenuating or blocking radiation.

[00151] FIG. 14I is a cross-sectional view of a UV detector arrangement 1480" according to one embodiment of the invention. The UV detector arrangement 1480" shown in FIG. 14I is generally similar to the UV detector arrangement 1480' shown in FIG. 14H, except that the UV detector arrangement 1480" does not use the optical filter 1489 or the foil tape 1494. In such an embodiment, an optical filter (such as the optical filter 1489) is not required because the spectral response of the phototransistor 1483' is appropriate without filtering or because a coating provided on the phototransistor 1483' or its housing (package) effectuates similar filtering and obviates the need for a separate optical filter (such as the optical filter 1489).

[00152] FIG. 14J is a partial block diagram of a radiation monitoring system 3000 according to one embodiment of the invention. The radiation monitoring system 3000 represents one implementation of a portion of the radiation monitoring system 1400 illustrated in FIG. 14A or a portion of the radiation monitoring system

1420 illustrated in FIG. 14B. In particular, the radiation monitoring system 3000 provides reduced power operation. The reduced power operation can substantially extend battery life. In this embodiment, a radiation-to-frequency converter 3002 receives a low duty cycle signal V_D . The low duty cycle signal V_D causes the radiation-to-frequency converter to periodically operate briefly. The duty cycle and frequency for the low duty cycle signal V_D can vary with implementation.

[00153] FIG. 14K is a schematic diagram of a radiation-to-frequency converter 3010 and a sensor according to one embodiment of the invention. The radiation-to-frequency converter 3010 is generally similar to the radiation-to-frequency converter 1440 illustrated in FIG. 14C. However, the radiation-to-frequency converter 3010 uses a photodiode 3012 instead of the phototransistor 1442. Also, the resistor 1452 and the diode 1454 illustrated in FIG. 14C are typically not needed as the photodiode 3012 is a diode and often includes an internal resistance. One example of such a photodiode is Everlight PD-15-22, though various different photodiodes can be used, and an optical filter may be used with the photodiode. Additionally, the radiation-to-frequency converter 3010 also include a transistor 3014. The transistor 3014 is controlled by the low duty cycle signal V_D such that the low power operation results. Namely, only when the low duty cycle signal V_D is "low" is significant power being consumed by the radiation monitoring system to monitor radiation. As a result, the radiation monitoring system can operate under battery power for extended durations.

[00154] FIG. 14L is a diagram of a representative waveform 3020 of a low duty cycle signal V_D . The low duty cycle signal V_D is "low" much less than it is "high." In this embodiment, radiation monitoring occurs when low duty cycle signal V_D is "low." Hence, the on time for a periodic low duty cycle signal V_D is denoted t_{ON} and the off time is denoted t_{OFF} . As an example, the on time t_{ON} can be 0.5 seconds, while the off time t_{OFF} can be 128 seconds (which is a duty cycle of 256 to 1).

[00155] FIG. 14M is a schematic diagram of a power supply 3040 according to one embodiment of the invention. The power supply 3040 represents a detailed embodiment for a power supply that could be an alternative design for the power supply 1434 illustrated in FIG. 14B.

[00156] The power supply 3040 includes a battery 3042 that is coupled between a positive voltage terminal (B+) and ground terminal (GND). The power supply 3040 includes an on/off switch S3. When the switch S3 is closed the power supply is turned on. In one implementation, the switch S3 is a push button switch

that is normally open (i.e., not close). The power supply 3040 also includes a resistor 3044 and a transistor 3046. In one embodiment, the transistor 3046 is an enhancement type p-channel MOSFET. The drain terminal of the transistor 3046 is coupled to the ground terminal (GND) of the power supply 3040 via a resistor 3048, and a source terminal of the transistor 3046 is coupled to the positive voltage terminal (B+) of the battery 3042. A gate terminal of the transistor 3046 is coupled to a first node 3049. The first node 3049 is coupled to the positive voltage terminal (B+) by the resistor 3044, and can be coupled to the ground terminal (GND) via the switch S3. The power supply 3040 also includes a transistor 3050, having a gate terminal coupled to a second node 3051, a source terminal connected to the ground terminal (GND), and a drain terminal connected to a third node 3052. In one embodiment, the transistor 3050 is an enhancement type n-channel MOSFET. Further, the power supply 3040 includes a transistor 3054, a resistor 3056 and a capacitor 3058. In one embodiment, the transistor 3054 is an enhancement type p-channel MOSFET. The gate terminal of the transistor 3054 connects to the third node 3052, the source terminal of the transistor 3054 connects to the positive voltage terminal (B+), and the drain terminal of the transistor 3054 connects to a voltage output terminal (V+). The resistor 3056 and the capacitor 3058 are connected in parallel between the positive voltage terminal (B+) and the third node 3052.

[00157] The operation of the power supply 3040 can be briefly explained as follows. When the switch S3 is press (momentarily), the transistor 3046 pulls the second node 3051 to approximately the positive voltage terminal (B+), which activates the transistor 3050. When the transistor 3050 is activated, the third node is pulled to approximately ground, which activates the transistor 3054. When the transistor 3054 is activated, the voltage output terminal (V+) is capable of outputting power for use by other circuitry. Since the switch S3 is soon released, the transistors 3046 and 3050 deactivate. However, the transistor 3054 remains on for a period of time determined by a time constant determined by the resistor 3056 and the capacitor 3058. Hence, during the period of time, charge from the capacitor 3058 is slowly discharged. Once substantially discharged, the transistor 3054 deactivates, thus ceasing output of any power to the other circuitry. In effect, the power supply 3040 automatically turns off after the period of time. As an example, the period of time can be 12 hours (e.g., representing daily usage of a radiation

monitoring system). The power supply 3040 can also receive a reset signal that serves to restart any "auto-off" timing that may be used.

[00158] It should be noted that a power supply for a radiation monitoring system can be implemented in various ways. The power supply 1475 illustrated in FIG. 14F uses an "on" switch and an "off" switch. The power supply 3040 in FIG. 14M uses a single "on" switch (e.g., push button) and an "auto-off" feature. In still another embodiment, the power supply, and thus the radiation monitoring system, can always be powered on. With CMOS transistor devices, the power consumption is relatively low such that a radiation monitoring system could be battery powered for an extended period of time without the need to recharge or replace the battery (i.e., long battery life). When the radiation monitoring is only briefly performed periodically, such as discussed above with reference to FIGs. 14J, 14K and 14L, the power consumption is particularly low and the battery life can be particularly long.

[00159] FIG. 14N is a diagram of a binary counter 4000 according to one embodiment of the invention. The binary counter 4000 is, for example, suitable for use as at least a portion of the divider 1426 illustrated in FIG. 14B. As an example, the binary counter 4000 can be a 26-bit counter. The inputs to the binary counter 4000 include the frequency signal ϕ_1 from a radiation-to-frequency converter (e.g., radiation-to-frequency converter 1424), a reset signal (such as from a switch S1), and an enable signal. The switch S1 is, for example, a push-button type switch. The binary counter 4000 can have a plurality of output lines (e.g., twenty-six (26) output lines), of which five such lines Q_{19} through Q_{24} are illustrated. These output lines are representative outputs that might be utilized by subsequent circuitry to control an output device. However, it should be understood that other output lines could alternatively be used. The enable input to the binary counter 4000 permits the binary counter to count when "high" but stops the binary counter 4000 from counting when "low."

[00160] FIG. 14O is a block diagram of latch-driver circuitry 4100 according to one embodiment of the invention. In one embodiment, the latch-driver circuitry 4100 can correspond to the latch 1428, the LCD driver 1430 and the LCD display 1432 as shown in FIG. 14B.

[00161] In this embodiment, the latch-driver circuitry 4100 has the capability to separately drive a plurality of different segments. These segments can be segments of a LCD display and can be combined to form symbols or charts. For example, in one embodiment, the LCD segments can be utilized to form a bar graph output.

[00162] The latch-driver circuitry 4100 includes a latch 4102 that receives an input associated with output Q_{19} from a divider (e.g., the binary counter 4000). The output of the latch 4102 is supplied to a LCD driver 4104. The LCD driver 4104 includes NAND gates 4106 and 4108. The outputs of the NAND gates 4106 and 4108 are supplied to a LCD segment-1 4110. The LCD driver 4104 also includes frequency signals ϕ_2 and $/\phi_2$ from an oscillator 4112.

[00163] The latch-driver circuitry 4100 further includes a latch 4114, a LCD driver 4116 and a LCD segment-2 4118. The latch 4114 receives an input signal associated with the output Q_{20} from the divider (e.g., the binary counter 4000). Likewise, for one or more other outputs from the divider (e.g., the binary counter 4000), the latch-driver circuitry 4100 can include a latch, a LCD driver and a LCD segment. In this regard, the output Q_N from the divider represents a generic output signal which is supplied to a latch 4120. The output of the latch 4120 is supplied to a LCD driver 4122. The output of the display driver 4122 is coupled to a LCD segment-N 4124. Additionally, each of the latches 4102, 4114 and 4120 receives a reset signal from a switch S1.

[00164] Still further, the output Q_N is coupled to an enable terminal of the divider (e.g., the binary counter 4000) via an inverter 4126. When the signal Q_N is high, the LCD segments are fully illuminated; hence, the enable signal output by the inverter 4126 is "low" so that the divider (e.g., the binary counter 4000) is disabled, until reset.

[00165] FIG. 14P is a block diagram of driver circuitry 4200 according to one embodiment of the invention. The driver circuitry 4200 is coupled to one or more outputs from a divider (e.g., the binary counter 4000). In this illustrated embodiment, the driver circuitry 4200 couples to the outputs Q_{20} and Q_{21} .

[00166] The driver circuitry 4200 includes a LCD driver 4202 that receives the outputs Q_{20} and Q_{21} from the divider (e.g., the binary counter 4000). These signals Q_{20} and Q_{21} are supplied to a NOR gate 4206 whose output is supplied to NAND gates 4208 and 4210. The outputs of the NAND gates 4208 and 4210 are supplied to a LCD graphic segment-1 4204. As shown in FIG. 14P, the LCD graphic segment-1 4204 represents a "happy " smiley face.

[00167] Additionally, the output Q_{20} is supplied to a LCD driver 4212 whose output in turn drives a LCD graphic segment-2 4214. Further, the output Q_{21} is supplied to a LCD driver 4216 whose output in turn drives a LCD graphic segment-3 4218. As shown in FIG. 14P, the LCD graphic segment-2 4214 is a "neutral" smiley

face, and the LCD graphic segment -3 4248 is a "sad" smiley face. It should be understood that various other graphical symbols or images can be used in place of smiley faces.

[00168] The driver circuitry 4200 also includes an oscillator 4220 that supplies the output frequency signals ϕ_2 and $\bar{\phi}_2$ to the LCD drivers 4202, 4212 and 4216. The driver circuitry 4200 further includes an inverter 4222 coupled to the output Q_{21} . The output of the inverter 4222 is coupled to the enable terminal of the divider (e.g., the binary counter 4000) so that the divider (e.g., the binary counter 4000) is stopped once the output Q_{21} is "high."

[00169] FIG. 14Q is a block diagram of driver circuitry 4300 according to another embodiment of the invention. In this embodiment, the output is a numerical value. In one embodiment, the driver circuitry 4300 can correspond to the latch 1428, the LCD driver 1430 and the LCD display 1432 as shown in FIG. 14B.

[00170] In this embodiment, the driver circuitry 4300 has the capability to separately drive a plurality of different segments. These segments are segments of a LCD display and can be combined to form numerical values. For example, in one embodiment, the segments can be utilized to output numerical values from 0 – 9. In other embodiments, the range of numerical outputs could be more or less than 0 through 9.

[00171] The driver circuitry 4300 receives a plurality of outputs from a divider (e.g., the binary counter 4000), such as outputs Q_{19} , Q_{20} , Q_{21} and Q_{22} . These outputs are supplied to a BCD-to-7 segment converter 4302. The output of the converter 4302 is supplied to a 7-segment LCD driver 4304. The 7-segment LCD driver 4304 couples to a 7-segment display 4306. Here, the outputs from the divider (e.g., the binary counter 4000) are converted such that a numerical range is output on the 7-segment display 4306. For example, the 7-segment display 4306 can display a number from 0 to 9 indicating a quantity or intensity of radiation. A NAND gate 4308 is coupled to the output Q_{19} and the output Q_{22} so as to decode a value of "9" at the outputs and cause the enable signal to go "low", thereby ceasing operation of the divider (e.g., binary counter 4000) when such reaches its maximum value.

[00172] FIGs. 15A, 15B and 15C are radiation detection systems according to different embodiments of the invention. These radiation detection systems are described in the context of UV radiation detection (which uses a UV sensor); however, it should be understood that these radiation detection systems can be also be used to detect other types of radiation. This can be accomplished, for example,

by replacing the UV sensor in the radiation detection system with another type of sensor, such as an infrared sensor or light sensor. These UV detection systems are compact modular systems. The UV detection systems can be built on a single substrate that is designed to be inserted into an end product. Since the UV detection system is compact and modular, the end product need only have an opening, cavity or container to hold or encompass the UV detection system. As such, the end product can quickly be transformed into an end product capable of providing UV monitoring. Advantageously, in one embodiment, the UV detection system is such that has minimal impact on design of the end product and no tedious wiring is required. For example, in case in which the end product is an eyeglass frame, a temple of the eyeglass frame can have an opening, cavity or container to hold or encompass the UV detection system, whereby no other changes or complications to the eyeglass frames need be imposed. Other such end-products can include: hats, shoes, tee-shirts, swimming-suits, key rings, purses, beverage can holders, and other consumer products.

[00173] FIG. 15A is a cross-sectional diagram of a UV detection system 1500 according to one embodiment of the invention. The UV detection system 1500 is build on a substrate 1502. The substrate 1502 can be a printed circuit board, a flexible tape or film (e.g., Kapton® polyimide film), ceramic, and the like, as known in the art. The UV detection system 1500 includes a power source 1504, an UV sensor 1506, electrical circuitry 1508 and a display device 1510 (e.g., LCD or LED). The display device 1510 is one type of output device, so it should be recognized that other embodiments can utilize other types of output devices. The power source 1504 is, for example, a battery or a solar panel of one or more solar cells. For example, if the power source 1504 is a battery, the battery can be a coin battery, such as often used in electronic watches. In one embodiment, the UV sensor 1506 includes a phototransistor. In one embodiment, the electrical circuitry 1508 includes one or more of analog electrical components (e.g., capacitors, resistors, diodes, transistors) or integrated circuits. Any such integrated circuits can be provided in a variety of packages, but surface mount packages can help maintain a thin profile for the UV detection system 1500. The various electrical components can be wire bonded onto the substrate 1502. For example, a SiC or GaNi phototransistor (or photodiode) can serve as at least part of a UV sensor and be wire bonded onto the substrate 1502 or other electrical component. The UV detection system 1500 shows components of the system mounted to both sides of the substrate 1502.

[00174] FIG. 15B is a cross-sectional diagram of a UV detection system 1520 according to another embodiment of the invention. The UV detection system 1520 can utilize the same or similar components as the UV detection system 1500. However, unlike the UV detection system 1500, the UV detection system 1520 mounts all components on one side of the substrate 1502. The effect of the UV detection system 1520 is a thinner module, though the substrate 1502 may be longer, as compared to the UV detection system 1500 shown in FIG. 15A.

[00175] FIG. 15C is a cross-sectional diagram of a UV detection system 1540 according to another embodiment of the invention. The UV detection system 1540 can utilize the same or similar components as the UV detection system 1500. However, unlike the UV detection system 1500, the UV detection system 1540 mounts the UV sensor 1506 at or near the edge of the substrate 1502. This has the potential advantage of positioning the UV sensor 1506 in a position so that it is better able to receive incident radiation (e.g., sunlight). The mounting of the UV sensor 1506 with respect to the substrate 1502 can also be flexible so that the UV sensor 1506 can be positioned, such as angularly positioned with respect to the substrate 1502 and/or angularly oriented when assembled into an opening, cavity or container of an end-use product. For example, the UV sensor 1506 could be soldered onto the substrate 1502 tipped at an angle. Alternatively, a small prism could be mounted on top of the UV sensor 1506, providing an angled direction of sensitivity. For example, the prism could be formed in place by filling a small, angled, box with clear optical adhesive (such as epoxy) that, when set would provide a prism, efficiently-coupled to the UV sensor 1506.

[00176] The UV sensor 1506 utilized in the UV detection systems 1500, 1520 and 1540 may use an optical filter with an optical sensor. For example, the optical sensor can respond to light, UV and infrared radiations, and the sensitivity of the optical filter causes the optical sensor to capture primarily the target radiation (e.g., UV) wavelengths of light. Hence, the UV sensor 1506 can include such optical filter. For example, the optical filter can be implemented as a coating on the optical filter. Alternatively, the optical filter can also be a separate component that is positioned proximate to the optical sensor when the end product is assembled. In other words, an optical filter can be another component of the UV detection system, or can be a separate component that is inserted when assembled into the end product. In one embodiment, an optical adhesive can be used to secure the optical filter to the optical sensor.

[00177] FIG. 16A is a cross-sectional view of an eyewear housing 1600 containing a UV detection system according to one embodiment of the invention. Here, the eyewear housing 1600 can represent a portion of the temple region of a frame for a pair of glasses. Typically, the portion of the temple region is forward of the user's ear (i.e., towards the lens holders) when the glasses are being worn. The UV detection system contained within the eyewear housing 1600 is, for example, the UV detection system 1500 shown in FIG. 15A. The eyewear housing 1600 has an opening, cavity or container to receive the UV detection system. The eyewear housing 1600 also has a first opening 1602 and a second opening 1604. The first opening 1602 is aligned with the power supply 1504, which would in such an embodiment be a solar panel. Hence, the first opening 1602 can allow light to impinge on the solar panel. The second opening 1604 is aligned with the display device 1510 so that information displayed can be seen. The eyewear housing 1600 also includes an optical filter 1606 that is positioned proximate to the UV sensor 1506. In one embodiment, the optical filter 1606 is a separate component that inserted into an opening in the eyewear housing 1600 that is proximate (e.g., adjacent) to the UV sensor 1506. In another embodiment, the optical filter 1606 is integral with the UV sensor 1506.

[00178] FIG. 16B is a cross-sectional view of an eyewear housing 1620 containing a UV detection system according to another embodiment of the invention. The eyewear housing 1620 has an opening, cavity or container to receive the UV detection system, such as the UV detection system 1500 shown in FIG. 15A. The eyewear housing 1620 also has a first window 1622 and a second window 1624. The first window 1622 is aligned with the power supply 1504, which would in such an embodiment be a solar panel. Hence, the first window 1622 can allow light to impinge on the solar panel. The second window 1624 is aligned with the display device 1510 so that information displayed can be seen. The eyewear housing 1600 also includes a third window 1626. The third window 1626 is positioned proximate to the UV sensor 1506. The third window 1626 can, in one embodiment, operate as an optical filter for the UV sensor 1506. The first and second windows 1622 and 1624 can be clear or colored so long as adequate light passes through.

[00179] FIG. 16C is a cross-sectional view of an eyewear housing 1640 containing a UV detection system according to still another embodiment of the invention. The eyewear housing 1640 is generally similar to the eyewear housing 1620 illustrated in FIG. 16B. However, FIG. 16C illustrates one way to secure the

UV detection system within the portion of the temple region of the eyewear housing 1640. In particular, the eyewear housing 1640 include a stand 1642 and an adhesive material 1644. When assembled, the UV detection system can be placed within the temple region of the eyewear housing 1640 and positioned against the stand 1642, then the adhesive 1644 can be provided within the temple region to secure the UV detection system in position. The adhesive can vary widely, such as glue, double-stick tape, silicone rubber, epoxy, etc.

[00180] FIG. 16D is a cross-sectional view of an eyewear housing 1660 containing a UV detection system according to yet still embodiment of the invention. The eyewear housing 1660 is generally similar to the eyewear housing 1600 illustrated in FIG. 16A, except that the electrical circuitry 1508 may be repositioned on the substrate 1502 and a switch base 1662 and a switch 1664, such as a button switch, are provided. As shown in FIG. 16D, the switch base 1662 can attach to the substrate 1502 and thereby support the switch 1664 that protrudes outside of the eyewear housing 1660 (or is otherwise accessible) so that a user can activate the switch (e.g., press the button).

[00181] In general, the UV detection system according to the invention can make use of zero or more switches. One type of switch is a button switch, such as a push-button switch. As an example, the switch can serve as a reset switch, an on/off switch, or a on (and reset) switch.

[00182] FIG. 17A is a cross-sectional view of a module housing 1700 according to one embodiment of the invention. As shown in FIG. 17A, the module housing 1700 can operate as a housing for the UV detection system 1500 shown in FIG. 15A. The module housing 1700 includes a first window 1702 and a second window 1704. The first window 1702 can be proximate to the display device 1510, and the second window 1704 can be proximate to the power supply 1504, which would in such an embodiment be a solar panel. The first and second windows 1702 and 1704 can be clear or colored so long as adequate light passes through. In one embodiment, the thickness of the first and second windows 1702 and 1704 is greater than the thickness of the walls of the module housing 1700. The module housing 1700 can also include an opening 1706 that is positioned proximate to the UV sensor 1506. Still further, although not illustrated in FIG. 17A, the module housing 1700 can further include one or more vents or holes so that air can circulate through the module housing 1700. Alternatively, the module housing 1700 does not include vents or holes, so as to be water-resistant or water-proof.

[00183] The module housing 1700 is a housing for a module, such as a UV detection system. The module housing 1700 is then placed into an opening, cavity or container of an eyewear housing, such as a temple region of the eyewear housing. The module housing 1700 protects the module. The module housing 1700 can also be used to regularize or standardize the form factor for the UV detection system, such that the opening, cavity or container of the eyewear housing can be regularized or standardized.

[00184] FIG. 17B is a cross-sectional view of an eyewear housing 1720 according to one embodiment of the invention. The eyewear housing 1720 has an opening, cavity or container 1721 for receiving the module housing 1700. As shown in FIG. 17B, the module housing 1700 is contained by the eyewear housing 1720. The eyewear housing 1720 includes an opening 1722 that corresponds to the first window 1702 of the module housing 1700. The eyewear housing 1720 also includes an opening 1724 that corresponds to the second window 1704 of the module housing 1700. Still further, the eyewear housing 1720 can optionally further include an optical filter 1726 corresponding to the third opening 1706 of the module housing 1700 (and thus proximate to the UV sensor 1506). The module housing 1700 can, for example, be held in position with respect to the eyewear housing 1720 by an adhesive or by an interference fit.

[00185] FIG. 18 is a cross-sectional view of an eyewear housing 1800 having a reflective-type filter according to one embodiment of the invention. Here, the eyewear housing 1800 can represent a temple region of a frame for a pair of glasses. Typically, a large percentage of the temple region is in front of the user's ear when the glasses are being worn. The eyewear housing 1800 has an internal cavity 1802 where a circuit board 1804 is provided. Electrically coupled to the circuit board 1804 are a UV detector 1806 (e.g., based on a photodetector), electrical circuitry 1808, a display device (e.g., LED, LCD) 1810, and solar cell(s) 1812. As a result, the circuit board 1804 and the UV detector 1806, the electrical circuitry 1808, the display device 1810 and the solar cell(s) 1812 are within the internal cavity 1802 and thus embedded within the eyewear housing 1800.

[00186] A UV reflector 1814 is mounted on an internal support 1816. Light impinges on the UV reflector 1814 via an opening 1818 in the eyewear housing 1800. The opening 1818 allows radiation to pass through to the UV reflector 1814. In one embodiment, there can be a piece of transparent material at the opening 1818 to prevent dust or dirt from getting through the opening 1818 into the internal

cavity 1802. The opening 1818 can also be considered a transparent region in the eyewear housing 1800. The UV reflector 1814 selectively reflects primarily the UV portion of the radiation towards the UV detector 1806. As a result, the reflector 1814 serves as a reflective-type filter, that is, a type of optical filter. For example, the reflector 1814 can be made of a material that substantially reflects UV light but does not reflect non-UV light. An example of one such reflector is known as a UV hot mirror. Also, the eyewear housing 1800 can also include transparent portions 1820 and 1822 which are adjacent to the display device 1810 and the solar cell(s) 1822, respectively. The transparent portion 1820 allows light from the display device 1810 to be seen from the outside of the eyewear housing 1800. The transparent portion 1822 allows light from an external light source to impinge on the solar cell(s) 1812. Alternatively, the display device 1810 could extend to and conform with an outer surface of part of the eyewear housing 1800, and the solar cell(s) 1812 could extend to and conform with an outer surface of part of the eyewear housing 1800. Alternatively, if a battery were used in place of the solar cell(s) 1822, then the transparent portion 1822 would not be needed.

[00187] In one embodiment, a number of previously described transparent regions, portions, or sheets of materials, such as the transparent portions 1820 and 1822 in FIG. 18, can be translucent (including partially translucent). Still another alternative is that the eyewear housing 1800 could be primarily translucent.

[00188] The optical sensor or UV sensor can receive impinging light from a variety of different directions (i.e., angle of incidence) depending on implementation. For example, the light can come from an opening in the top of the temple, such as shown in FIG. 18, or at a side of the temple, such as shown in FIGs. 16A-16C and 17B. As another example, the light can come from an opening at an angle between the top and the side of the temple. Typically, the optical sensor or the UV detector would be aligned with the opening at whatever angle it takes, such alignment tends to maximize sensitivity of the optical sensor or the UV detector. The optimal angle can also be based on the latitude. Thus, at the equator, the UV detector should point upward. And at the north pole, the sensor should point horizontally. In one embodiment, the size of the opening can be larger to increase impinging light, or can be smaller to decrease impinging light. In another embodiment, the opening can be flared outward so as to increase the amount of impinging light. Further, the opening can also support a lens for focusing impinging light.

[00189] The UV detection system can also have a "being-worn" switch as noted above. In one embodiment, the "being-worn" switch enables the UV monitoring system to automatically determine when to monitor UV radiation and when not to monitor UV radiation. In particular, the UV radiation can be monitored when an eyeglass frame having the UV detection system is "being-worn" and not when the eyeglass frame is not "being-worn." The "being-worn" switch can be positioned in the temple portion with the other components of the UV detection system. In one embodiment, the UV detection system is provided, as a module as noted above, and which further includes a switch. The switch can, for example, be a "being worn" switch. By having the switch in the module, the manufacture and assembly of the end-product having the UV detection system can be simplified. As examples, the "being-worn" switch can be an optical, magnetic or mechanical switching device.

[00190] The "being-worn" switch can make use of the situation that the temples are in an open position when the eyeglass frame is being worn, and in a closed position when not being worn. In one embodiment, the "being-worn" switch can be positioned at a temple proximate to a region that couples the temple to its corresponding lens holder. For example, the UV detection system (e.g., module) can be provided within the temple region near the end of the temple so that the "being worn" switch is adjacent the lens portion of the eyeglass frame.

[00191] FIG. 19 is a side view of a temple 1900 for an eyeglass frame according to one embodiment of the invention. The side view of FIG. 19 shows an outer side of the temple 1900, namely, the side of the temple 1900 that faces outward when being worn. The temple 1900 includes therein a UV detection system 1902 internal to the temple 1900. A window 1904 is provided in the temple 1900 for light (e.g., sunlight) to impinge on a UV sensor of the UV detection system 1902. The window 1904 can also provide some optical filtering effects, such as noted above. Although not shown in FIG. 19, the temple 1900 may also have a window or opening for a solar panel. At a forward end 1906 of the temple 1900 where a hinge is typically provided, a pin 1908 is exposed. The pin 1908 passes through an opening at the forward end 1906 of the temple 1900. The pin 1908 is coupled to a switch internal to the temple 1900 and part of the UV detection system 1902. When the pin 1908 is not depressed, as shown in FIG. 19, the switch informs the UV detection system 1902 that the eyeglass frame is closed, i.e., not being worn. On the other hand, when the eyeglass frame is opened, i.e., presumably being worn, the

pin 1908 is depressed by the forward end 1906 abutting against a portion of its corresponding lens holder, thereby informing the UV detection system 1902 that the eyeglass frame is opened. In one embodiment, the pin 1908 is only depressed when the temple 1900 of the eyeglass frame is fully opened, such that the eyeglass frame would almost necessarily be worn (particularly when there is a bias against the eyeglass frame being fully open).

[00192] FIGs. 20A and 20B are top view diagrams of a portion of an eyeglass frame 2000 according to one embodiment of the invention. The eyeglass frame 2000 includes a lens holder 2002 and a temple 2004. The temple 2004 includes a UV detection system therein. The UV detection system includes an opening or window 2006 that corresponds to an optical sensor used by the UV detection system. The optical sensor is used as a "being-worn" switch. When the eyeglass frame 2000 is in the open position as shown in FIG. 20A, the optical sensor detects significant light, thereby informing the UV detection system that the eyeglass frame 2000 is presumably being worn. On the other hand, when the eyeglass frame 2000 is in the closed position as shown in FIG. 20B, the opening or window 2006 is covered by a flap 2008 provided on the lens holder 2002. When the flap 2008 covers the opening or window 2006, no significant light can be detected by the optical sensor. In such case, the UV detection system is informed that the eyeglass frame 2000 is not being worn.

[00193] FIG. 21 is a side view of a temple 2100 for an eyeglass frame according to one embodiment of the invention. The side view of FIG. 21 shows an inner side of the temple 2100, namely, the side of the temple 2100 that faces inward when being worn. The temple 2100 includes therein a UV detection system 2102 internal to the temple 2100. The temple 2100 may also have a window or opening (not shown) that corresponds to an output device (e.g., display). A window or opening 2104 is provided at a rearward portion of the temple 2100. The window or opening 2104 corresponds to an optical sensor (internal to the temple 2100) provided at the window or opening 2104. The window or opening 2104 allows light (e.g., sunlight) to impinge on the optical sensor. The optical sensor is coupled to the UV detection system 2102 via one or more electrical wires 2106. When the temple 2100 of the eyeglass frame is being worn by a user, the optical sensor will be blocked from receiving significant amounts of light, thereby informing the UV detection system 2102 that the eyeglass frame is being worn. For example, the optical sensor can be blocked by the user's head or hair when the eyeglass frame is

being worn. On the other hand, when the temple 2100 of the eyeglass frame is not being worn by a user, the optical sensor will receive significant amounts of light, thereby informing the UV detection system 2102 that the eyeglass frame is not being worn. Of course, at night often little or no light will impinge on the optical sensor. Optionally, in such case the lack of any significant light (e.g., detected by another optical sensor or solar cell) can be used to ensure that the UV detection system does not operate at night, such that the eyeglass frame can be considered not being worn at night (even if being worn at night).

[00194] FIG. 22 is a side view of a temple 2200 for an eyeglass frame according to another embodiment of the invention. The side view of FIG. 22 shows an outer side of the temple 2200, namely, the side of the temple 2200 that faces outward when being worn. The temple 2200 includes therein a UV detection system 2202 internal to the temple 2200. Although not shown in FIG. 22, the temple 2200 may also have windows or openings for a solar panel and/or an optical sensor. At a forward end 2204 of the temple 2200, a magnetic switch 2206 is provided. The magnetic switch 2206 is internal to the temple 2200 and part of the UV detection system 2202. The magnetic switch 2206 can use a magnet to provide a switch. The magnetic switch 2206 switches from a first position to a second position when a metallic material is adjacent the forward end 2204 of the temple 2200. For example, such metallic material can be provided in a portion of a lens holder that abuts the forward end 2204 when the temple 2200 is in the open position. Here, when the switch is in the open position, the metallic material is adjacent the forward end 2204 of the temple 2200, and the UV detection system 1902 understands that the eyeglass frame is opened, i.e., presumably being worn. In such case, the switch can be considered to be in the second position. On the other hand, when the eyeglass frame is closed, i.e., not being worn, the switch is in the first position because the metallic material is no longer adjacent the forward end 2204 of the temple 2200. Then, the UV detection system 2202 understands that the eyeglass frame is closed (i.e., not being worn). In one embodiment, the magnetic switch 2206 can be implemented by a Hall effect sensor. Alternatively, it should be understood that the magnetic switch could be provided at a portion of a lens holder that abuts the forward end 2204 when the eyeglass frame has the temple 2200 open, and the metallic material could be at the forward end 2204.

[00195] The “being worn” switch can also be used by a user to signal the UV detection system to provide its output at an output device, such as a display device.

For example, when the "being worn" switch is initially closed (i.e., being worn), the UV detection system can output its text or graphical output to the display device. Typically, the displayed output would be displayed only for a limited period of time (e.g., 10 seconds). Such an approach is power efficient, yet permits the user to obtain the output information when desired. Alternatively, another switch (e.g., dedicated output switch) could be used to cause the output to be displayed for a limited period of time or while the switch is depressed.

[00196] The UV detection system can also make use of one or more switches to change operational settings, such as threshold levels, output type, user preferences, user physical characteristics (e.g., skin type), accumulation mode or non-accumulation mode, activation/deactivation of auxiliary sensors.

[00197] The UV detection system can make use of one or more variable capacitors or resistors within the design of the electronic circuit to facilitate a manufacturer or dispenser to calibrate the UV detection. Such can assist with quality control as well as consistency or uniformity. The UV detection system can also alter another aspect of the electronic circuitry, such as a count or divide amount (FIG. 14B), to calibrate the UV detection.

[00198] Calibration or customization of the UV detection system can also be performed after manufacture by a user or dispenser. As one example, the eyewear can be sold or dispensed with one or more stickers available for placement over the radiation detector (e.g., UV sensor). The stickers can attenuate the radiation impinging on the radiation detector. In other words, the stickers can perform sensitivity adjustment on the UV detection system. Different ones of the stickers can offer different degrees of attenuation. A user can thus select an appropriate sticker based on their skin type (or amount of exposure they prefer) and place it over the radiation detector, thereby calibrating or customizing the UV detection system to the user.

[00199] As previously noted, the optical sensor (e.g., UV sensor) can be implemented by at least one photodetector, such as a phototransistor. Although various different phototransistors can be utilized, one example of a suitable phototransistor is Part No. PT100MCOMP available from Sharp Microelectronics of the Americas. As another example, a suitable phototransistor for the phototransistor is Part No. EL-PT15-21B (1206 phototransistor) available from Everlight Electronics Co., Ltd. As still another example, other suitable phototransistors are GaNi or SiC phototransistors. Alternatively, although the discussion above at times refers to

phototransistors, the photodetector can also be a photodiode. In the case of a photodiode, similar circuitry to that noted above would be utilized. Although various different photodiodes can be utilized, one example of a suitable photodiode is Part No. PD100MCOMP available from Sharp Microelectronics of the Americas.

[00200] The radiation sensors or detectors, including phototransistors and photodiodes, used for radiation monitoring are often designed for sensing or detecting certain types of radiation. For example, a UV sensor or UV detector would be an electronic device that is sensitive to UV radiation, namely, the wavelengths of light pertaining to UV spectrum. While such electronic device may be primarily sensitive to such radiation of interest (e.g., UV radiation), they may also be somewhat sensitive to other radiation. Optical filters can be used to assist these sensors or detectors in sensing the desired type of radiation. Nevertheless, radiation monitoring can be achieved even though the radiation sensors or detectors are sensitive to non-desired radiation so long as they are primarily or principally responsive to the desired radiation.

[00201] When the radiation to be monitored is UV radiation, the optical filter described above is typically implemented by a material that passes radiation in the UV wavelength band and blocks radiation not in the UV wavelength band. Various materials can be used in this regard. In one embodiment, the material providing the optical filtering can be known as a UV cold mirror. However, in another embodiment, the optical filter may have other characteristics, such as a material (e.g., polycarbonate) that passes radiation not in the UV wavelength band and blocks radiation in the UV wavelength band. In another embodiment, the optical filter can utilize a material that passes light primarily associated with the ultraviolet wavelength range while substantially blocking light of other wavelengths. Such a material can, for example, be a filter made from quartz-glass with nickel oxide, such is commonly known as Wood's glass. The material implementing the optical filter can also be configured in various ways, such as a plug for an opening or a coating on a surface (or on the photodetector itself). In one embodiment, the material implementing the optical filter can either pass or reflect the UV radiation.

[00202] An output (e.g., notification, such as a warning) to the user can vary in content and type. The type can be visual and/or audio. The content can be numerical, graphical, musical, textual, synthesized text, etc. A progression of warnings can be used to give more substantial warning (such as when prior warnings are ignored). The output can also be predetermined, dynamically

determined or configurable. Still further, the output can be dependent on user preferences, user physical characteristics (e.g., skin type), auxiliary sensor information (e.g., location), and degree of health risk.

[00203] The radiation monitoring system can also include one or more connectors with the eyewear. The connectors can, for example, facilitate electrical or mechanical interconnection with an external electrical device (e.g., computing device, media player, headset, power source). Although the format and size of the connectors can vary, in one embodiment, the connector is a standard audio connector or a peripheral bus connector (e.g., USB connector).

[00204] The radiation monitoring system can also include one or more switches with the eyewear. The switches can, for example, facilitate user input or control with respect to the radiation monitoring system. For example, the switches can provide one or more of on/off, reset, on, on (and reset), and calibration. One example of a calibration switch is a skin type switch that provides switch positions for different skin types (e.g., light, medium and dark). The radiation monitoring system can also provide a user with an indication of whether the system is currently on or off, such as by a graphical image on a display device or by a LED.

[00205] A radiation monitoring system can also include a memory. The memory can be volatile or non-volatile. The memory can also be removable or non-removable with respect to the eyewear. If the memory is volatile, the radiation monitoring system could include a battery to provide power to the memory so that stored data (e.g., accumulated radiation, user preferences, etc.) can be retained even when adequate solar energy is not available. As an example, the presence of a memory can allow storage of radiation information for an extended period of time to acquire a historical understanding of radiation information.

[00206] In one embodiment, an eyeglass frame can include memory that can store acquired radiation information, such stored radiation information can be subsequently uploaded to a computer, in a wired or wireless manner. The radiation information can then be analyzed by the computer. For example, a doctor may require a patient to keep track of his exposure to UV radiation, or other radiations, to assist the doctor to evaluate risks or symptoms.

[00207] In another embodiment, a user of an eyeglass frame interact with a switch provided on the eyeglass frame to set a calibration level. As an example, in the case of UV radiation, the calibration level can correspond to the user's skin type.

In general, the calibration level causes the amount of acceptable radiation (e.g., threshold levels) to vary.

[00208] In still another embodiment, a user can go through a calibration procedure when the user purchases the eyeglasses. The calibration procedure can operate to personalize the UV detection system for the user. For example, the complexion of the user's skin affects the user's sensitivity to UV. Based on the skin complexion, a UV monitoring system adjusts the levels of acceptable exposure to UV. The calibration procedure can be performed wired or wirelessly. For example, the calibration can be done by a computer, with the calibration data downloaded to the eyeglasses through a connector integral with the eyeglasses.

[00209] A radiation monitoring system can also include a communication module. The communication module would allow data transmission to and from the radiation monitoring system (namely, the eyewear) and an external device. The data being transmitted can, for example, be radiation information, configuration data, user preferences, or auxiliary sensor data. The data transmission can be wireless or wireline based. The eyewear can further include a connector operatively connected to the radiation monitoring system. Such a connector can facilitate data transmission with respect to the radiation monitoring system or the eyewear.

[00210] A temple of a pair of glasses can be removable of the remainder of the frame. Such facilitates replacement of temples. For example, a convention temple could be removed from a frame and replaced with a temple having a least one electrical component at least partially embedded therein.

[00211] A radiation monitoring system can be partially or fully contained in a temple arrangement associated with a temple of a pair of glasses. In one embodiment, the temple arrangement can be removable from the temple. A temple arrangement can be a temple tip, a temple cover or a temple fit-over.

[00212] A radiation monitoring system can be partially or fully tethered to a pair of glasses. For example, some of the components for monitoring radiation or one or more auxiliary sensors can be tethered to the eyewear. In one embodiment, the tethered components can be tethered at the neck or upper back region of the user. Tethering components allows for increased design freedom with the eyewear as well as additional area with which to house the components.

[00213] Still further, a radiation monitoring system could be partially or completely within a device or a base that can be tethered to eyewear.

[00214] A number of embodiments have been described above for an eyeglass frame, i.e., primary frame. Such embodiments are also applicable to an auxiliary frame. An auxiliary frame can attach to a primary frame through different techniques, such as using clips. Another technique to attach an auxiliary frame to a primary frame is by way of magnets. Examples of using magnets as an attachment technique can be found, for example, in U.S. Patent 6,012,811, entitled, "EYEGLOSS FRAMES WITH MAGNETS AT BRIDGES FOR ATTACHMENT."

[00215] Although much of the discussion above concentrates on UV monitoring, the invention is generally applicable to radiation monitoring. The radiation can, for example, pertain to one or more of UV, infrared, light and gamma radiation. Light, namely visible light, can be referred to as ambient light.

[00216] Also, the above discussion concerning UV sensor or UV monitor is generally applicable to radiation sensors or monitors. One embodiment of a radiation sensor or monitor which principally measures light is a light sensor or a light monitor. More particularly, in measuring light, sunlight is a dominant source of light, such that a radiation sensor or monitor which principally measures light can be referred to as a sun sensor or a sun monitor. In such case, radiation monitoring can be considered light monitoring or sunlight monitoring.

[00217] Visible light is part of everyday life and is generally not considered harmful to persons. In one embodiment, the measurement of light can be used to infer a measurement of harmful radiation (e.g., UV radiation).

[00218] A number of embodiments have been described where a radiation monitoring system is embedded in a temple of an eyeglass frame. However, in other embodiments, the radiation monitoring system can be in other parts of the eyeglass frame, such as the bridge or lens holder region. Also, for eyewear having shield(s) or wrap-around lenses, the radiation monitoring system can also be in such shield(s) or lenses.

[00219] Although much of the above discussion pertains to providing radiation (e.g., radiation) monitoring capabilities in eyewear, it should be understood the any of the various embodiment, implementations, features or aspects noted above can also be utilized in other or on end products besides eyewear. Examples of other such end-products can include: hats (e.g., soft hats, hard-hats, helmets), watches or watch bands, bracelets, bracelet accessories, necklaces, necklace accessories, rings, shoes (e.g., sandals, athletic shoes, beach shoes), shoe accessories, clothing (e.g., tee-shirt, swimming-suit, ties, pants, jackets, etc.), belts, belt accessories,

zippers, key rings, purses, beach-tags, containers (e.g., cups, bottle, tube --such as a sun tan lotion bottle or tube); container holders (e.g., can holders, coasters, coolers, etc.), and other consumer products.

[00220] FIGs. 23A-23G illustrate examples of various end products having radiation monitoring capability. FIG. 23A illustrates a hat 2300 having a radiation monitoring system 2302. The radiation monitoring system 2302 can be attached to or embedded within the hat 2300. FIG. 23B illustrates a watch 2304 having a radiation monitoring system 2302. The watch 2304 can have a base 2306 and a band 2308. The radiation monitoring system 2302 can be coupled to the band 2308 as illustrated in FIG. 23B. Alternatively, the radiation monitoring system 2302 can be coupled to the base 2306. FIG. 23C illustrates a shirt 2310 having a radiation monitoring system 2302. As shown in FIG. 23C, in one embodiment, the radiation monitoring system 2302 can be placed in the upper, chest, back or shoulder region of the shirt 2310. FIG. 23D illustrates a shoe 2312 having a radiation monitoring system 2302. The radiation monitoring system 2302 can, for example, be placed at the top, upper portion of the shoe 2312. FIG. 23E illustrates a key chain 2314 having a radiation monitoring system 2302. FIG. 23F illustrates a bracelet or necklace 2316 having a radiation monitoring system 2302. FIG. 23G illustrates a bottle or tube 2318 having a radiation monitoring system 2302.

[00221] If the end product is soft or made of cloth (e.g., clothing, purse, hat, etc), then the radiation monitoring system (e.g., provided as a module) can be sewn onto the cloth or adhered to the cloth using an adhesive (e.g., adhesive tape). The module, or a case for the module, can have thin flanges about its periphery which can be easily sewn onto the cloth. The case for the radiation monitoring system can be molded into its desired shape (e.g., injection molded, compression molded or vacu-formed). The case can be soft (vinyl, thin polypropylene, soft polyurethane, or PET). Typically, if flanges are utilized for sewing, they would be thin and soft. Alternatively, the case can be hard (e.g., PVC, polypropylene, nylon, polycarbonate, or styrene). If the end product is hard, the case can also be hard.

[00222] When the end product is a container, such as the bottle or tube 2318 shown in FIG. 23G, the radiation monitoring system 2302 can be attached to the bottle or tube 2318 or can be molded into the bottle or tube 2318. In one embodiment, the bottle or tube 2318 is a plastic container. The radiation monitoring system 2302 is particularly well suited to be attached or integral with a bottle or tube,

often plastic, that contains sun tan lotion. Sun tan lotion includes sun tan or sun block lotions, including sun tan or sun block oils.

[00223] The various embodiments, implementations and features of the invention noted above can be combined in various ways or used separately. Those skilled in the art will understand from the description that the invention can be equally applied to or used in other various different settings with respect to various combinations, embodiments, implementations or features provided in the description herein.

[00224] The invention can be implemented in software, hardware or a combination of hardware and software. A number of embodiments of the invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[00225] The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. One advantage of the invention is that radiation monitoring can be inconspicuously performed in conjunction with eyewear. Another advantage of the invention is that electrical components for radiation monitoring can be embedded within a frame (e.g., temple) of eyewear. Still another advantage of the invention is that radiation monitoring can be intelligently performed such that it operates only at likely appropriate times to improve accuracy and usefulness. Yet another advantage of the invention is that eyewear may further include one or more auxiliary sensors that can cause additional output to be provided to the user.

[00226] Numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be understood by those skilled in the art that the invention may be practiced without these specific details. The description and representation herein are the common meanings used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. In other instances, well-known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

[00227] In the foregoing description, reference to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

[00228] The many features and advantages of the invention are apparent from the written description and, thus, it is intended by the appended claims to cover all such features and advantages of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation as illustrated and described. Hence, all suitable modifications and equivalents may be resorted to as falling within the scope of the invention.

[00229] Following the claims is an appendix containing additional circuit designs and other implementation information that is hereby incorporated herein by reference.

[00230]

What is claimed is:

CLAIMS

1. A frame for eyeglasses, comprising:
a UV detector for sensing an amount of UV radiation; and
an electronic circuit operatively connected to said UV detector, said electronic circuit providing at least radiation information based on at least the amount of UV radiation sensed by said UV detector,
wherein said UV detector and said electronic circuit are at least partially embedded in said frame.
2. A frame as recited in claim 1, wherein said UV detector and said electronic circuit are at least partially embedded in at least one temple of said frame.
3. A frame as recited in claim 2, wherein said electronic circuit includes at least a circuit board and at least one electrical component.
 - 3.1. A frame as recited in claim 3, wherein the at least one electrical component is one of a transistor and a controller.
 - 3.2. A frame as recited in claim 1, wherein said UV detector and said electronic circuit are primarily internal to said frame.
 - 3.3. A frame as recited in claim 1, wherein said UV detector and said electronic circuit are primarily internal to at least one temple of said frame.
 - 3.4. A frame as recited in claim 1, wherein at least a portion of said frame is comprised by only an underlying circuit board.
4. A frame as recited in claim 1, wherein said UV detector comprises:
an optical filter for restricting passage of non-UV radiation therethrough; and
a photodetector for sensing the amount of UV radiation that passes through said optical filter.

5. A frame as recited in claim 4, wherein said optical filter, said photodetector and said electronic circuit are internal to said frame, and wherein said frame has an opening adjacent said optical filter to allow light to impinge on said photodetector
6. A frame as recited in claim 4, wherein said frame has temples, and wherein said optical filter, said photodetector and said electronic circuit are at least partially embedded in at least one temple of said frame.
7. A frame as recited in claim 4, wherein said frame has temples, and wherein said optical filter is provided at or adjacent to an outer surface of the at least one of said temples, whereby sunlight incident on said frame can be sensed by said photodetector via said optical filter.
8. A frame as recited in claim 4, wherein said optical filter primarily implements a high pass filtering operation, allowing radiation beyond the optical range to pass.
9. A frame as recited in claim 4, wherein said optical filter is a material that restricts passage of radiation having a frequency above the optical radiation.
10. A frame as recited in claim 4, wherein said optical filter is placed or integral with a temple of said frame.
11. A frame as recited in claim 4, wherein said photodetector is a photodiode or a phototransistor.
- 11.1. A frame as recited in claim 1, wherein said UV detector comprises:
 - an optical reflector that substantially reflects UV radiation and substantially absorbs non-UV radiation; and
 - a photodetector for sensing the amount of UV radiation that is supplied to said photodetector via said optical reflector.
- 11.2 A frame as recited in claim 4, wherein said photodetector is a Silicon Carbide photodetector.

11.3 A frame as recited in claim 11.2, wherein said photodetector is a photodiode or a phototransistor.

11.4 A frame as recited in claim ,
wherein said UV detector comprises a photodetector for sensing the amount of UV radiation, and
wherein said photodetector is a Gallium Nitride photodetector.

11.5 A frame as recited in claim 11.4, wherein said photodetector is a photodiode or a phototransistor.

11.6 A frame as recited in claim 11.1, wherein said UV detector comprises a photodetector for sensing the amount of UV radiation, and
wherein said photodetector is a Silicon Carbide photodetector.

11.7 A frame as recited in claim 11.6, wherein said photodetector is a photodiode or a phototransistor.

12. A frame as recited in claim 1, wherein said UV detector comprises:
an optical reflector that substantially reflects UV radiation and substantially absorbs optical radiation; and
a photodetector for sensing the amount of UV radiation that is supplied to said photodetector via said optical reflector.

13. A frame as recited in claim 1, wherein the eyeglasses are sunglasses.

14. A frame as recited in claim 1, wherein the eyeglasses are fit-over glasses.

15. A frame as recited in claim 1, wherein said frame further comprises:
at least one additional sensor operatively connected to at least said electronic circuit.

16. A frame as recited in claim 15, wherein said additional sensor provides additional sensor information that is used by said electronic circuit to determine whether said frame is being worn by a user.

17. A frame as recited in claim 16, wherein said at least one additional sensor comprises at least one thermal sensor.
18. A frame as recited in claim 16, wherein said at least one additional sensor comprises a plurality of thermal sensors for use in determining whether said frame is being worn by the user.
19. A frame as recited in claim 16, wherein said at least one additional sensor comprises at least one motion detector.
20. A frame as recited in claim 15, wherein said additional sensor further provided is at least partially embedded in the at least one temple of said eyeglass frame.
21. A frame as recited in claim 15, wherein said additional sensor provides sensor information pertaining to at least one of ambient temperature, humidity, and barometric.
22. A frame as recited in claim 15, wherein said additional sensor provides sensor information pertaining to health or physical condition of a user of said frame.
23. A frame as recited in claim 15, wherein said frame further comprises an output device to inform a user of said frame of the radiation information and sensor information, and
wherein said electronic circuit further being operatively connected to said output device to direct said output device to present the radiation information and the sensor information to the user.
24. A frame as recited in claim 23, wherein the radiation information and the sensor information can be alternatively displayed at said output device.
25. A frame as recited in claim 1, wherein said frame further comprises:
at least one solar element for converting light into electrical energy, the electrical energy being provided to said electronic circuit.

26. A frame as recited in claim 25, wherein said frame further comprises:
at least one battery operatively connected to provide electrical energy to said electronic circuit.
27. A frame as recited in claim 1, wherein said frame further comprises:
at least one battery operatively connected to provide electrical energy to said electronic circuit.
28. A frame as recited in claim 27,
wherein said at least one battery is rechargeable, and
wherein said frame further comprises:
at least one solar element for converting light into electrical energy, the electrical energy being provided to recharge said at least one battery.
29. A frame as recited in claim 1, wherein said frame further comprises an output device to inform a user of said frame of the radiation information, and
wherein said electronic circuit further being operatively connected to said output device to direct said output device to present the radiation information to the user.
30. A frame as recited in claim 29, wherein the radiation information is a UV radiation warning.
31. A frame as recited in claim 29, wherein the radiation information is a UV intensity value.
32. A frame as recited in claim 29, wherein the radiation information depends on UV radiation collected and integrated across a duration of time.
33. A frame as recited in claim 29, wherein the radiation information is an audio indication.
- 33.1. A frame as recited in claim 29, wherein the radiation information is a visual indication.

34. A frame as recited in claim 29, wherein said output device is a speaker.
35. A frame as recited in claim 34, wherein said speaker produces an audible sound for the user.
36. A frame as recited in claim 29, wherein said output device is a display device.
37. A frame as recited in claim 36, wherein said display device displays the radiation information for the user.
- 37.1. A frame as recited in claim 37, wherein the radiation information being displayed on said display device is at least one of: a numerical value, a word or a graphic symbol.
- 37.2. A frame as recited in claim 37, wherein the radiation information being displayed on said display device comprises one or more segments that are displayed depending on the radiation information to be presented.
- 37.3. A frame as recited in claim 37.2, wherein the one or more segments form a bar graph of on said display device.
- 37.4. A frame as recited in claim 37, wherein the radiation information being displayed on said display device is one of a plurality of predetermined graphic symbols, the one of the plurality of predetermined graphic symbols being displayed depends on the radiation information to be presented.
- 37.5. A frame as recited in claim 37.4, wherein a first of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is low, a second of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is moderate, and a third of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is high.
- 37.6. A frame as recited in claim 37, wherein the radiation information being displayed on said display device is one of a plurality of numerical values, the one of

the plurality of numerical values being displayed depends on the radiation information to be presented.

38. A frame as recited in claim 37, wherein said display device comprises a liquid crystal display.

39. A frame as recited in claim 37, wherein said display device comprises a light emitting diode.

40. A frame as recited in any of claims 1-39, wherein said frame further comprises a connector that facilitates electrical connection with respect to said electronic circuit.

40.1 A frame as recited in any of claims 1-39, wherein said frame further comprises a switch operatively connected to said electronic circuit to facilitate user interaction.

40.2 A frame as recited in any of claims 1-39, wherein said frame further comprises a calibration switch operatively connected to said electronic circuit to provide a calibration adjustment for said electronic circuit.

40.3. A frame as recited in claim 40.2, wherein the calibration switch has multiple of positions, each of the positions pertaining to a different skin type.

40.4 A frame as recited in any of claims 1-39, wherein said frame further comprises a switch that controls supply of power, a reset operation or a user setting for said electronic circuit.

41. A frame as recited in claim 40, wherein said connector is provided at a rearward position of an arm of said frame.

42. A frame as recited in any of claims 1-41, wherein said frame further comprises at least one additional electrical component tethered to said frame.

42.1. A frame as recited in claim 42, wherein the at least one electrical components is tethered to said frame via an eyeglass cord having an electrical conductor therein.

42.2. A frame as recited in claim 42 or 42.1, wherein the at least one electrical components is tethered to said frame at a position behind the neck or upper back region of a user when said frame is being worn by the user.

43. A frame as recited in claim 42, wherein said at least one additional electrical component being tethered to said frame is at least electrically coupled to said electronic circuit.

43.1. A frame as recited in any of claims 1-41, wherein at least a portion of at least one of said UV detector and said electronic circuit is at least partially embedded in a temple arrangement associated with a temple of said frame.

43.2. A frame as recited in any of claims 1-41, wherein said frame further comprises a memory device for storage of radiation information.

44. A method for monitoring radiation for a person, said method comprising:
obtaining a pair of glasses, the glasses having a lens holder for holding lens, a pair of temples, and a radiation detector, the pair of glasses being worn by the person;
acquiring a radiation level impinging on the radiation detector of the pair of glasses being worn by the person wearing the pair of glasses; and
outputting radiation information to the person based on the radiation level.

44.1. A method as recited in claim 44, wherein the radiation detector is an ultraviolet detector, and the radiation level pertains to an ultraviolet radiation level.

44.2. A method as recited in claim 44, wherein the radiation detector is a sunlight detector, and the radiation level pertains to a sunlight radiation level.

45. A method as recited in claim 44,
wherein said method further comprises:
determining whether the person is wearing the pair of glasses, and

wherein said acquiring and said outputting are performed only when the person is determined to be wearing the pair of glasses.

46. A method as recited in claim 44,
wherein said method further comprises:
determining whether an adequate amount of solar energy is present,
and

wherein said acquiring and said outputting are performed only when said determining determines that there is an adequate amount of solar energy.

47. A method as recited in claim 44,
wherein said method further comprises:
determining whether the person is wearing the pair of glasses; and
determining whether an adequate amount of solar energy is present,
and

wherein said acquiring and said outputting are performed only when said determining determines that there is an adequate amount of solar energy and when the person is determined to be wearing the pair of glasses.

48. A method as recited in any of claims 44-47, wherein the radiation detector is positioned at or within at least one of the temples.

48.1. A method as recited in claim 44-47, wherein the radiation information being output is displayed on a display device, and wherein the radiation information being output is at least one of: a numerical value, a word or a graphic symbol.

48.2. A method as recited in claim 44-47, wherein the radiation information being output is displayed on a display device.

48.3. A method as recited in claim 48.2, wherein the radiation information being displayed on said display device comprises one or more segments that are displayed depending on the radiation information to be presented.

48.4. A method as recited in claim 48.3, wherein the one or more segments form a bar graph of on said display device.

48.5. A method as recited in claim 48.2, wherein the radiation information being displayed on said display device comprises one of a plurality of predetermined graphic symbols, the one of the plurality of predetermined graphic symbols being displayed depends on the radiation information to be presented.

48.6. A method as recited in claim 48.5, wherein a first of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is low, a second of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is moderate, and a third of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is high.

48.7. A method as recited in claim 48.2, wherein the radiation information being displayed on said display device comprises one of a plurality of numerical values, the one of the plurality of numerical values being displayed depends on the radiation information to be presented.

49. A radiation monitoring system, comprising:
a substrate;
an output device coupled to said substrate.
a radiation detector coupled to said substrate; and
circuitry coupled to said substrate and electrically coupled to said output device and said radiation detector.

50. A radiation monitoring system as recited in claim 49, wherein said output device is mounted to said substrate, and wherein said radiation detector is mounted to said substrate.

51. A radiation monitoring system as recited in claim 49, wherein said output device, said radiation detector and said circuitry are components, and where at least one component is mounted on each of the front and back sides of said substrate.

52. A radiation monitoring system as recited in claim 49, wherein said radiation monitoring system further comprises:

a power supplying device operatively connected to said circuitry.

53. A radiation monitoring system as recited in claim 52, wherein said output device, said radiation detector and said power supplying device are each mounted to said substrate.

54. A radiation monitoring system as recited in claim 52, wherein said output device, said radiation detector, said circuitry and said power supplying device are components, and wherein at least one the components is mounted on each of the front and back sides of said substrate.

55. A radiation monitoring system as recited in claim 49, wherein the radiation monitoring system is a self-sufficient module.

56. A radiation monitoring system as recited in claim 55, wherein the radiation monitoring system is embedded within a frame for eyeglasses.

57. A radiation monitoring system as recited in claim 55, wherein the radiation monitoring system is a module that is embedded within a temple of a frame for eyeglasses.

58. A radiation monitoring system as recited in claim 49, wherein the radiation monitoring system is a module that is embedded within a frame for eyeglasses.

59. A radiation monitoring system as recited in claim 49, wherein the radiation monitoring system is a module that is embedded within a temple of a frame for eyeglasses.

59.1. A radiation monitoring system as recited in any of claims 49-59, wherein said radiation detector primarily detects ultraviolet radiation.

59.2. A radiation monitoring system as recited in any of claims 49-59, wherein said radiation detector primarily detects infrared radiation.

59.2. A radiation monitoring system as recited in any of claims 49-59, wherein said radiation detector primarily detects light.

60. A pair of eyeglasses, comprising:
at least one lens holder;
a pair of temples; and
a radiation monitoring system completely embedded within one of the temples.

61. A pair of eyeglasses as recited in claim 60, wherein the one of the temples has a cavity for receiving said radiation monitoring system.

62. A pair of eyeglasses as recited in claim 60, wherein said pair of eyeglasses further comprises a cover to close the cavity after said radiation monitoring system has been received into the cavity.

63. A pair of eyeglasses as recited in claim 60, wherein the one of the temples has at least one opening that substantially aligns with a component of said radiation monitoring system when received into the cavity.

64. A pair of eyeglasses as recited in claim 60, wherein said radiation monitoring system includes at least a radiation sensor, a power source, circuitry and an output device.

65. A pair of eyeglasses as recited in claim 60, wherein said radiation monitoring system further comprises at least one switch.

66. A pair of eyeglasses as recited in claim 65, wherein the at least one switch is a "being worn" switch.

67. A pair of eyeglasses as recited in claim 65, wherein the at least one switch is an output request switch.

68. A pair of eyeglasses as recited in claim 67, wherein the output request switch is a "being worn" switch.

69. A pair of eyeglasses as recited in claim 67, wherein the output request switch is a reset switch.

70. A pair of eyeglasses as recited in claim 67, wherein the output request switch is a user setting switch.

71. A pair of eyeglasses as recited in claim 67, wherein the output request switch is an on or off switch.

71.1. A radiation monitoring system as recited in any of claims 60-71, wherein said radiation monitoring system primarily detects ultraviolet radiation.

71.2. A radiation monitoring system as recited in any of claims 60-71, wherein said radiation monitoring system primarily detects infrared radiation.

71.3. A radiation monitoring system as recited in any of claims 60-71, wherein said radiation monitoring system primarily detects light.

72. An electronic circuit for monitoring radiation, said electronic circuit comprises:
a radiation detector that detects a radiation intensity;
a radiation accumulator that receives and accumulates the radiation intensity from said radiation detector;
a comparator that determines whether the accumulated radiation intensity exceeds at least one threshold level; and
an output device that indicates whether the accumulated radiation intensity exceeds the at least one threshold level.

73. An electronic device as recited in claim 72,
wherein said electronic circuit is at least partially embedded within or attached to a consumer product, and
wherein said output device informs a consumer that excess radiation has been received when the accumulated radiation intensity exceeds the at least one threshold level.

74. An electronic device as recited in claim 73, wherein the consumer product is eyewear.

75. An electronic device as recited in claim 73, wherein the consumer product is an article of clothing.

76. An electronic device as recited in claim 72, wherein said output device is a display device.

77. An electronic device as recited in claim 76, wherein said display device displays at least a first graphic when the accumulated radiation intensity exceeds the at least one threshold level, and displays a second graphic or no graphic when the accumulated radiation intensity does not exceeds the at least one threshold level.

78. An electronic device as recited in claim 72, wherein said radiation detector detects UV radiation.

78.1. An electronic device as recited in claim 72, wherein said radiation detector detects infrared radiation.

78.2. An electronic device as recited in claim 72, wherein said radiation detector detects light.

79. An electronic device as recited in claim 72, wherein said radiation detector detects at least one of UV radiation, infrared radiation and light.

80. An electronic device as recited in claim 72, wherein said radiation detector detects radiation associated with a particular wavelength range.

81. An electronic device as recited in claim 72, wherein said radiation detector is only activated on a periodic basis, thereby reducing power consumption of said electronic circuit.

82. An electronic device as recited in claim 81, wherein said electronic circuit further comprises a battery.

83. An electronic device as recited in claim 72, wherein said electronic circuit further comprises a battery.
84. An electronic device as recited in claim 83, wherein said electronic circuit further comprises at least one of a reset switch and an on/off switch, said reset switch if provided being coupled to said radiation accumulator, and said on/off switch if provided being coupled to said battery.
- 84.1. An electronic device as recited in claim 83, wherein said electronic circuit further comprises at least one of a reset/on switch.
85. An electronic device as recited in claim 72, wherein said electronic circuit further comprises a least one solar cell.
86. An electronic device as recited in claim 72, wherein said electronic circuit further comprises at least one of a reset switch and an on/off switch.
87. An electronic device as recited in any of claims 72-86, wherein said electronic circuit is at least partially embedded in a temple portion of an eyeglass frame.
88. An electronic circuit for monitoring radiation, said electronic circuit comprises:
a radiation detector that detects a radiation intensity;
a radiation-to-frequency converter that receives the radiation intensity from said radiation detector and converts the radiation intensity to a frequency signal, the frequency signal having a frequency that is dependent on the radiation intensity;
an output manager operatively connected to said radiation-to-frequency converter, said output manager determines whether to output an output indication based on the frequency signal; and
an output device that outputs the output indication.
89. An electronic circuit as recited in claim 88, wherein the frequency of the frequency signal is not more than 1000 Hertz.

89.1. An electronic circuit as recited in claim 88 or 89, wherein said radiation-to-frequency converter is periodically activated by a control signal.

89.2. An electronic circuit as recited in claim 89.1, wherein said electronic circuit is powered by a battery, and

wherein the periodic nature of the control signal reduces power consumption by said electronic circuit and thus conserves charge drawn from the battery.

89.3. An electronic circuit as recited in claim 89.1 or 89.2, wherein the duty cycle for the control signal is such that, for a given period of the control signal, the control signal causes said radiation-to-frequency converter to be off substantially more than on.

90. An electronic circuit as recited in claim 88, wherein said output manager comprises a divider that divides down the frequency signal to control when to output the output indication.

91. An electronic circuit as recited in claim 88,
wherein said electronic circuit is at least partially embedded within or attached to a consumer product, and

wherein said output device informs a consumer that excess radiation has been received when said output manager causes the output indication to be output by said output device.

92. An electronic circuit as recited in claim 91, wherein the consumer product is eyewear.

93. An electronic circuit as recited in claim 91, wherein the consumer product is an article of clothing (e.g., hat, shirt, jacket, pants).

93.1. An electronic circuit as recited in claim 91, wherein the consumer product is one of a hat, watch, watch band, bracelet, bracelet accessory, necklace, necklace accessory, ring, shoe, shoe accessory, clothing, belts, belt accessory, zipper, key ring, purse, beach-tag, container, and container holder.

94. An electronic circuit as recited in claim 88, wherein said output device is a display device.

95. An electronic circuit as recited in claim 94, wherein said display device displays at least a first graphic when amounts of radiation that have been accumulated by said output manager are excessive, and displays a second graphic or no graphic when the accumulated amounts of radiation are not excessive.

96. An electronic circuit as recited in claim 88, wherein said radiation detector detects UV radiation.

96.1. An electronic circuit as recited in claim 88, wherein said radiation detector detects infrared radiation.

96.2. An electronic circuit as recited in claim 88, wherein said radiation detector detects light.

97. An electronic circuit as recited in claim 88, wherein said radiation detector detects at least one of UV radiation, infrared radiation and light.

98. An electronic circuit as recited in claim 88, wherein said radiation detector detects radiation associated with a particular frequency range.

99. An electronic circuit as recited in claim 88, wherein said radiation detector is only activated on a periodic basis, thereby reducing power consumption of said electronic circuit.

100. An electronic circuit as recited in claim 99, wherein said electronic circuit further comprises a battery.

101. An electronic circuit as recited in claim 88, wherein said electronic circuit further comprises a battery.

102. An electronic circuit as recited in claim 101, wherein said electronic circuit further comprises at least one of a reset switch and an on/off switch, said reset

switch if provided being coupled to said output manager, and said on/off switch if provided being coupled to said battery.

103. An electronic circuit as recited in claim 88, wherein said electronic circuit further comprises a least one solar cell.

104. An electronic circuit as recited in claim 88, wherein said electronic circuit further comprises at least one of a reset switch and an on/off switch.

105. An electronic circuit as recited in claim 88, wherein said output manager comprises:

- a divider operatively connected to receive the frequency signal from said light-to-frequency converter and to produce a divided frequency signal; and

- a latch operatively connected to said divider to produce an output control signal based on the divided frequency signal.

106. An electronic circuit as recited in claim 105, wherein said output device produces the output indication based on the output control signal.

107. An electronic circuit as recited in any of claims 88-106, wherein said electronic circuit is at least partially embedded in a temple portion of an eyeglass frame.

108. An electronic circuit for radiation detection as shown and described in the specification and/or drawings.

109. A frame for eyeglasses as shown and described in the specification and/or drawings.

110. A method, system, device, apparatus or computer readable medium as described in the specification and/or described in the drawings.

111. A frame for eyeglasses, comprising:

- a radiation detector for sensing an amount of radiation; and

an electronic circuit operatively connected to said radiation detector, said electronic circuit providing at least radiation information based on at least the amount of radiation sensed by said radiation detector,
wherein said radiation detector and said electronic circuit are at least partially embedded in said frame.

112. A frame as recited in claim 111, wherein said radiation detector and said electronic circuit are at least partially embedded in at least one temple of said frame.

113. A frame as recited in claim 112, wherein said electronic circuit includes at least a circuit board and at least one electrical component.

113.1. A frame as recited in claim 113, wherein the at least one electrical component is one of a transistor and a controller.

113.2. A frame as recited in claim 111, wherein said radiation detector and said electronic circuit are primarily internal to said frame.

113.3. A frame as recited in claim 111, wherein said radiation detector and said electronic circuit are primarily internal to at least one temple of said frame.

113.4. A frame as recited in claim 111, wherein at least a portion of said frame is comprised by only an underlying circuit board.

114. A frame as recited in claim 111, wherein said radiation detector comprises:
an optical filter for restricting passage of predetermined undesired radiation therethrough; and
a photodetector for sensing the amount of radiation that passes through said optical filter.

115. A frame as recited in claim 114, wherein said optical filter, said photodetector and said electronic circuit are internal to said frame, and wherein said frame has an opening adjacent said optical filter to allow light to impinge on said photodetector.

116. A frame as recited in claim 114, wherein said frame has temples, and

wherein said optical filter, said photodetector and said electronic circuit are at least partially embedded in at least one temple of said frame.

117. A frame as recited in claim 114, wherein said frame has temples, and wherein said optical filter is provided at or adjacent to an outer surface of the at least one of said temples, whereby sunlight incident on said frame can be sensed by said photodetector via said optical filter.

118. A frame as recited in claim 114, wherein said optical filter primarily implements a high pass filtering operation, allowing radiation beyond the optical range to pass.

119. A frame as recited in claim 114, wherein said optical filter is a material that restricts passage of radiation having a frequency above the optical radiation.

120. A frame as recited in claim 114, wherein said optical filter is placed or integral with a temple of said frame.

121. A frame as recited in claim 114, wherein said photodetector is a photodiode or a phototransistor.

121.1. A frame as recited in claim 111, wherein said radiation detector comprises:
an optical reflector that substantially reflects desired radiation and substantially absorbs undesired radiation; and
a photodetector for sensing the amount of radiation that is supplied to said photodetector via said optical reflector.

121.2 A frame as recited in claim 114, wherein said photodetector is a Silicon Carbide photodetector.

121.3 A frame as recited in claim 121.2, wherein said photodetector is a photodiode or a phototransistor.

121.4. A frame as recited in claim 114,

wherein said radiation detector comprises a photodetector for sensing the amount of radiation, and
wherein said photodetector is a Gallium Nitride photodetector.

121.5 A frame as recited in claim 121.4, wherein said photodetector is a photodiode or a phototransistor.

121.6 A frame as recited in claim 111, wherein said radiation detector comprises a photodetector for sensing the amount of radiation, and
wherein said photodetector is a Silicon Carbide photodetector.

121.7 A frame as recited in claim 111, wherein said radiation detector comprises a photodetector for sensing the amount of radiation, and
wherein said photodetector is a Gallium Nitride (GaN) photodetector.

122. A frame as recited in claim 121.6, wherein said photodetector is a photodiode or a phototransistor.

123. A frame as recited in claim 111, wherein the eyeglasses are sunglasses.

124. A frame as recited in claim 111, wherein the eyeglasses are fit-over glasses.

125. A frame as recited in claim 111, wherein said frame further comprises:
at least one additional sensor operatively connected to at least said electronic circuit.

126. A frame as recited in claim 125, wherein said additional sensor provides additional sensor information that is used by said electronic circuit to determine whether said frame is being worn by a user.

127. A frame as recited in claim 126, wherein said at least one additional sensor comprises at least one thermal sensor.

128. A frame as recited in claim 126, wherein said at least one additional sensor comprises a plurality of thermal sensors for use in determining whether said frame is being worn by the user.

129. A frame as recited in claim 126, wherein said at least one additional sensor comprises at least one motion detector.

130. A frame as recited in claim 125, wherein said additional sensor further provided is at least partially embedded in the at least one temple of said eyeglass frame.

131. A frame as recited in claim 125, wherein said additional sensor provides sensor information pertaining to at least one of ambient temperature, humidity, and barometric.

132. A frame as recited in claim 125, wherein said additional sensor provides sensor information pertaining to health or physical condition of a user of said frame.

133. A frame as recited in claim 125, wherein said frame further comprises an output device to inform a user of said frame of the radiation information and sensor information, and

wherein said electronic circuit further being operatively connected to said output device to direct said output device to present the radiation information and the sensor information to the user.

134. A frame as recited in claim 133, wherein the radiation information and the sensor information can be alternatively displayed at said output device.

135. A frame as recited in claim 111, wherein said frame further comprises:
at least one solar element for converting light into electrical energy, the electrical energy being provided to said electronic circuit.

136. A frame as recited in claim 135, wherein said frame further comprises:
at least one battery operatively connected to provide electrical energy to said electronic circuit.

137. A frame as recited in claim 111, wherein said frame further comprises:
at least one battery operatively connected to provide electrical energy to said electronic circuit.
138. A frame as recited in claim 137,
wherein said at least one battery is rechargeable, and
wherein said frame further comprises:
at least one solar element for converting light into electrical energy, the electrical energy being provided to recharge said at least one battery.
139. A frame as recited in claim 111, wherein said frame further comprises an output device to inform a user of said frame of the radiation information, and
wherein said electronic circuit further being operatively connected to said output device to direct said output device to present the radiation information to the user.
140. A frame as recited in claim 139, wherein the radiation information is a radiation warning.
141. A frame as recited in claim 139, wherein the radiation information is a radiation intensity value.
142. A frame as recited in claim 139, wherein the radiation information depends on radiation collected and integrated across a duration of time.
143. A frame as recited in claim 139, wherein the radiation information is an audio indication.
- 143.1. A frame as recited in claim 139, wherein the radiation information is a visual indication.
144. A frame as recited in claim 139, wherein said output device is a speaker.

145. A frame as recited in claim 144, wherein said speaker produces an audible sound for the user.

146. A frame as recited in claim 139, wherein said output device is a display device.

147. A frame as recited in claim 146, wherein said display device displays the radiation information for the user.

147.1. A frame as recited in claim 147, wherein the radiation information being displayed on said display device is at least one of: a numerical value, a word or a graphic symbol.

147.2. A frame as recited in claim 147, wherein the radiation information being displayed on said display device comprises one or more segments that are displayed depending on the radiation information to be presented.

147.3. A frame as recited in claim 147.2, wherein the one or more segments form a bar graph of on said display device.

147.4. A frame as recited in claim 147, wherein the radiation information being displayed on said display device is one of a plurality of predetermined graphic symbols, the one of the plurality of predetermined graphic symbols being displayed depends on the radiation information to be presented.

147.5. A frame as recited in claim 147.4, wherein a first of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is low, a second of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is moderate, and a third of the predetermined graphic symbols is displayed on said display device when an accumulated radiation level is high.

147.6. A frame as recited in claim 147, wherein the radiation information being displayed on said display device is one of a plurality of numerical values, the one of

the plurality of numerical values being displayed depends on the radiation information to be presented.

148. A frame as recited in claim 147, wherein said display device comprises a liquid crystal display.

149. A frame as recited in claim 147, wherein said display device comprises a light emitting diode.

150. A frame as recited in any of claims 1-149, wherein said frame further comprises a connector that facilitates electrical connection with respect to said electronic circuit.

150.1 A frame as recited in any of claims 1-149, wherein said frame further comprises a switch that controls supply of power, a reset operation or a user setting for said electronic circuit.

151. A frame as recited in claim 150, wherein said connector is provided at a rearward position of an arm of said frame.

152. A frame as recited in any of claims 1-151, wherein said frame further comprises at least one additional electrical component tethered to said frame.

152.1. A frame as recited in claim 152, wherein the at least one electrical components is tethered to said frame via an eyeglass cord having an electrical conductor therein..

152.2. A frame as recited in claim 152 or 152.1, wherein the at least one electrical components is tethered to said frame at a position behind the neck or upper back region of a user when said frame is being worn by the user.

153. A frame as recited in claim 152, wherein said at least one additional electrical component being tethered to said frame is at least electrically coupled to said electronic circuit.

154. A frame as recited in any of claims 111-153, wherein said radiation detector comprises:

an attenuation material for restricting passage of radiation therethrough; and
a photodetector for sensing the amount of radiation that passes through said attenuation material.

155. A frame as recited in claim 154, wherein said optical filter, said photodetector and said electronic circuit are internal to said frame, and wherein said frame has an opening adjacent said optical filter to allow light to impinge on said photodetector.

156. A frame as recited in claim 154, wherein said frame has temples, and wherein said attenuation material, said photodetector and said electronic circuit are at least partially embedded in at least one temple of said frame.

157. A frame as recited in claim 154, whereby sunlight incident on said frame can be sensed by said photodetector via said attenuation material.

157.1. A frame as recited in any of claims 1-111, wherein said electronic circuit operates to re-determine the radiation information periodically.

157.2. A frame as recited in any of claims 1-111, wherein said radiation detector is only enabled periodically for a short duration, thereby reducing power consumption by said radiation detector.

158. A consumer product for monitoring radiation, comprising:
a radiation detector for sensing an amount of radiation; and
an electronic circuit operatively connected to said radiation detector, said electronic circuit providing at least radiation information based on at least the amount of radiation sensed by said radiation detector,
wherein said radiation detector and said electronic circuit are at least partially embedded in said consumer product.

159. A consumer product as recited in claim 158, wherein the radiation being detected by said radiation detector is principally ultraviolet radiation.

160. A consumer product as recited in claim 158, wherein the radiation being detected by said radiation detector is principally light.

161. A consumer product as recited in claim 158, wherein the radiation being detected by said radiation detector is principally solar radiation from the sun.

162. A consumer product as recited in any of claims 158-161, wherein said consumer product is worn by a user, and wherein the radiation being monitored is ambient radiation.

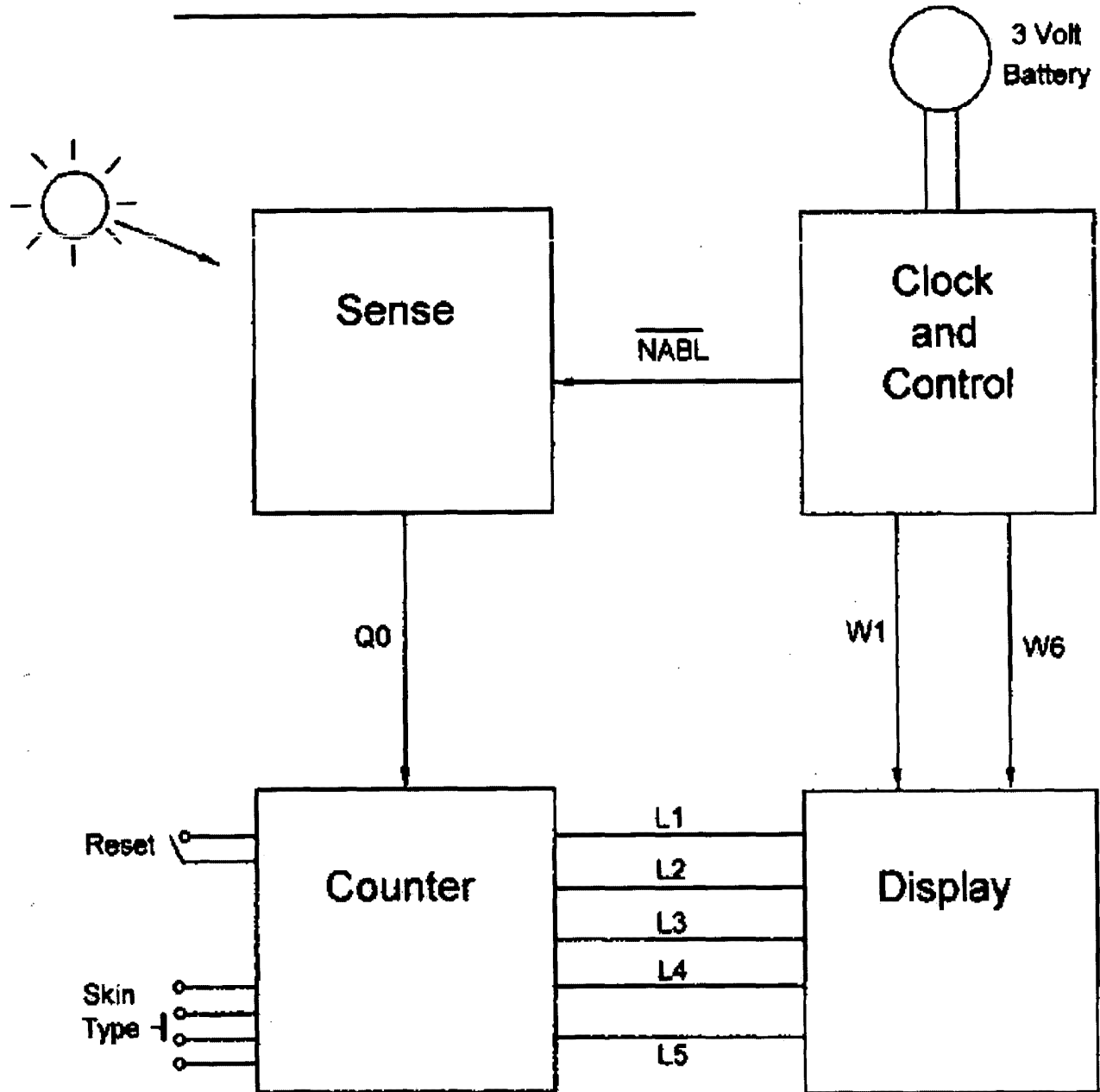
163. A consumer product as recited in any of claims 158-161, wherein said consumer product is worn by a user, and wherein the radiation being monitored is ambient radiation associated with the user's environment.

164. A consumer product as recited in any of claims 158-163, wherein said consumer product is one of a hat, watch, watch band, bracelet, bracelet accessory, necklace, necklace accessory, ring, shoe, shoe accessory, clothing, belts, belt accessory, zipper, key ring, purse, beach-tag, container, and container holder.

165. A consumer product as recited in any of claims 158-164, wherein said radiation detector and said electronic circuit are formed as a module, and wherein the module is partially embedded in said consumer product.

166. A strap for eyewear, comprising:
a radiation detector for sensing an amount of radiation; and
an electronic circuit operatively connected to said radiation detector, said electronic circuit providing at least radiation information based on at least the amount of radiation sensed by said radiation detector,
wherein said radiation detector and said electronic circuit are attached or at least partially embedded in said strap.

System Layout



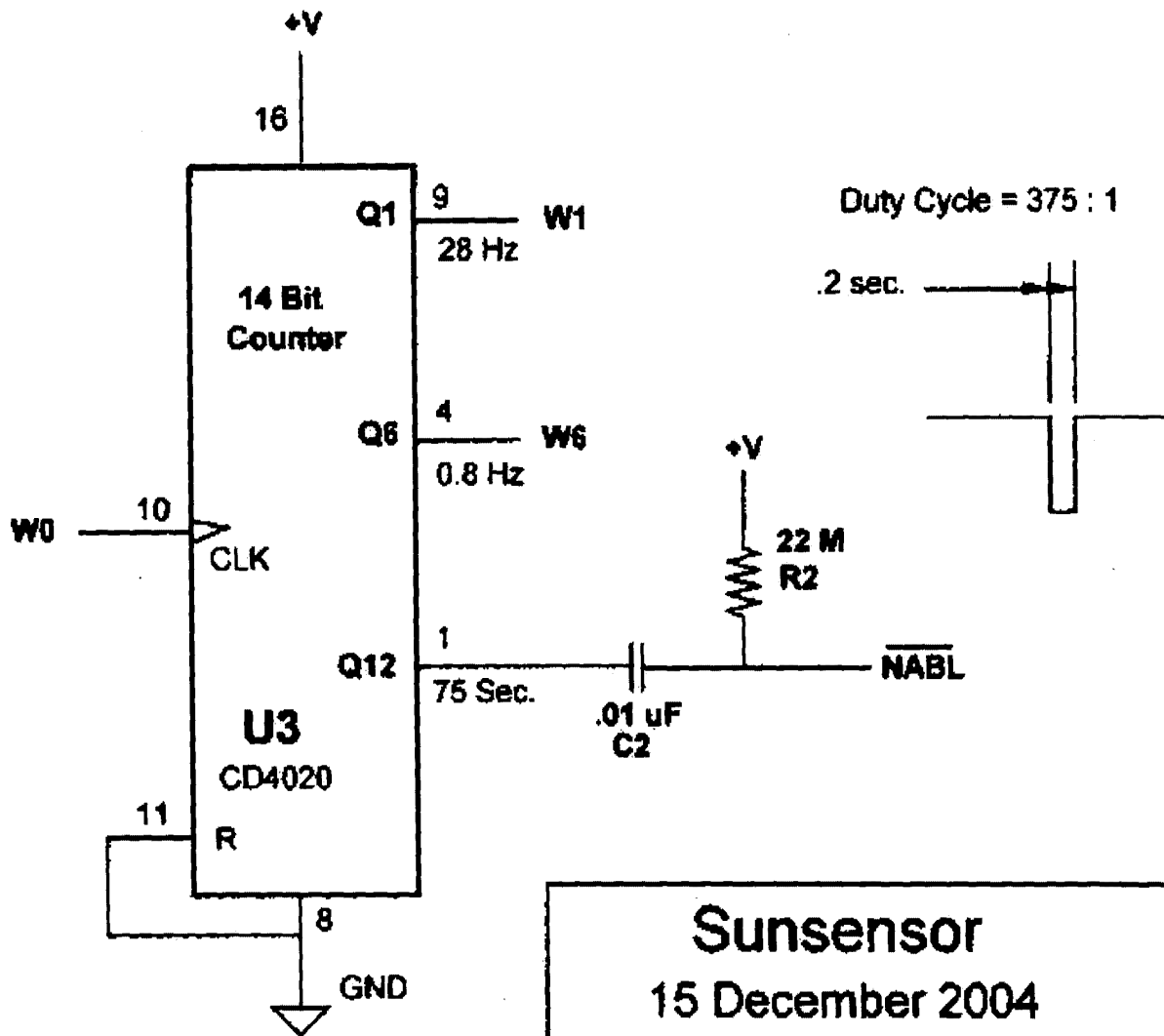
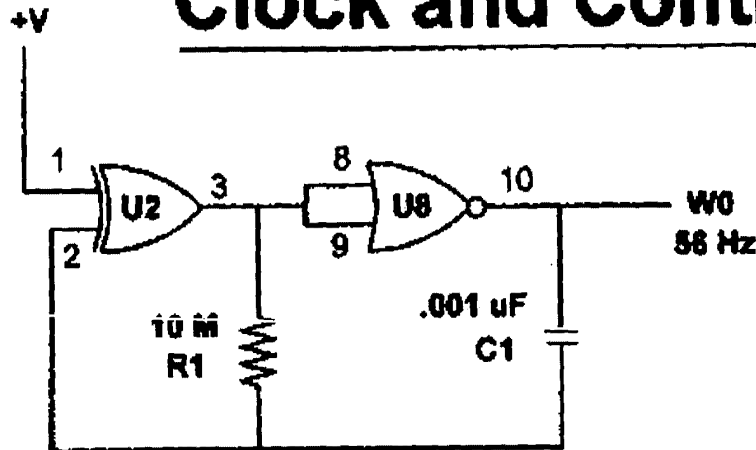
Sunsensor

15 December 2004

Thomas Howell

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Clock and Control



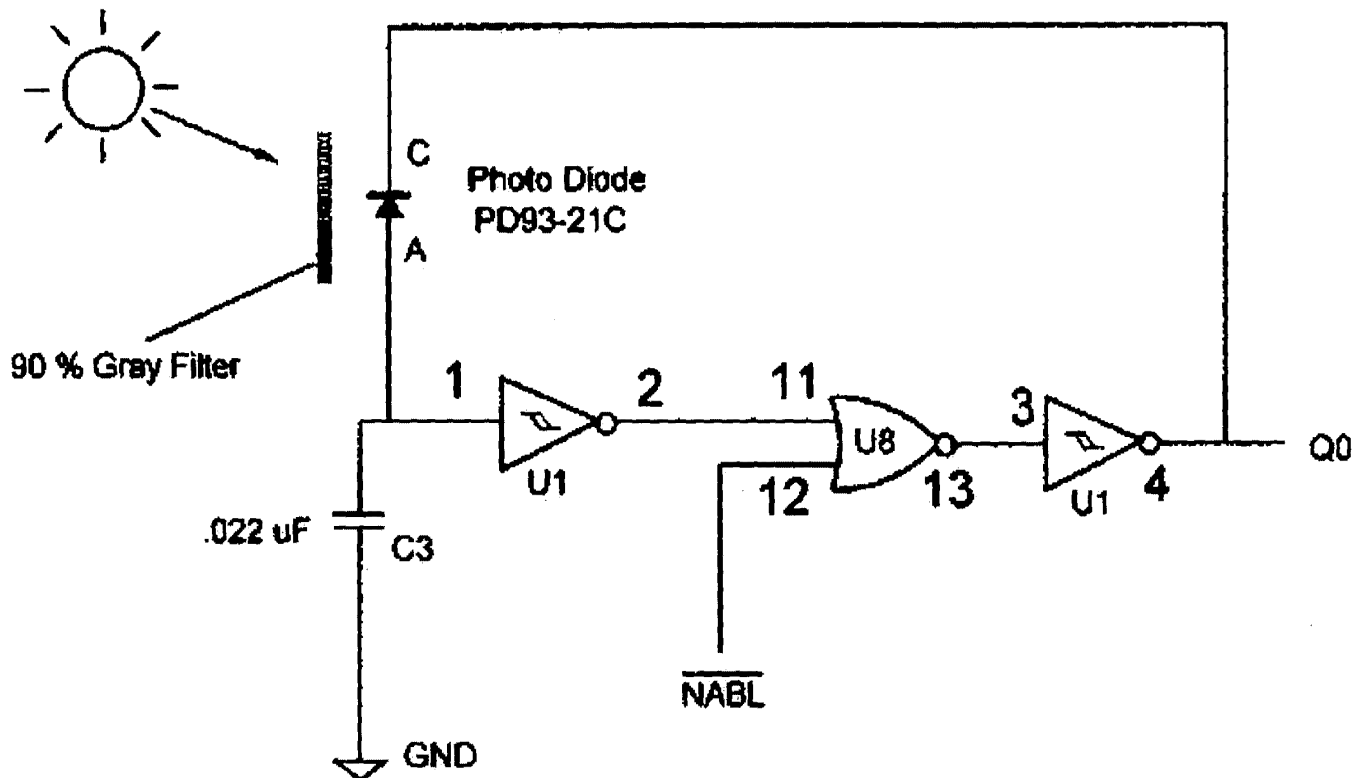
Sunsensor

15 December 2004

Thomas Howell

pp. 2/5

Sense



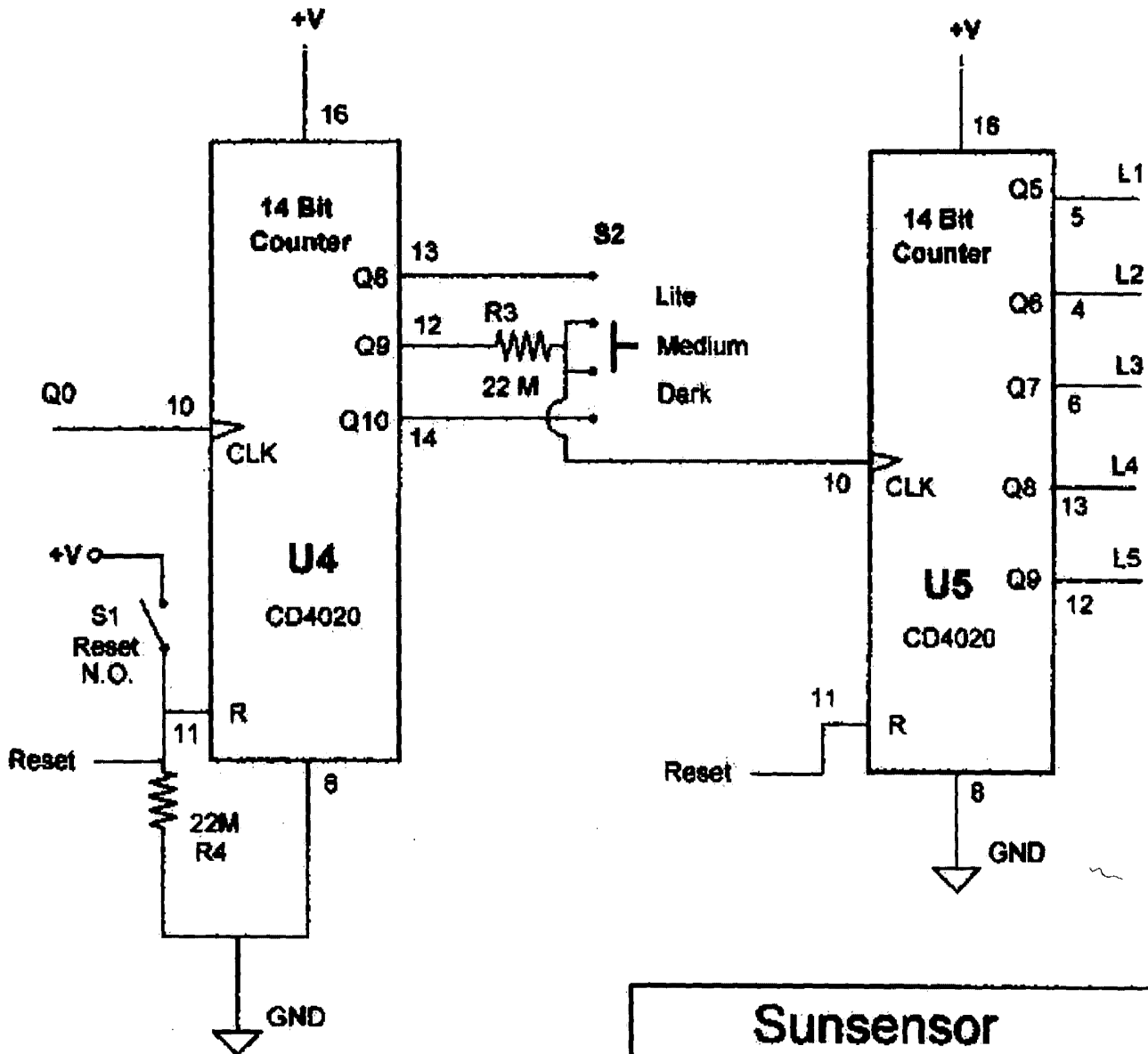
Sunsensor

15 December 2004

Thomas Howell

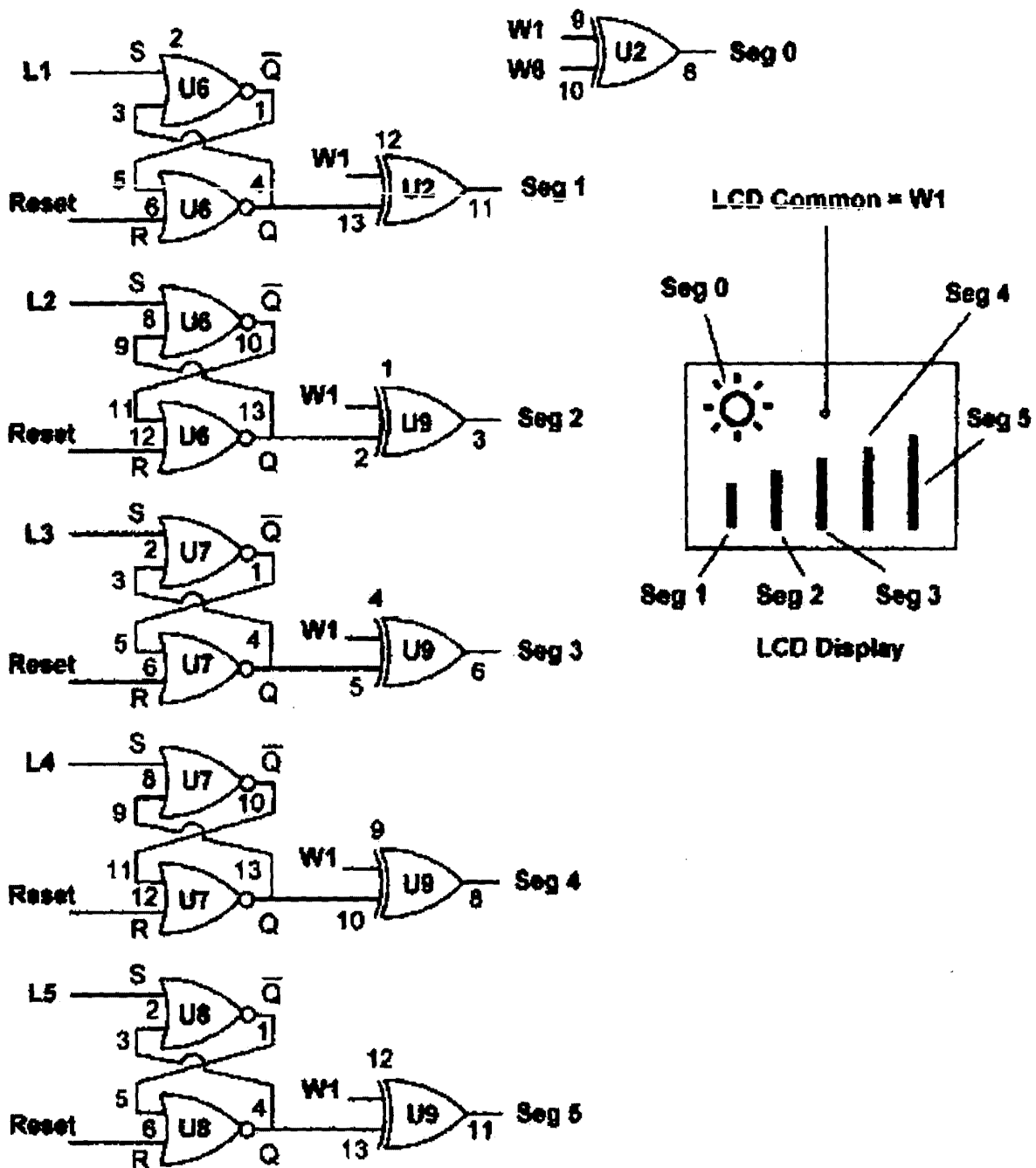
pp. 3/5

Counter



Sunsensor
 15 December 2004
 Thomas Howell
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Display



Sunsensor

15 December 2004

Thomas Howell

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DISPLAY MEANING:

<u>Seg1</u>	<u>Seg2</u>	<u>Seg3</u>	<u>Seg4</u>	<u>Seg5</u>
<u>Lite Skin:</u>				
¼ Med	½ Med	1 Med	2 Med	4 Med
<u>Medium Skin:</u>				
½ Med	1 Med	2 Med	4 Med	8 Med
<u>Dark Skin:</u>				
1 Med	2 Med	4 Med	8 Med	16 Med
<u>This Means:</u>				
¼ done	½ done	DONE	Burnt	BadlyBurnt

Parts List:

Sunsensor

Thomas Howell

12-14-04

<u>Name</u>	<u>Number</u>	<u>Function</u>
Bat		Battery, 3V, coin cell
PD1	PD93-21C	Silicon Photodiode, Clear
Fil	filter	90 % Gray, optical filter, plastic.
C1	.001 uF	Capacitor, X7R
C2	.01 uF	Capacitor, X7R
C3	.022 uF	Capacitor, X7R
R1	10 M	Resistor, 5 %
R2	22 M	Resistor, 5 %
R3	22 M	Resistor, 5 %
R4	22 M	Resistor, 5 %
U1	74HC14	CMOS, Schmitt-Trigger, Invertor
U2	74HC86	CMOS, Quad, X-OR Gate
U3	74HC4020	CMOS, binary counter
U4	74HC4020	CMOS, binary counter
U5	74HC4020	CMOS, binary counter
U6	74HC02	CMOS, Quad, OR Gate
U7	74HC02	CMOS, Quad, OR Gate
U8	74HC02	CMOS, Quad, OR Gate
U9	74HC86	CMOS, Quad, X-OR Gate
S1	switch	Push-button, N.O.
S2	switch	slide-switch, 3-position, 4-pins

Battery, Power-Supply Connections:

GND=0 volt=Battery - :

U1	7,5,9,11,13
U2	7,4,5
U3	8,11
U4	8
U5	8
U6	7
U7	7
U8	7
U9	7
C3	
R4	

+V=+3volt=Battery+ :

U1	14
U2	14,1
U3	16
U4	16
U5	16
U6	14
U7	14
U8	14
U9	14
R2	

Sunsensor Calibration Calculation:

Thomas Howell 12-15-04

Measured Data:

UVI=2

Q1=600 Hz , Q0=1200 Hz, DutyCycle=1

Therefore:

For light intensity=1 MED/hr=58.3 mW/M2 = 2.33 UVI

So, if UVI=2.33

Q1=700 Hz, Q0=1400 Hz

And, after DutyCycle = 375:1 ,

Q0 = 1400/375 = 3.73 Hz = .268 sec/wave = .1339 sec/halfwave .

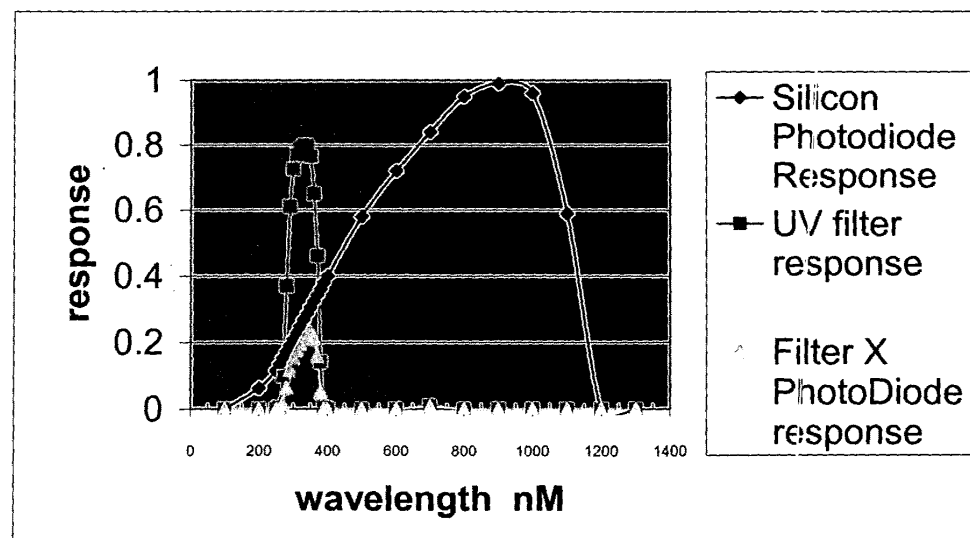
Name	Frequency (after DutyCycle)	½ wave time (sec)
Q0	3.73	.1339
Q1	1.87	.268
Q2	.933	.536
Q3	.466	1.07
Q4	.233	2.14
Q5	.117	4.28
Q6	.0583	8.57
Q7	.0291	17.1
Q8	.0146	34.3
Q9	.00729	68.3
Q10		137
Q11		274
Q12		548
Q13		1097
Q14		2194
Q15		*** 4388 *** 1 MED
Q16		8775
Q17		17550

1 UVI = 25 mW/squareMeter

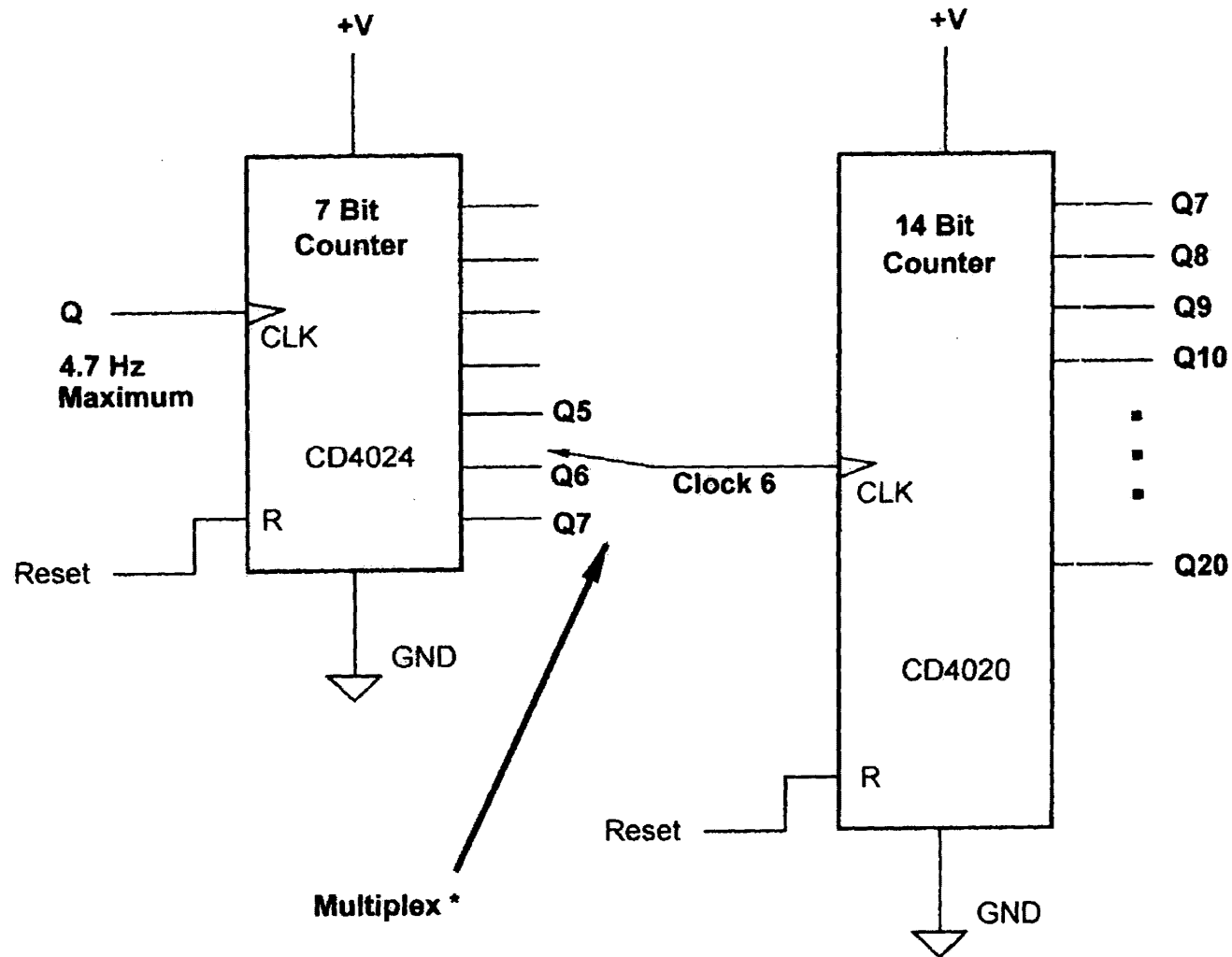
1 MED/hr = 58.3 mW/squareMeter

94

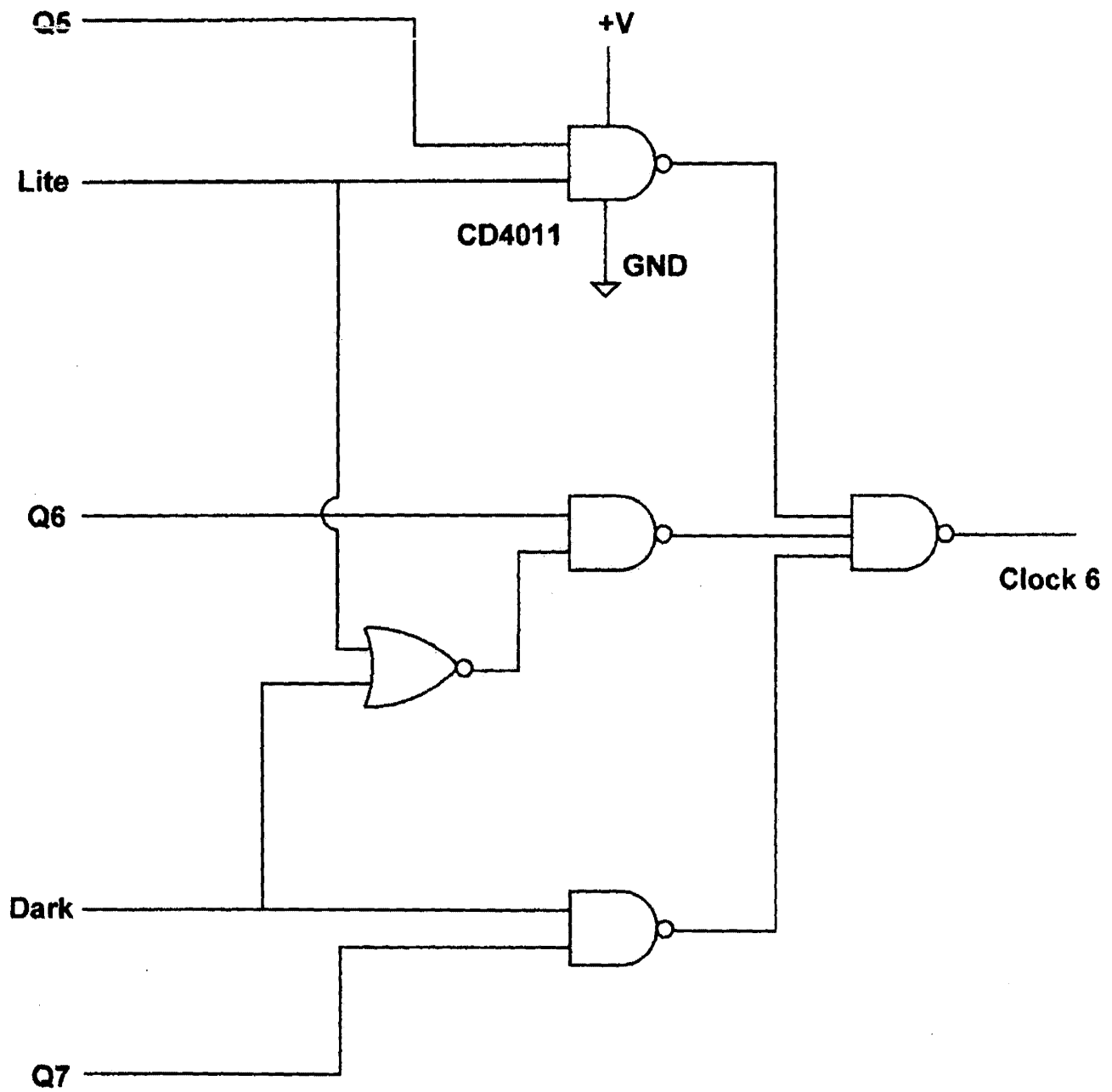
nM	silicon	filter	convolution
100	0	0	0
200	0.063	0	0 UV sensor design
250	0.115	0	0 thomas howell 12-13-04
260	0.134	0.005	0.00067
270	0.153	0.1	0.0153 silicon photodiode - - EVERLIGHT # PD93-21C
280	0.172	0.37	0.06364 UV filter - - HOYA # U-340
290	0.191	0.61	0.11651 (available at Edmund Industrial Optics, # Y46-096)
300	0.21	0.725	0.15225
310	0.229	0.77	0.17633
320	0.248	0.79	0.19592
330	0.267	0.8	0.2136
340	0.286	0.8	0.2288
350	0.305	0.765	0.233325
360	0.324	0.65	0.2106
370	0.343	0.46	0.15778
380	0.362	0.14	0.05068
390	0.381	0.005	0.001905
400	0.4	0	0
500	0.58	0	0
600	0.72	0	0
700	0.84	0.01	0.0084
800	0.95	0	0
900	0.99	0	0
1000	0.96	0	0
1100	0.59	0	0
1200	0	0	0
1300	0	0	0



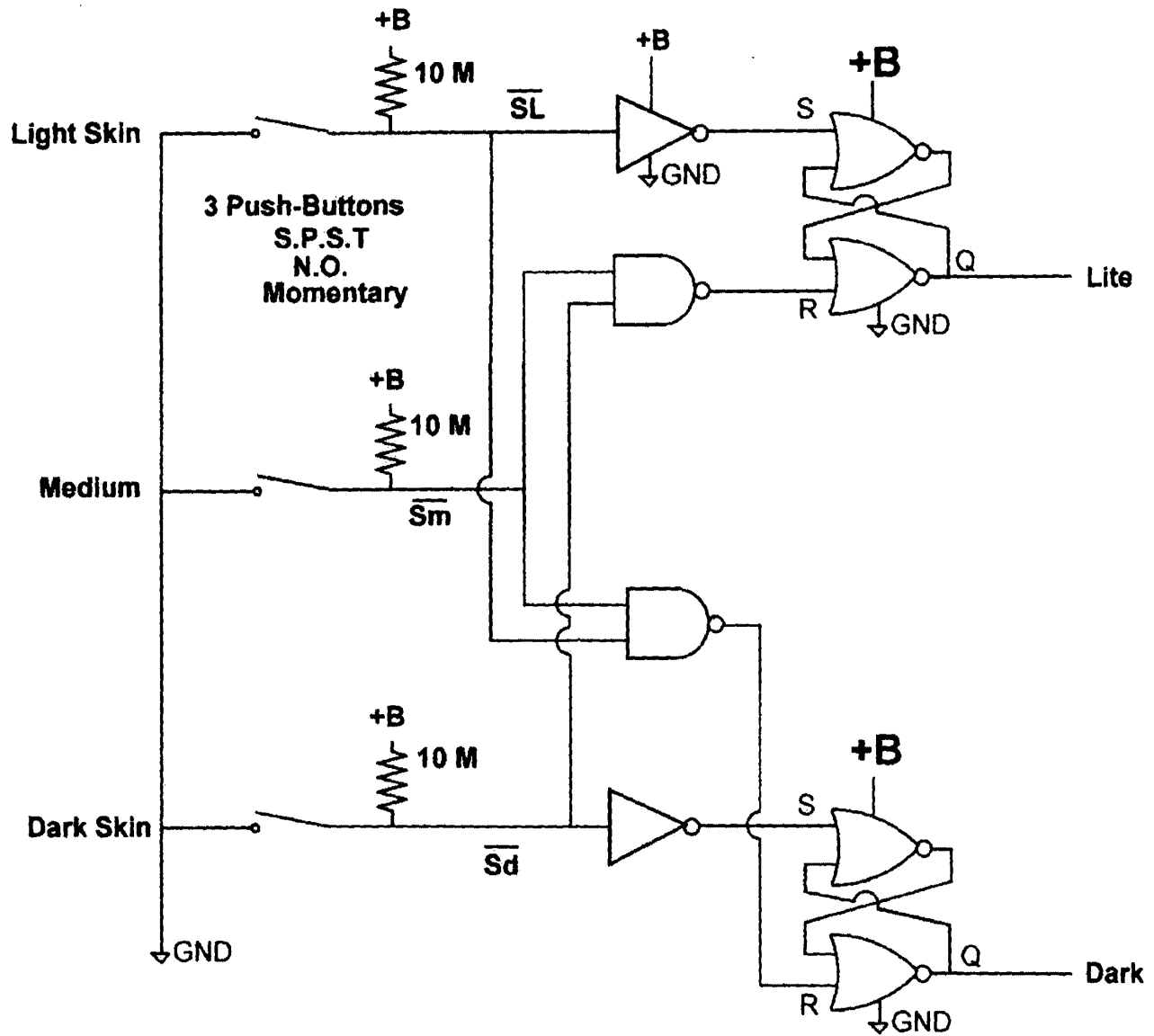
DIVIDE



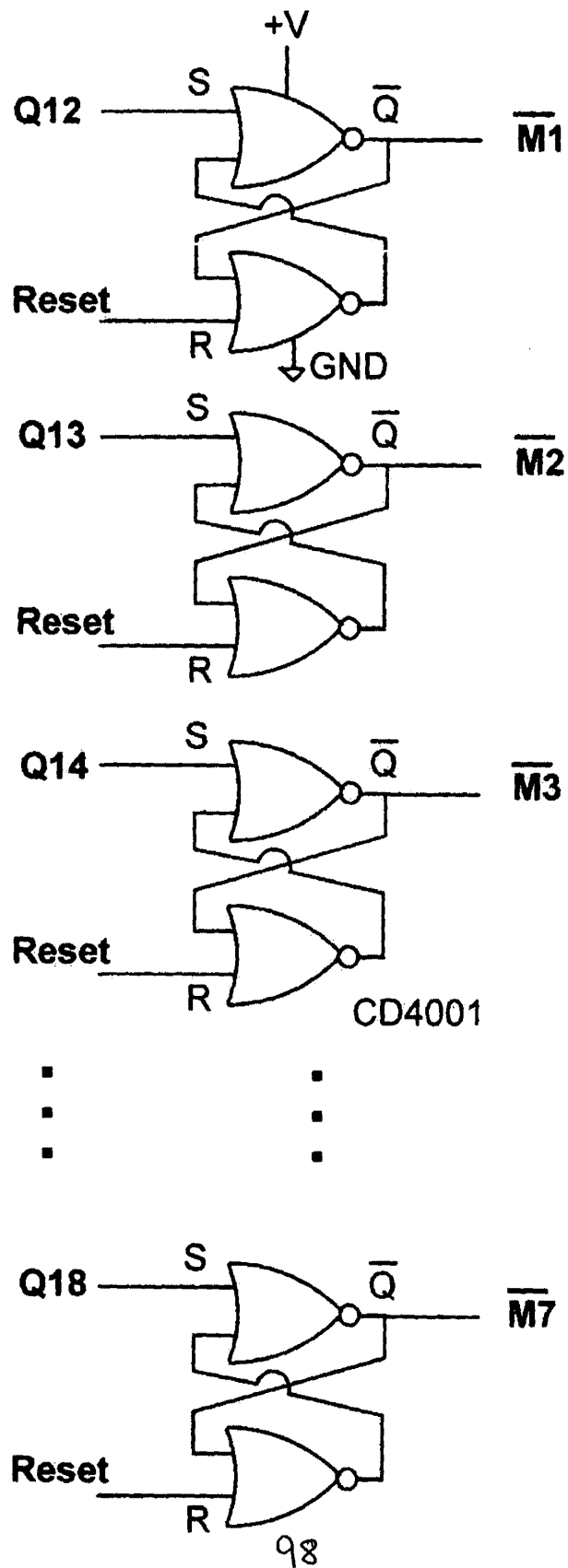
Multiplex *



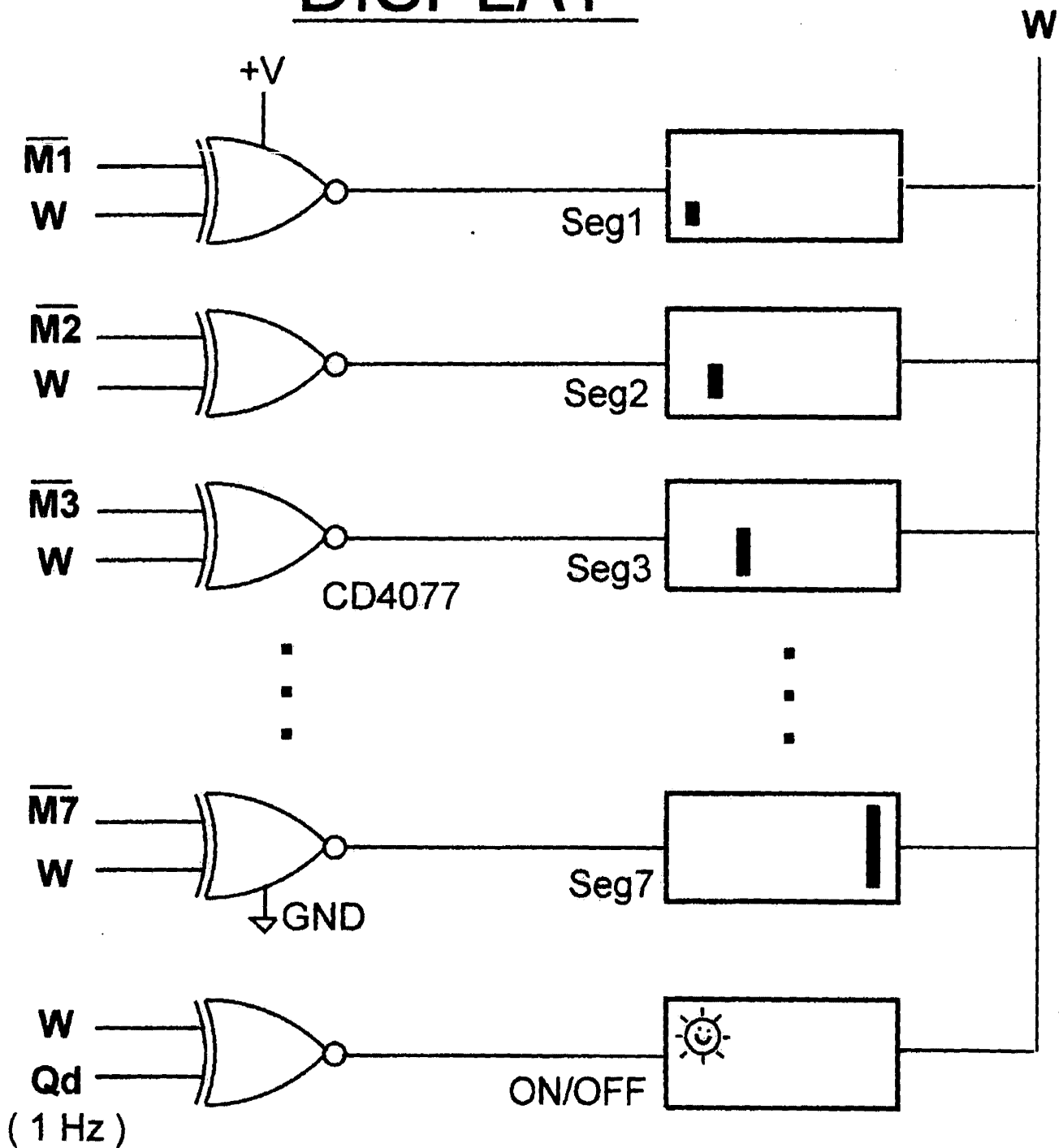
Skin-Type Adjust



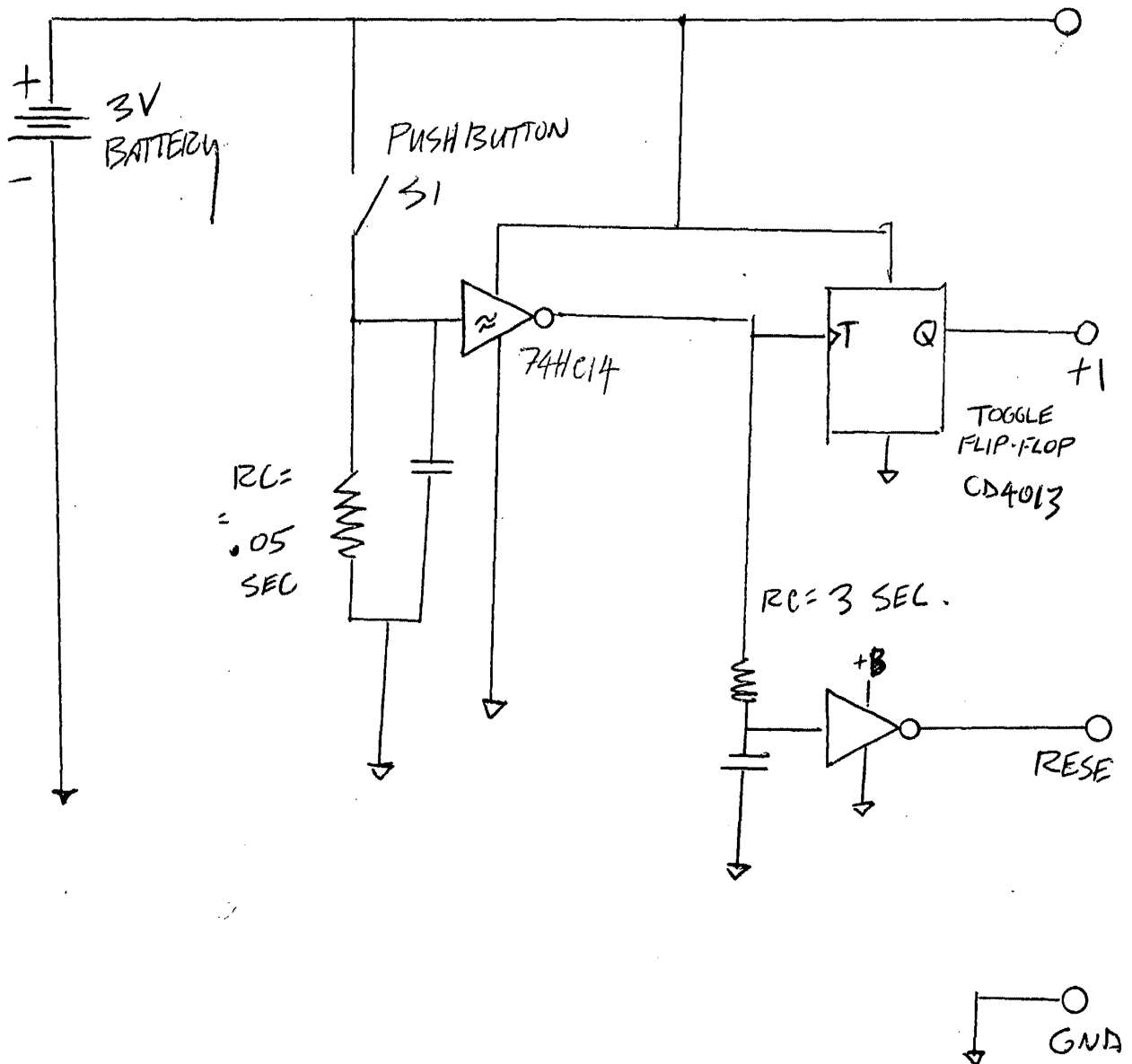
LATCH



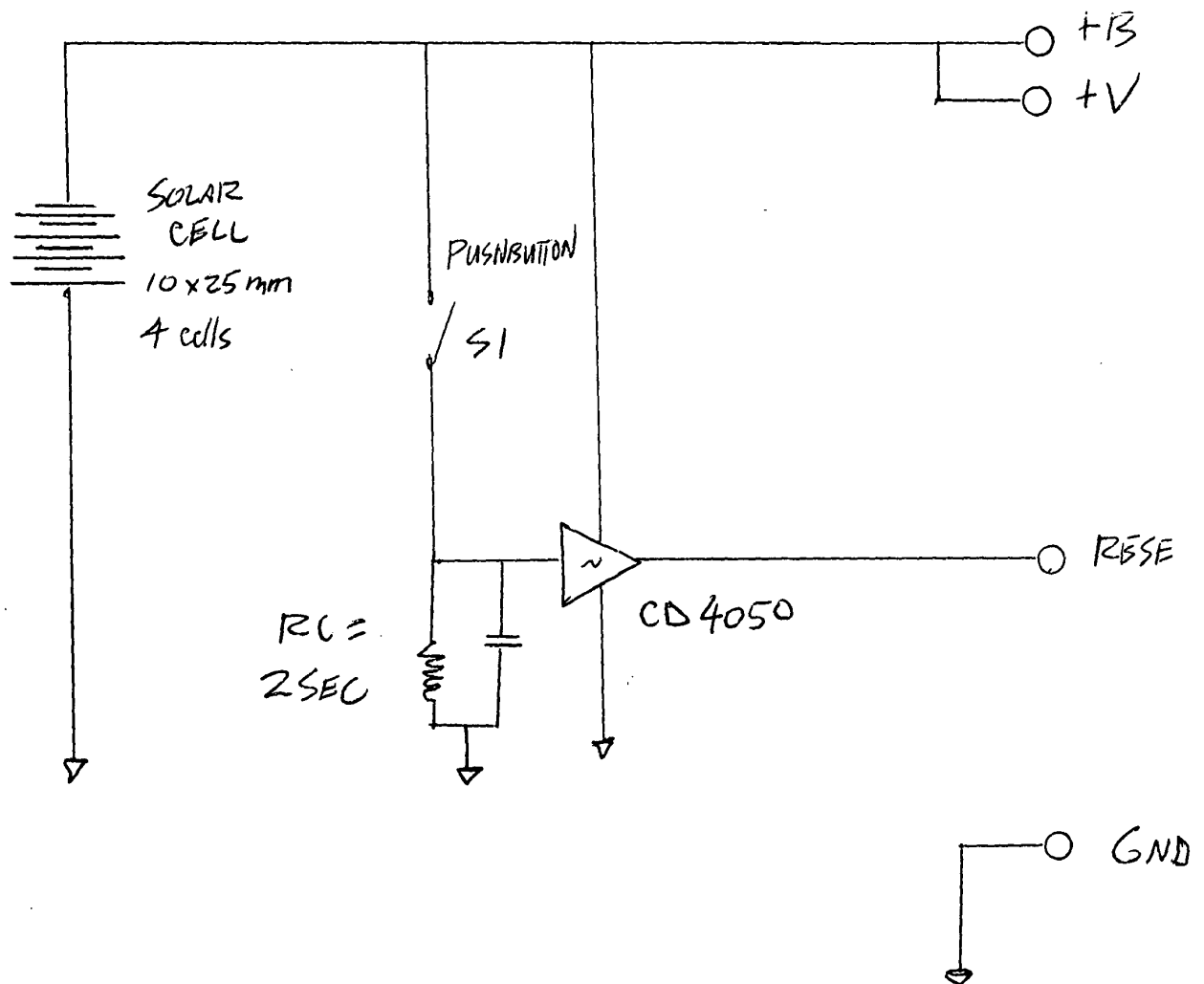
DISPLAY



POWER SUPPLY -- BATTERY

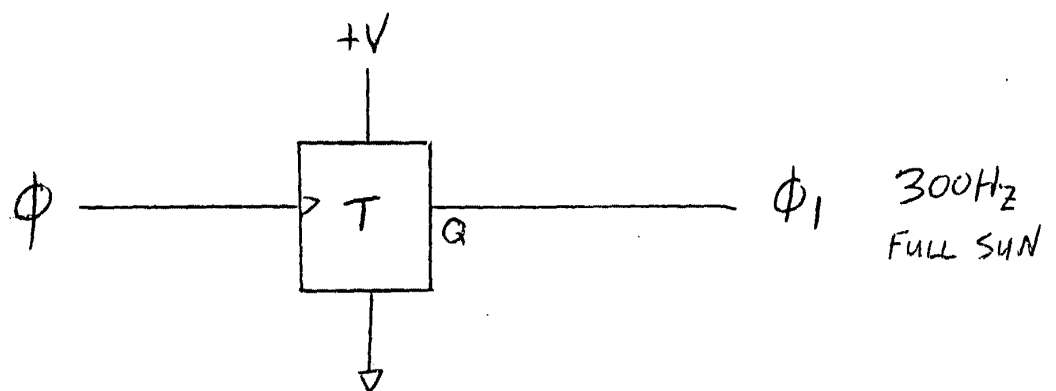
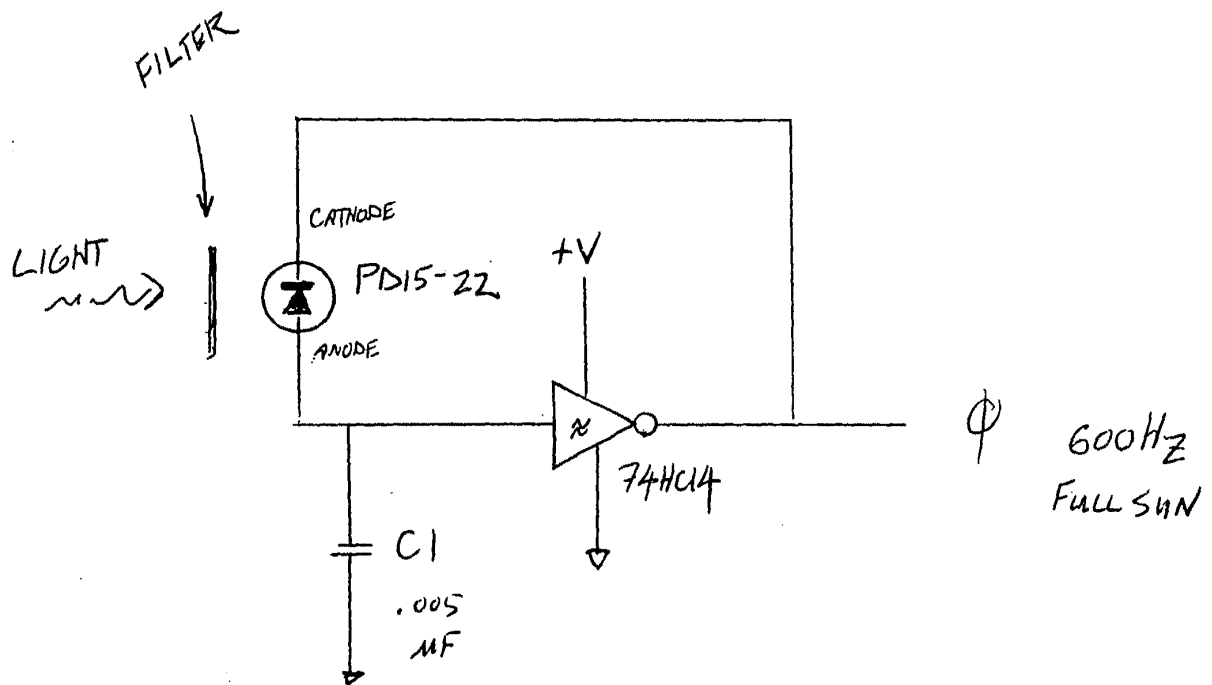


POWER SUPPLY -- SOLAR



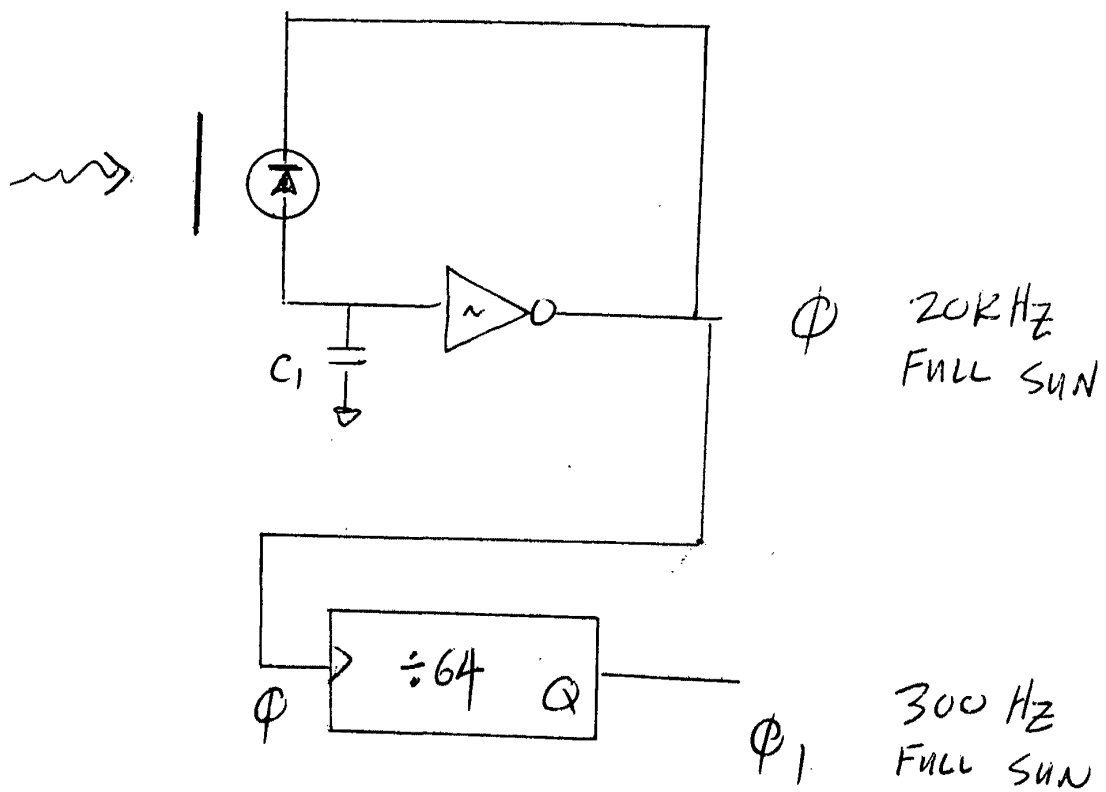
LIGHT to FREQUENCY

VERSION 1



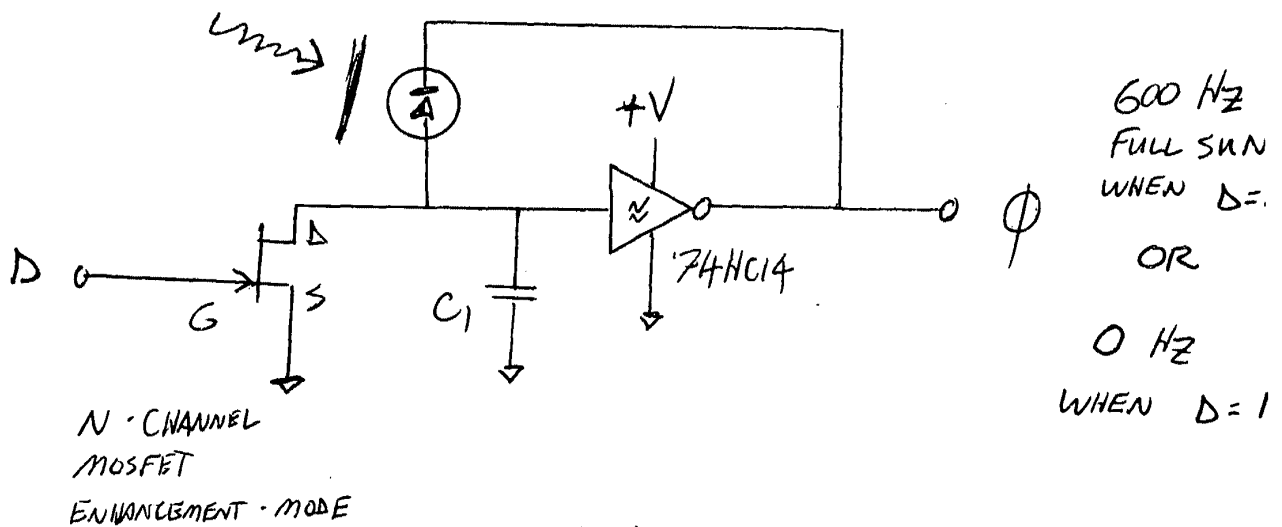
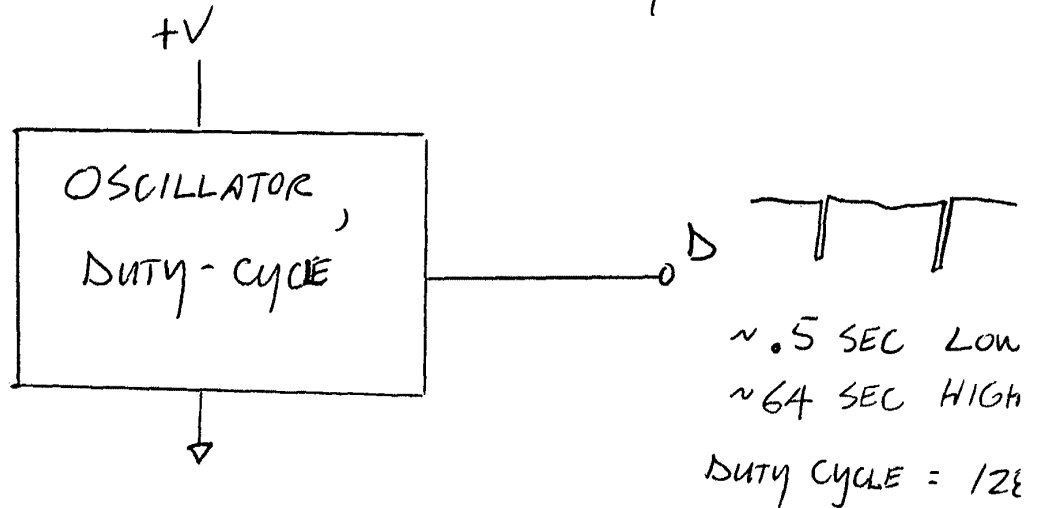
LIGHT TO FREQUENCY

VERSION 2

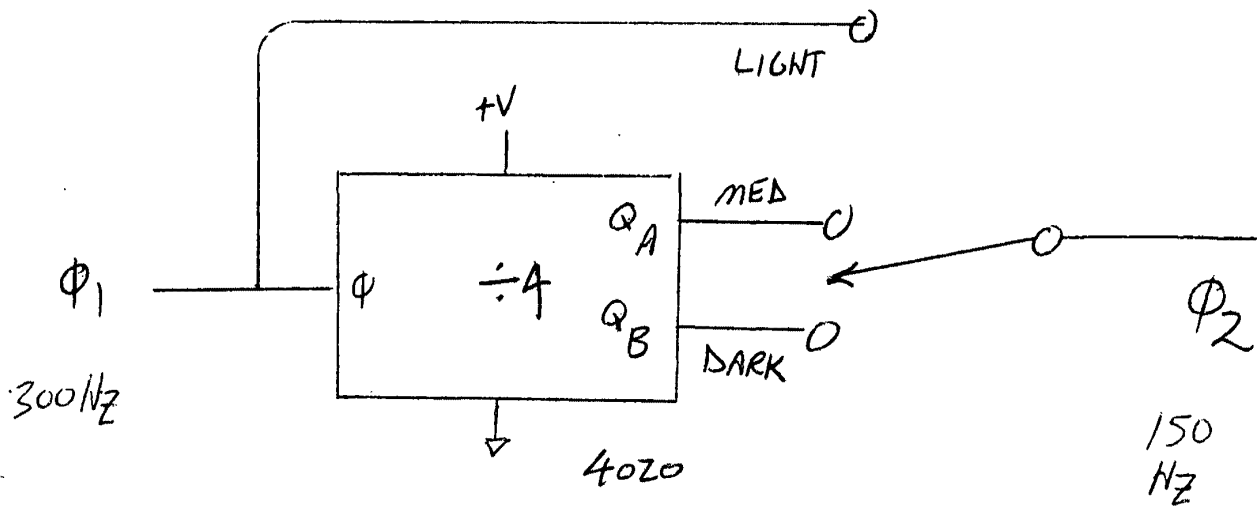


LIGHT to FREQUENCY

VERSION 3
WITH DUTY-CYCLE BATTERY SAVER



SKIN-TYPE SWITCH

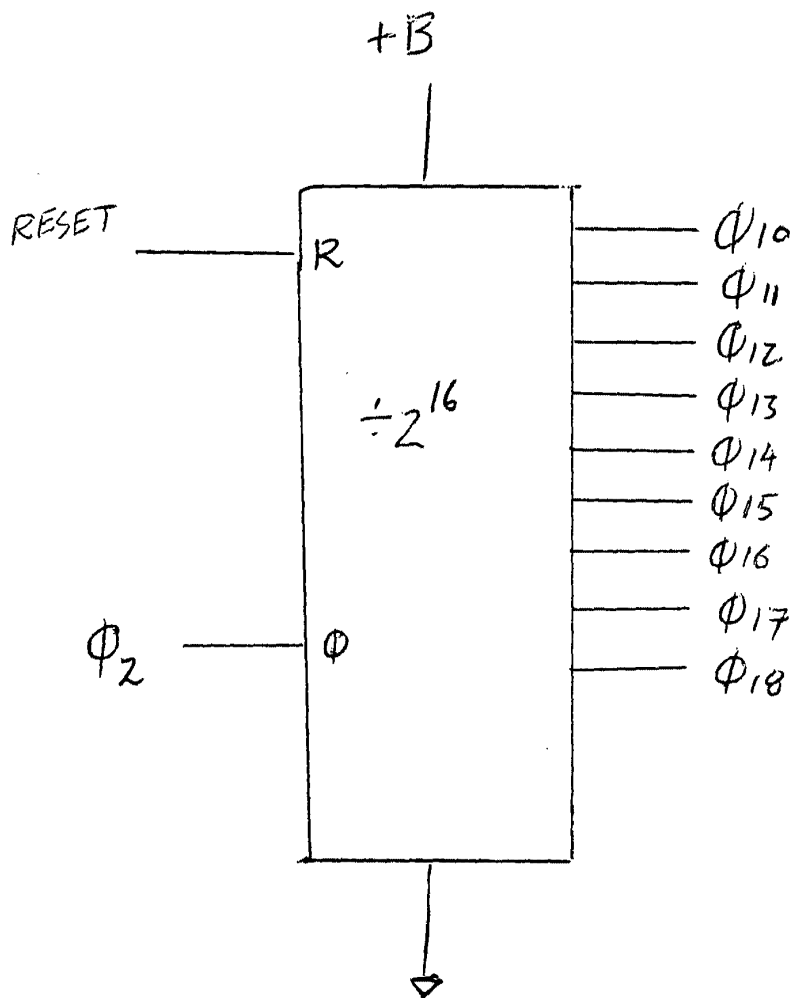


SLIDE SWITCH SP3T

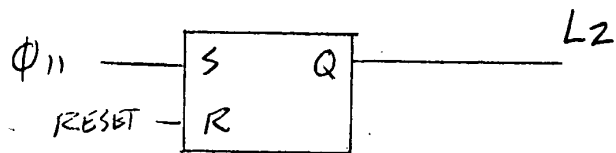
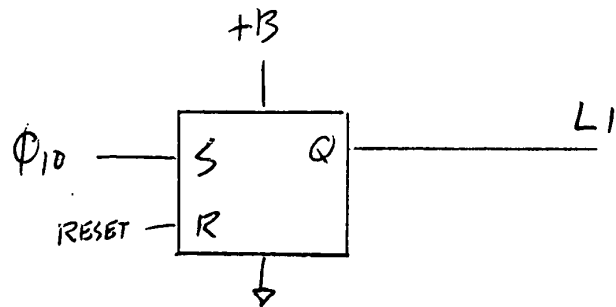
OR

3 PUSHBUTTONS

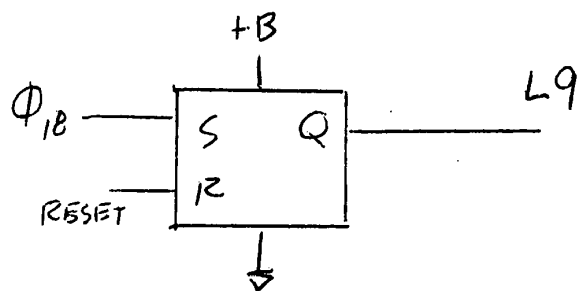
DIVIDE



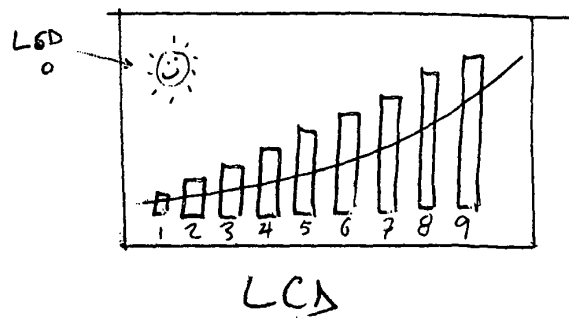
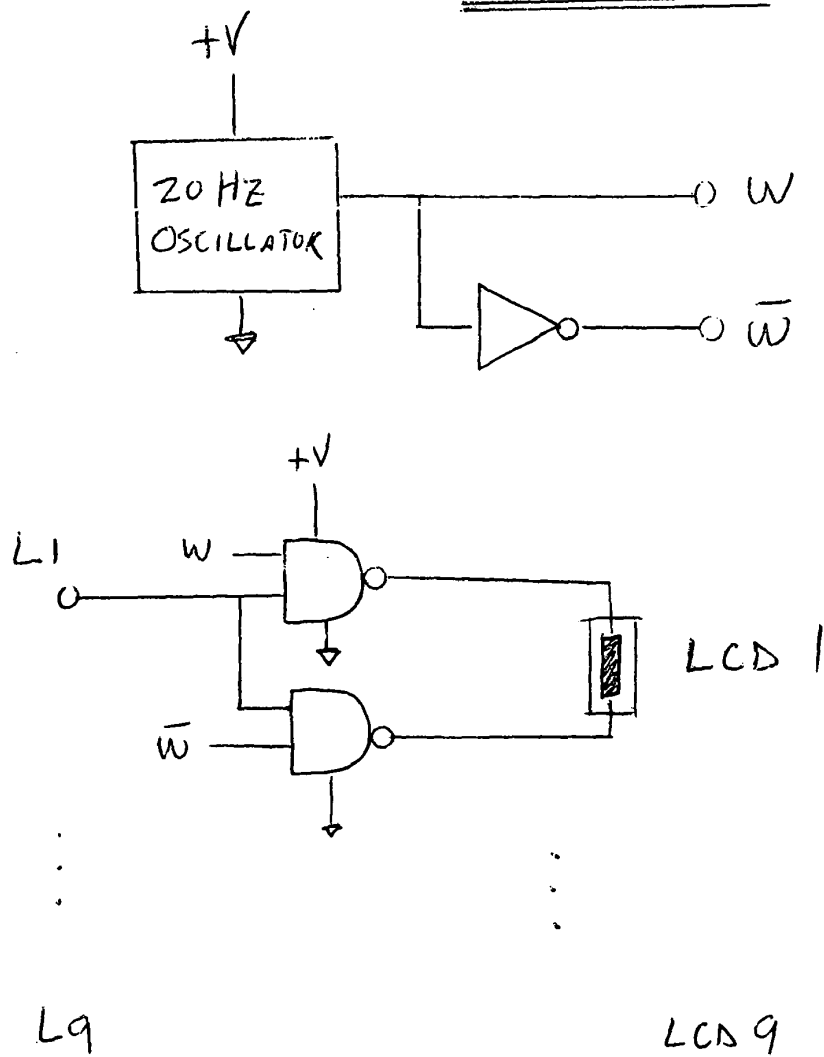
LATCH OUTPUT

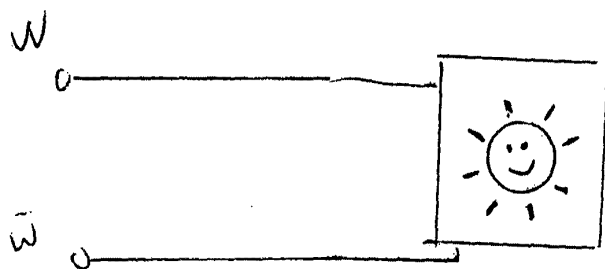


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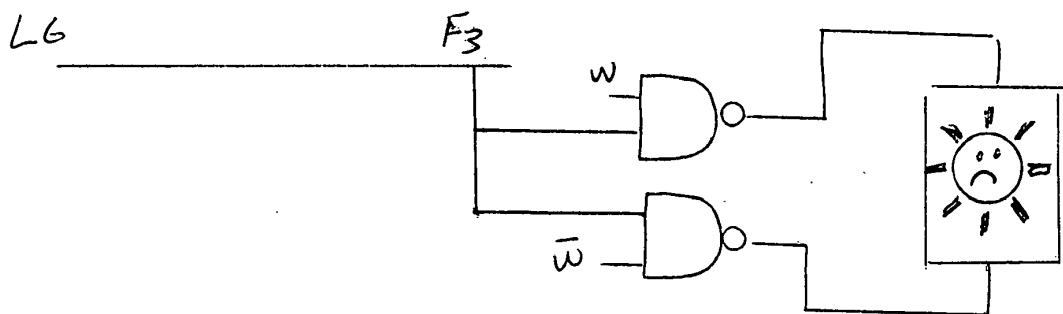
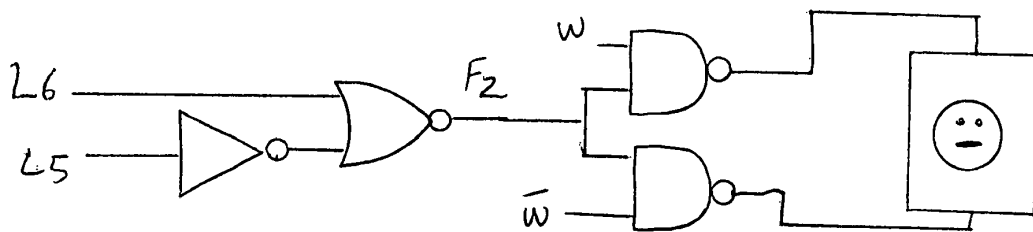
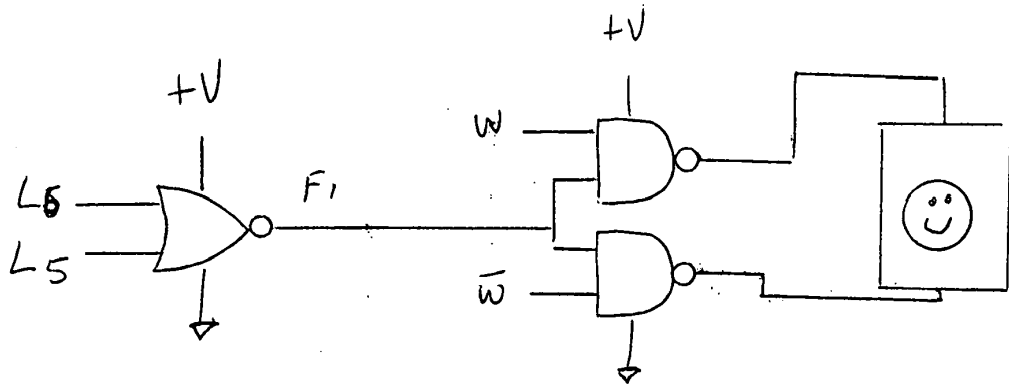
LCD DRIVER





LCD
O
ON/OFF INDICATOR

3 - FACE DISPLAY



SunSensor

Notes for the Circuit Drawing

Thomas Howell 9-9-04

ON/OFF ; Push-Button ; RESET ; Battery

3-volt battery , coin-cell

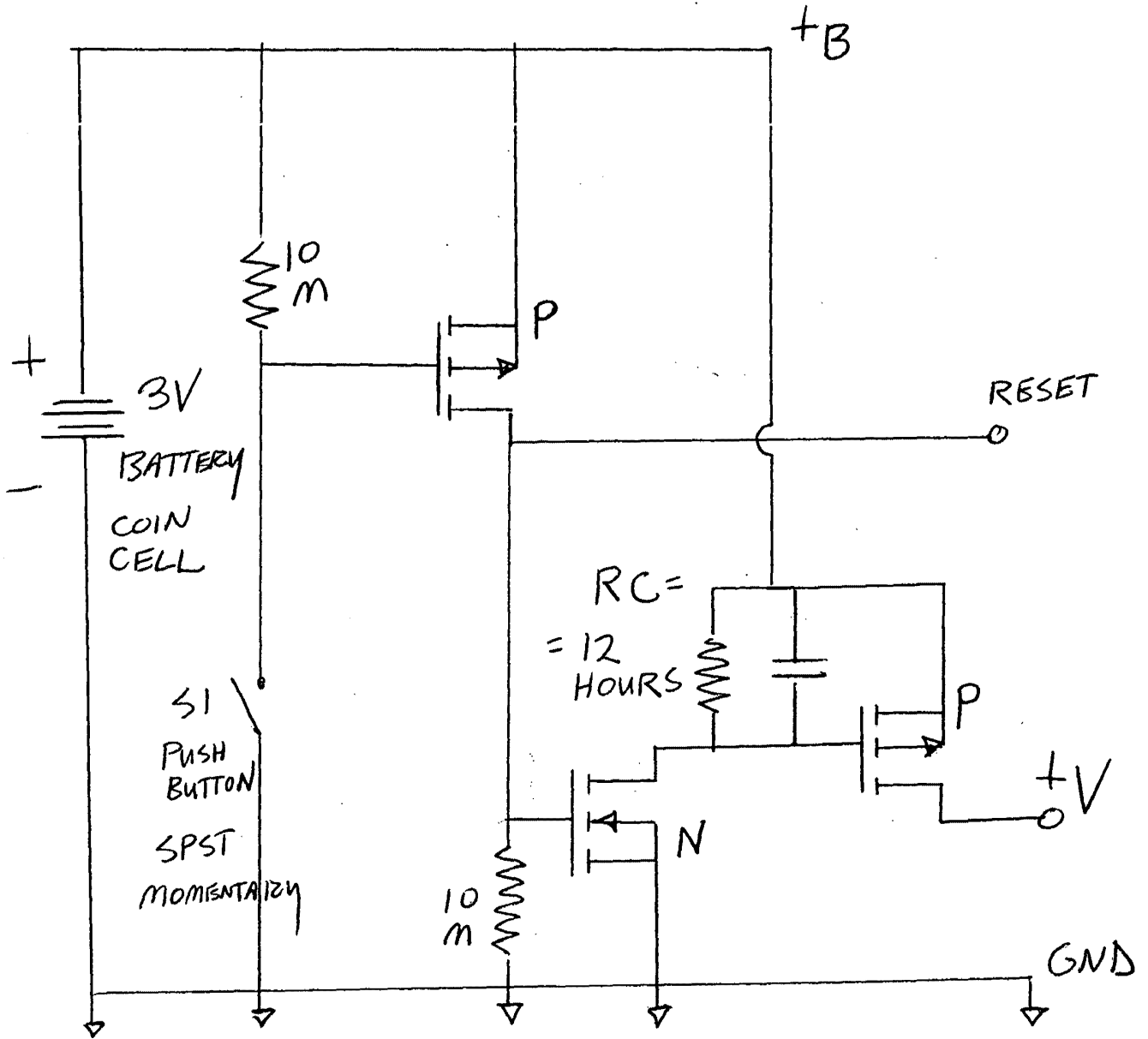
1 Push-Button switch; (S.P.S.T. ; N.O. ; Momentary)

*** When you push button,
Circuit turns ON,
 $+V = +B = 3$ volts
Reset pulse is sent
Start 12 hour timer.

*** If you push button again,
Circuit stays ON,
Another reset pulse is sent.
Start 12 hour timer again.

*** After 12 hours,
Circuit turns OFF,
 $+V = 0$

ON/OFF ; PUSH-BUTTON ; RESET ; BATTERY



Battery-Saver, Duty-Cycle Oscillator

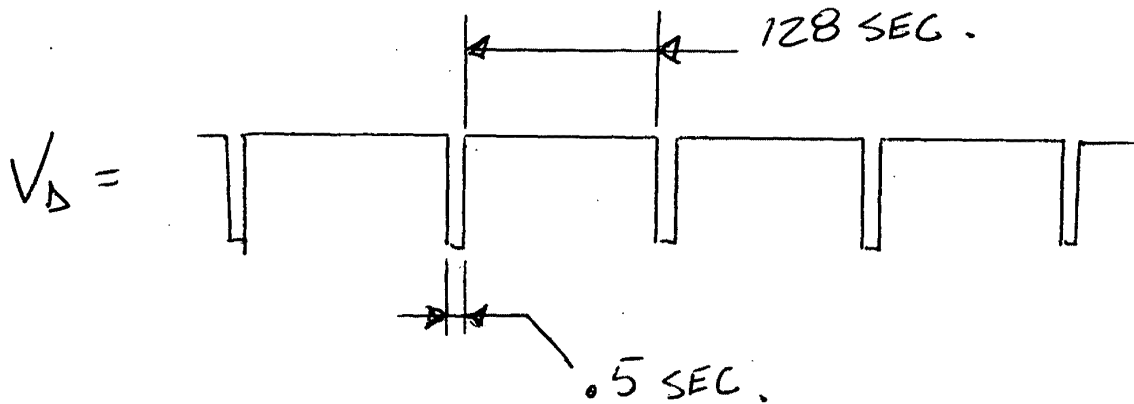
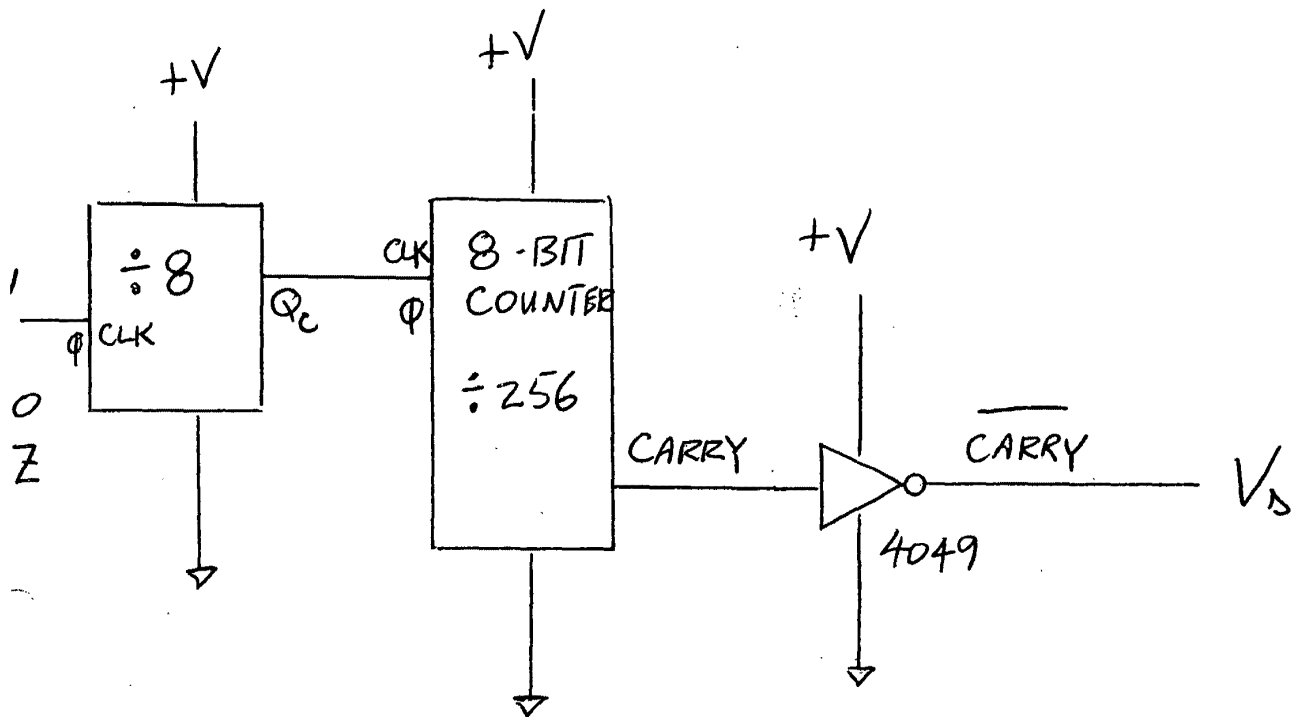
256:1 Duty Cycle

Turns sensor ON for .5 seconds.
Then OFF for 128 seconds.

When $V_d = 0$ volts = ON ,
Frequency $Q = 1200$ Hz , @ full sun

When $V_d = +3$ volts = OFF ,
Mosfet T1 connects to GND,
Stopping the oscillator,
Frequency = 0
Battery current = 0 .

BATTERY SAVER, DUTY-CYCLE OSCILLATOR



$$\text{DUTY CYCLE} = 256:1$$

Light to Frequency

Silicon PhotoDiode : Everlight PD15-22- ***
With special filter **
Only sensitive to UV.

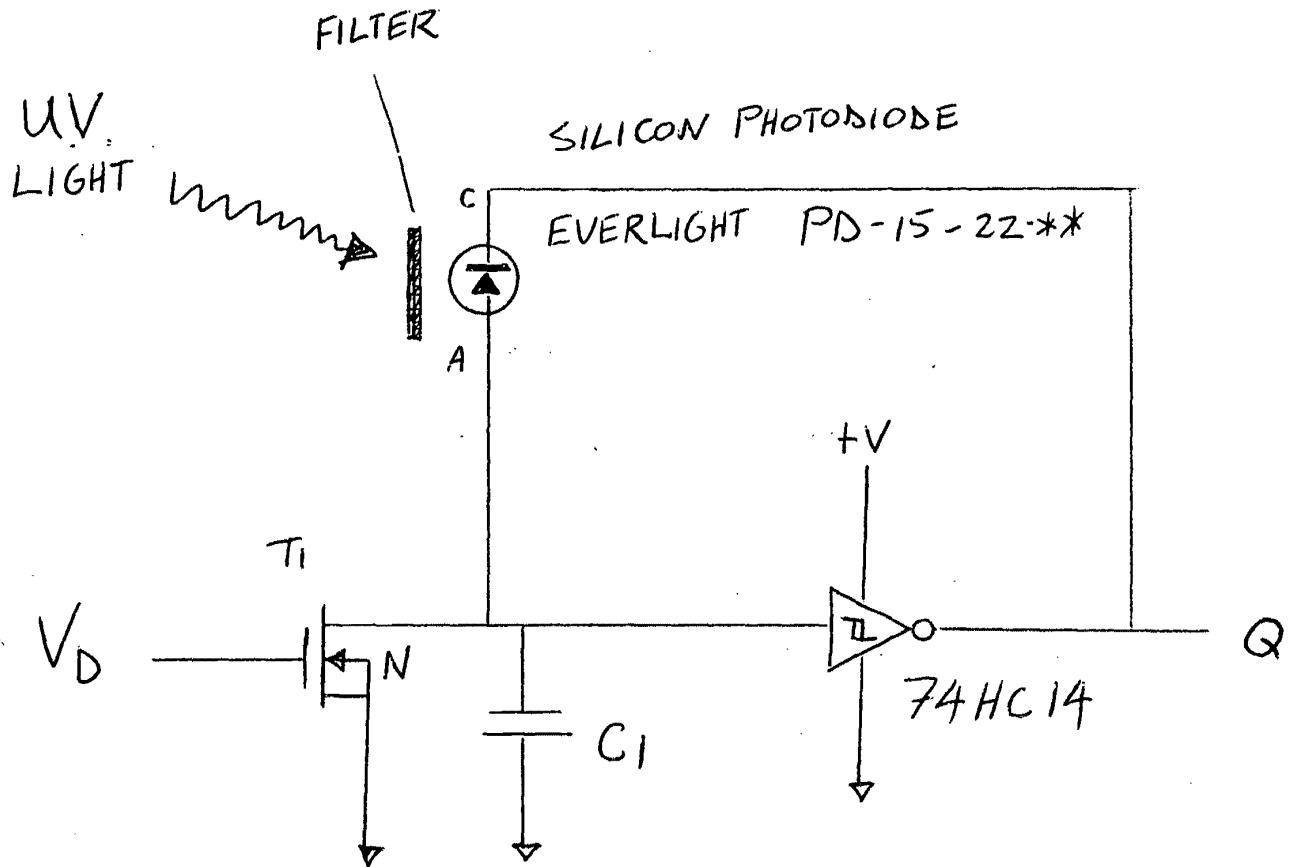
Frequency is proportional to UV light intensity.
Frequency is also proportional to C1
Choose C1 so that
Frequency $Q = 1200 \text{ Hz}$, @ full sun.
(C1 = .005 μF)

definition:

"full sun" = 58 mW of UV(B) / (square meter)

= NOON on a clear day in California.

LIGHT TO FREQUENCY



DIVIDE

The MATH:

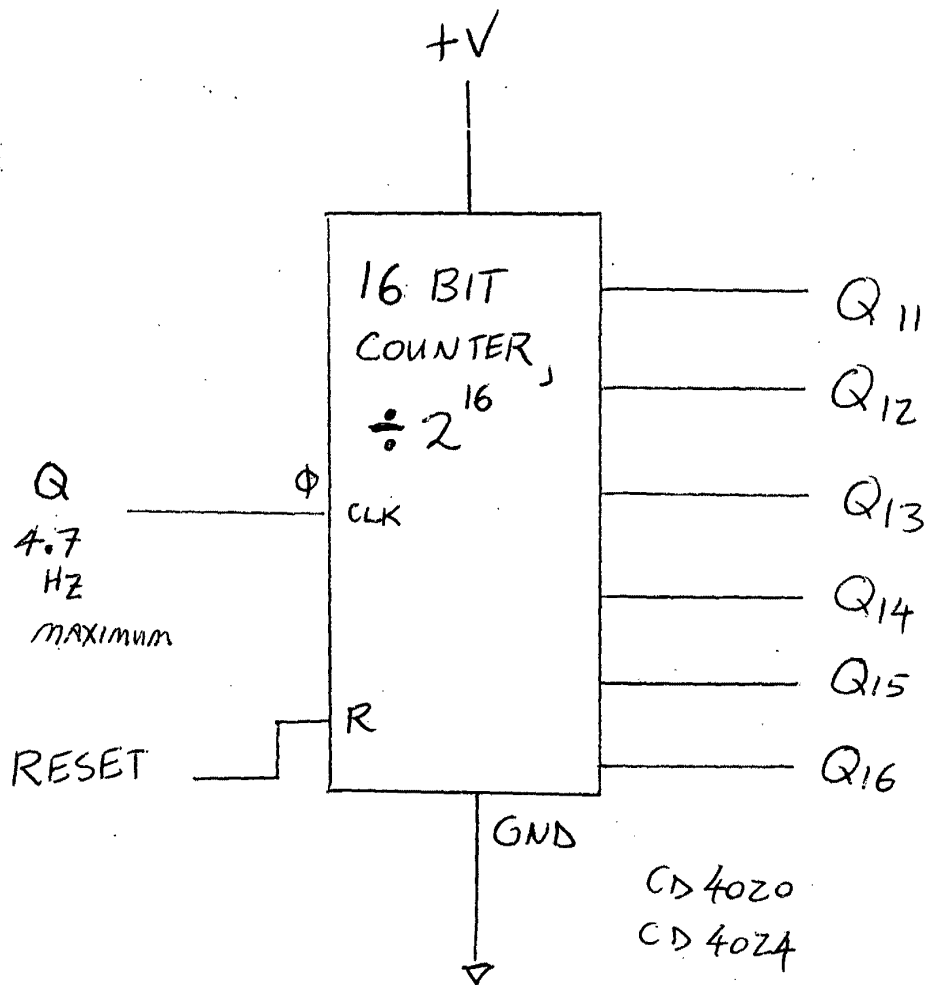
Name	freq. Hz	After Duty-Cycle /256, freq. Hz	half-wave time, (seconds)
Q	1200	4.69	.11
Q1	600	2.34	.21
Q2	300	1.17	.43
Q3	150	.59	.85
Q4	75	.29	1.7
Q5	...	...	3.4
Q6			6.8
Q7			13.6
Q8			27
Q9			55
Q10			109
Q11			219
Q12			437
Q13			874
Q14			1750
Q15		**	3500
Q16			7000

** 1 Hour = 3600 seconds

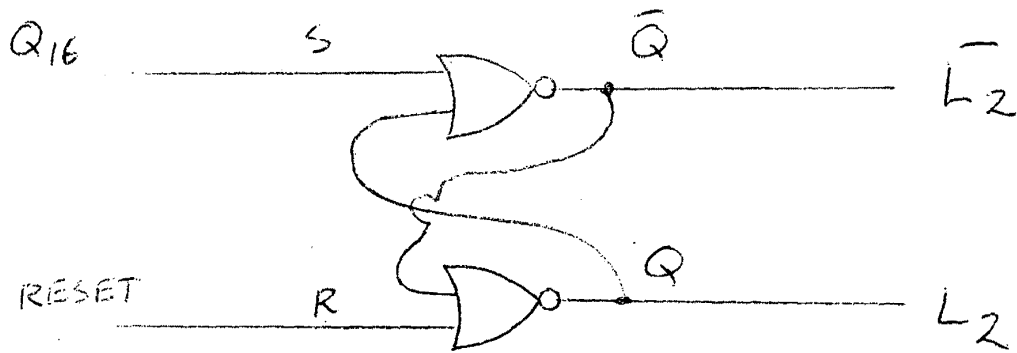
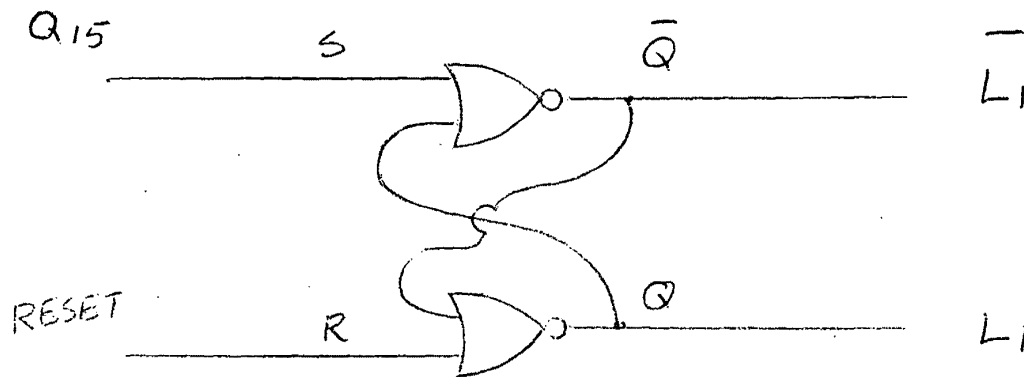
L1 triggers after 1 hour X full sun.

L2 triggers after 2 hour X full sun.

DIVIDE

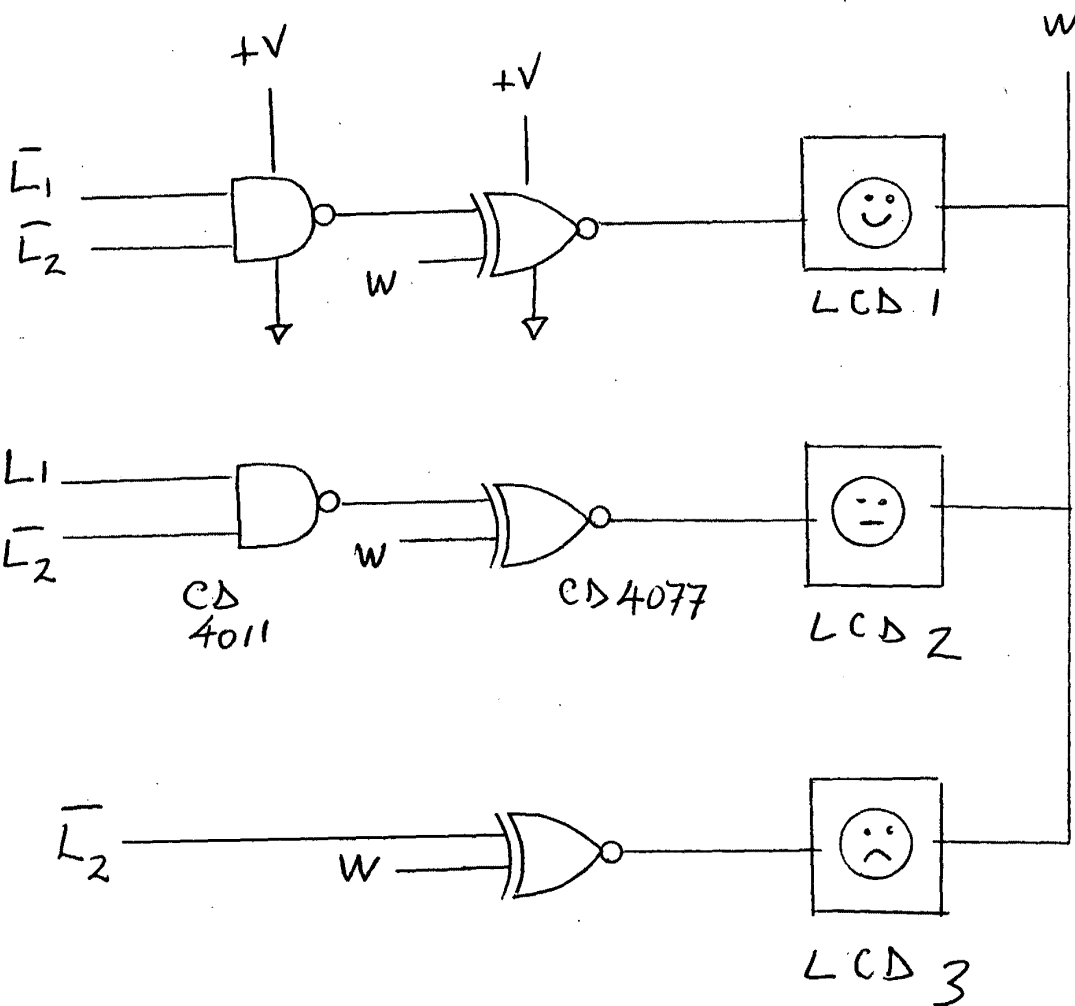
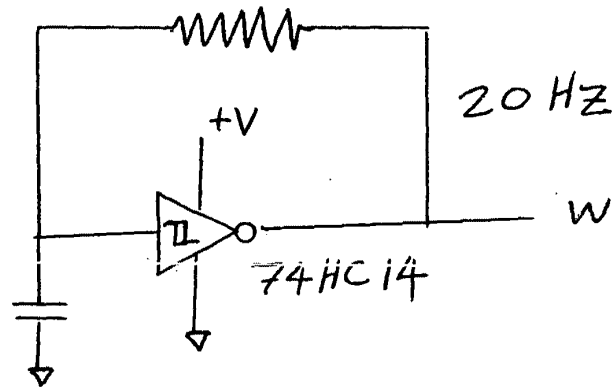


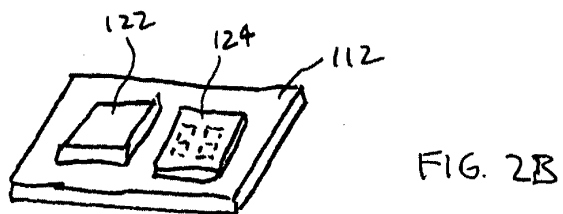
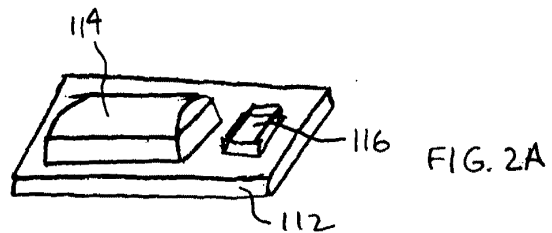
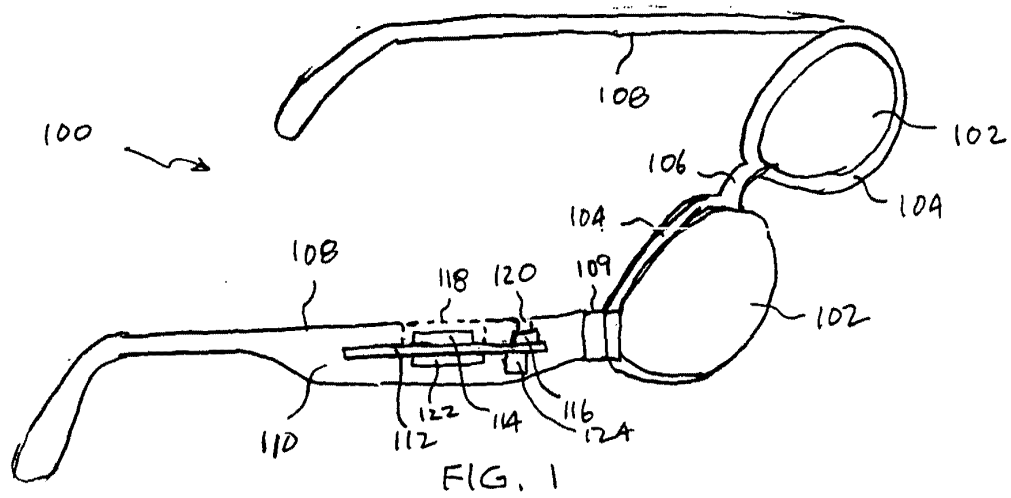
LATCH



CD4001

DISPLAY





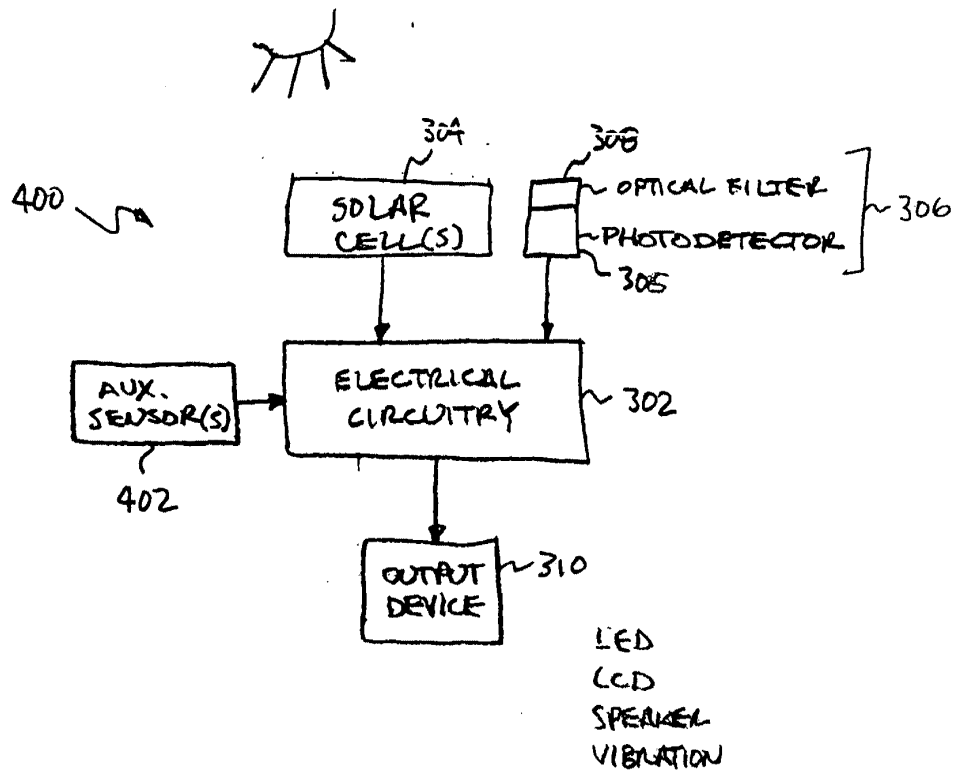


FIG. 4A

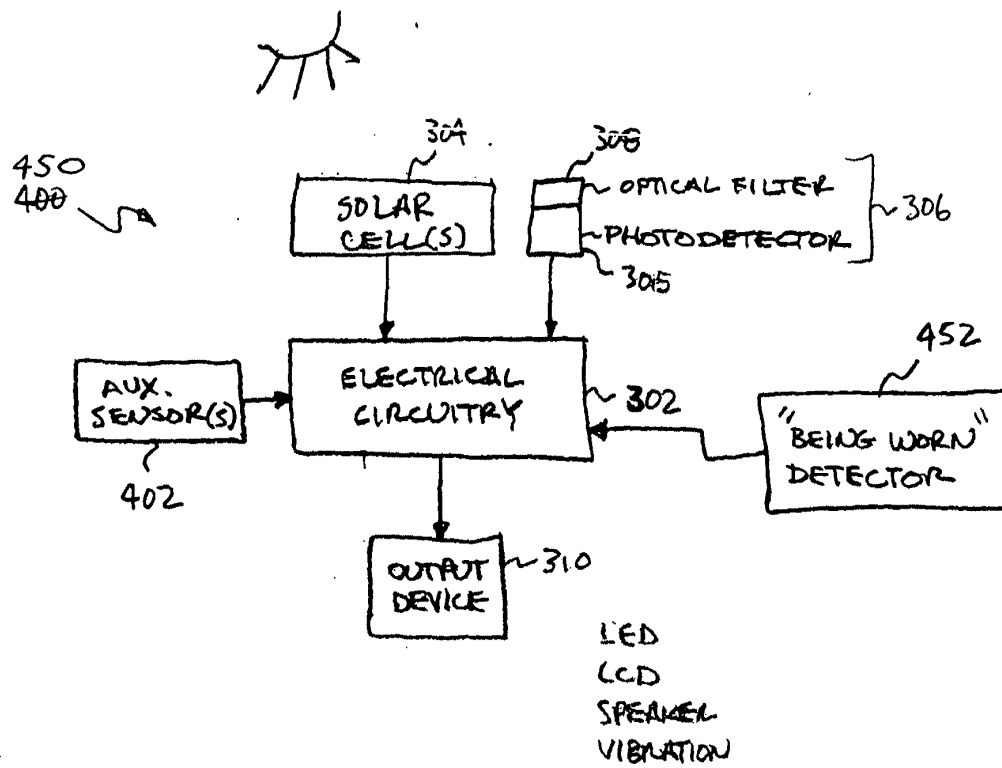


FIG. 4B

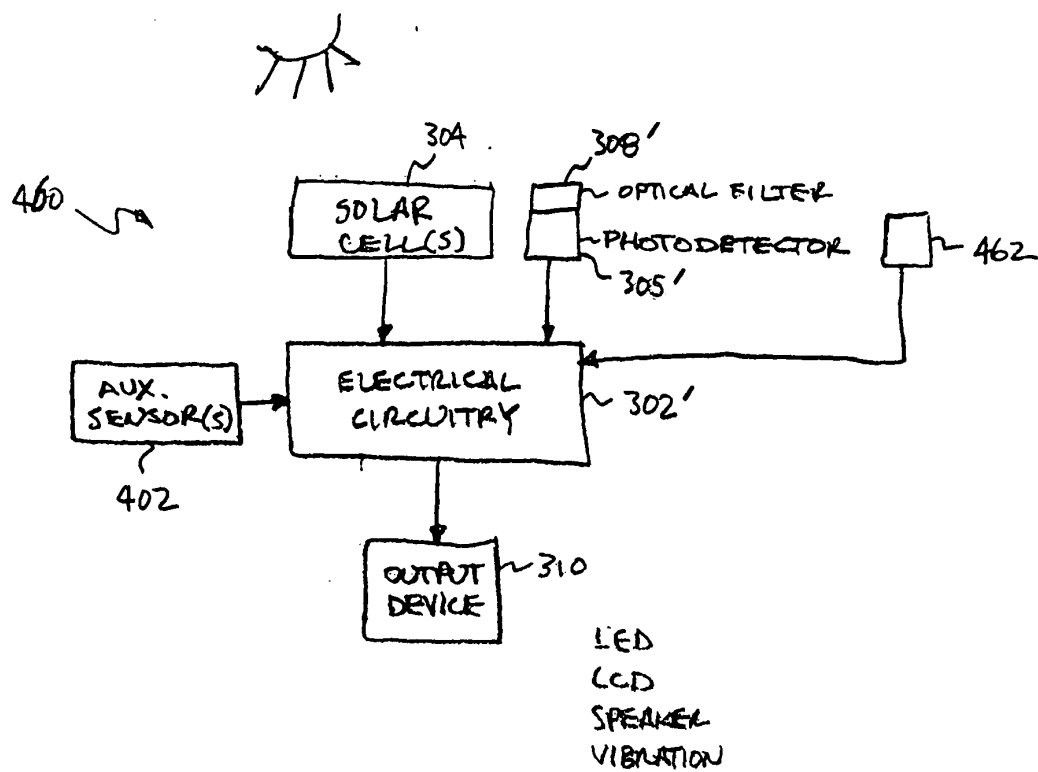


FIG. 4C

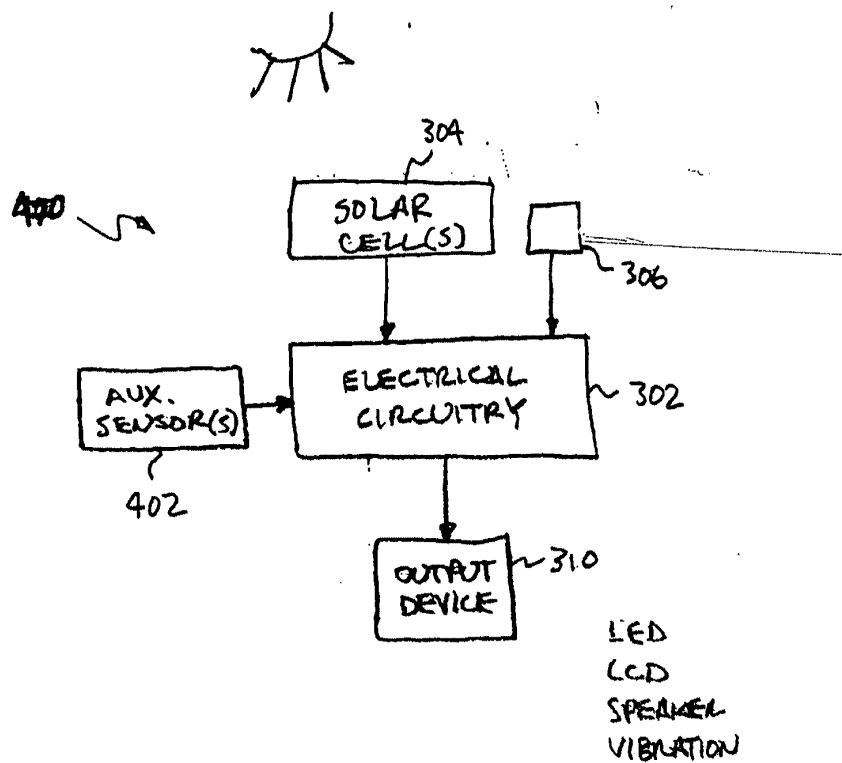


FIG. 4D

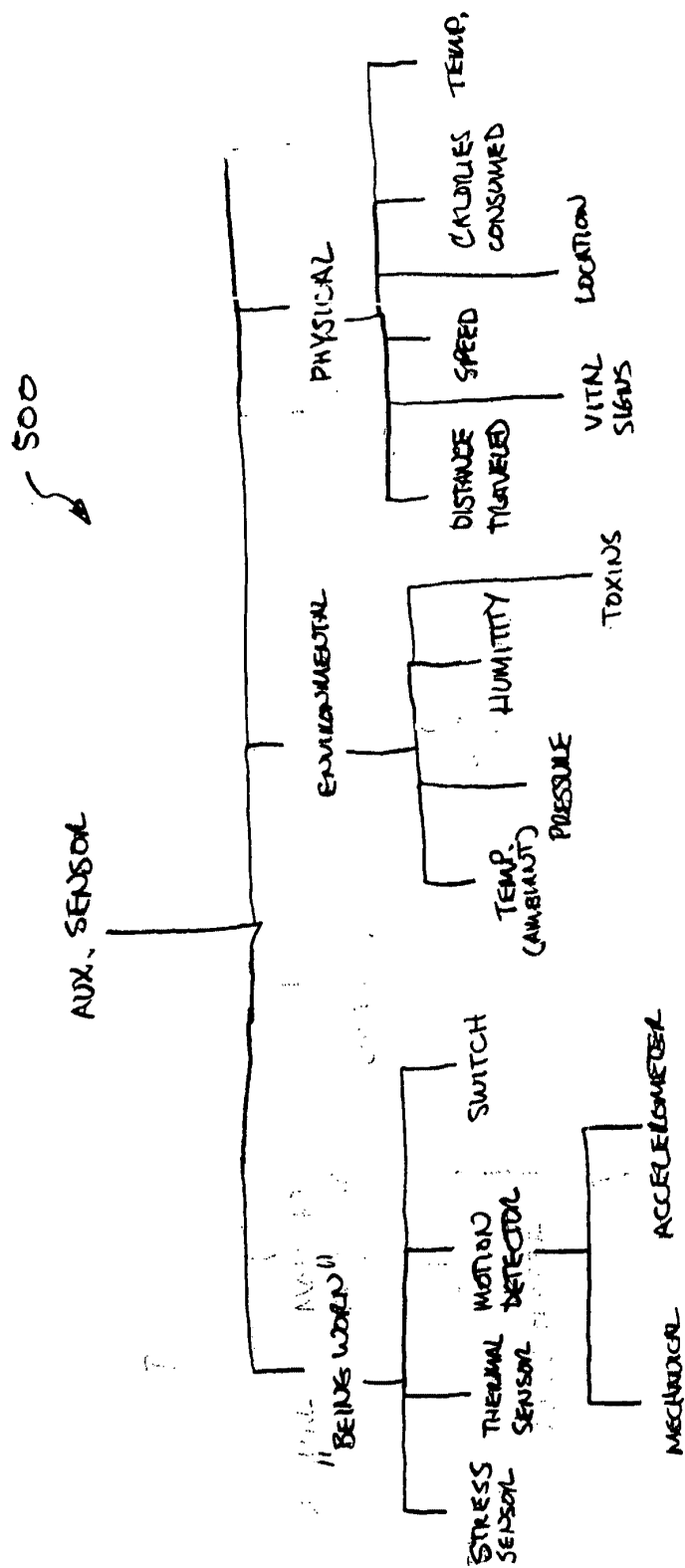


FIG. 5

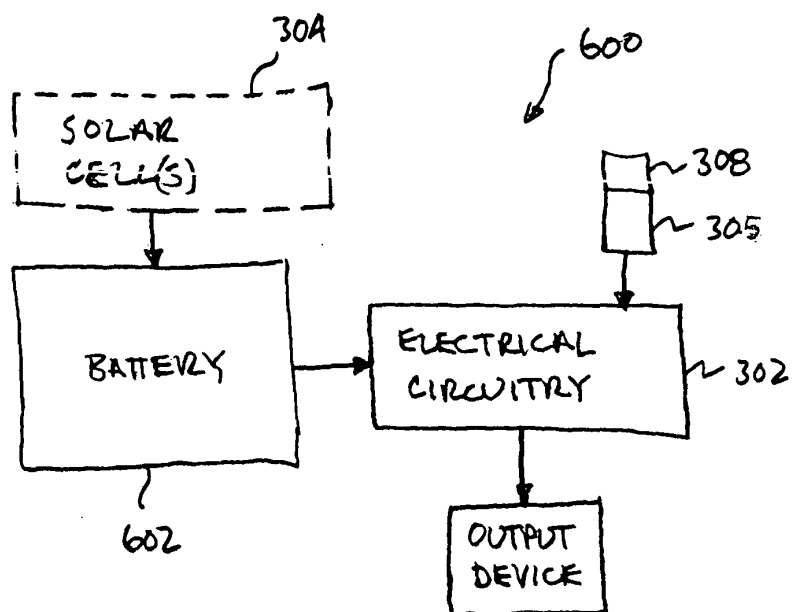


FIG. 6

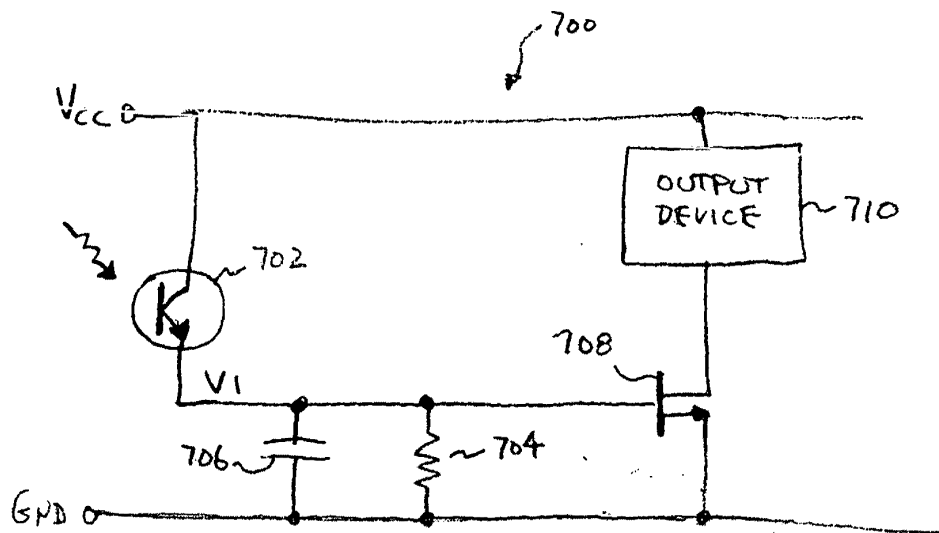


FIG. 7A

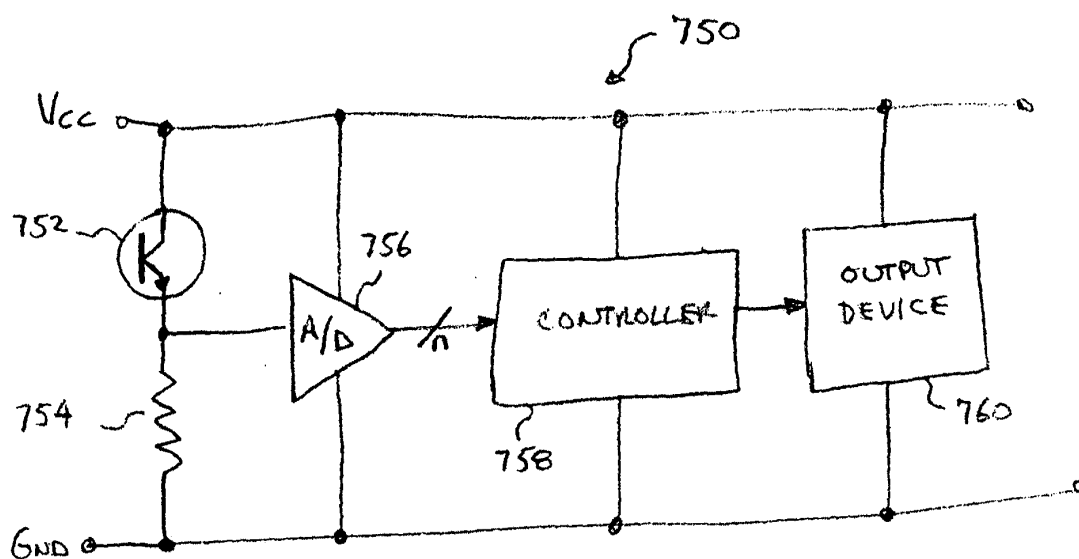


FIG. 7B

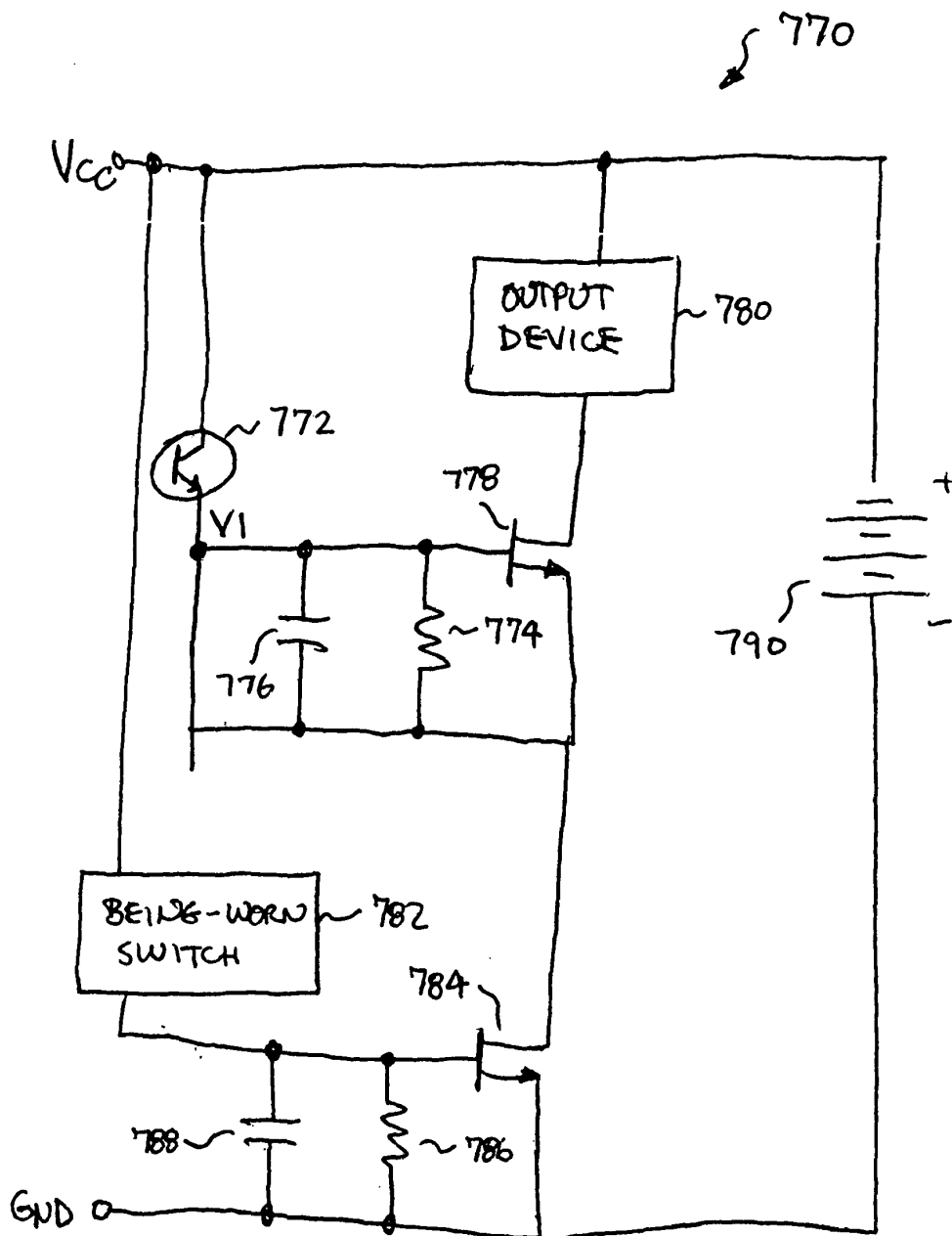


FIG. 7C

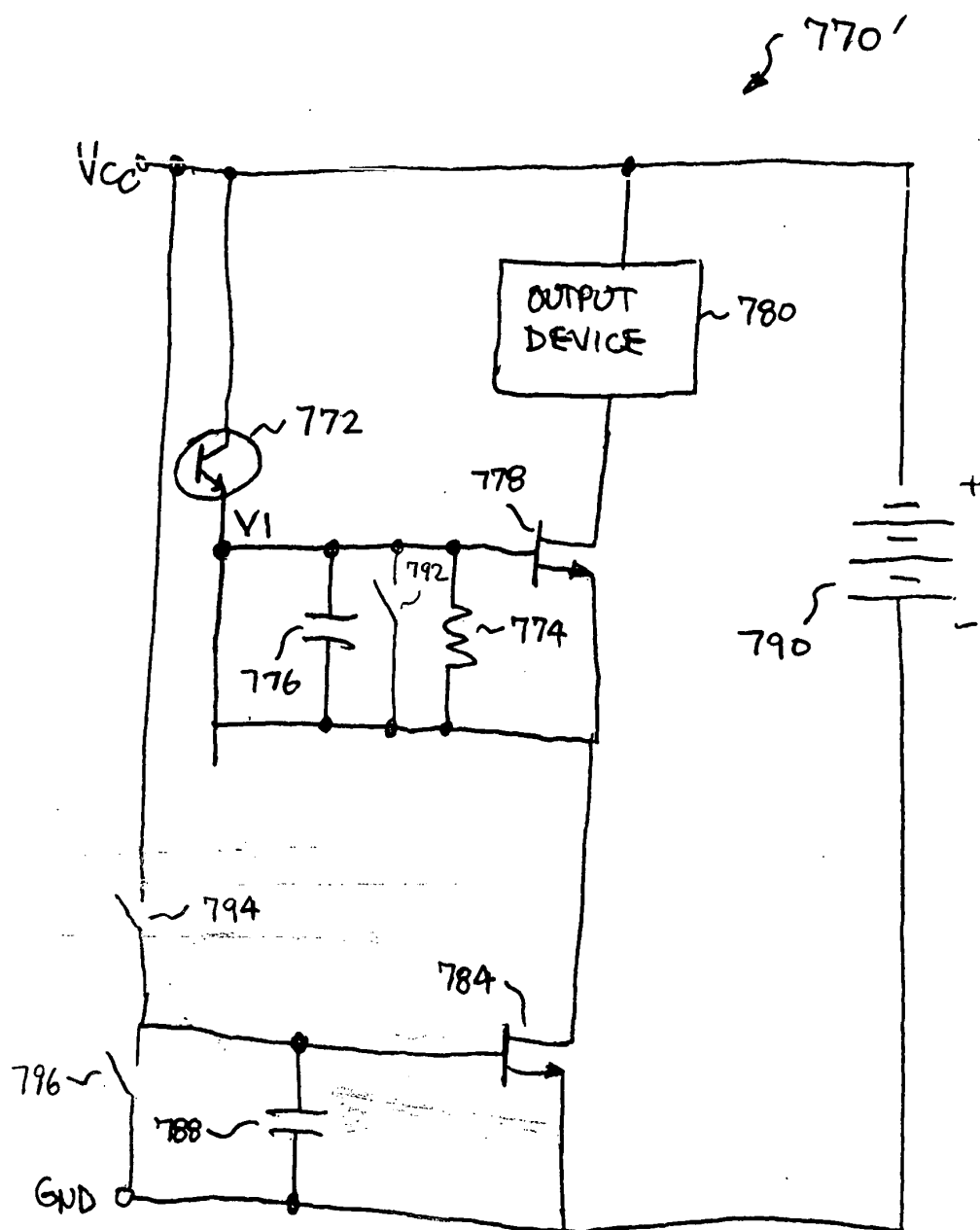


FIG. 7D

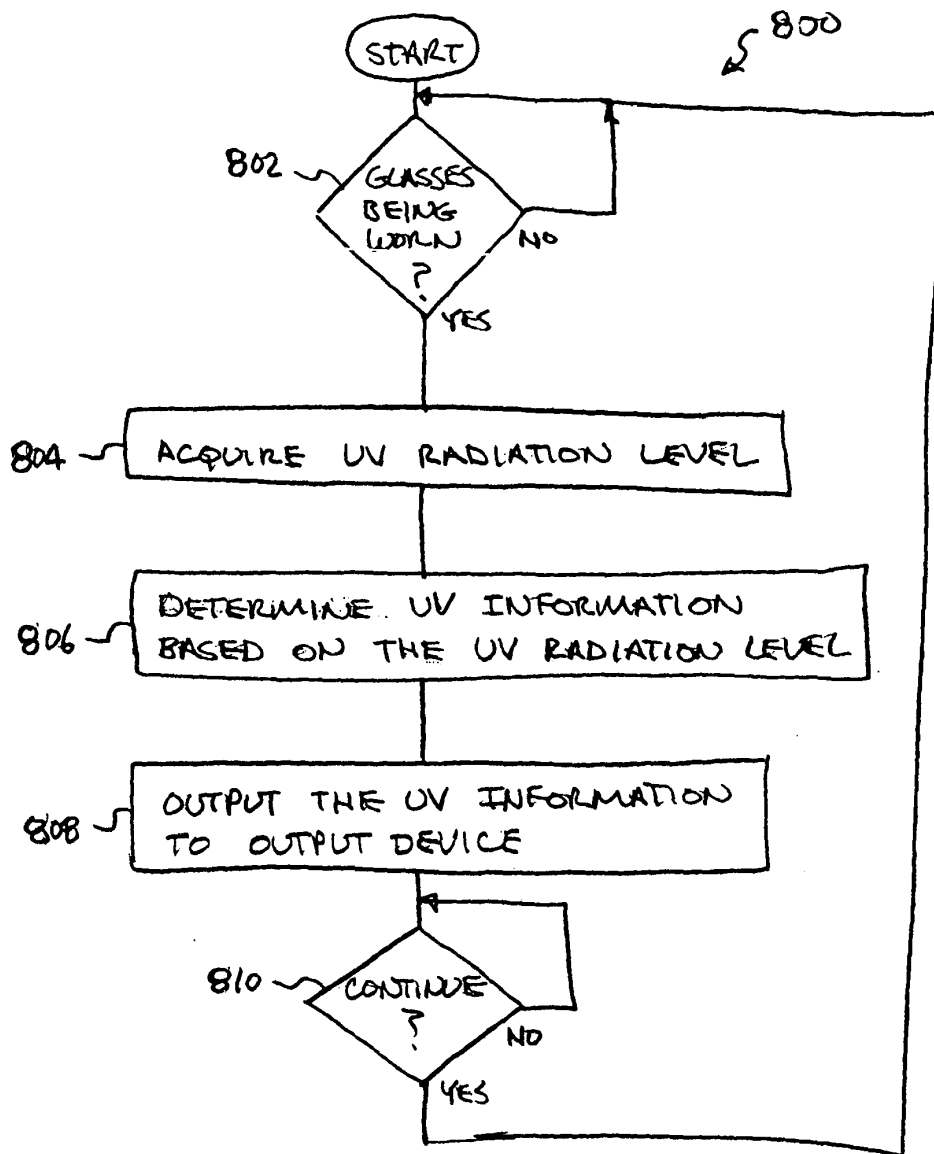


FIG. 8

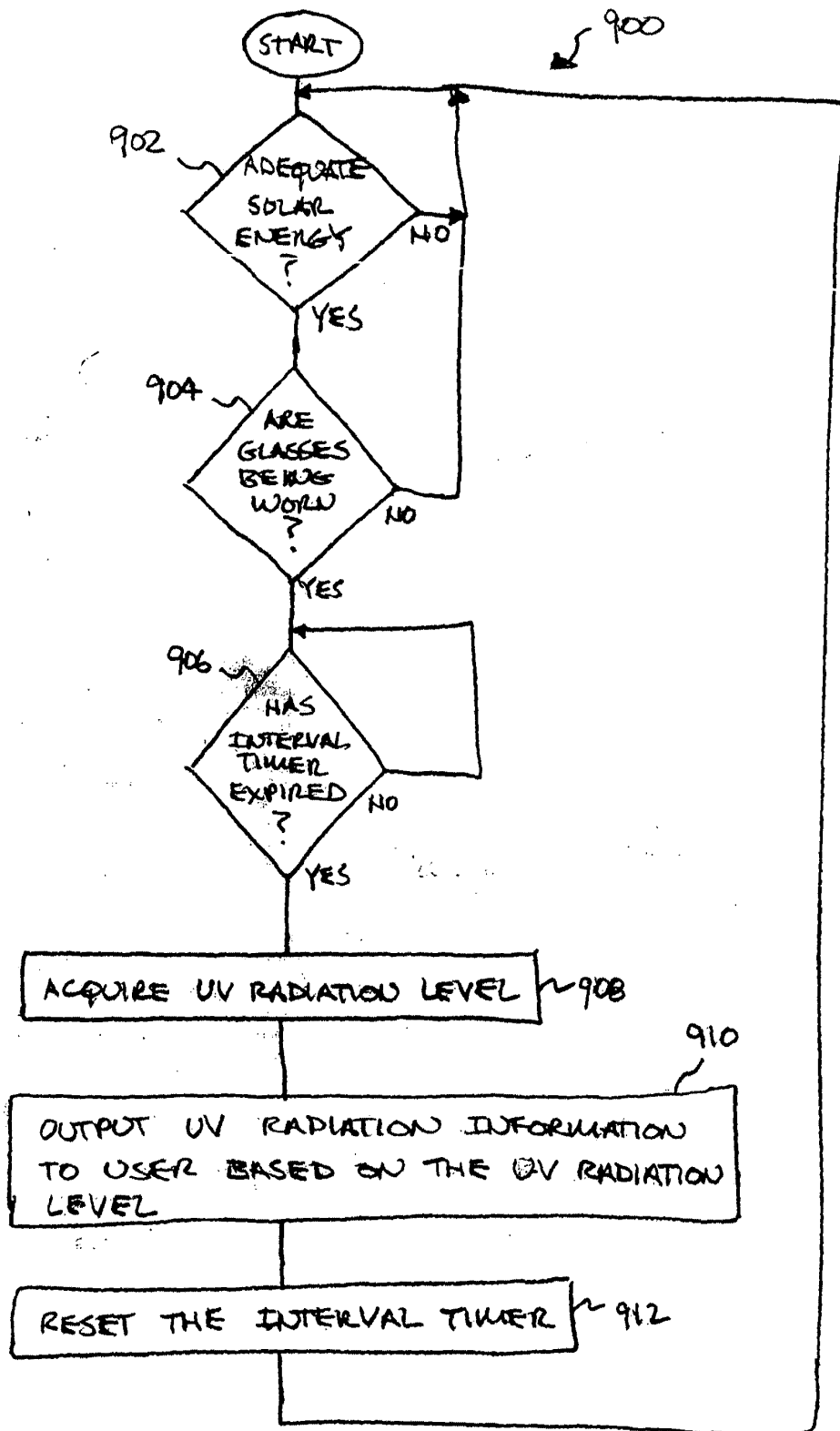


FIG. 9

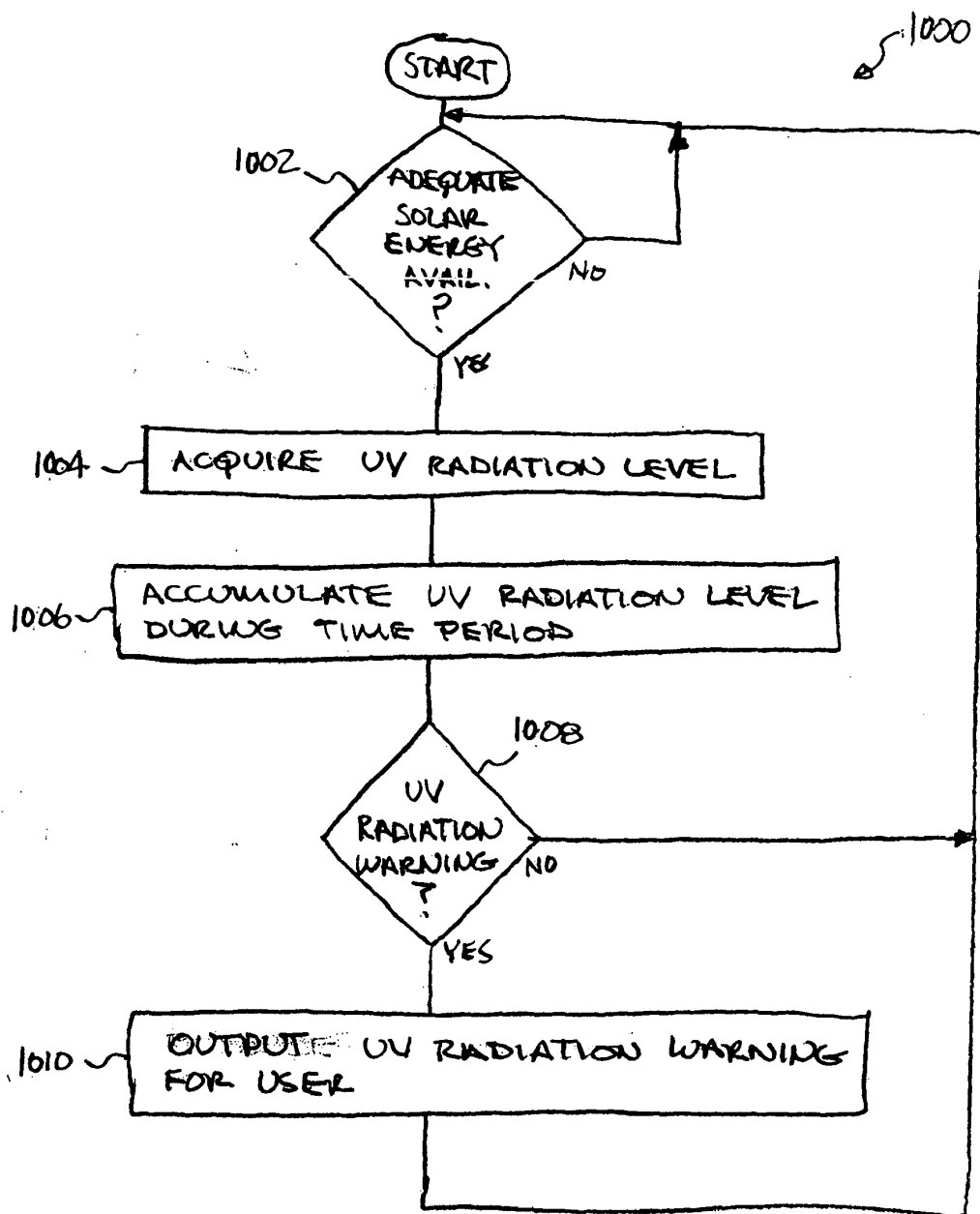


FIG. 10

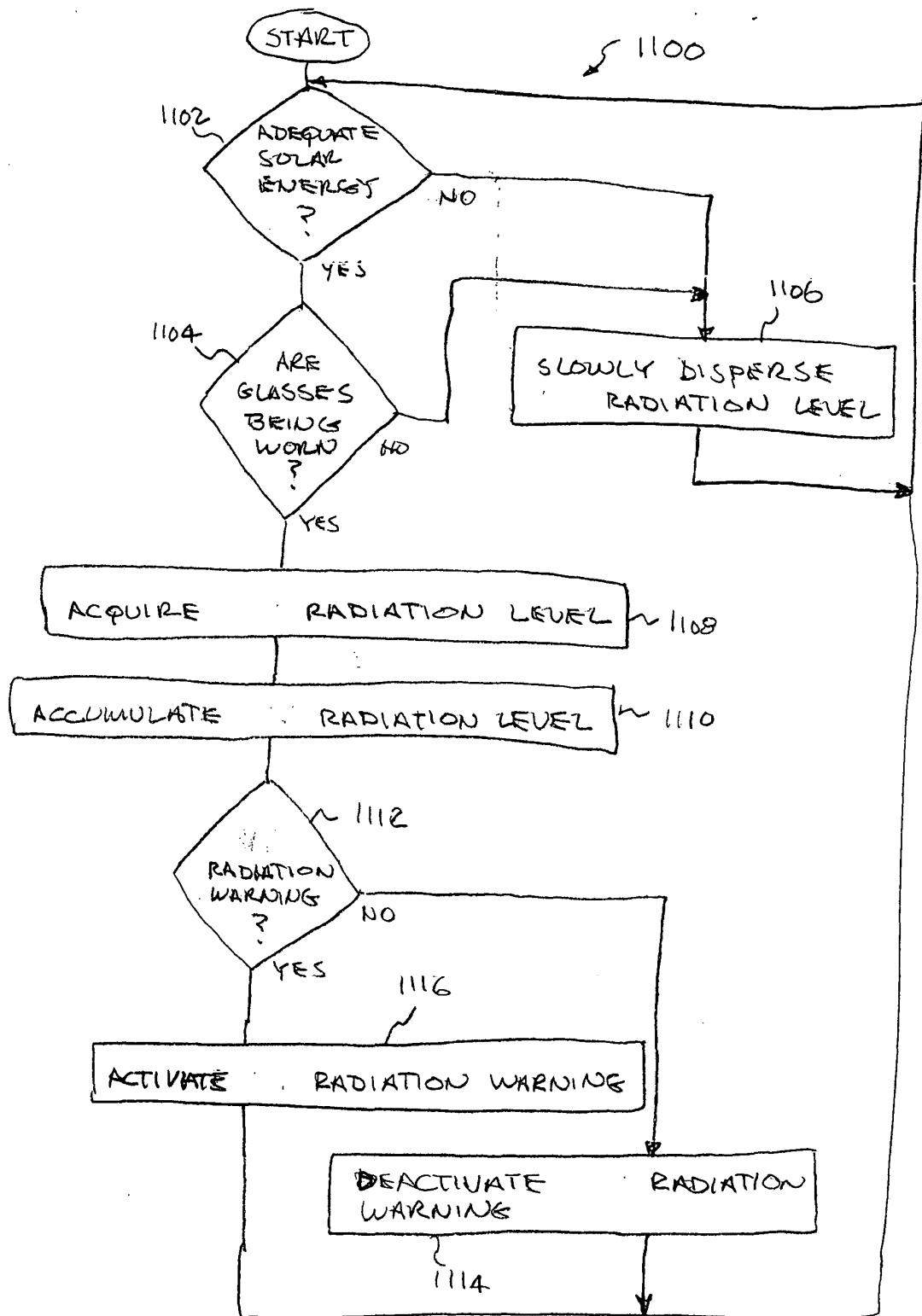


FIG. 11

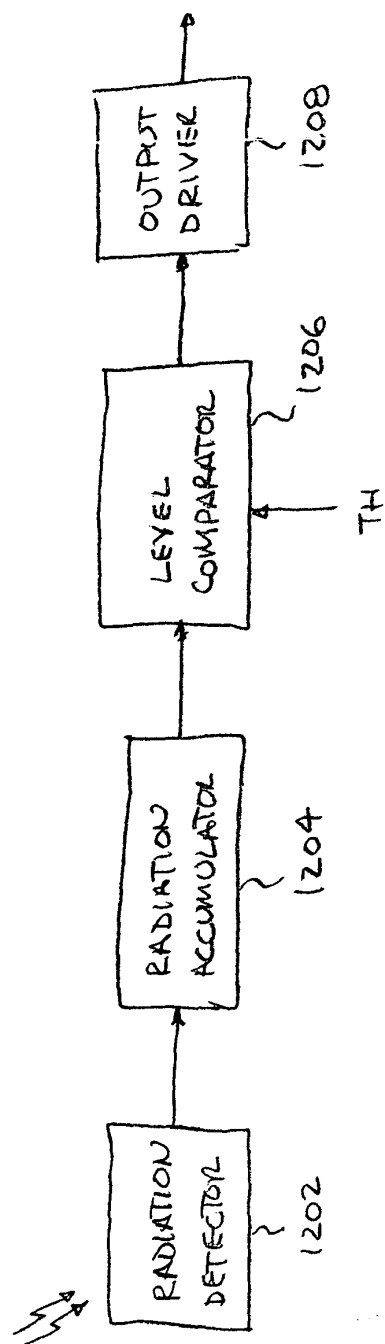


FIG. 12

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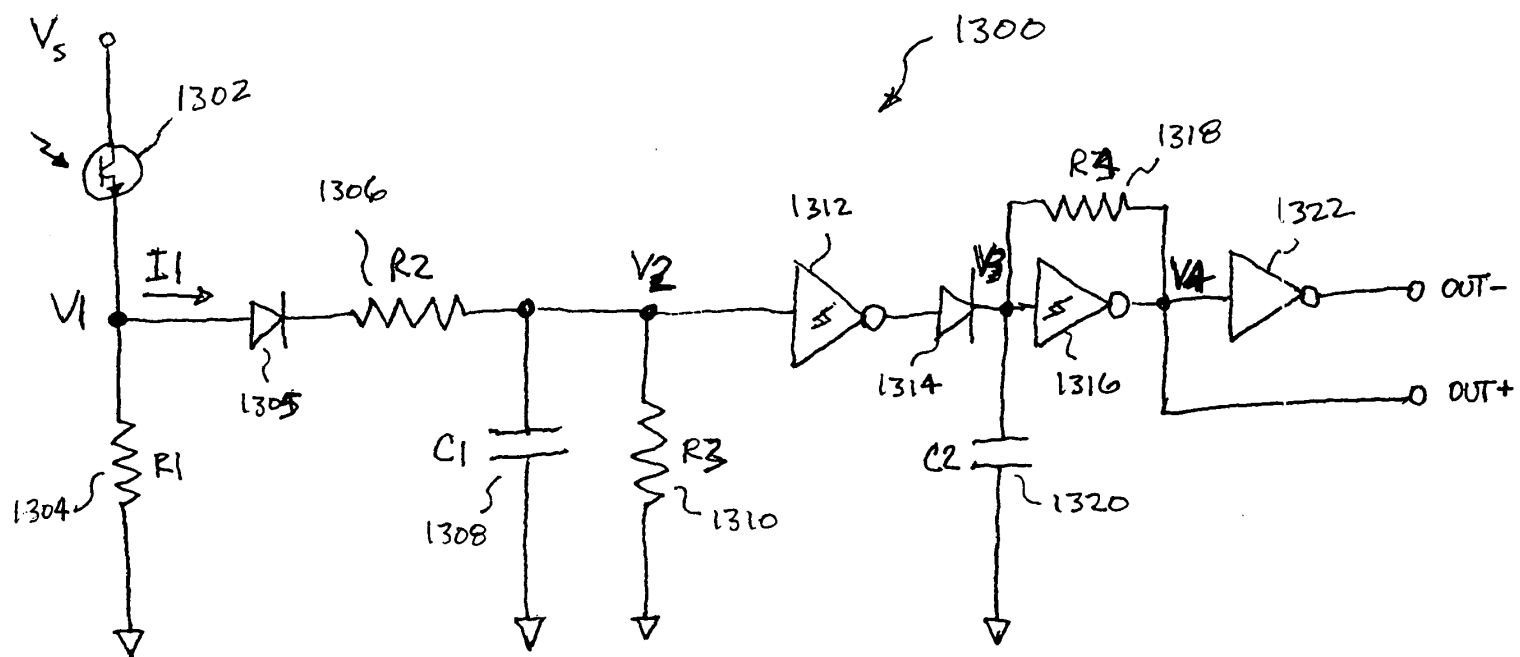


FIG. 13A

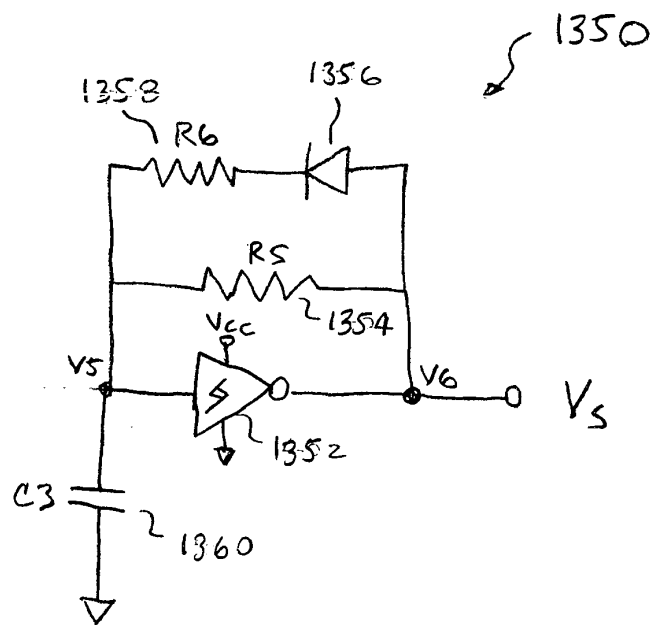


FIG. 13B

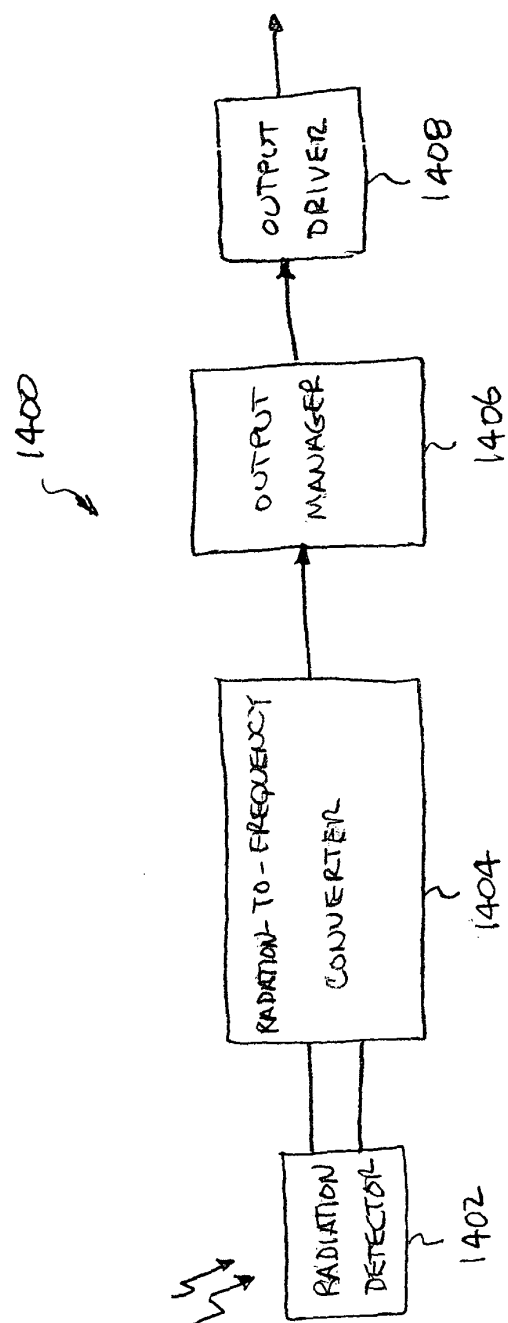


FIG. 14A

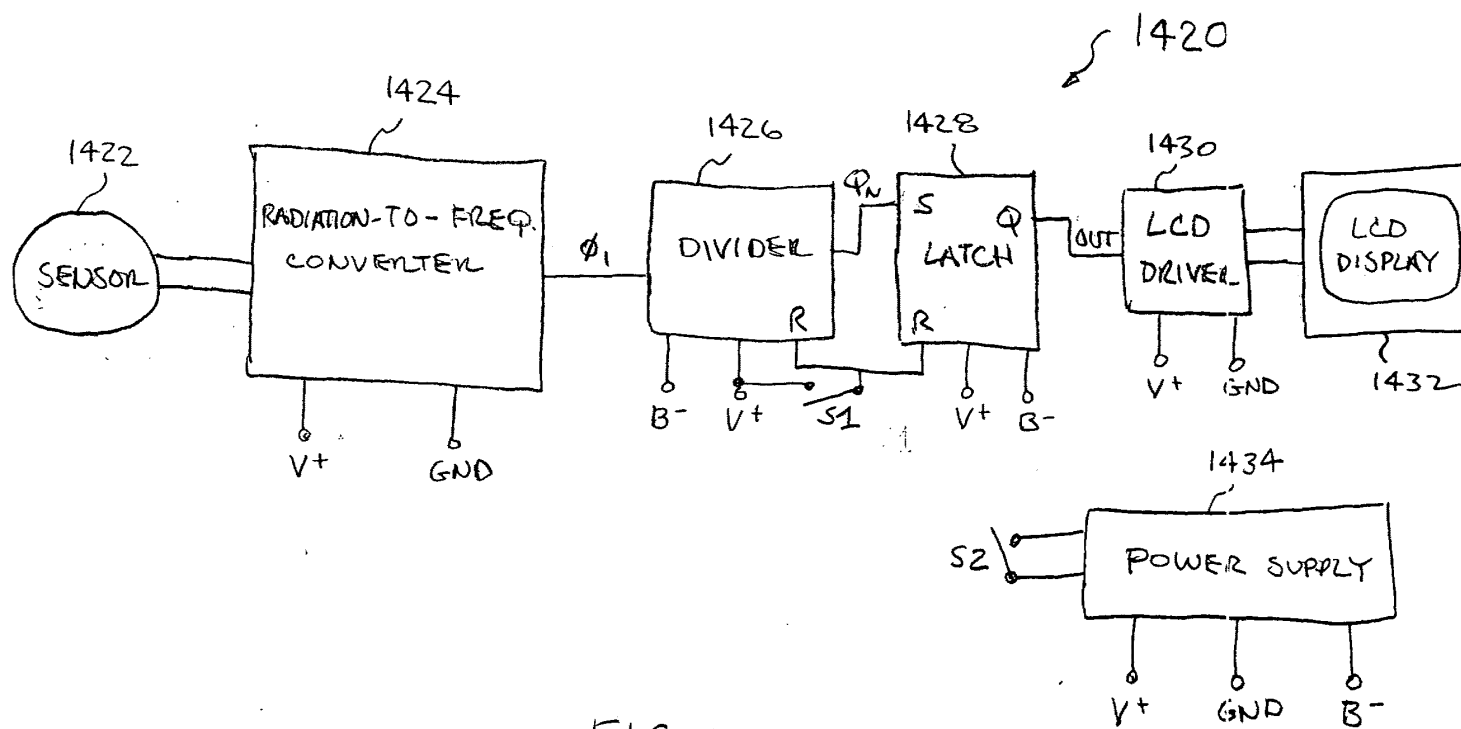


FIG. 14B

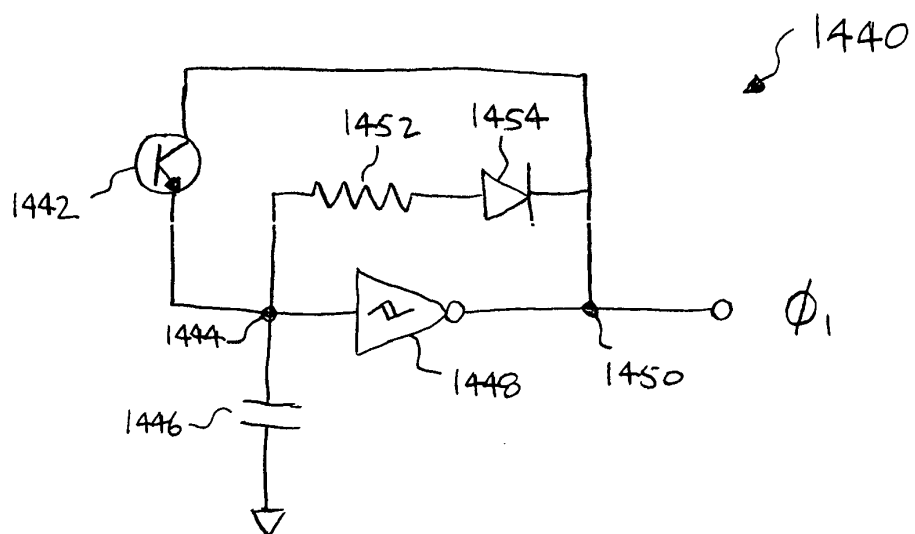


FIG. 14C

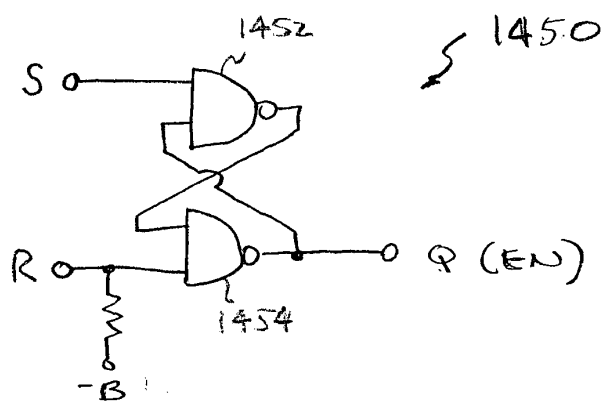
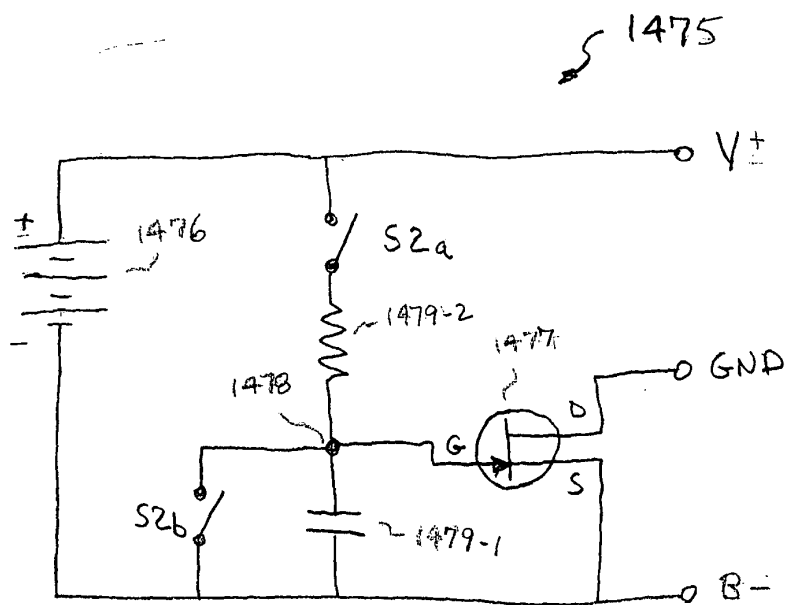
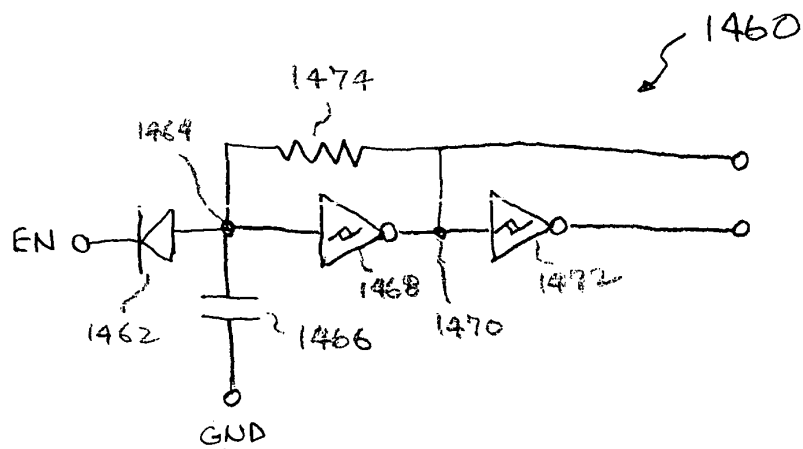


FIG. 14D



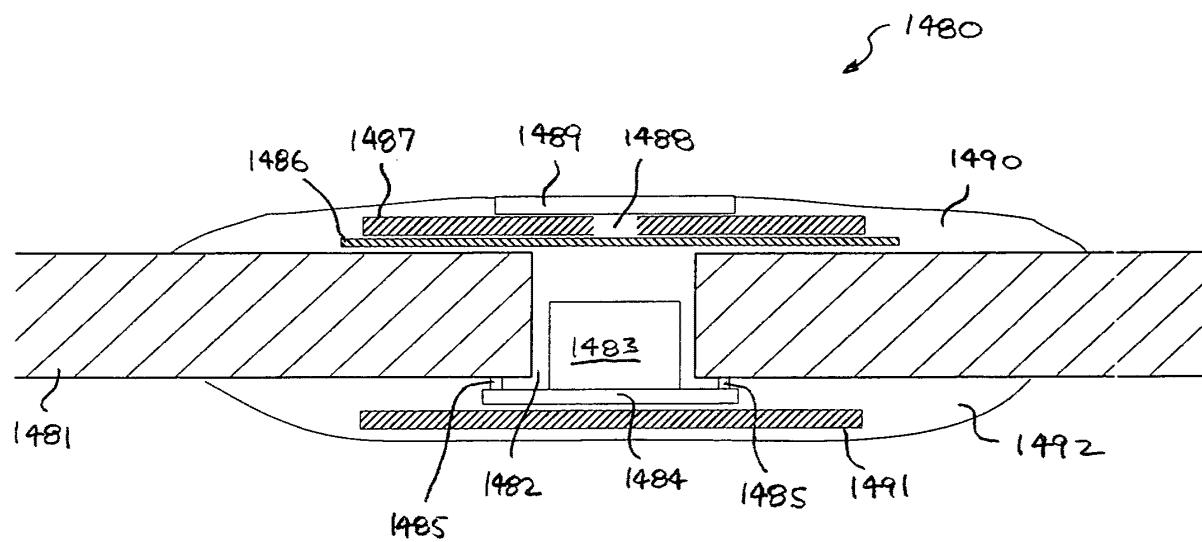


FIG. 14G

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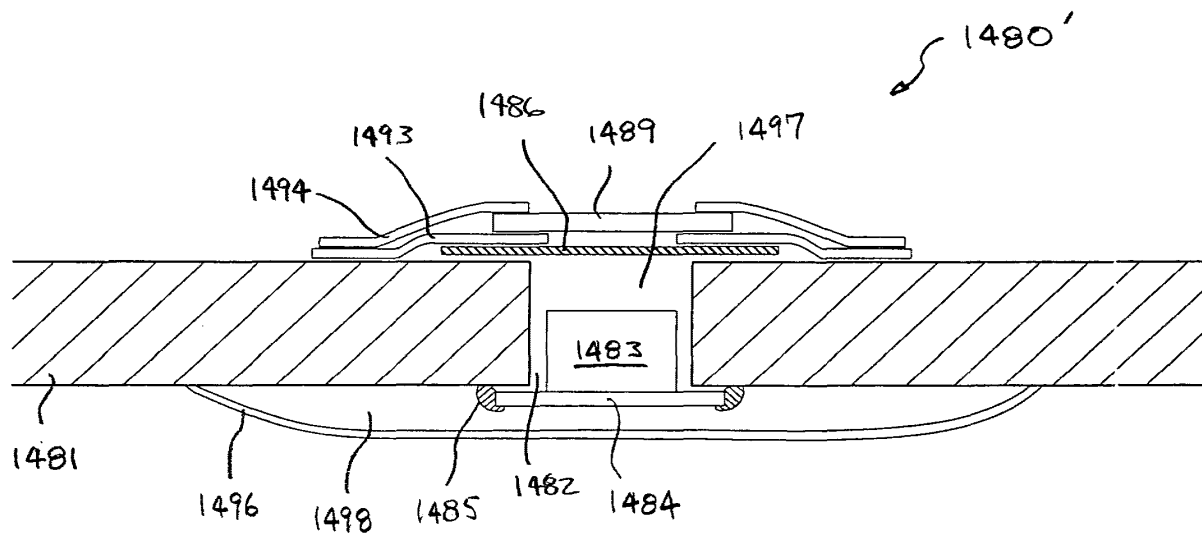


FIG. 14H

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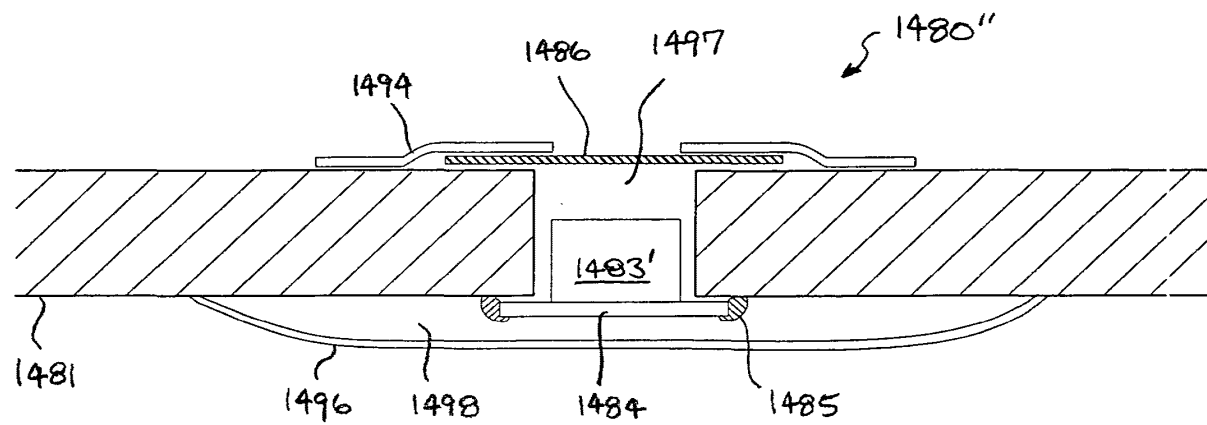
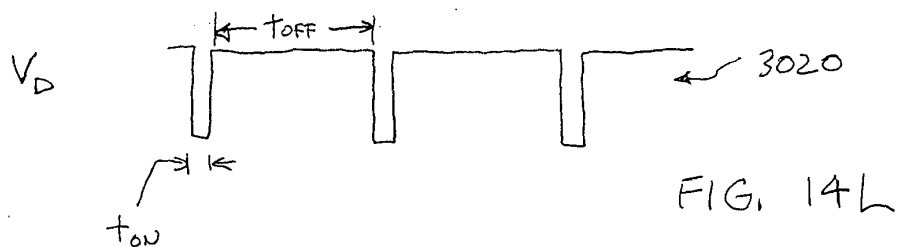
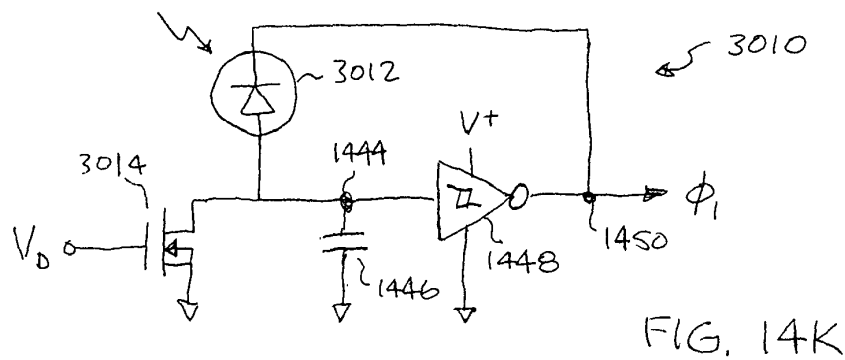
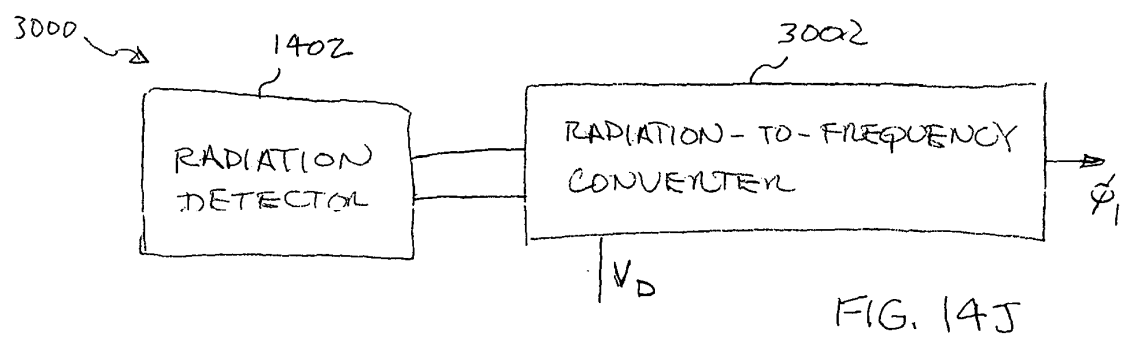


FIG. 14I



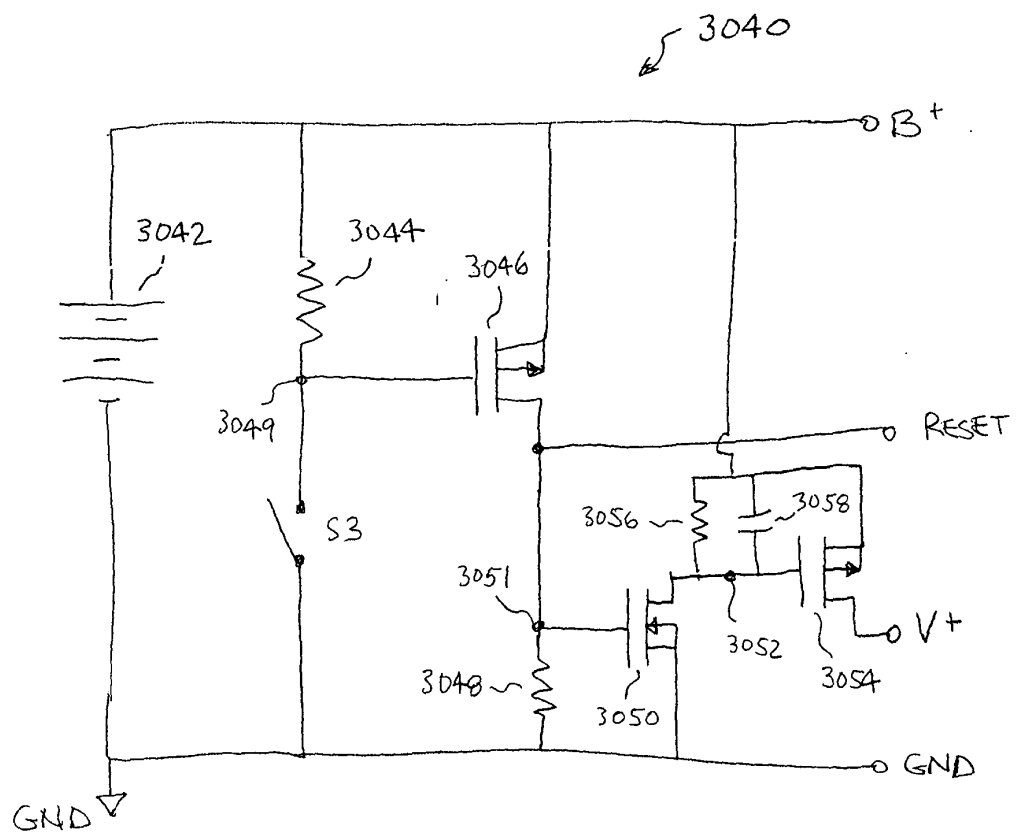


FIG. 14W

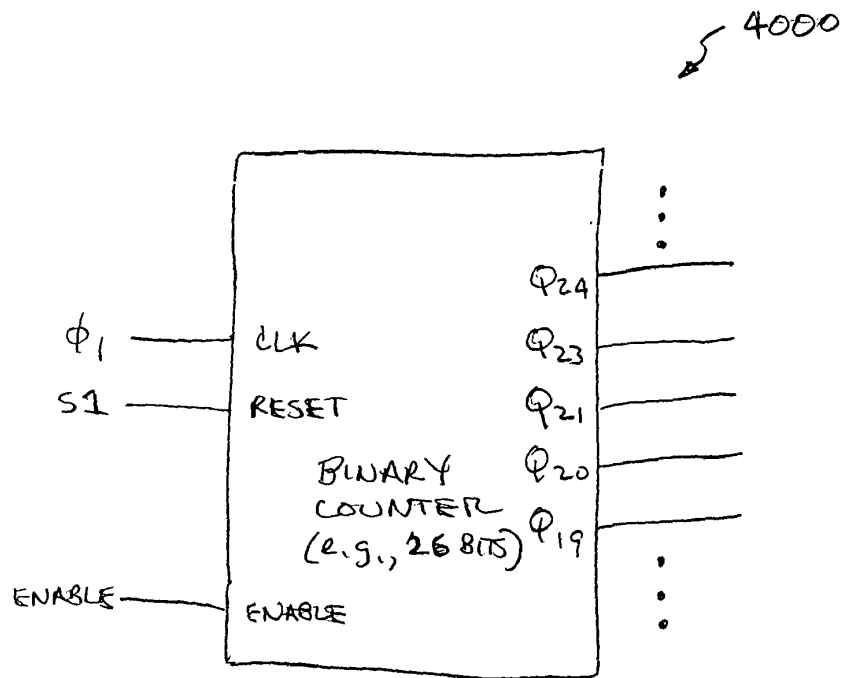


FIG. 14N

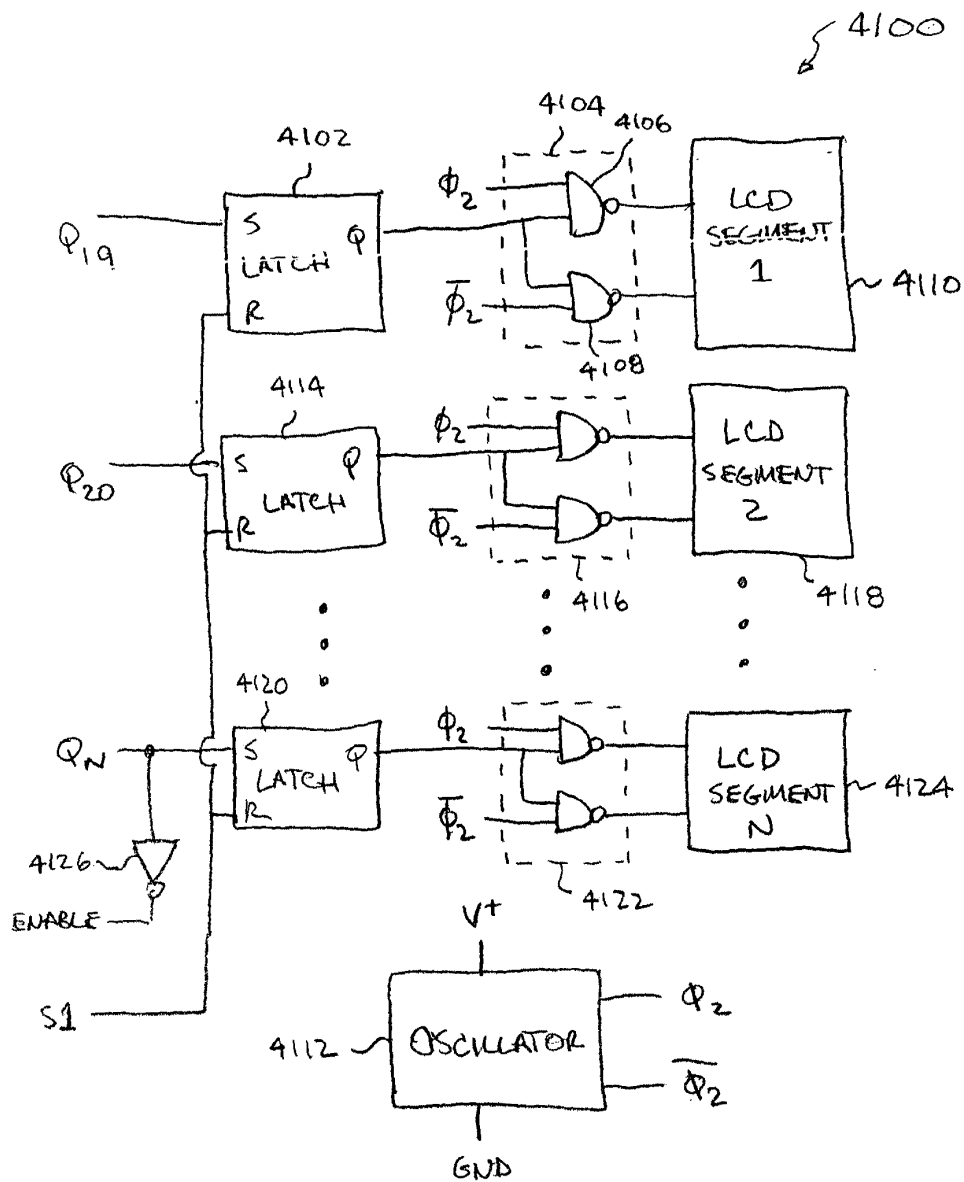


FIG. 140

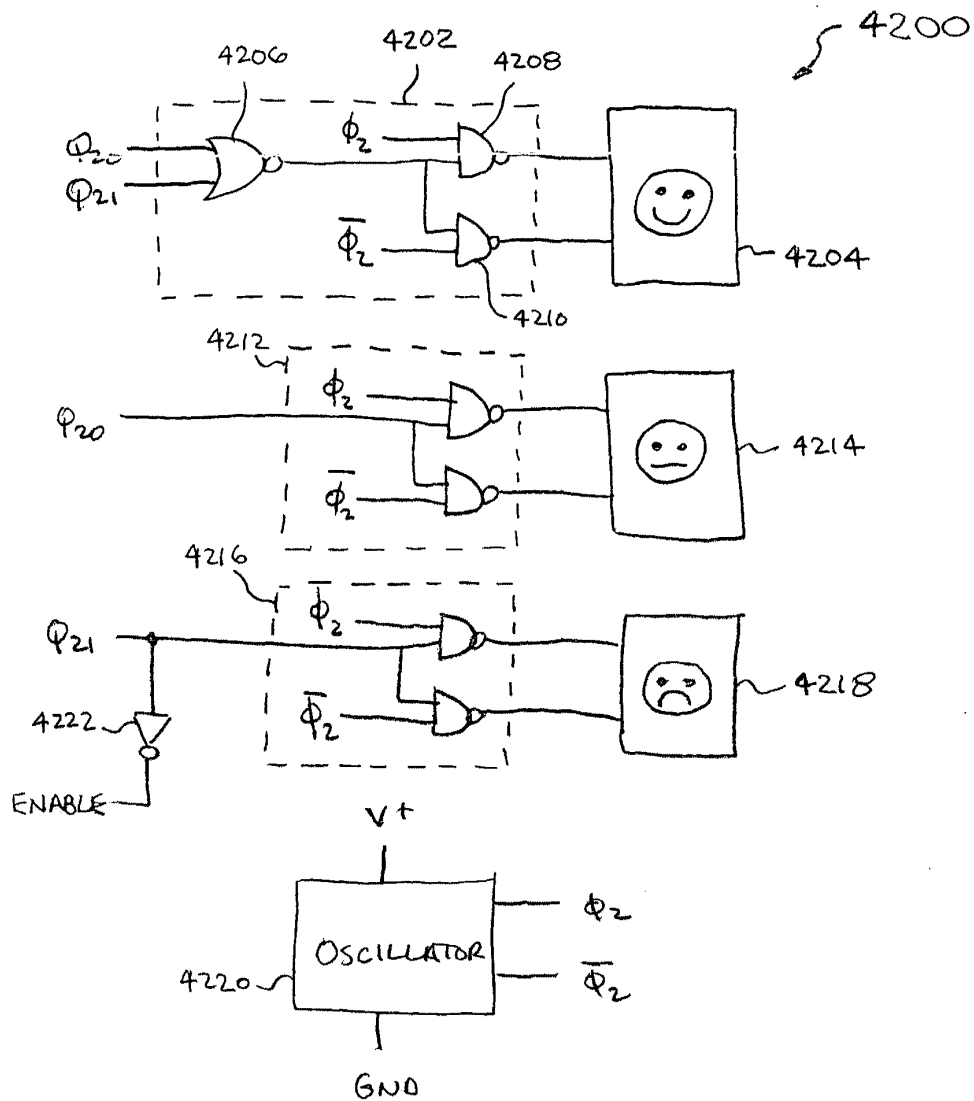


FIG. 14P

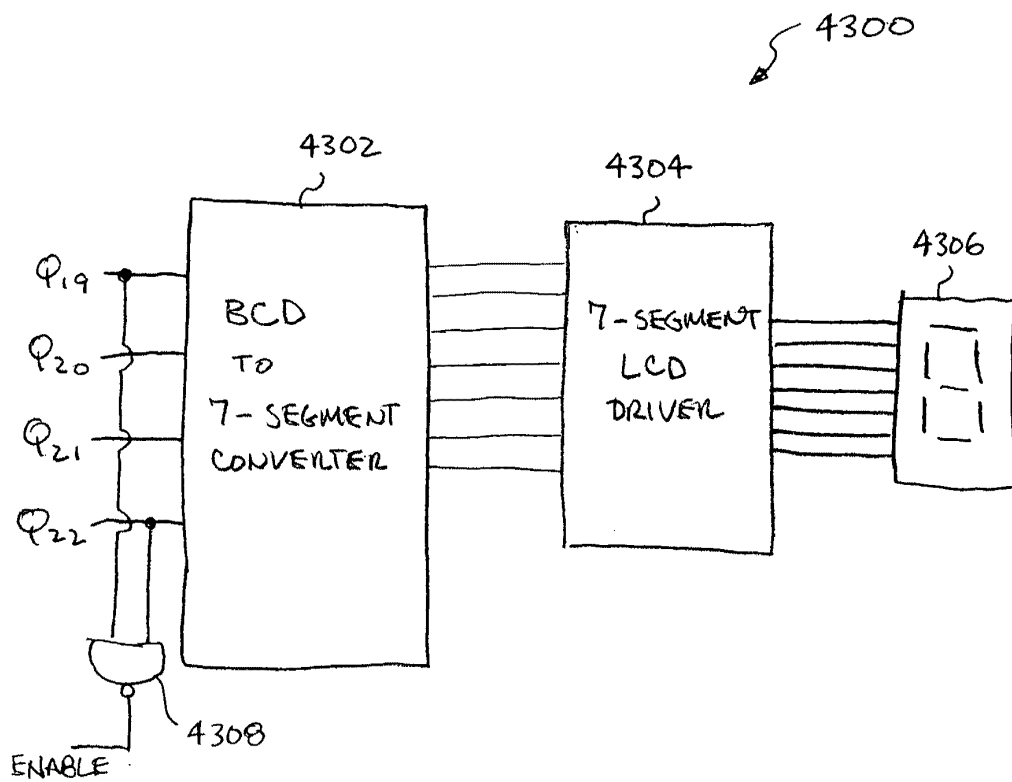


FIG. 14Q

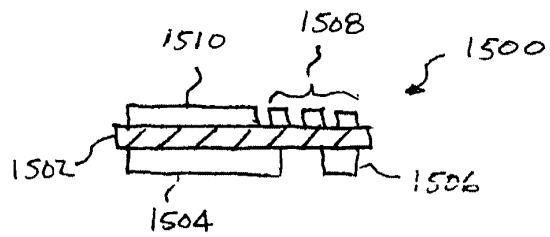


FIG. 15A

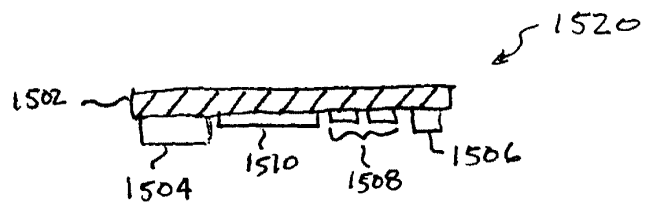


FIG. 15B

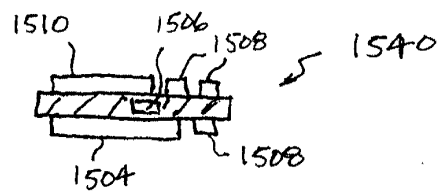


FIG. 15C

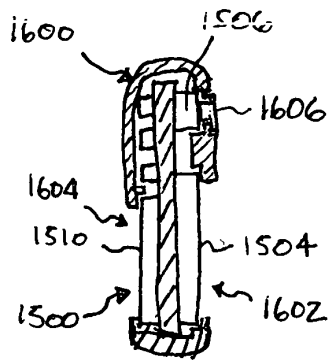


FIG. 16A

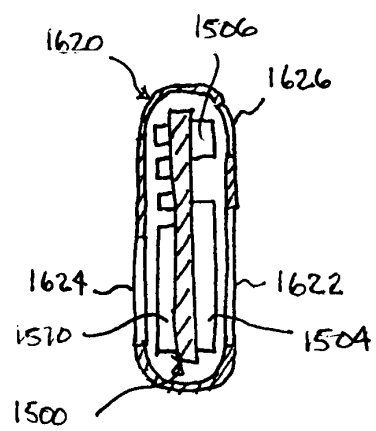


FIG. 16B

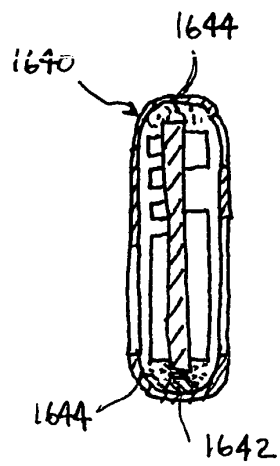


FIG. 16C

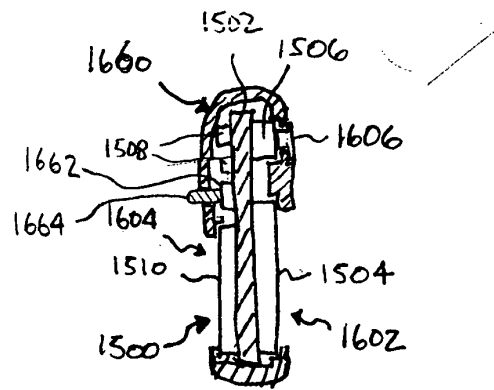


FIG. 16D

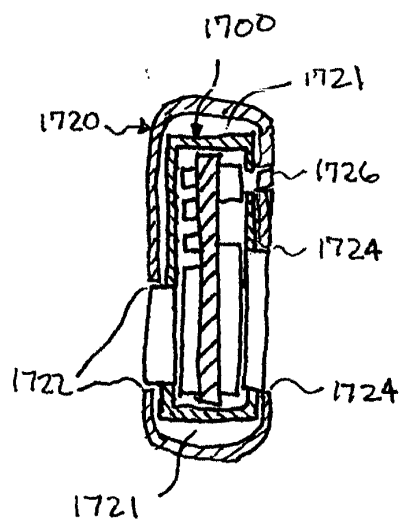


FIG. 17B

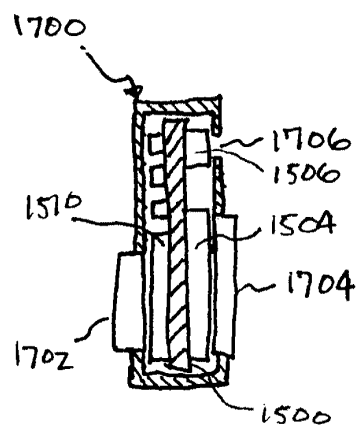
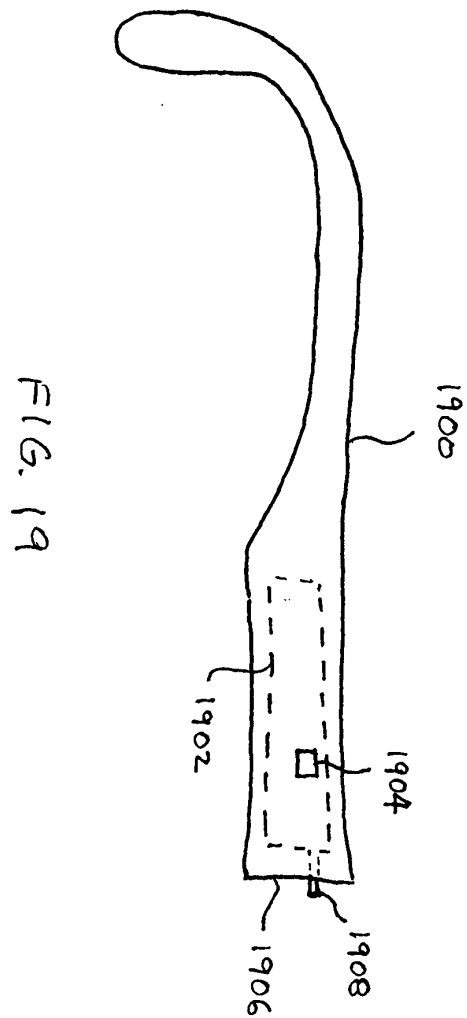


FIG. 17A





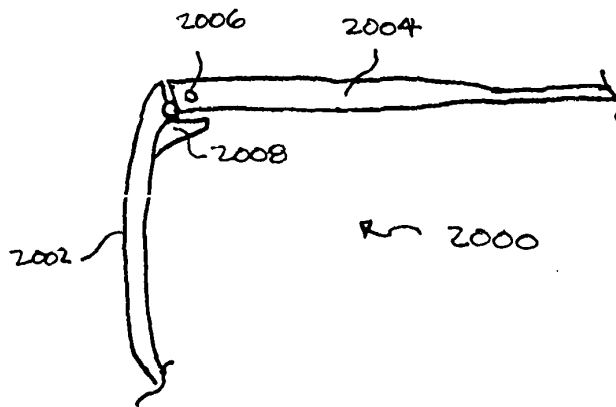


FIG. 20A

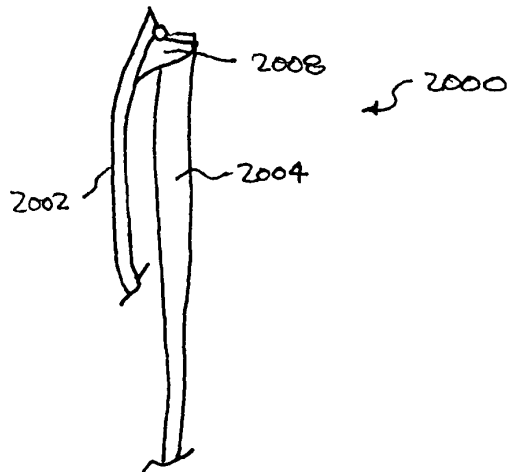


FIG. 20B

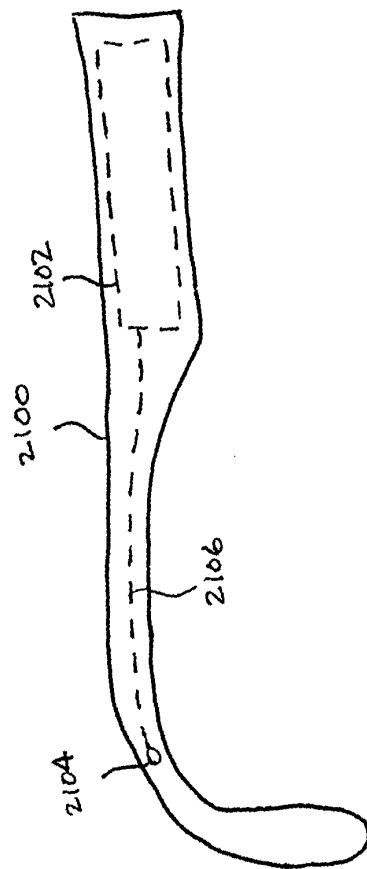


FIG. 21

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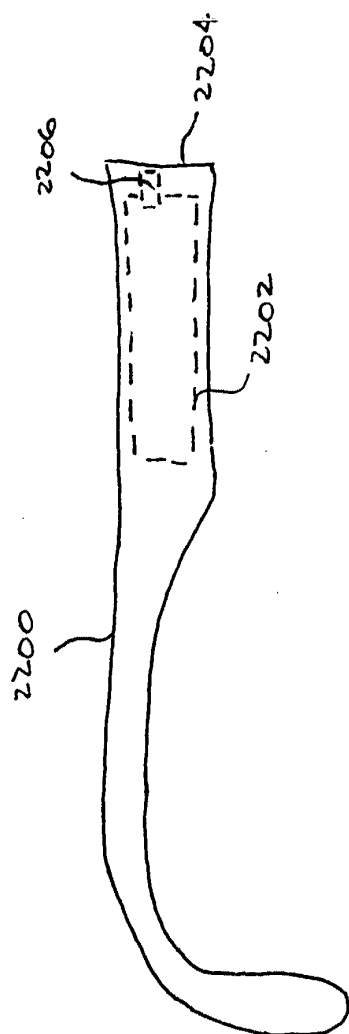


FIG. 22

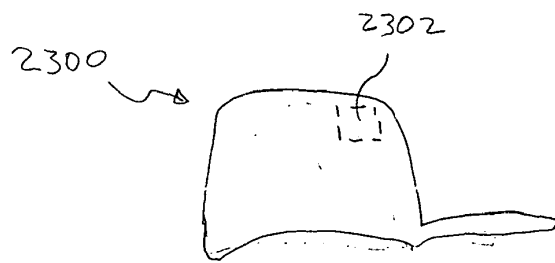


FIG. 23A

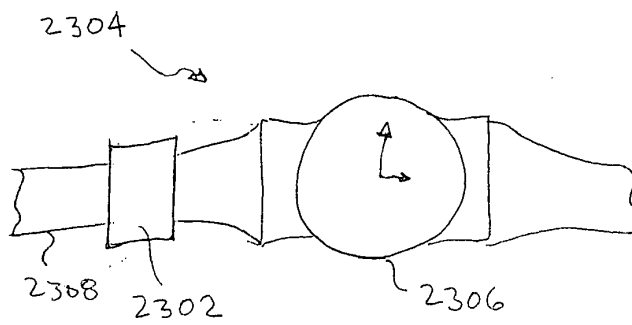


FIG. 23B

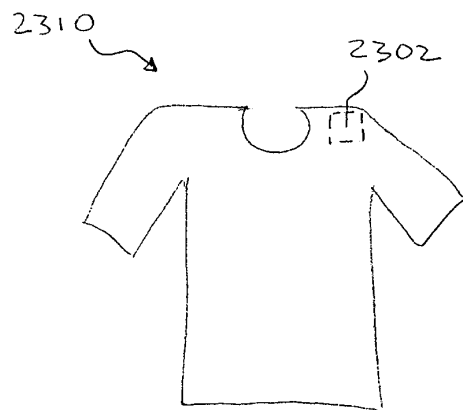


FIG. 23C



FIG. 23D

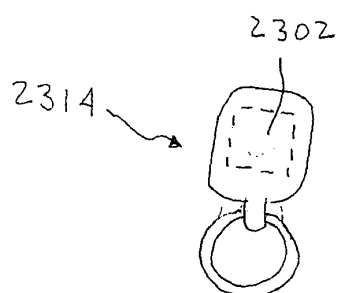


FIG. 23E

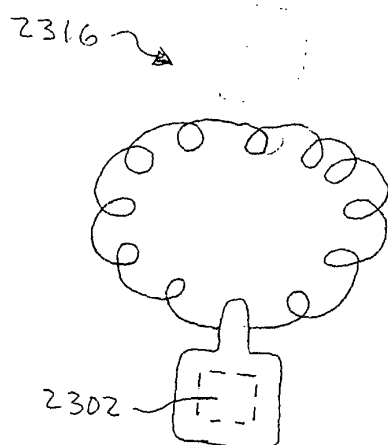


FIG. 23F

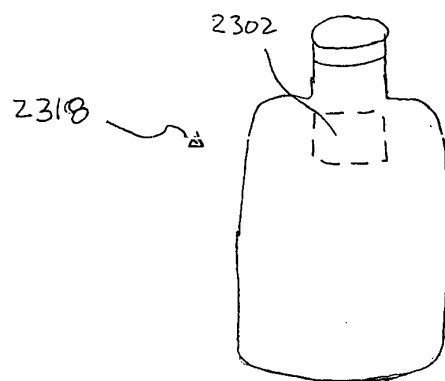


FIG. 23G

B. EVENT EYEGLASSES

FIELD OF THE INVENTION

[00231] The present invention relates to eyeglasses and, more particularly, to eyeglasses for events.

BACKGROUND OF THE INVENTION

[00232] Many of us have been to events, such as to a baseball game. It would be fun to get information regarding the event, while attending it. For example, the information can be related to the teams playing at the game, their players and their statistics. If different teams are vying for a playoff spot at a different site, it would be interesting to know how the other teams are doing. Such information should be provided at the discretion of the users. You don't want to hear the scoring statistic of a player during a very intense moment of the game. If possible, you also do not want to hold onto a device that provides such information because, during the game. Your hands should be free. They need to be available for different purposes, such as to make interesting gestures.

[00233] Sometimes you may be inclined to provide feedbacks to the teams or the organization running the event you are attending. For example, waiters are serving food orders to fans in premium seats and you feel unfairly ignored after waving at the waiters for 10 minutes. In addition to screaming, you may want to inform the organization running the event your grievances during the game.

[00234] It is also not uncommon for the organization running or companies sponsoring the event to provide promotional gadgets. These devices typically are used to give company information to customers. Corporations usually use them to advertise their products and to promote themselves. Sometimes, the devices can be specifically related to the event.

[00235] For example, companies like to give away pens in events. One reason is that we need to write and, as we write, we look in the vicinity around the pen. But, the pen only has so much space for a company to provide information. Also, the information printed on the pen is static and cannot be changed. It would be advantageous if more information can be provided, and the information can be changed, as desired by the company.

[00236] As another example, you are at a company store, which can be considered as an event from your perspective. If you have a question, but the company employees are tied up, you have to wait. Similarly, if you are at a trade

show booth and the company representative is talking to other customers, again you have to wait. May be you can get their brochures and read. However, it would be advantageous if you can be provided an unguided tour as you walk around the store or the booth. Only when you need more detailed information or help, you go to the employees.

[00237] Accordingly, there is a need for a device that can provide information to a user for an event. The information can be provided to the user hands-free. The information can be available for a relatively short duration of time, such as during the event. It may also be advantageous if the device allows the user to provide some feedback.

SUMMARY OF THE INVENTION

[00238] One embodiment of the invention includes a pair of glasses that can provide, in an audio manner, information to a user. With the information coming from the glasses, the user does not have to hold onto the glasses to hear them. In other words, the information is provided in a hands-free manner. The information can be pre-recorded. In another embodiment, the information is transmitted to and received by the glasses. This allows the information to be dynamic. The information can be directly relevant to an event attended by the user. There can also be a user input mechanism at the glasses, allowing the user to provide feedback.

[00239] In one embodiment, the pair of glasses has a first and a second lens holders for receiving lenses. Each of the lens holders has a first side and a second side. The pair of glasses has a bridge element that couples the first side of the first lens holder to the second side of the second lens holder. The pair of glasses also includes a first temple and a second temple. The temples can also be known as arms. The first temple is pivotally secured to the second side of the first lens holder through a joint, while the second temple is pivotally secured to the first side of the second lens holder through another joint. The pair of glasses can also include a speaker, which is powered by a power source, and the speaker can be turned on and off.

[00240] In another embodiment, each of the temples has a taper profile that is wider when it is closer to its corresponding joint. Each lens holder can also have a shield at least at one of its edges. In one embodiment, the shields are shaped to generally conform to the profile of the face of the wearer. The surface areas on the

temples or the shields can be used for promotion. For example, advertisements can be located on these areas.

[00241] The pair of glasses can deliver information through a speaker at the glasses to the person wearing the glasses. The information can be related to an event. The event can be organized by a company. In another embodiment, an event can be viewed from the perspective of the person attending it. For example, an event can be buying a product from a store. When the person is at the store, the person is at the event.

[00242] The information available can be entertaining, or for promoting a product or a company. The information can be in different languages depending on the preference of the person. The information can be available for a duration of time. This duration of time can be set by an event. When the event is over, there can be no more information available. The duration can also be set by the power source running the electrical components in the glasses. The power source can be designed not for replacement by the user. So, when the power source is drained, no more information will be available to the user.

[00243] In one embodiment, the speaker at a pair of glasses is part of a radio, and the information is wirelessly received by the radio. In another embodiment, the speaker is part of a player, with the information previously recorded and stored in a storage medium of the player. The previously recorded information can be stored in the glasses, or in a storage device attachable to the glasses.

[00244] In another embodiment, a pair of glasses includes an information input mechanism, which allows a user to provide inputs. The mechanism can be implemented by a switch at the glasses. The glasses can have a transceiver. The user inputs can be wirelessly transmitted to, for example, the company sponsoring the event that the user is attending. The company can use such glasses, for example, to obtain feedback from the audience of the event.

[00245] In one embodiment, the glasses can be given away, such as for promotional purposes. The glasses can also be rented out during an event. Such glasses can be tracked with bar codes or RFID tags.

[00246] In yet another embodiment, the glasses function as a headset, and are wired or wirelessly coupled to a portable device. The portable device can also be carried by the user of the glasses. The portable device can provide more areas for user inputs and outputs.

[00247] The invention can be implemented in numerous ways including, a method, system, device, apparatus, and a computer readable medium. Several embodiments of the invention are discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00248] FIG. 1 shows one embodiment of the invention with a speaker in one of the temples of the glasses.

[00249] Fig. 2 shows a number of attributes regarding a number of applications of the glasses according to different embodiments of the invention.

[00250] FIG. 3 shows some of the electrical components of a player according to an embodiment of the invention.

[00251] Fig. 4 illustrates a number of forces activating a switch according to a number of embodiments of the invention.

[00252] Fig. 5 illustrates a number of mechanical forces activating a switch according to a number of embodiments of the invention.

[00253] FIG. 6 shows a Hall-effect detector at a joint of a pair of glasses according to an embodiment of the invention.

[00254] FIGs. 7A-7C illustrate different embodiments of a quadrature sensor according to the invention.

[00255] Same numerals in Figures 1-7C are assigned to similar elements in all the figures. Embodiments of the invention are discussed below with reference to Figures 1-7C. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

DETAILED DESCRIPTION OF THE INVENTION

[00256] Fig. 1 shows one embodiment of the present invention. It includes a pair of glasses 10 with a first lens holder 12 and a second lens holder 14. Both lens holders are for receiving lenses. The first lens holder 12 has a first side and a second side. The second lens holder 14 also has a first side and a second side. The pair of glasses has a bridge element 16. The bridge element is coupled to the first side of the first lens holder 12 and the second side of the second lens holder 14. In one embodiment, the lens holders and the bridge element are not separate pieces, but are an integral piece.

[00257] The pair of glasses 10 also includes a first temple 16 and a second temple 18. The first temple 16 is pivotally secured to the second side of the first lens holder 12 through a joint 20. And, the second temple 18 is pivotally secured to the first side of the second lens holder 14 through another joint 22. The glasses 10 further include a speaker 24, a power source 26 and a switch 28. The speaker 24 is powered by the power source 26, and the switch 28 is used to turn the speaker 24 on and off. The pair of glasses 10 can deliver information through the speaker 24 to the wearer or user of the glasses 10. In one embodiment, the information is available for a duration of time. With the speaker 24 close to at least one of ears of the wearer of the glasses 10, the information provided to the user can be provided in a relatively private manner.

[00258] In different embodiments, the glasses 10 can be a pair of sunglasses, fit-over glasses, prescription glasses or other types of glasses. In a number of embodiments, the frames of the glasses have more surface area than frames with minimal structure, such as those frames with lenses connected together by wires. For example, the temples of the glasses can have a taper profile. Each of the temples is wider or broader when it is close to its corresponding joint. In one embodiment, the temple is wider or broader by spanning across a wider or broader area longitudinally downward, creating a bigger surface in an orientation generally parallel to the side of the user's head. FIG. 1 shows an example of such an embodiment.

[00259] In another embodiment, there can be a shield at least at one edge of each of the lens holders of the glasses. These shields can wrap around, or better conform to the profile of, the face of the wearer. The shields can be opaque. There can be transparent or translucent windows on these shields. To illustrate, in fit-over sunglasses, when worn over a pair of prescription glasses, such shields can go over or cover at least a portion of the pair of prescription glasses. Note that in one embodiment, a pair of glasses does not have to include lenses.

[00260] In one embodiment, a pair of glasses is for an event. An event can be viewed from the perspective of one or more organizations sponsoring or organizing the event. These events can be, for example, a basketball game, a concert, or a trade show. These events are provided or sponsored by one or more organizations or companies. In a number of embodiments where information is available from a speaker at a pair of glasses and the glasses are for an event, the information made available from the speaker is related to the event. In such embodiments, the

information is available for a limited duration of time and the duration is associated with the event, which can include some time (such as buffer time) before the event and some time after the event. When the event is over, which can include any post-event buffer time, the information will generally not be available.

[00261] In another embodiment, an event can be viewed from the perspective of the person at the event. From the perspective of the person, an event can be buying a product from a store. This can be considered an event from the point of view of the person at the event. Typically, it has a beginning, it has an end, and there is a purpose or a theme. The information is available to the person when the person is at or proximate to a location associated with the event, such as a building. When the person is away from the location, the information will not be available.

[00262] In one embodiment, the duration of an event is not more than a week. In another embodiment, the duration is not more than a day. In yet another embodiment, the duration of an event is not more than a few hours, such as nine hours.

[00263] In one embodiment, there is advertising or promotional materials on a pair of glasses, and the materials are related to an event. The materials can be on the surface area provided by temples, shields or other areas on a pair of glasses. For example, if the event is about dinosaurs in the Jurassic period provided by an organization, there can be a Brachiosaurus printed on the glasses. The organization can use the surface area on the glasses as places for advertisement of not only the event, but also the organization itself. The organization can also sell such surface area to other companies, which can provide promotional materials on the glasses.

[00264] Referring back to FIG. 1, it shows one embodiment of the invention where there is a speaker 24 in one of the temples 18 of the glasses 10.

[00265] In one embodiment, the information is available for a duration of time, which can be short. For example, the power source 26, which can be a battery, does not have enough power to run the speaker 24 in its full capacity for a long duration. To illustrate, the battery 26 only has enough power to run the speaker continuously for a short duration of time, which can be less than a few hours with the speaker 24 at its highest volume possible when it is turned on by the switch 28 in the glasses 10. The battery can be encapsulated in the glasses 10, such as in one of the temples 18 of the glasses 10. The battery can be a coin battery or a AAA battery, or other types of batteries. In this embodiment, the glasses are designed such that the battery is not easily replaceable by the user. The battery can be inside

a temple and the temple can be sealed so that the battery is typically not replaceable without breaking the temple.

[00266] Fig. 2 shows a number of attributes regarding the applications of the glasses, such as the glasses shown in Fig. 1, according to different embodiments of the invention.

[00267] The information provided by the glasses can be driven by an event organized by an organization 50. For example, the user is at a football game in a stadium. The information can be related to a star player, such as his statistics, or other interesting information regarding the team. The information can be for an event related to the event at the stadium. For example, the user is at the Stanford Stadium watching the game between the Stanford and the Berkeley football teams. However, periodic update information or other types of information, such as play-by-play information, from a game at the UCLA Stadium between UCLA and USC can be provided to the user. All four teams are vying for the PAC 10 title. The person at the Stanford Stadium, who might be an UCLA fan, can hear about how the UCLA team is performing, while watching the Stanford/Berkeley game.

[00268] In the embodiments where information is available from the glasses, the information is available hands-free. This allows the user to use both of his hands totally freely, for whatever other purposes, or gestures, the user prefers.

[00269] In the embodiments where information is available, such as through a radio, the information can be available almost instantaneously when the electrical components in the embodiments are activated or turned on. This can be important during high intensity games. If it takes 30 seconds to start the operating system before information is available, such down time may not be available or tolerable during the games.

[00270] The user in an event may not be the audience or the observer of the event. In one embodiment, the user using a pair of glasses in the present invention not only attends the event, the person also helps to produce the event. For example, the event is a game, and the person is a coach of one of the teams playing in the game. Additional embodiments will be described where a pair of glasses is coupled to a handheld device. The glasses provide information to the coach, who can use the handheld device for a number of purposes, such as to track plays or calls.

[00271] In one embodiment, the information available at a pair of glasses can be advertising materials available during the break time of a game. The advertising

materials can, for example, be from a company organizing or sponsoring the event, or from one of the teams in the event.

[00272] As another example, the event is an indoor event, such as an indoor concert.

[00273] The information can be location driven 52, which in one embodiment can be considered as an event attended by a user when the user is at the location. For example, the user is in a store, with many products. The products can be services. As the user moves around the store, he looks at different products. In one approach, each product is designated by a number. By entering the specific number into the glasses or into a portable device coupled to the glasses, such as through a switch, information pertinent to the corresponding product will be available to the user. As another example, the user can be in an exhibit hall, a trade show or in a museum. As the user strolls in the hall, information of different exhibits is available to him. Or, the user can be walking around a botanical garden, and is given a virtual, unguided tour by the glasses of the different type of plants in the garden. When the user moves away from such locations, the information will not be available.

[00274] The user can be at places where he is alone, or he does not know anybody. He might be bored. For example, he can be in a dental office having his teeth cleaned. Or, he can be in a bank waiting for his turn. Different types of information can be available to him. For example, if the bank has a new home loan program, such information is available to him. Again, when the user moves away from such location, the information will not be available.

[00275] The information can be for entertaining 54 the user. Or, the information is primarily promotional 56 in nature. The promotion can be related to the event the user is participating, or the promotion can be related to the location, such as the company the user is physically at.

[00276] The information can be in different languages 58. For example, glasses with a red dot provide information in English, while glasses with a white dot provide information in Spanish. Or, there can be a switch on the glasses that allows setting the language preferred by the user.

[00277] The glasses can be given away 60. They can be sold at a relatively low price 62. Or, the glasses can be for temporarily use, such as the user can borrow, rent or lease 64 it for a short duration of time. To track such rented glasses, each pair of glasses can have an identifier, such as a bar code, which can be

wirelessly tracked. The bar code can be located on the inside of the glasses, such as on the inside of a temple of the glasses. In another embodiment, each pair of glasses can also or alternatively have a RFID tag, which can be wirelessly tracked. The tag can be in a temple, such as in the vicinity of the tip of the temple, or its temple tip. A temple tip is, in general, in a region of the temple substantially furthest away from the hinge of that temple. The organization responsible for renting out the glasses can ask for the user's identity card, which can be the user's driver's license. The card is then tied to the bar code, the RFID tag or other identifier of the glasses. When the user returns the glasses, the user can reclaim the card.

[00278] Referring back to Fig. 1, the embodiment 10 includes a speaker 24 that is at least partially embedded into the glasses. There are different approaches to embed an electrical component, such as a speaker, into different types of glasses. A number of approaches are described, for example, the related patent applications which have been incorporated by reference.

[00279] In one embodiment, the pair of glasses 10 shown in FIG. 1 includes a radio, and the speaker is a part of the radio. All the electronics are at least partially embedded in the glasses. For example, the electronics can be on a printed circuit board, and the board is in one of the temples of the glasses. Information is provided to the user through the radio. The radio can be an AM or a FM receiver. In one embodiment, the receiver is pretuned to the frequencies of the transmitter of the information. Or, before the glasses are distributed, the radio is set to receive signals from a specific frequency band. And the radio does not include an external tuner or switch on the glasses for the user to tune the radio to listen to another frequency band. In another embodiment, the receiver is tunable by a switch on the glasses to one or more frequencies.

[00280] The information can be information captured by a microphone, a wireless mike or other pickup device, and transmitted over radio frequency waves to the radio.

[00281] As to the transmitted frequencies, typically government agencies, such as the FCC in the United States, regulate the availability of frequency ranges, particularly when the power of transmission is not low. In one embodiment, the transmitted frequencies can be on either side of the standard FM radio bands. They can be within the television VHF frequency range of 50 megahertz to 150 megahertz, or 49 to 88 MHz, or 108 to 220 MHz. Selecting such frequencies can have the advantage of having receiver components more readily available and less

expensive. But, the frequencies selected may vary depending on costs, performance and/or FCC or other government agency requirements.

[00282] In another embodiment, the transmitted frequencies are in the CB (Citizen Band) radio band.

[00283] In yet another embodiment, the transmitted frequencies are FM-sidebands. This would allow the use of FM sideband receivers. Using such sidebands typically would require a lease from radio stations.

[00284] In one embodiment, information is transmitted to the glasses through a Wi-Fi network, or a WiMax network.

[00285] Also, the frequencies transmitted could be based on spread spectrum techniques. In other words, though the frequencies are constantly changing, the transmitter and the receiver are in sync. In a number of countries, such embodiments do not require government license.

[00286] Information can typically reside within a few MHz. In one embodiment, the radio in the glasses is a narrow-band receiver, with a bandwidth of 3-6 MHz.

[00287] In yet another embodiment, the radio can receive signals from one of multiple and proximate AM modulated frequencies. For example, in a museum, information from adjacent artwork can be transmitted based on frequencies centered at the different frequencies. The radio receiver is a broader band AM receiver, which can be a receiver non-tunable by the user. Depending on proximity, the radio will adjust automatically to capture the frequency of the carrier for information regarding the particular artwork and excludes cross-talks from information regarding its immediate adjacent artworks. The design of such a radio is known in the art and will not be further discussed.

[00288] Another embodiment considers the power level of the transmitted signals. If the power level of the transmitted signals is low, signals do not travel an excessive distance beyond the transmitter of the signals. For example, the low power level can be between $\frac{1}{4}$ to $\frac{1}{2}$ watts. Or, the low power level is not more than 50 milliwatts. If the transmitted power level is low, it is relatively easier to meet government agencies, such as the FCC's, guideline. Cost and complexity of the circuitry are usually reduced also. High power transmission typically requires special government approval.

[00289] In one embodiment, the transmission path between the transmitter and the receiver is primarily line of sight, and the information can be transmitted via, for example, infrared.

[00290] In yet another embodiment, there can be multiple transmitters. This can then keep transmission power low even if a large or unusually shaped area is to be covered. The corresponding radio will capture its signals from the transmitters based on proximity.

[00291] In one embodiment, the frequency of the radio cannot be tuned at the glasses by the user. The frequencies are fixed upon distribution of the glasses. In another embodiment, the frequencies of interest can be changed. For example, there can be an EPROM in the glasses that can be programmed. Or, one can replace a chip in the glasses to adjust the frequencies. In yet another embodiment, there can be one or more switches at the glasses to change the frequencies.

[00292] A number of embodiments have been described where the glasses include a radio to receive broadcast information. In another embodiment, the information to be received is previously programmed or recorded within a memory device. The glasses include a player to play the information stored in the memory device, and the player includes a speaker. The player is at least partially embedded in the glasses. In one embodiment, the glasses can include the memory device with the recorded information.

[00293] The memory can be on a printed-circuit board and, for example, can store up to 256 MB. The memory can be a built-in or removable flash memory. In one embodiment, the glasses include one or more connectors. The memory embedded in the glasses can be coupled to a device external to the glasses through the one or more connectors. As an example, a 256 MB flash memory is in one of the temples of a pair of glasses, and there is a USB connector at, for example, the end of that temple (close to the ear) to couple to an external device or instrument.

[00294] With the storage medium embedded, the glasses can upload information in the memory to or download information into the memory from an external device, such as a computer. A user can plug the glasses into the computer through a connector, either directly, or indirectly, with, for example, an intermediate wire in between.

[00295] In yet another embodiment, the memory device is external to the glasses. The memory device is coupled to the glasses through a connector at the glasses. If such removable memories are deployed for an event, the memories can be rented out during the event. Again such memories can be tracked based on, for example, identifiers on the memories.

[00296] FIG. 3 shows some of the electrical components for a player 100 in a glasses according to an embodiment of the invention. The player includes a speaker 102, a data bus 104 to facilitate data transfer among, for example, a processor 106, a storage device 108, and a coder/decoder (CODEC) 110. The processor 106, which can be a microprocessor or controller, controls the operation of the player 100. The storage device 108 stores the information, which can be different types of appropriately-formatted media data. In one example, the information is digitally encoded audio signals. The storage device 108 can include a number of separate storage elements. For example, the device can be a flash memory device, or a minidisk device, and a cache, which can improve the access time and reduce power consumption of the storage device 108. The storage device 108 typically also includes a Read-Only Memory (ROM), which stores programs, utilities or processes to be executed in a non-volatile manner. The player 100 can also include a RAM, such as for the cache.

[00297] Once a piece of information is selected to be played, the processor 106 would supply the piece of information to the CODEC 110, which decompresses the data asset and produces analog output signals for the speaker 102. In one embodiment, the bus 104 is also coupled to an input/output device 112, which would allow information to be downloaded from an instrument to the glasses.

[00298] There are different approaches to identify a piece of information to be played. In one embodiment, different pieces of information in the storage device 108 can be categorized, and the categorization can be hierarchical, with multiple levels in the hierarchy. To illustrate, assume that there are three levels. The top level can be the name of the football team; the second level can be the names of the players on the team, and the third level can be scoring statistics or other attributes of the players. The entries, such as the name of the players, can be abbreviated. There can be a control knob or switch to allow the user to scroll down entries in a level. By pushing the knob, the user selects an entry, which can lead the user to the next level. There can be an entry for moving up a level also. In one embodiment, once an entry is selected, the identity of that entry will be announced. For example, a selected entry is about the statistics of Joe Smith. Once that entry is selected, the speaker will state, "Joe Smith statistics." If that is the one the user wants, the user can signal his preference by, for example, pushing a switch.

[00299] In another embodiment, the information can be searched. The search can be based on one or more key words. As an example, the information is related

to songs. A user can search by the name of the song, the name of the artists or music genre. Entry for the search term can be through voice recognition applications in the glasses. Based on the term verbalized by the user, a song will be selected. The glasses can ask the user if that is the song the user has selected. If the response is positive, the song will be played. If not, the glasses will ask the user to verbalize the term again. In another embodiment, entering the search terms is through the key pad of a portable device, wired or wirelessly, coupled to the glasses. Additional descriptions regarding having a portable device linked to a pair of glasses will be further discussed below.

[00300] With the speaker relatively close to at least one ear of the user, the volume of the speaker does not have to be very high. In one embodiment, the volume of the speaker is limited, such as the maximum sound level is not more than 60 dB. If the glasses are powered by a battery, limiting the volume of the speaker would extend the lifetime of the battery. Such a limit can also reduce the chance of the speaker generating audio signals that might disturb people in the vicinity of the user. This, in turn, helps to provide information to the user in a relatively private manner.

[00301] In one embodiment, the glasses are powered by a battery. To extend its lifetime, the glasses include a timer. For example, if the glasses have a radio, after the radio is turned on for a preset amount of time, the timer will turn the radio off automatically. In another embodiment, the glasses include a speaker and the timer would turn the speaker off after the speaker has been turned on for a preset amount of time. The preset time can be determined by the timer.

[00302] In another embodiment, the glasses are powered by other types of sources, such as a solar cell, or a fuel cell. Such other type of sources can be at one of temples of the classes.

[00303] As explained, in a number of embodiments, the glasses include a switch, or a switch is at least partially embedded in the glasses. For example, the switch can be used to turn the speaker on, or to tune the frequency of a radio. If the glasses have two speakers, such as one on each of the temples, there can be two switches, one on each temple to control the corresponding speaker. The two speakers can be for generating stereo audio signals for the user. There can also be one control switch for both speakers.

[00304] The switch in the glasses can have different attributes. It can be activated by different type of forces, including mechanical, radiation, magnetic,

electrical, and temperature. The switch can also be activated remotely by a remote device. The switch can be based on one or more detectors. The switch can have different degrees or ranges of control, such as binary, multiple discrete steps or incremental control. The switch can be placed at different position on the glasses, such as on the side or top surface of a temple or at a joint. The control can take perception into consideration, such as based on texture, height and lateral position of multiple switches.

[00305] Fig. 4 illustrates a number of forces 150 activating the switch according to different embodiments of the invention. They can be based on, for example, mechanical 152, radiation 154, magnetic 156, electrical 158, and temperature 160.

[00306] FIG. 5 illustrates a number of mechanical forces 152 activating the switch according to different embodiments of the invention. The mechanical switch or sensor can be a conductive-elastomer switch 202, a membrane switch 204, a dome switch 206, a relatively simple wire switch 208, and a roller switch 210, such as a switch including a wheel. Another type of mechanical force can be based on stress 210, such as a switch based on piezoelectric force or a piezoelectric device.

[00307] In yet another embodiment, the mechanical switch is made so that the electrical circuitry in the glasses can be activated but not deactivated by the user. In other words, once activated, the switch is designed not to be deactivated by the user, and the circuit will remain on till the power source inside the glasses is depleted. One approach to implement such a switch is based on a piece of insulating material 216 between a terminal of, for example, a battery and its contact with the circuit embedded in the glasses. When the battery is installed, at least one of its terminals is separated from its circuit contact. There can be a thin, flexible, insulating material, 216, such as a ribbon, positioned between the terminal and the contact. Though the circuit is embedded in the glasses, the insulating material 216 extends outwardly from inside the glasses through a hole, such as a small hole, in the side wall of, for example, a temple of the glasses. In one embodiment, the hole or slot is located above or below the terminal and the contact, or the hole is not directly inline with the terminal and the contact. By pulling the insulating material out from the glasses, the terminal will establish electrical connection with the contact, activating the circuit and turning the speaker on.

[00308] In another embodiment of a switch based on mechanical force 154, the mechanical force is the force that is used to insert 218 a battery into the glasses. Once the battery is inserted, the speaker in the glasses will be activated. The

speaker will remain on until the battery is removed, or until the power in the battery is drained.

[00309] The switch can be activated by radiation forces 154, or energies in a type of radiation, according to a number of embodiments of the invention. The radiation 154 can be in the optical, or infrared or ultraviolet range. For example, the switch includes a photodiode or photo sensor in the glasses, and there is an opening above the photodiode. In one embodiment, the diode is activated by light getting to the diode through the opening. In another embodiment, the circuit is activated if the opening is covered, such as by your finger, to prevent light from getting to the diode.

[00310] The switch can be activated by magnetic forces 156. For example, there can be a magnetic sensor or a Hall effect detector inside a temple at a joint of a pair of glasses. FIG. 6 shows a section of a pair of glasses 250 with such a detector 254. The detector 254 is electrically connected to a printed circuit board 255. When the temple 252 is in its extended position, as when the glasses 250 are ready to be worn, the detector 254 will be directly adjacent to a magnet 256 inside a lens holder 258 at the corresponding joint 260. The magnet 256 would activate the Hall effect detector 254. In another embodiment, a magnetic switch is activated based on changing the inductance of a coil. For example, the switch includes a steel rod that can be positioned in or out of a coil. The switch's range of control is based on the position of the rod with respect to the coil.

[00311] The switch can be activated depending on electrical forces 158. In one embodiment, the electrical force depends on capacitive effect. By changing the capacitance, the switch is turned on and off. For example, the capacitance is changed by placing one's finger over a metallic pad. In another example, by changing the amount of overlap between two metallic sheets that are not in contact, the capacitance between the two metallic sheets will change. This then changes the range of control of the switch.

[00312] In another embodiment, the electrical force 158 is based on resistive effect. For example, the switch is made up of a slide or a rotary potentiometer. By changing the amount of coupling, the amount of resistance is changed to reflect the range of control of the switch.

[00313] In one embodiment, the switch's activation can depend on temperature 160. For example, the switch includes a temperature sensor. When the temperature reaches a certain point, the switch is activated.

[00314] In yet another embodiment, the switch is controlled by a remote controller. For example, the glasses include an infrared detector. The remote controller can generate infrared radiation. By aiming the controller at the detector, the infrared radiation can activate the infrared detector and the switch is activated. Or, if the user moves into the vicinity of a corresponding infrared transmitter, circuits in the glasses would be activated.

[00315] The switch can include one or more previously-described sensor or detector of different types of forces. For example, the switch uses two photo sensors. One sensor is exposed to light on the outside surface of the temple and the other is exposed to light on the inside surface of the temple, such as close to the ear. Based on their differential output, the switch is activated. As another example, there are two temperature sensors in the glasses. One is located close to a joint and the other is at the temple close to the ear. Again, the switching action depends on their differential outputs. In yet another embodiment, the glasses include more than one type of switches. There can be one type of switch, such as a mechanical switch, acting as an on/off switch, and another, such as a switch using electrical forces, as an incremental switch to change frequency.

[00316] As described, in a number of embodiments, the switch can provide different degrees or ranges of control. In one embodiment, there are two degrees of control, such as in an on/off switch. In another embodiment, there can be multiple discrete degrees, steps or positions. For example, the switch is a roller with discrete notches to indicate different discrete positions. Or, there can be two mechanical switches, placed side-by-side. Pushing one switch will increment one step, and pushing the other will decrement one step.

[00317] In yet another embodiment, the change from one degree to the next is gradual and not noticeably discrete. This can be achieved with 2 sensors arranged in quadrature. FIGs. 7A-C show examples of different embodiments of such a switch based on 2 photodiodes or photo detectors.

[00318] FIG. 7A shows an embodiment 300 with a wheel 302 having clear strips, 304, 306 and 308, alternating with black strips, 310, 312 and 314, and two photodiodes, 316 and 318. Most of the wheel 302 and the two diodes, after incorporated into the temple 320, are covered by a piece of material 322. The two diodes, 316 and 318, are exposed to ambient light through a clear window, 324. A part of the wheel 302 is extended out of the temple 320, allowing the wheel 302 to be turned about its axis 326. The wheel 302 can have teeth for friction turning. As

the wheel 302 rotates about the axis 326, based on the differential outputs from the diodes, the direction of movement of the wheel 302—clockwise or counterclockwise—is determined. For example, if the wheel is rotated clockwise, the top diode 316 senses light before the bottom 318 senses light. On the other hand, if the wheel 302 is rotated counterclockwise, the bottom diode 318 senses light before the top 316. Based on the signals from the two diodes, one would be able to tell if the wheel is being turned clockwise or counterclockwise. Clockwise can denote increase and counterclockwise can denote decrease. This embodiment can be used, for example, to change frequency. By turning the roller 302 clockwise, the frequency of the radio goes up. And, by turning it counter-clockwise, the frequency goes down. Such a roller is also applicable for other purposes, such as controlling the volume of a speaker.

[00319] FIG. 7B shows an embodiment 350 with a wheel 352 having black 354 and reflecting 356 strips, two photodiodes, 358 and 360, and a LED 362. Again, most of the wheel, the two diodes and the LED are covered by a sheet of material 364. If a reflecting strip 356, instead of a black strip 354, goes over a diode, more light from the LED will be reflected back and received by the diode. If a black strip 354 goes over a diode, output from the diode will be significantly reduced. Again based on the signals from the diodes, the direction of rotation can be determined, which, in turn, can be used to indicate incrementing or decrementing outputs.

[00320] FIG. 7C shows an embodiment 400 again using two photodiodes, 402 and 404, but without a wheel. The two diodes, 402 and 404, are exposed to ambient light unless they are covered. In this embodiment, whether the finger 406 or another object is moving from the first diode 402 to the second diode 404, or from the second diode 404 to the first diode 402 can be determined based on the signals from the diodes. For example, the finger 406 sliding in a forward direction would trigger a signal from the first diode 402 before the second diode 404. On the other hand, sliding the finger in a backward direction would trigger a signal from the second diode before the first diode. Thus, the outputs from the two diodes can show the direction of movement of the finger. One can then, for example, assign forward movement (from the first 402 to the second 404) as increment, and backward movement (from the second 402 to the first 402) as decrement.

[00321] A switch can be placed at different location on a pair of glasses. In one embodiment, the switch is positioned on one of the side surfaces of one of the temples, such as the side that is not facing the face of the user when the glasses are

worn. In another embodiment, the switch is positioned on a top surface of one of the temples. The switch 28 shown in FIG. 1 falls under this category. In yet another embodiment, the switch is positioned at one of the joints or hinges of the glasses. For example, there is a mechanical switch at a joint. If the corresponding temple is extended, as in the position when the glasses are worn, the switch will be pressed, which can indicate that the switch has been activated.

[00322] In one embodiment, the user can be using a switch when the glasses are worn. Depending on the position and the type of switch, the user may not be able to see the switch when he is manipulating it. In one embodiment, the design of the switch takes into consideration perception. To illustrate, there are two mechanical switches on the glasses. The top surfaces of the two switches have different texture. One switch has a smooth surface and the other has a rough surface. Pushing the rough surface implies incrementing one step and pushing the smooth surface implies decrementing one step. This type of perception design is based on tactile effect. In another example, the heights of the two switches are different. The taller switch is for one effect and the shorter is for another. In yet another embodiment, the lateral position of the two switches has significance. For example, the two mechanical switches are on the top surface or edge of a temple. By pushing the switch closer to the lens holder, the volume of the speaker in the glasses goes up; and by pushing the switch further away from the lens holder, the volume of the speaker goes down. In another example, the two switches are under the two ends of a piece of materials, such as a rocker-lever, which can be plastic. Rocking the plastic piece forward is an increment motion, and rocking the plastic piece backwards is a decrement motion.

[00323] A number of embodiments have been described where information is available only for a relatively short duration of time. In one embodiment, the information is available for a longer duration of time. For example, after the short duration of time, the battery in the glasses is drained. In order to continue on running the electronics inside the glasses to get the information, the user can replace the battery in the glasses with a new battery. In this embodiment, the glasses are designed so that the battery is replaceable by the user. Or, in another embodiment, the battery is rechargeable through a connector at the glasses.

[00324] A number of embodiments have been described regarding the glasses with a speaker for providing information to the user. In one embodiment, the glasses also include one or more light emitting diodes. The LEDs can be for entertaining

purposes. For example, the information provided to the user is music. If the audio signals received are beyond a certain threshold, one or more of the LEDs will be activated. The activation of the one or more LEDs can then be synchronized to the sound of the speaker. In another example, a number of LEDs could be arranged as an array on the outside surface of one of the temples. The array could display graphics, pictures, or scrolling text. The array could also be located at other locations on the glasses, such as across the front surface or the top surface of the bridge or the lens-holders of the glasses.

[00325] One embodiment of the glasses includes a specially-designed surface texture, such as on the outside surface of a temple of the glasses. By scratching the surface texture, depending on its design, one can generate specific audio tones.

[00326] A number of embodiments have been described regarding electrical components in a temple of a pair of glasses. All of the electronic components can be self-contained inside the temple of the glasses. The components can be coupled to a printed circuit board. In other embodiments, some of the components are embedded fully or partially in other areas of the glasses, such as the lens holders or the bridge of the glasses. Or, one or more electrical components can be in a shield of the glasses.

[00327] A number of embodiments have been described regarding information available for a pair of glasses. In one embodiment, a pair of glasses also includes an information input mechanism that allows its user to input information into the glasses. Such information allows the user to provide inputs or feedbacks.

[00328] The information input mechanism can be implemented by a switch at the glasses, such as one of the switches previously described. The user input can be stored in the glasses if the glasses include memory storage electrical components. The input can be wirelessly transmitted from the glasses to a remote device if the glasses include wireless transceiver electrical components. For example, the user is at a football game, and the referee has made a controversial call. A broadcaster at the event can instantaneously use such glasses to perform a simple polling. This can be done by the broadcaster as part of the wireless transmission of information (e.g., event information) to the wearer of the glasses. Alternatively, the broadcaster can transmit a message to the user. There can be an indicator on the glasses to indicate that there is a message for the wearer of the glasses. The indicator can be a LED light flashing for a few seconds, a ringing tone that rings for a few seconds, or other types of indication at the glasses. In any case,

if desired, the wearer can receive the message. The message asks the wearer to push a button (an information input mechanism) at the glasses one time, if the wearer believes the call was correct, and two times otherwise. Such input information from the glasses is then wirelessly transmitted from the glasses and received by the broadcaster. Statistics on the responses can then be automatically performed. Such statistics can be provided almost instantaneously to, for example, the referee.

[00329] In one embodiment, each pair of such glasses also includes an identifier that identifies the glasses, such as an identification number. When input information is transmitted from such a pair of glasses, such as back to the broadcaster, its identifier can also be transmitted together with the corresponding input information.

[00330] Organizers of an event or a company affiliated with or related to the event also can use the glasses to gather other information from the wearers of the glasses, such as the audience of the event. For example, the audience can be electronically polled regarding ways to improve on the services they received.

[00331] The information input mechanism can include a microphone at the glasses. The organizers again can send a message to a user of a pair of such glasses. The message can be as follows: "If you like the ways we take food orders, say yes. If not, say no." The voice response from the user is transmitted to the organizers. Such simple yes/no responses can be automatically deciphered based on voice recognition mechanisms and then automatically tabulated for the organizers.

[00332] In one embodiment, not all of the electrical components in a number of the glasses previously described are in the glasses. Instead, at least one of the electrical components, such as its power source, is in a portable device, which can also be carried by the user of the glasses. In another embodiment, a pair of glasses can function as a headset and are wired or wirelessly coupled to a portable device. The portable device can provide additional areas for user input, or outputs to the user.

[00333] As an example of wireless coupling for a pair of glasses functioning as a headset, the glasses include a wireless transceiver that is based on, for example, Bluetooth, UWB, Zigbee, or other types of short-distance wireless transmission standards. Based on the transceiver, the glasses are wirelessly coupled to a

corresponding portable device. Information from long distances can be received by the portable device, which can then re-transmit such information to the glasses.

[00334] As an example of wired coupling for a pair of glasses functioning as a headset, the glasses include a connector. The connector can be used to electrically connect to a portable device through, for example, a wire. In one embodiment, the connector at the glasses is a male connector and is located at the tip of one temple of the glasses, such as at the tip position 19 of the second temple 18, shown in FIG. 1. When the male connector is not inserted into a female connector, the male connector can be covered, such as with a cap or a cover, to protect, encapsulate or shroud the connector. In one embodiment, at least a portion of the connector is covered.

[00335] Different embodiments of glasses functioning as a headset have been described in the related patent application which have been incorporated by reference.

[00336] A number of embodiments have been described regarding glasses with a number of structural elements. In one embodiment, the glasses can be rimless frames. The glasses can include two lenses held together by a bridge. A temple can be attached to each lens through a joint that is connected to the corresponding lens by one or more screws. For example, there can be two screws at each lens to hold onto a temple piece, which includes a joint for a corresponding temple. One or more electrical components can be fully or partially embedded in the glasses, such as in a temple of the glasses.

[00337] The various embodiments, implementations and features of the invention noted above can be combined in various ways or used separately. Those skilled in the art will understand from the description that the invention can be equally applied to or used in other various different settings with respect to various combinations, embodiments, implementations or features provided in the description herein.

[00338] A number of embodiments in the invention can be implemented in software, hardware or a combination of hardware and software. A number of embodiments of the invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices, and carrier

waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[00339] Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the invention may be practiced without these specific details. The description and representation herein are the common meanings used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. In other instances, well-known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

[00340] Also, in this specification, reference to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

[00341] Other embodiments of the invention will be apparent to those skilled in the art from a consideration of this specification or practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

[00342] Other embodiments of the invention will be apparent to those skilled in the art from a consideration of this specification or practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

What is claimed is:

CLAIMS

1. A pair of glasses comprising:
 - a first lens holder for receiving lenses, the first lens holder having a first side and a second side;
 - a second lens holder for receiving lenses, the second lens holder having a first side and a second side;
 - a bridge element coupling the first side of the first lens holder to the second side of the second lens holder;
 - a first temple pivotally secured to the second side of the first lens holder through a first joint;
 - a second temple pivotally secured to the first side of the second lens holder through a second joint;
 - a speaker at least partially embedded in the glasses, with the speaker powered by a power source; and
 - a switch that can turn the speaker on and off,wherein the pair of glasses can deliver information through the speaker to the person wearing the glasses, and
wherein the information delivered is related to an event attended by the person.
2. A pair of glasses as recited in claim 1, wherein the event is organized by a company.
3. A pair of glasses as recited in claim 2, wherein the information is on another event that is related to the event attended by the person, which allows the person to physically attend one event while hearing information regarding the another event.
4. A pair of glasses as recited in claim 2, wherein the person helps to produce the event.
5. A pair of glasses as recited in claim 2, wherein the information is a piece of advertising materials from the company.
6. A pair of glasses as recited in claim 1,
wherein the person is at a location, and

wherein the information delivered is available when the person is at or proximate to the location.

7. A pair of glasses as recited in claim 1, wherein the person is inside a store, which has a plurality of products, and wherein the information delivered is related to the products.
8. A pair of glasses as recited in claim 1, wherein there are promotional materials on the glasses, and wherein the promotional materials are related to the event.
9. A pair of glasses as recited in claim 1, wherein the information can be in a plurality of languages.
10. A pair of glasses as recited in claim 1, wherein the glasses include an identification to track the glasses.
11. A pair of glasses as recited in claim 10, wherein the glasses include a RFID tag for tracking the glasses.
12. A pair of glasses as recited in claim 1, wherein the speaker is part of a radio, which is at least partially embedded in the pair of glasses.
13. A pair of glasses as recited in claim 1, wherein the speaker is part of a player that can play the information stored in a memory device.
14. A pair of glasses as recited in claim 13, wherein the glasses include a connector, which can couple to the memory device that is external to the glasses.
15. A pair of glasses as recited in claim 1, wherein the power source is a battery, wherein the battery is encapsulated in a temple of the glasses, so that the battery is not designed to be replaced without breaking the temple.

16. A pair of glasses as recited in claim 1 further comprising an information input mechanism that allows the person to input information.
17. A pair of glasses as recited in claim 16,
wherein a company related to the event can send a message to the person,
who can use the information input mechanism to respond to the message, and
wherein the message and the response are wirelessly received and
transmitted respectively.
18. A pair of glasses as recited in claim 17 wherein the message is related to a
polling performed by the company.
19. A pair of glasses as recited in claim 17,
wherein the glasses include an identifier that identifies the glasses, and
wherein the identifier is transmitted together with the response.
20. A pair of glasses as recited in claim 1 further comprising a wireless
transceiver to wirelessly couple to a portable device carried by the person.
21. A pair of glasses as recited in claim 1 further comprising a connector to
electrically connect to a portable device carried by the person.
22. A pair of glasses as recited in claim 21
wherein the connector is a male connector,
wherein the connector is located at a tip of the first temple, and
wherein the connector is covered when the connector is not connected to a
female connector.

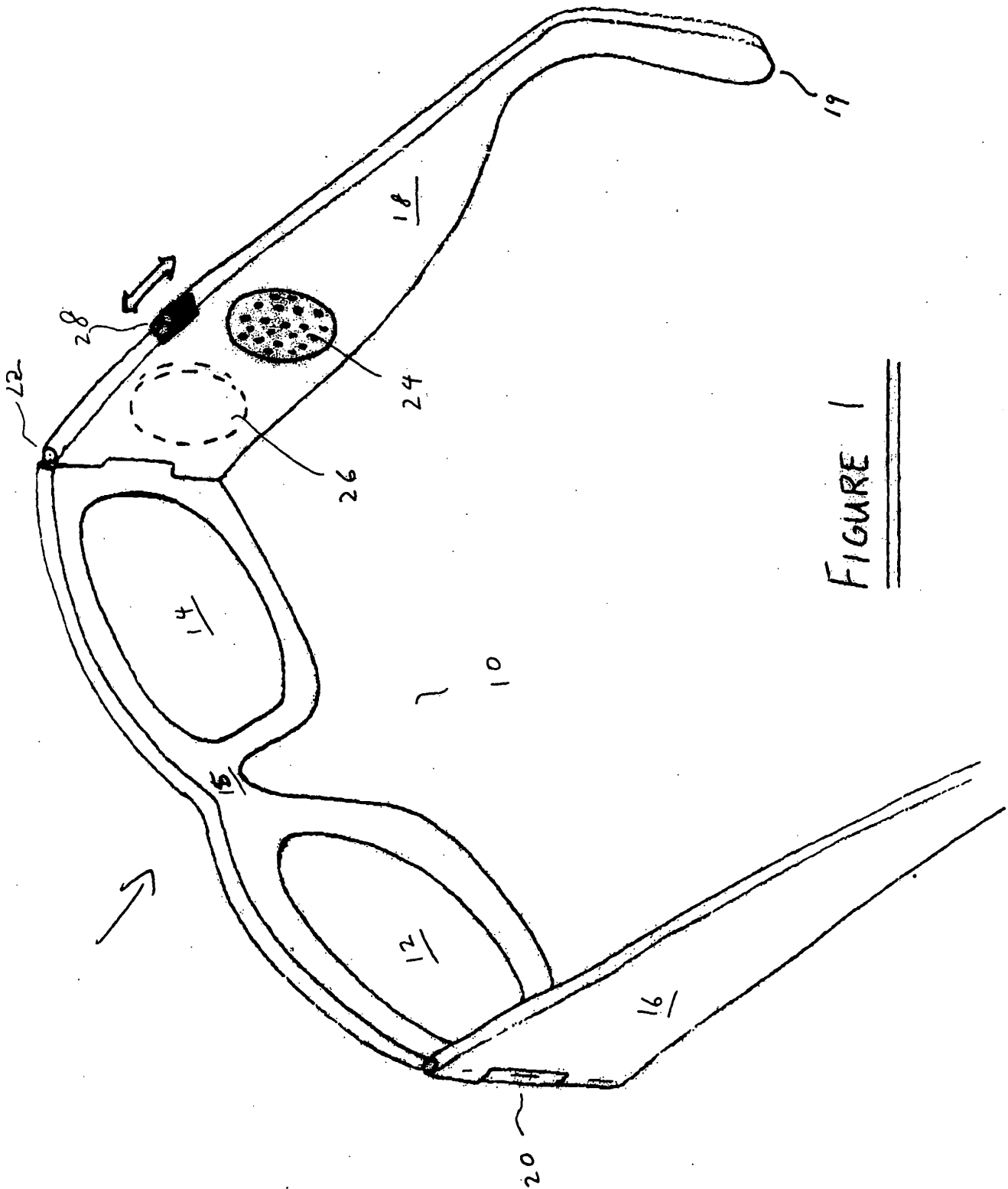


FIGURE 1

Glasses Application Attributes

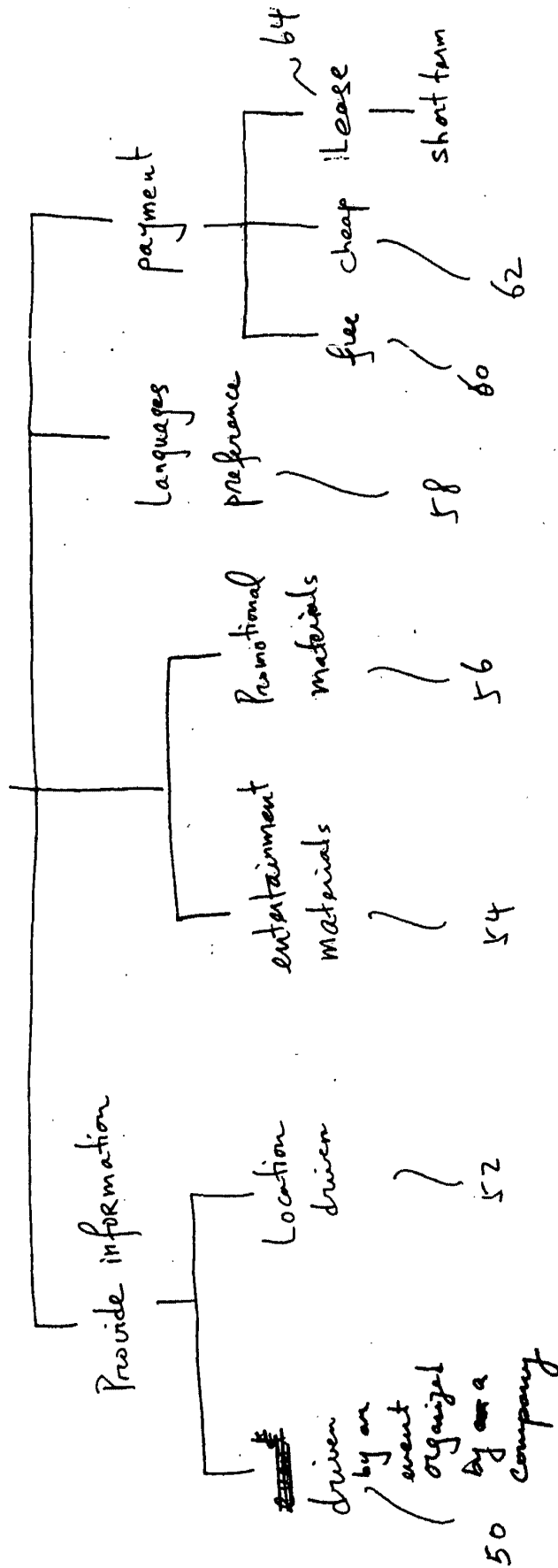


Fig. 2

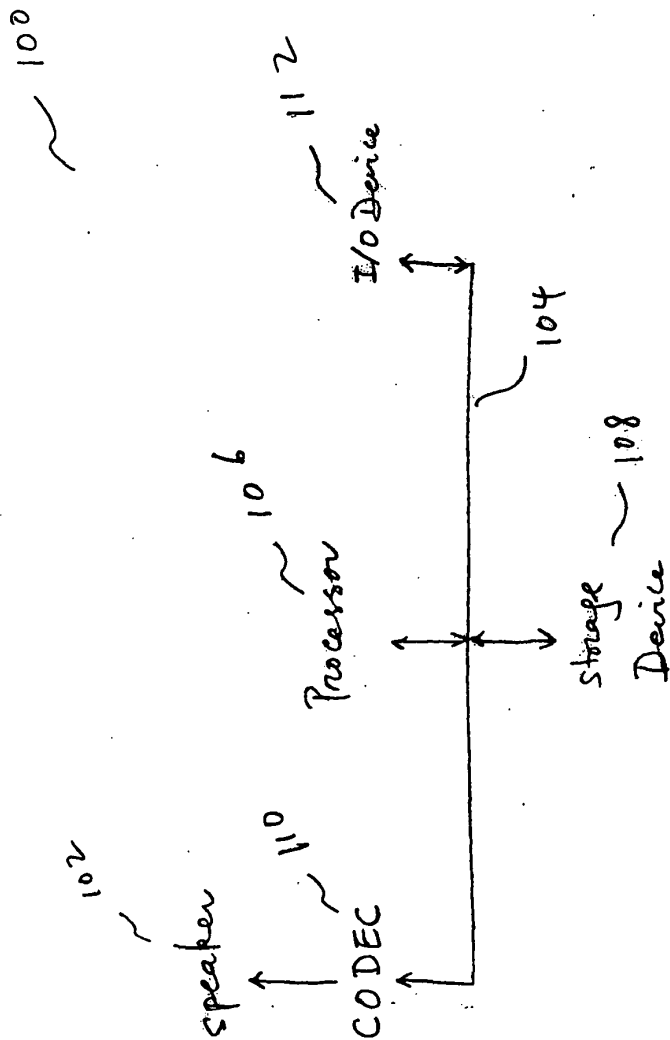


Fig. 3

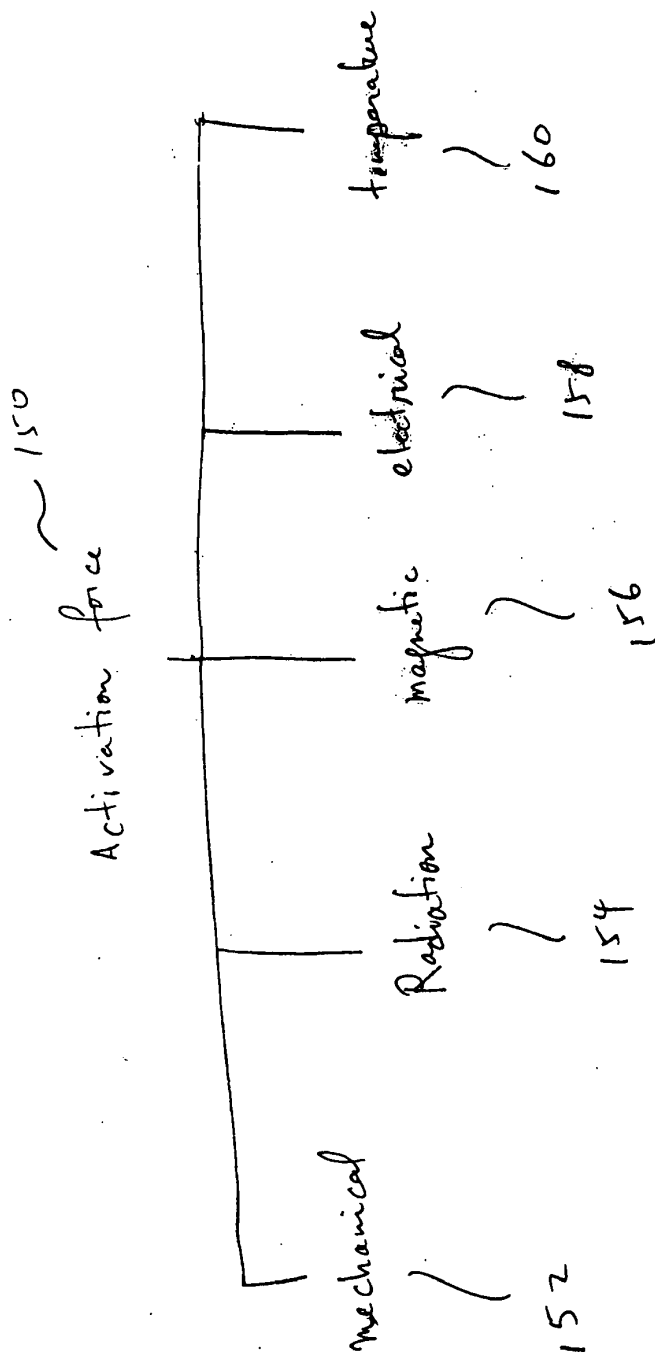


Fig 4

Mechanical Activation force ~ 152

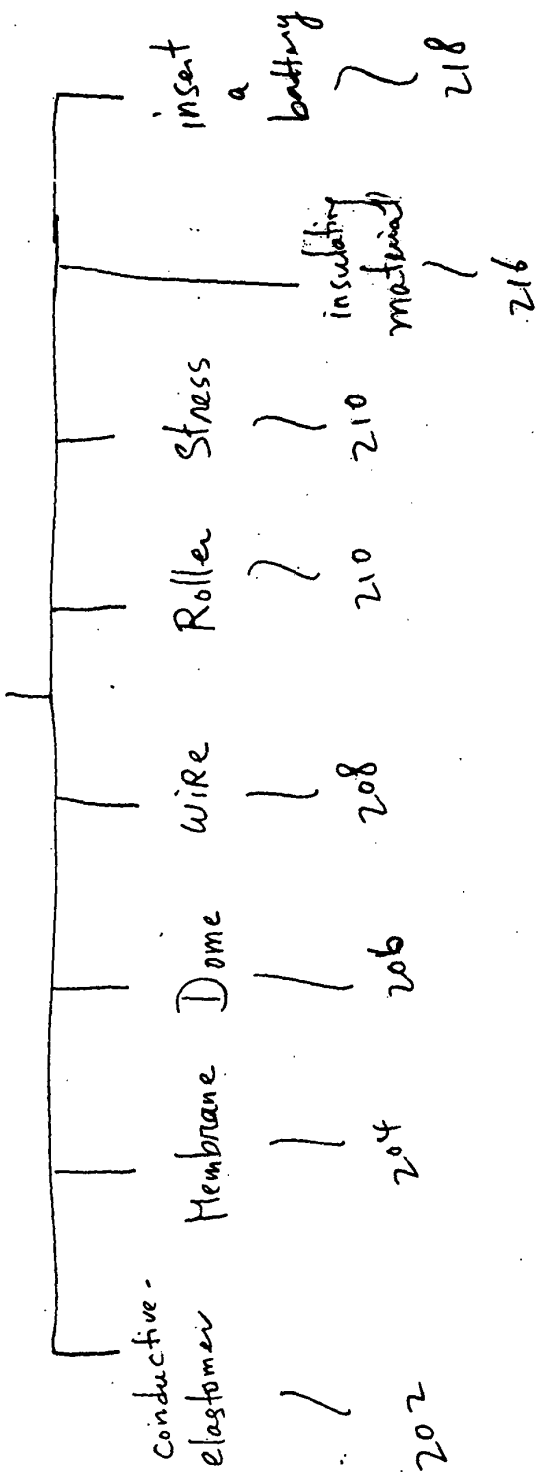


Fig. 5

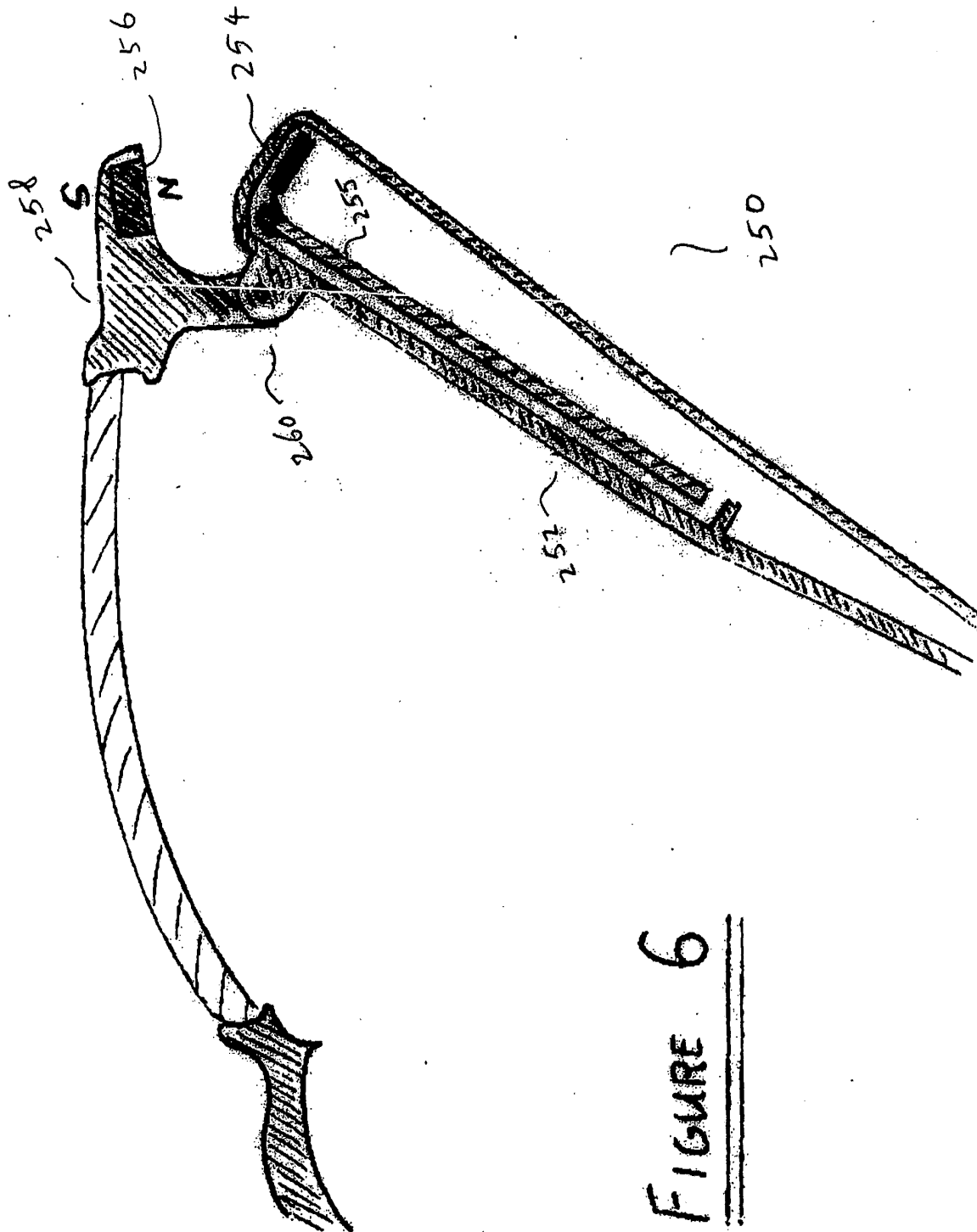


FIGURE 6

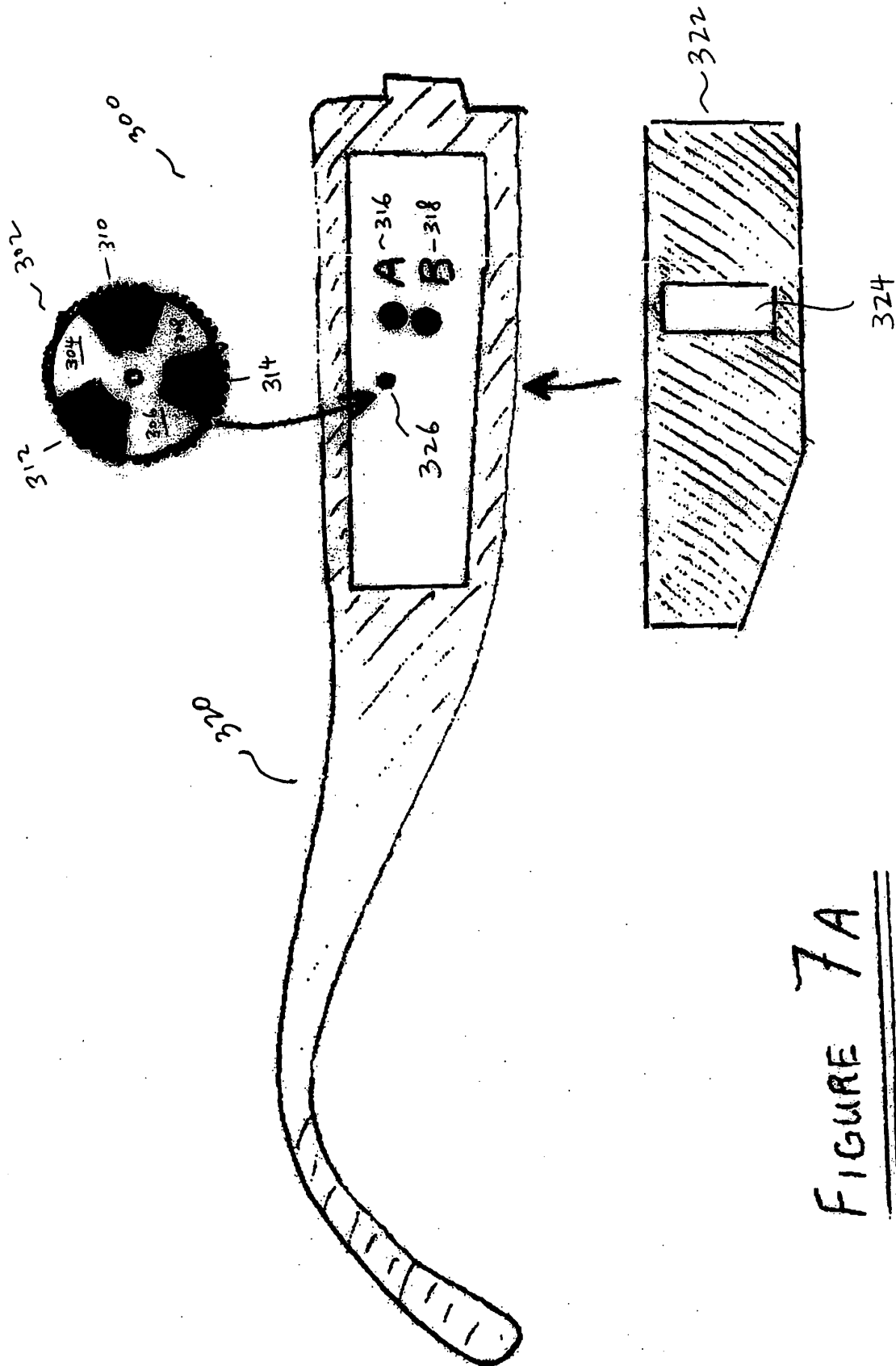


FIGURE 7A

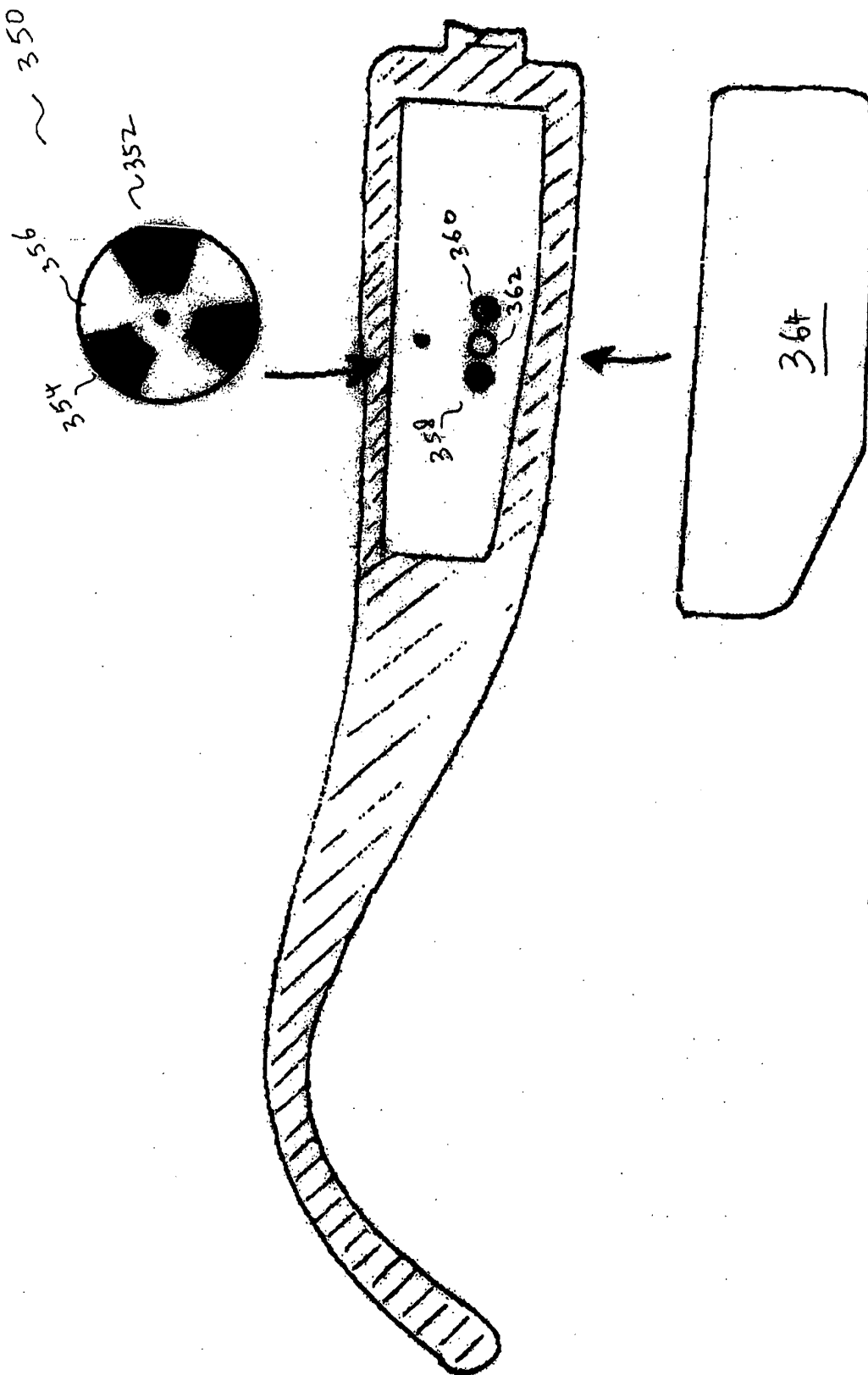


FIGURE 7B

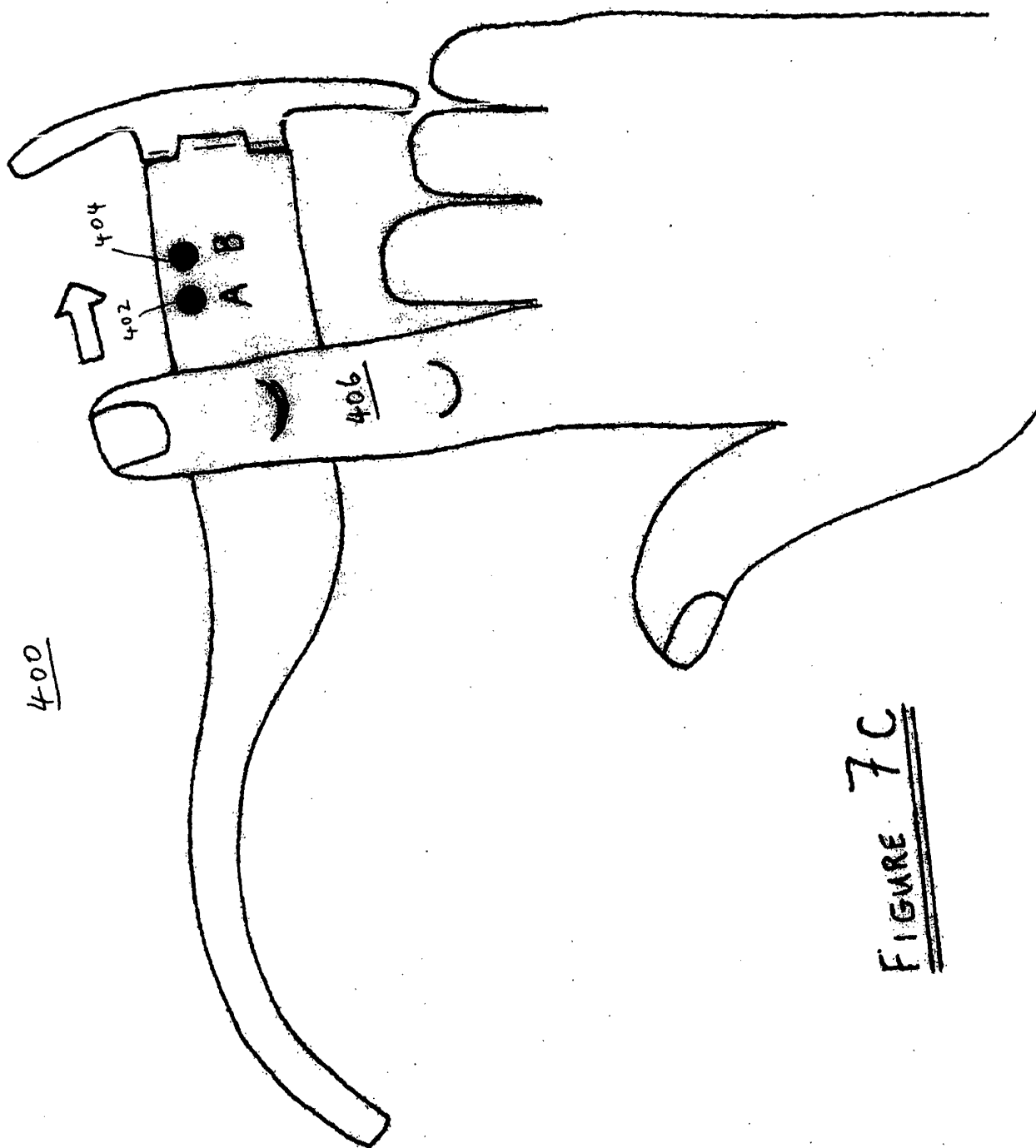


FIGURE 7C

C. EYEWEAR SUPPORTING AFTER-MARKET ELECTRICAL COMPONENTS

FIELD OF THE INVENTION

[00343] The present invention relates to eyeglasses and, more particularly, to electrical components for eyeglasses.

BACKGROUND OF THE INVENTION

[00344] Traditionally, eyeglasses have not contained or made any use of electrical components. In recent years, attempts to include electrical components within eyeglasses have had limited success. Even incorporating a small electrical component, such as a microphone, into an eyeglass frame may not be a simple task because, for example, of the necessary electrical connections with the electrical component. Clearly, larger scale electrical components would be more difficult to be provided in or attached to eyeglass frames. Many eyeglasses frames tend to be very compact and lightweight and thus may not have a lot of space for electrical components. Moreover, since eyeglass frames are often fashionable items whose designs are important, there are substantial design tradeoffs involved with providing or attaching electrical components to eyeglass frames.

[00345] Even if electrical components are provided in an eyeglass frame, the ability to alter or change electrical components is problematic. Conventionally, once an eyeglass frame is manufactured, electrical components embedded in the eyeglass frame may not be removed, nor can additional electrical components be added into the eyeglass frame. Attachment of electrical components to eyeglass frames has not proven to be reliable, design friendly or commercially successful.

[00346] Hence, there is a need for improved approaches to facilitate modifications or alterations to electrical components used with eyeglasses.

SUMMARY OF THE INVENTION

[00347] Generally speaking, the invention pertains to techniques for providing eyewear with electrical components. The electrical components can provide electrical technology to eyewear (e.g., eyeglasses) without having to substantially compromise aesthetic design principles of the eyewear. Often, the electrical components can be attached to the eyewear as an after-market enhancement. The electrical components can operate independently or together with other electrical components provided elsewhere.

[00348] One aspect of the invention relates to temple arrangements for use with eyeglasses. According to this aspect, a temple arrangement includes one or

more electrical components. The one or more electrical components are attached to or at least partially embedded in the temple arrangement.

[00349] Another aspect of the invention relates to a temple adapter for use with eyeglasses. According to this aspect, a temple adapter includes one or more electrical components that are able to be mechanically (and optionally electrically) coupled to a temple (including a temple tip) of the eyeglasses.

[00350] The electrical components can support signal capturing, signal processing, signal transmission, signal display, signal storage and/or power provision. The signals can be, for example, analog or digital signals. The electrical components can, for example, be used to provide audio output and/or audio pick-up. The electrical components may include and/or control one or more sensors to monitor and/or signal the conditions of a user of the eyewear. The electrical components may also include and/or control one or more operation indicators to signal operational status of at least some other electrical components. In addition, the electrical components can be or pertain to a circuit board or module, which includes a plurality of electrical components.

[00351] In one embodiment, the one or more electrical components support audio capabilities allowing a user to hear audio output. In another embodiment, the one or more electrical components support communication capabilities allowing a user to communicate with a communication device in a hands-free manner.

[00352] The invention can be implemented in numerous ways, including a method, system, device, apparatus, and a computer readable medium. Several embodiments of the invention are discussed below.

[00353] Other aspects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[00354] The invention will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

[00355] FIG. 1 is a perspective view of a pair of glasses according to one embodiment of the invention.

[00356] FIG. 2 illustrates a diagram of a number of different embodiments of temple arrangements according to the invention.

- [00357]** FIG. 3A is a diagram of a temple arrangement according to one embodiment of the invention.
- [00358]** FIG. 3B is a diagram of a temple cover that at least partially covers a temple (e.g., temple and/or temple tip) according to one embodiment of the invention.
- [00359]** FIG. 3C is a diagram of a fit-over temple that at least partially fits over a temple (e.g., temple and/or temple tip) according to one embodiment of the invention.
- [00360]** FIG. 3D and 3E are diagrams of a temple arrangement according to another embodiment of the invention.
- [00361]** FIG. 4 shows examples of different electrical components according to the invention.
- [00362]** FIG. 5 is a chart that depicts examples of sensors suitable for use according to the invention.
- [00363]** FIG. 6 illustrates a diagram of a number of different embodiments of temple adapters according to the invention.
- [00364]** FIG. 7A is a diagram of a temple adapter according to one embodiment of the invention.
- [00365]** FIG. 7B is a diagram of a temple adapter according to another embodiment of the invention.
- [00366]** FIGs. 8A and 8B are diagrams of a temple adapter according to another embodiment of the invention.
- [00367]** FIG. 9A is a diagram of a temple adapter according to one embodiment of the invention.
- [00368]** FIGs. 9B and 9C are diagrams of a temple adapter according to another embodiment of the invention.
- [00369]** FIG. 9D is a diagram of a temple adapter according to still another embodiment of the invention.
- [00370]** FIGs. 10A-10C are diagrams of a temple having a bone conducting element according to still other embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[00371] The invention pertains to techniques for providing eyewear with electrical components. The electrical components can provide electrical technology to eyewear (e.g., eyeglasses) without having to substantially compromise aesthetic

design principles of the eyewear. Often, the electrical components can be attached to the eyewear as an after-market enhancement. The electrical components can operate independently or together with other electrical components provided elsewhere.

[00372] One aspect of the invention relates to temple arrangements for use with eyeglasses. According to this aspect, a temple arrangement includes one or more electrical components. The one or more electrical components are attached to or at least partially embedded in the temple arrangement.

[00373] Another aspect of the invention relates to a temple adapter for use with eyeglasses. According to this aspect, a temple adapter includes one or more electrical components that are able to be mechanically (and optionally electrically) coupled to a temple (including a temple tip) of the eyeglasses.

[00374] The electrical components can support signal capturing, signal processing, signal transmission, signal display, signal storage and/or power provision. The signals can be, for example, analog or digital signals. The electrical components can, for example, be used to provide audio output and/or audio pick-up. The electrical components may include and/or control one or more sensors to monitor and/or signal the conditions of a user of the eyewear. The electrical components may also include and/or control one or more operation indicators to signal operational status of at least some other electrical components. In addition, the electrical components can be or pertain to a circuit board or module, which includes a plurality of electrical components.

[00375] In one embodiment, the one or more electrical components support audio capabilities allowing a user to hear audio output. In another embodiment, the one or more electrical components support communication capabilities allowing a user to communicate with a communication device in a hands-free manner.

[00376] Embodiments of different aspects of the invention are discussed below with reference to FIGs. 1 – 10C. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

[00377] FIG. 1 is a perspective view of a pair of glasses 100 according to one embodiment of the invention. The glasses 100 include a frame and a pair of lenses 102. The frame has lens holders 104 that hold the lenses 102 in position. The frame also has a bridge 106. The glasses 100 further include a pair of temples (or

arms) 108. The temples 108 are considered part of the frame. As shown in FIG. 1, each of the temples 108 is coupled to one of the lens holders 104 by a hinge 109. In one embodiment, the temples 108 can be removed from the frame (e.g., at the hinge 109).

[00378] In addition, temple arrangements 110 are attached to the temples 108. Here, one or both of the temples 108 can include a temple arrangement 110. A temple arrangement 110 can include one or more electrical components 112. In one embodiment, the temple arrangements 110 can be considered separate parts that can be attached to respective temples 108. Once attached, the temple arrangements 110 can be considered part of, or an extension to, the temples 108.

[00379] By having one or more electrical components 112 in one or more of the temple arrangements 110, electrical capabilities can be provided to the glasses 100 without burdensome impact to the design of other parts of the frames. Moreover, by providing electrical components in one or more of the temple arrangements 112, electrical capabilities can be added to eyeglasses in an after-market manner. Still further, by replacing temple arrangements, a user could alter the electrical capabilities of his eyeglasses.

[00380] In one embodiment, the glasses 100 do not have any other embedded electrical components, such as within the frame, except those in one or both of the temple arrangements 112. In another embodiment, the glasses 100 include one or more other electrical components embedded or attached to the frame of the glasses 100 and the components are electrically coupled to the one or more electrical components 112 in one or both of the temple arrangements 110.

[00381] In different embodiments, the glasses 100 can be, for example, a pair of sunglasses, fit-over glasses, prescription glasses, reading glasses, or safety glasses.

[00382] FIG. 2 illustrates a diagram of a number of different embodiments of temple arrangements 200 according to the invention. A temple arrangement 200 can be a temple tip, a temple fit-over, or a temple cover. In one embodiment, a temple tip is a structure that attaches to a rearward portion of a temple. In one embodiment, a temple tip can pertain to an enclosure that grabs onto a rearward portion of a temple. A temple tip is particularly common for wire frame eyeglass where the temple tip attaches to the rearward end of the temple and provides a surface suitable for positioning proximate to the user's ear. For example, FIG. 1 illustrates the temple arrangement 112 implemented as a temple tip.

[00383] In one embodiment, a temple tip is removable from its corresponding temple so that it can be replaced. The temple tip can be originally provided with the purchase of a pair of eyeglasses. Alternatively, the temple tip can be a replacement part that can be purchased separately and subsequently mounted onto a rearward portion of a temple of a pair of eyeglasses after removing any original temple tip. In another embodiment, a temple tip is permanently held onto the corresponding temple, for example, by an adhesive (e.g., epoxy, glue, etc.).

[00384] In one embodiment, a temple fit-over fits over at least a portion of the rearward end of a temple. If the rearward end of the temple has a temple tip, at least a portion of the temple tip can be fitted over by the temple fit-over. In one embodiment, a temple cover slides over and at least partially covers a portion of the rearward end of a temple. If the rearward end of the temple has a temple tip, at least a portion of the temple tip can be covered by the temple cover.

[00385] A temple cover is typically made of a material that is more flexible than a temple fit-over. For example, a temple cover can be made of a fabric or other materials, such as a sock or sleeve; while a temple fit-over can be made of plastic.

[00386] A temple arrangement 200 can be made of the same or different materials than the temple or other parts of the frame of the pair of eyeglasses. To illustrate, a pair of glasses with a metal frame can have non-metallic temple tips. A temple arrangement 200 can be of a color that is the same as, or similar to, or different from, that of the temple.

[00387] A temple arrangement 200 can be held onto a temple by frictional force. For example, if the temple arrangement 200 is a temple fit-over, it can be held onto an existing temple or temple tip by frictional force. Here, the temple fit-over is often removable. In another embodiment, the temple arrangement 200 can be permanently held onto its corresponding temple or temple tip. For example, the temple arrangement can be permanently held onto the corresponding temple or temple tip, for example, by an adhesive (e.g., epoxy, glue, etc.).

[00388] Depending on applications, a temple arrangement can be of different shapes. The shape can depend on the type of glasses. For example, a temple arrangement for fit-over glasses can be bigger than a temple arrangement for prescription glasses. The shape of the temple arrangement can also depend on applications for the electronic component(s) that are fully or partially embedded in the temple arrangement. Of course, aesthetic reasons can also influence shape (e.g., design, size, style) of a temple arrangement.

[00389] In one embodiment, the temple arrangement is a structure that has at least one electrical component attached thereto or at least partially embedded therein. In another embodiment, all of the electrical components to be provided with the temple arrangement are at least partially embedded in the temple arrangement.

[00390] FIG. 3A is a diagram of a portion 300 of a pair of eyeglasses according to one embodiment of the invention. The portion 300 includes a temple 302 that is associated with a pair of eyeglasses. Over the end of the temple 302 that is opposite the associated lens holder, a temple tip 304 is provided. The temple tip 304 can, for example, be held to the temple 302 by frictional forces and/or adhesive. The temple tip 304 includes at least one electrical component 306 that is at least partially embedded therein. A wide range of functionalities can be provided by the at least one electrical component 306. The temple tip 304 can be considered separate from or part of the temple 302. For example, when the temple tip 304 is not attached to the temple 302, the temple tip 304 is considered a separate part. As another example, when the temple tip 304 is attached to the temple 302, the temple tip 304 can be considered separate from or part of the temple 302.

[00391] The temple tip 304 can be manufactured and delivered to resellers or retailers and thereafter sold attached to eyeglasses. Alternatively, the temple tip 304 can be separately provided as an optional replacement temple tip for an original temple tip. Hence, after or during purchasing a pair of eyeglasses, upgrade of the eyeglasses can be had by replacing an existing temple tip with a replacement temple tip. The colors and shapes of the temple tip 304 can vary widely. In the after manufacturing environment, the reseller or retailer can be provided with a range of different colors and shapes so that a user can receive a replacement temple tip that reasonably matches the color and shape of the temple or that provides an altered appearance as desired by the user.

[00392] A number of embodiments have been described regarding one or more electrical components at least partially embedded in a pair of glasses. In one embodiment, one or more electrical components are at least partially embedded in a temple tip of a pair of glasses. Temple tips are relatively common for wire or metal frames which have wire or metal temples. The pair of glasses has a first and a second lens holders for receiving lenses. Each of the lens holders has a first side and a second side. The pair of glasses has a bridge element that couples the first side of the first lens holder to the second side of the second lens holder. The pair of glasses also includes a first temple and a second temple. The first temple is

pivotally secured to the second side of the first lens holder through a joint, while the second temple is pivotally secured to the first side of the second lens holder through another joint. A temple typically has two ends, a first end and a second end. The first end can be the end that is pivotally secured to a lens holder through a joint, and the second end can be the other end of the temple. It is not uncommon that a temple includes a main body and an enclosure that grabs onto the main body of the temple. The second end is typically where the enclosure grabs onto the main body. The enclosure can be made of a different material than the main body of the temple. In one embodiment, such an enclosure is a temple tip, and there is an electrical component, partially or fully, embedded in the temple tip. There can also be a connector at the temple tip. In another embodiment, the temple tip can include a female connector. In still another embodiment, as a temple tip grabs onto the main body of the temple, a connector at the temple tip (such as a female connector) can make electrical contact with another connector (such as a male connector) at the main body of the temple. Typically, particularly before a pair of glasses has been extensively worn, the temple tip can be removed and re-inserted back on to the main body of the temple without much difficulty. Such a temple tip can be an after-market component, with different temple tips having different electrical components to serve different functions.

[00393] Besides a temple tip such as illustrated in FIG. 3A, a temple tip can also be effectively modified by a fit-over temple or temple cover.

[00394] FIG. 3B is a diagram of a temple cover 320 that at least partially covers a temple (e.g., temple and/or temple tip) according to one embodiment of the invention. As an example, the temple cover 320 can be made of a fabric or other material, such as a sock or sleeve, that slides over and at least partially covers a temple or a temple tip. The temple cover 320 can include at least one electrical component 322 that is either attached thereto or at least partially embedded therein. The temple cover 320 can also include an opening 324 so as to receive a temple or a temple tip. In one embodiment, the temple cover 320 is placed over a substantial portion of a temple tip, and the opening 324 can extend to a far end 326 so as to receive all or a substantial part of the temple tip. The temple cover 320 can, for example, be held to a temple or a temple tip by frictional forces and/or adhesive.

[00395] FIG. 3C is a diagram of a fit-over temple 340 that at least partially fits over a temple (e.g., temple and/or temple tip) according to one embodiment of the invention. For example, the fit-over temple 340 can at least partially fit-over a temple

tip. The fit-over temple 340 includes at least one electrical component 342 that is either attached thereto or at least partially embedded therein. The fit-over temple 340 can also include an opening 344 so as to receive a temple or a temple tip. The depth and/or width of the opening 344 within the fit-over temple 340 can vary depending on the extent to which it is being fit over a temple or a temple tip. The fit-over temple 340 can, for example, be held to a temple or temple tip by frictional forces and/or adhesive. As an example, the fit-over temple 340 can be plastic or other material. The colors and shapes of the fit-over temple 340 can have a lot of variations.

[00396] A wide range of functionalities can be provided by the at least one electrical component (e.g., electrical component 322 and 342). In the after manufacturing environment, the reseller or retailer can be provided with a range of different colors and shapes so that a user can receive a replacement temple cover or fit-over temple that reasonably matches the color and shape of the temple or that provides an altered appearance as desired by the user.

[00397] FIG. 3D and 3E are diagrams of a temple arrangement 360 according to another embodiment of the invention. FIG. 3D is a side view of the temple arrangement 360, and FIG. 3E is a front view of the temple arrangement 360. In this embodiment, the temple arrangement 360 is a temple tip that can be attached to a temple (e.g., temple body) of a pair of eyeglasses. The temple arrangement 360 includes a speaker housing 362 allowing a speaker 364 to be at least partially embedded within the temple arrangement 360. An audio sound output by the speaker 364 is coupled to an ear plug 366 by way of the speaker housing 362 and a tube 368. Typically, the tube 368 is a flexible tube, such as a flexible plastic tube. A user of the eyeglasses having the temple arrangement 360 can place the ear plug 366 within her ear to facilitate coupling of the audio sound from the speaker 364 to the ear. The tube 368 can have a disconnection region 370 whereby at least a section of the tube 368 and the attached ear plug 366 can be removed from the temple arrangement 360, such as when audio output is not being listened to. The tube 368 and/or the speaker housing 362 can also be capable of rotating with respect to the temple arrangement 360 to facilitate ease of use. Still further, the temple arrangement 360 can include a connector 372, such as a male audio connector (e.g., 2.5 mm, stereo mini-phone connector). The connector 372 provides a means to electrically connect an external audio source to the speaker 364 within the temple arrangement 360. For example, at least one wire (not shown) that is

internal to the temple arrangement 360 can be used to electrically connect the speaker 364 to the connector 372.

[00398] In one embodiment, an electrical component is a component of an electrical circuit or system, and the electrical circuit or system is for performing at least a desired, intended or predetermined function.

[00399] In one embodiment, a temple tip, fit-over temple or temple cover according to the invention can further include a connector or cable to facilitate electrical connection with the at least one electrical component that is either attached to a temple or a temple tip or at least partially embedded therein.

[00400] FIG. 4 shows examples of different electrical components according to the present invention. Different embodiments of temple arrangements or temple adapters according to the invention can use one or more of these different electrical components.

[00401] In one embodiment, the electrical component is an electrical connector. The connector can be a male connector located at a temple tip. In another embodiment, the connector can be a female connector at a temple tip. For example, as a temple tip grabs onto the main body of its corresponding temple, a female connector at the temple tip can make electrical contact with a male connector at the temple. Examples of different types of connectors have previously been described in the related patent applications, which have been incorporated by reference.

[00402] In one embodiment, the embedded electrical component is an electrical switch, such as one or more of those previously described in the related patent applications, which have been incorporated by reference.

[00403] In one embodiment, one electrical component can be a power source. The power source can be a battery, a solar cell or other type of power source.

[00404] In one embodiment, one electrical component can include a circuit board. The circuit board can be a rigid or a flexible circuit board.

[00405] In one embodiment, one electrical component can be an indicator. The indicator can be audio, visual, or physical (e.g., vibration). For example, the indicator can signal an event or condition to a user of the glasses.

[00406] In one embodiment, one electrical component can be a display, such as a LCD display.

[00407] In one embodiment, one electrical component can be a speaker. The speaker can provide an audio output for the benefit of the wearer of the glasses.

The speaker can directly transmit sound to a user, such as a speaker mounted on an exterior surface of an eyeglass frame, or partially or fully embedded in an eyeglass frame, or a bone conducting type of speaker. Alternatively, the speaker can indirectly transmit sound to a user, such as through the use of a tube to deliver audio output proximate to a user's ear.

[00408] In one embodiment, one electrical component can be a controller. The controller can, for example, be a microprocessor.

[00409] In one embodiment, one electrical component can be a memory device. The memory device can be non-volatile memory, such as FLASH memory. The data stored in the memory device can be user data or data provided by other electrical components.

[00410] In one embodiment, one electrical component is a frequency receiver or a frequency transmitter. They can be in the radio frequency range.

[00411] In one embodiment, one electrical component can be a sensor. The sensor can be a temperature sensor. The temperature sensor can be used to sense the temperature of the wearer. In one embodiment, such a temperature sensor is in a temple tip. In measuring the temperature, the user can further press the temple tip towards his head to ensure better connection. One can also put the temple under one's tongue to measure body temperature.

[00412] In other different embodiments, one electrical component can be a motion detector, a speed sensor, a rate of ascent (or descent) detector, a pressure detector, or a detector for radiation, such as an ultraviolet (UV) detector.

[00413] In one embodiment, one electrical component is a radio frequency identification (RFID) tag. A RFID tag typically includes a memory chip and a radio antenna. The memory chip usually has a small storage capacity and thus does not include a large amount of information. A portion of such information can provide identifying information for the glasses. The memory chip may only have a few kilobytes, sufficient to encode information, such as a serial number, where and when the product (such as eyeglasses) was manufactured, and other relevant information.

[00414] The RFID tags can come in a number of configurations. For example, an active tag uses a battery-powered transponder to constantly emit signals which can carry information programmed into the memory chip. Active tags are more applicable to situations where readers are not close to the tags. A semi-passive tag likewise has a battery, but may not be activated until it receives a signal from a reader. They are more applicable to situations that do not need continuous

connection and accessing. A passive tag has no battery; its antenna extracts power from a reader's radio wave signal to transmit the identifying information. Passive tags are typically relatively inexpensive, but may have to be within a few feet of a reader to extract power. The electrical component can be a passive RFID tag, or some other type of tag.

[00415] In one embodiment, one electrical component can be for locating the corresponding glasses. For example, the electrical component can produce a beeping tone when it receives a specific radio signal. A handheld device (such as a key chain accessory, can generate the specific radio signal (e.g., when a button is pushed). Through the beeping tone, one can locate the glasses.

[00416] As noted above, in one embodiment, the electrical component can be a sensor. More generally, a pair of glasses can include one or more sensors that can be used individually or in combination. FIG. 5 is a chart 500 that depicts examples of sensors suitable for use in or attached to the glasses.

[00417] In one embodiment, the sensor is a "being worn" sensor. The "being worn" sensor indicates whether the glasses are being worn by its user. The "being worn" operation can be performed using, for example, a thermal sensor, a motion detector, a stress sensor or a switch.

[00418] In one embodiment, a motion detector is used as a "being worn" sensor. A threshold can be set, such that if the amount of motion exceeds the threshold, the glasses are assumed to be worn. The motion detector can, for example, be achieved by a mechanical mechanism or an accelerometer.

[00419] In another embodiment, the "being worn" sensor includes two thermal sensors. One sensor can be at approximately the middle of a temple, such as in a region that touches the head of the user wearing the glasses. The other sensor can be at one end of the temple, the end that is close to its hinge. If the temperature differential between the two sensors is beyond a certain preset value, the glasses would be assumed to be worn. The differential is presumed to be caused by a person wearing the pair of glasses.

[00420] In yet another embodiment, the "being worn" sensor includes a stress sensor at the hinge of the temple. The assumption is that when the eyewear is worn, the hinge is typically slightly stretched because typically, the width of the head of the user is slightly wider than the width between the temples when the two temples are in the extended positions. If the value of the stress sensor is beyond a certain preset value, the glasses would be assumed to be worn.

[00421] In a further embodiment, the “being worn” sensor can be a switch. For example, at the hinge between a temple and its corresponding lens holder, there is a switch. When that temple is in its extended position, i.e., fully extended outwards, the switch is turned on. The switch can be a pin-type switch. When the temple is fully extended outwards, the pin is pressed. When both temples are fully extended outwards, in one embodiment, the glasses would be assumed to be worn by the user.

[00422] In one embodiment, another type of sensor is an environmental sensor. The environmental sensor can sense environmental conditions, such as one or more of radiation (e.g., ultraviolet radiation or light), temperature (e.g., ambient temperature), pressure, humidity and toxins (e.g., chemicals, etc.).

[00423] In another embodiment, another type of sensor is a condition sensor. The condition sensor can sense the conditions of the user of the glasses. Examples of condition sensors include sensing one or more of distance traveled, location, speed, calories consumed, temperature and vital signs associated with the user of the glasses. The distance traveled could represent the horizontal distance traveled or the vertical distance (i.e., elevation) traveled. The speed can be the rate of movement along the horizontal distance traveled and/or the vertical distance. In yet another embodiment, the condition sensor can indirectly sense emotional conditions of the user of the glasses.

[00424] The sensors can be provided in a redundant or fault-tolerant manner. For example, sensors can come in pairs in the glasses. When one malfunctions, the other one will take over its operation. In another embodiment, the sensor information can be processed in a differential manner to examine changes to the sensor information. The differential can be based on time. The sensors can be powered by a battery, solar energy, or kinetic energy. For reduced power consumption, the sensors can remain in a low-power state unless data is being acquired by the sensors. In yet another embodiment, two or more of the sensors can communicate with one another (wired or wirelessly) to exchange data or control information.

[00425] FIG. 6 illustrates a diagram of a number of different embodiments of temple adapters 600 according to the invention. The temple adapters 600 serve to adapt a temple (i.e., a temple body or temple tip) of a pair of eyeglasses to provide for at least one electrical component. In one embodiment, a temple adapter can clip onto a temple body or a temple tip. In another embodiment, a temple adapter can

mount to a post provided on a temple body or a temple tip. In still another embodiment, a temple adapter can mount to a hole provided in a temple body or a temple tip. In yet another embodiment, a temple adapter can be bonded (or adhered) to a temple body or a temple tip.

[00426] The temple adapter is particularly well suited to adapt a pair of eyeglasses with communication components, such as a speaker and/or a microphone. As an example, a standard pair of eyeglasses can be transformed into an operational headset by attaching a temple adapter to a temple body or temple tip of the pair of eyeglasses, wherein the temple adapter includes at least one speaker and at least one microphone.

[00427] The temple adapter can be rigid or malleable. The benefit of being malleable is that the particular geometric arrangement/assembly of the temple adapter can be altered by its user for better user comfort or operation.

[00428] In one embodiment, the temple adapter is a structure that has at least one electrical component attached thereto or at least partially embedded therein. In another embodiment, all of the electrical components to be provided with the temple adapter are at least partially embedded in the temple adapter.

[00429] FIG. 7A is a diagram of a temple adapter 700 according to one embodiment of the invention. The temple adapter 700 attaches to a temple 702 (including any temple tip using a clip 704. The clip 704 can use force, such as an interference fit force or spring-induced force, to attach the temple adapter 700 to the temple 702. Besides the clip 704, the temple adapter 700 includes an angled arm 706 and an ear bud 708. The angled arm 706 can be malleable. When a pair of eyeglasses associated with the temple 702 is being worn by a user, the ear bud 708 can be placed in or near the user's ear canal. The ear bud 708 contains a speaker and receives electrical signals via a wire, such wire can be provided internal or external to the temple adapter 700 and can originate at the temple 702 or external to the temple 702.

[00430] FIG. 7B is a diagram of a temple adapter 720 according to another embodiment of the invention. The temple adapter 720 attaches to a temple 722 (including any temple tip) using a clip 724. The clip 724 can use force, such as an interference fit force or spring-induced force, to hold the temple adapter 720 to the temple 722. Besides the clip 724, the temple adapter 720 includes an angled arm 726, an ear bud 728, a microphone 730, an extension arm 732 and a cord 734. In this embodiment, the cord 734 includes a wire that connects to the speaker within

the ear bud 728 and another wire that connects to the microphone 730. There can be one or more conductors inside a given wire. For example, a wire might have one conductor serving as a signal line and another conductor serving as ground. Such wires can be provided internal to the extension arm 732 and the angled arm 726. The arm 732 can serve to guide the cord 734 away from the user's ear or rearward. The angled arm 726 can be malleable. The placement or position of the microphone 730 can vary with implementation. As shown in FIG. 7B, the microphone 730 is directed forward to a user's front when a pair of eyeglasses associated with the temple 722 are being worn. Alternatively, the microphone 730 could be directed outward away from the user's head when the pair of eyeglasses are being worn. When a pair of eyeglasses associated with the temple 722 is being worn by a user, the ear bud 728 can be placed in or near the user's ear canal. The ear bud 728 contains a speaker and receives electrical signals via a wire of the cord 734. The cord 734 can have another end (not shown) with a connector for coupling with an audio output device (e.g., radio, MP3 player) or a communication device (e.g., mobile phone).

[00431] FIGs. 8A and 8B are diagrams of a temple adapter 800 according to another embodiment of the invention. FIG. 8A is a side view of the temple adapter 800, and FIG. 8B is a front view of the temple adapter 800. The temple adapter 800 has a support body 802 which has a support arm 803. An ear bud 804 is attached to an end of the support arm 803. A connector 806, such as a male audio connector, is attached to one end of the support body 802. A microphone 808 can be optionally provided and attached to the support body 802 or the support arm 803. Additionally, an elastic member 810 can be provided to facilitate attachment of the support body 802 to a temple 812 of a pair of eyeglasses. The temple 812 can have a tip region 814, which can be referred to as a temple tip. When the temple adapter 800 is attached to the tip region 814 of the temple 812, the tip region 814 is placed in or through an opening 816 in the elastic member 810, as shown, for example, in FIG. 8B. The temple adapter 800 is thereby held in place relative to the tip region 814. Additionally, although not shown, the support body 802 would carry a first internal wire from the connector 806 to the microphone 808, and the support body 802 and the support arm 803 would carry a second internal wire from the connector 806 to the ear bud 804.

[00432] FIG. 9A is a diagram of a temple adapter 900 according to another embodiment of the invention. In FIG. 9A, a side-view of the temple adapter 900 is

depicted. The temple adapter 900 attaches to a temple 902 of a pair of eyeglasses. The temple 902 can have a tip region 904, which can be referred to as a temple tip. The temple adapter 900 has a support member 906. A first end 908 of the support member 906 couples to the temple 902 of a pair of eyeglasses. In one embodiment, the first end 908 serves to attach the temple adapter 900 to the temple 902. For example, the first end 908 can provide a clip, clamp, post, or hole to provide or assist with the attachment. As another example, the first end 908 can alternatively or additionally use an adhesive, bonding or fastener (e.g., hook and loop system, e.g., Velcro) to provide or assist with the attachment. A second end 910 of the support member 906 provides an opening through which an arm 912 extends. One end of the arm 912 has an ear bud 914 attached thereto. The arm 912 can be angled and/or malleable. When a pair of eyeglasses associated with the temple 902 is being worn by a user, the ear bud 914 can be placed in or near the user's ear canal. The ear bud 914 contains a speaker and receives electrical signals via a wire, such wire can be provided internal or external to the temple adapter 900 and can originate at the temple 902 or external to the temple 902.

[00433] FIGs. 9B and 9C are diagrams of a temple adapter 920 according to still another embodiment of the invention. FIG. 9B is a side view of the temple adapter 920, and FIG. 9C is a front view of the temple adapter 920. The temple adapter 920 attaches to a temple 922 of a pair of eyeglasses. The temple 922 can have a tip region 924, which can be referred to as a temple tip. The temple adapter 920 has a support member 926. A first end 928 of the support member 926 couples to the temple 922 of a pair of eyeglasses. In one embodiment, the first end 928 serves to attach the temple adapter 920 to the temple 922. For example, the first end 928 can provide a clip, clamp, post, or hole to provide or assist with the attachment. As another example, the first end 928 can alternatively or additionally use an adhesive, bonding or fastener (e.g., hook and loop system, e.g., Velcro) to provide or assist with the attachment. The first end 928 also has a bracket 930 having a connector 932 at one end, and an elastic member 934 for coupling about the tip region 924. The connector 932, such as a male audio connector, is attached to one end of the bracket 930. A microphone 936 can be optionally provided and, for example, attached to the support body 926.

[00434] A second end 938 of the support member 926 provides an opening through which an arm 940 extends. One end of the arm 940 has an ear bud 942 attached thereto. The arm 940 can be angled and/or malleable. The arm 940 is

also re-positionable within the opening at the second end 938 so as to permit user adjustment. When a pair of eyeglasses associated with the temple 922 is being worn by a user, the ear bud 942 can be placed in or near the user's ear canal. The ear bud 942 contains a speaker and receives electrical signals via a wire, such wire can be provided internal or external to the temple adapter 920 and can originate at the temple 902 or external to the temple 902. In this embodiment, a wire 944 is shown as passing through the arm 940 to provide signals to the speaker within the ear bud 942. More particularly, in one embodiment, although not shown in FIGs. 9B and 9C, a first wire would connect the speaker within the ear bud 942 to the connector 932 (e.g., wire 944), and a second wire would connect the microphone 936 to the connector 932. Such wires can be internal or external, or partially internal and partially external, to the temple adapter 920.

[00435] FIG. 9D is a diagram of a temple adapter 960 according to still another embodiment of the invention. In FIG. 9D, a side-view of the temple adapter 960 is depicted. The temple adapter 960 attaches to a temple 962 of a pair of eyeglasses. The temple 962 can have a tip region 964, which can be referred to as a temple tip. The temple adapter 960 has a support member 966. A first end 968 of the support member 966 couples to the temple 962 of a pair of eyeglasses. In one embodiment, the first end 968 serves to attach the temple adapter 960 to the temple 962. For example, the first end 968 can provide a clip, clamp, post, or hole to provide or assist with the attachment. As another example, the first end 968 can alternatively or additionally use an adhesive, bonding or fastener (e.g., hook and loop system, e.g., Velcro) to provide or assist with the attachment. A second end 970 of the support member 966 provides an opening through which an arm 972 extends. One end of the arm 972 has an ear bud 974 attached thereto. The arm 972 can be angled and/or malleable. When a pair of eyeglasses associated with the temple 962 is being worn by a user, the ear bud 974 can be placed in or near the user's ear canal. The ear bud 974 contains a speaker and receives electrical signals via a wire, such wire can be provided internal or external to the temple adapter 960 and can originate at the temple 962 or external to the temple 962. Further, the temple adapter 960 can include a microphone 976. In this embodiment, the microphone 976 is attached to the support member 966. In addition, an arm 978 is used to support an end of a cable 980 that is coupled to the arm 978. The cable 980 can include at least one wire for the microphone 976 and one wire for the speaker within the ear bud 974.

[00436] To the extent that any of the embodiments of the temple adapters discussed above use a microphone, a tube can be optionally attached to the microphone to facilitate voice pick-up of the user. One end of the tube can be placed over the microphone, and the other end of the tube is then positioned closer to the user's mouth than is the microphone. With a temple adapter on both temples, each providing a microphone and speaker to a pair of eyeglasses, only one temple adapter would typically make use of such a tube. Alternatively, the tube and the microphone could be replaced by a boom microphone.

[00437] FIG. 10A-10C are diagrams of a temple having a bone conducting element according to still other embodiments of the invention. The bone conducting elements can replace a traditional speaker to provide audio output to a user. Although not shown, electrical signals would be internally or externally supplied to the bone conducting element.

[00438] FIG. 10A illustrates a temple 1000 for a pair of eyeglasses. The temple 1000 includes a bone conducting element 1002 that can provide audio sound to a user by coupling vibrations to at least one bone of the user's face. The bone conducting element 1002 is held relative to the temple 1000 by an arm 1004. Hence, in this embodiment, the temple 1000, the arm 1004 and the bone conducting element 1002 can all be integrally formed.

[00439] FIG. 10B illustrates a temple 1020 for a pair of eyeglasses. The temple 1020 includes a bone conducting element 1022 that can provide audio sound to a user by coupling vibrations to at least one bone of the user's face. The bone conducting element 1022 is held relative to the temple 1020 by a support 1024 that removably attaches to the temple 1020.

[00440] FIG. 10C illustrates a temple 1040 for a pair of eyeglasses. The temple 1040 includes a bone conducting element 1042 that can provide audio sound to a user by coupling vibrations to at least one bone of the user's head. In this embodiment, the bone conducting element 1042 is positioned in the vicinity of the user's ear, such as behind the user's ear. The placement of the bone conducting element 1042 in this embodiment can reduce impact to the design of the eyeglasses.

[00441] In one embodiment, the electrical components associated with a temple arrangement or a temple adapter is for enhancing the hearing of the person wearing the corresponding pair of glasses. There can be at least a microphone and a speaker in a temple arrangement or a temple adapter. The microphone can be

close to an ear of the user when the glasses are worn by the user, and can be a directional microphone. The microphones can be a microphone in a temple adapter, such as the microphone 730 in FIG. 7B, 808 in FIG. 8A, 936 in FIG. 9B, or 976 in FIG. 9D. The microphones can be in a temple arrangement. The microphone in a temple arrangement can be attached to a temple tip, a temple fit-over or a temple cover. The microphones can be positioned to be in front of the user's ears so that the microphones will not be affected by the shadowing effect of the ears. The speaker can be inserted into the ear, as in some of the speakers previously described.

[00442] In another embodiment, there are two sets of microphones and speakers, such as in two temple arrangements or temple adapters. In the vicinity of each ear, there is a temple arrangement or temple adapter with its corresponding microphone and speaker. The microphones again can be directional, one pointing generally outwards in a position close to the left ear, and one pointing generally outwards in a position close to the right ear. Alternatively, the microphones can point forward.

[00443] The microphone and the speaker close to an ear do not have to be in very close proximity to each other, as in many hearing aids existing nowadays. They can be spaced apart by, such as, one to several inches, with the microphone being directional and pointing to the front and to either the left or the right of the user, and with the speaker pointing toward or inserted into the corresponding ear of the user. Such a distance apart can significantly reduce feedback effect of existing hearing aids. Another advantage of such a hearing enhancement device is that users may not need to be fitted into ears with ear molds. In any case, additional details on hearing enhancement are further described in the related applications that have been incorporated herein by reference, such as U.S. Provisional Patent Application No. 60/620,238, filed October 18, 2004, and entitled "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES."

[00444] The various embodiments of the invention noted above, whether temple arrangement or temple adapter, can have a cable or cord attached or attachable thereto. The cable or cord has one or more conductors. The cable or cord can serve to provide electrical signals to or receive electrical signals from the temple arrangement or the temple adapter. In one embodiment, one end of a cable or cord attaches to a temple arrangement or temple adapter (either permanently or

via a connector) and the other end of the cable or cord attaches (either permanently or via a connector) to an electronic device. As an example, the electronic device can be an audio output device (e.g., audio player) or a communication device (e.g., mobile telephone). In a first example, the cable or cord could provide a male audio (stereo) connector at one end, and a pair of female audio connectors at the opposite end, each being for use with a different temple. In a second example, the cable or cord could provide a set of connectors, such as a male mini-phone connector (2.5 mm) and a male audio (stereo) connector, at one end, and one or a pair of female phone connectors at the opposite end.

[00445] In one embodiment, the cable or cord can also have a switch coupled thereto so as to permit a user to switch modes. For example, if the temple arrangement or temple adapter provides a speaker and microphone to a pair of eyeglasses, a switch on a cable or cord that connects the temple arrangement or temple adapter to an electronic device could provide different switch positions for different electronic devices or different functional modes of operation of a single electronic device. As an example, if the electronic device is (or operates as) an audio player, a first switch position could be used. Alternatively, if the electronic device is (or operates as) a mobile telephone, a second switch position could be used. Additional discussion of suitable cables and cords is provided in the related applications that have been incorporated herein by reference.

[00446] Electrical components can form an electronic module. The electronic module can provide radiation monitoring, wireless communication, enhanced hearing, etc. A radiation monitoring system can be partially or fully contained in a temple arrangement or temple adapter associated with a temple of a pair of glasses. Typically, the temple arrangement or temple adapter can be removable from the temple.

[00447] In another embodiment, an electronic component in a temple arrangement or temple adapter interacts with another electronic component in another part (e.g., frame) of the glasses or in a device tethered to the glasses. For example, a temple of a pair of glasses holds one portion of an electronic circuit. That portion can include generic parts, such as a battery, that are applicable to different applications. Another portion of the electronic circuit is in a temple arrangement or temple adapter. This portion can be application specific, such as an electronic clock without a battery, or a temperature sensor.

[00448] In yet another embodiment, the electrical components can provide audio player capabilities. In such an embodiment, the electrical components can include audio file storage, an audio player and a battery. The electrical components may or may not include wireless communication circuitry.

[00449] Further, in an alternative embodiment, the output of an operation indicator can be audio. The audio output can be from one or more speakers associated with the frame of the eyeglasses. Such audio output can signal the user using natural language, voice synthesis, pre-recorded messages, etc.

[00450] In another embodiment, the electrical components can include a memory module. The memory module provides non-volatile data storage. For example, the memory module can be a portable (or removable) memory device (e.g., memory card). The memory module can, for example, store sensor information (which can be over an extended period of time). Such memory module can be remotely interrogated using wireless communication circuitry, or can be accessed through a wired connection with a tethered device.

[00451] In one embodiment, the electrical connection(s) can alternatively be used to allow information stored in the electrical components to be accessed or queried by a device. For example, when the electrical components include a memory module, the memory module can be accessed to read data (e.g., status information) stored therein.

[00452] As previously noted, the electrical components associated with a temple arrangement and/or a temple adapter can pertain to radiation monitoring circuitry. In such case, the electrical components within the temple arrangement or temple adapter alone or together with eyeglass electrical components can implement a radiation monitoring system. The radiation being monitored can, for example, pertain to one or more of UV, infrared and gamma radiation. In one embodiment, sunlight is considered as a type of radiation. In any case, additional details on radiation monitoring are further described in the related applications that have been incorporated herein by reference.

[00453] Also, the electrical components can pertain to health or fitness monitoring circuitry. In such case, the electrical components within the temple arrangement or the temple adapter alone or together with eyeglass electrical components can implement a health or fitness monitoring system. Additional details on health or fitness monitoring are further described in the related applications that have been incorporated herein by reference.

[00454] In yet another embodiment, an electronic component in a temple arrangement or a temple adapter of a frame of eyeglasses interacts with an electronic component of an apparatus tethered to the eyeglasses to perform an operation. For example, a temple arrangement or a temple adapter of a pair of eyeglasses holds one portion of an electronic system, and a tethered apparatus that tethers to the pair of eyeglasses includes another portion of the electronic system.

[00455] Still further, the invention can provide a new approach to marketing accessories, namely, electrical accessories, for eyewear. According to one method for providing temple arrangements and/or temple adapters for use with a pair of glasses, the method can initially provide a plurality of temple arrangements and/or temple adapters for a customer. This enables the customer to browse and select at least one temple arrangement or temple adapter. Each of the temple arrangements or temple adapters can have one or more electrical components at least partially embedded therein, with different temple arrangements or temple adapters providing different electrical capabilities. Once a temple arrangement or temple adapters has been selected, the selected temple arrangement or temple adapters can be coupled to one of the corresponding temples of the eyewear (e.g., a pair of glasses). In the case where the selected temple arrangement is a temple tip, the selected temple tip is inserted onto (e.g., slid over) an end of the corresponding temple (after removing any previously installed temple tip if there was one). In the case where the selected temple adapter is to be coupled, the selected temple adapter can be attached to the corresponding temple. Thereafter, the customer can make use of the eyewear with its associated electrical capabilities provided by the temple arrangement or temple adapters.

[00456] In one embodiment, once a temple arrangement and/or a temple adapter is provided to a customer, the customer can test the electrical capabilities of the pair of glasses. If the customer does not like the current selected temple arrangement or temple adapter, the customer can repeat the process by selecting and testing another temple arrangement or temple adapter. Before providing the eyewear with the temple arrangement or temple adapter, the customer can be required to pay a purchase (or rental) price for at least the temple arrangement or the temple adapter. Thereafter, the customer can be permitted to return and replace the temple arrangement or temple adapter with another temple arrangement or temple adapter. Such returns or replacements can be available only for a limited period of time following their purchase.

[00457] The various aspects, embodiments, implementations and features of the invention noted above can be combined in various ways or used separately. Those skilled in the art will understand from the description that the invention can be equally applied to or used in other various different settings with respect to various combinations, aspects, embodiments, implementations or features provided in the description herein.

[00458] Certain aspects of the invention can be implemented in software, hardware or a combination of hardware and software. Certain aspects of the invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[00459] The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. One advantage of the invention is that electrical components can be provided integral with or attached to a temple arrangement or a temple adapter for use with a pair of eyeglasses. Another advantage of the invention is that after-market changes to electrical capabilities of eyeglasses can be relatively easily achieved. Another advantage of the invention is that communication, computation, information capturing or sensing, and/or operational capabilities can be provided for eyeglasses without substantial interference to style or design choices of the glasses. Still another advantage of the invention is that wireless communications, radiation monitoring, fitness monitoring and/or health monitoring can be supported by the electrical components. Yet another advantage of the invention is the ability to provide hands-free wireless communications capability.

[00460] Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the invention may be practiced without these specific details. The description and representation herein are the common meanings used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. In other instances, well-known methods,

procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

[00461] In the foregoing description, reference to “one embodiment” or “an embodiment” means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

[00462] The many features and advantages of the present invention are apparent from the written description and, thus, it is intended by the appended claims to cover all such features and advantages of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation as illustrated and described. Hence, all suitable modifications and equivalents may be resorted to as falling within the scope of the invention.

What is claimed is:

CLAIMS

1. A pair of glasses comprising:
 - a first lens holder for receiving lenses, the first lens holder having a first side and a second side;
 - a second lens holder for receiving lenses, the second lens holder having a first side and a second side;
 - a bridge element coupling the first side of the first lens holder to the second side of the second lens holder;
 - a first temple having a first end and a second end, with the first end pivotally secured to the second side of the first lens holder through a first joint, and with the second end having a first temple arrangement;
 - a second temple having a first end and a second end, with the first end pivotally secured to the first side of the second lens holder through a second joint, and with the second end having a second temple arrangement; and
 - an electrical component at least partially embedded in one of the temple arrangements.
2. A pair of glasses as recited in claim 1, further comprising another electrical component physically separated from the temple arrangements and operatively interconnected with the electrical component at least partially embedded in one of the temple arrangements.
3. A pair of glasses as recited in claim 1, wherein the temple arrangements are temple tips, each grabbing onto its corresponding temple.
4. A pair of glasses as recited in claim 1, wherein the temple arrangements are temple fit-overs, each fits over at least a portion of its corresponding temple or temple tip.
5. A pair of glasses as recited in claim 1, wherein the temple arrangements are temple covers, each covering at least a portion of its corresponding temple or temple tip.

6. A pair of glasses as recited in claim 1, wherein the temple arrangements are made of a material that is different from that of the temples.
7. A pair of glasses as recited in claim 1, wherein the temple arrangements are permanently held onto their corresponding temples or temple tips.
8. A pair of glasses as recited in claim 1, wherein the electrical component is selected from the group of: an electrical connector, an electrical switch, a power source, a speaker, a frequency receiver, a frequency transmitter, a sensor and a hearing enhancement device.
9. A pair of glasses as recited in claim 1,
wherein the electrical component is a sensor, and
wherein the sensor is selected from the group of: a motion detector, a pressure detector and a radiation detector.
10. A pair of glasses as recited in claim 1, wherein the electrical component is an ultraviolet detector.
11. A pair of glasses as recited in claim 1, wherein the electrical component is a RFID tag.
12. A pair of glasses as recited in claim 11, wherein the tag is a passive RFID tag.
13. A pair of glasses as recited in claim 1, wherein the electrical component interacts with another electrical component in the glasses.
14. A pair of glasses as recited in claim 1, wherein the electrical component interacts with another electrical component in a device tethered to the glasses.
15. A pair of glasses as recited in claim 14, wherein the another electrical component is selected from the group of: a battery, a solar cell, a display, a controller, a memory device and a beeper.

16. A pair of glasses as recited in claim 1, wherein the electrical component is a temperature sensor.
17. A pair of glasses as recited in claim 16, further comprising another sensor physically separated from the temple arrangements, wherein the another sensor is also a temperature sensor.
18. A pair of glasses as recited in claim 16, further comprising a switch, a display, a processor, a memory device and a battery.
19. A pair of glasses as recited in claim 18, further comprising a beeper, which can produce a beeping tone based on the temperature measured by the temperature sensor.
20. A pair of glasses as recited in claim 1, wherein the electrical component is for locating the glasses.
21. A pair of glasses as recited in any of claims 1 – 20, wherein the glasses are selected from the list of sunglasses, fit-over glasses, prescription glasses, reading glasses and safety classes.
22. A pair of glasses as recited in claim 1, wherein the electrical component is a sensor.
23. A temple arrangement, comprising at least one electrical component.
24. A temple arrangement as recited in claim 23, wherein the at least one electrical component is at least partially embedded in the temple arrangement.
25. A temple arrangement as recited in claim 23 or 24, wherein the temple arrangement is configured to receive a portion of a temple of a pair of eyeglasses.
26. A temple arrangement as recited in any of claims 23-25, wherein said temple arrangement is a temple tip.

27. A temple arrangement as recited in claim 26, wherein the temple tip is attachable to a temple of an eyeglass frame.

28. A temple arrangement as recited in any of claims 23-25, wherein said temple arrangement is attachable to a temple of an eyeglass frame, and wherein said temple arrangement is a temple fit-over that fits over at least a portion of the temple.

29. A temple arrangement as recited in claim 28, wherein the temple includes a rearward end, and wherein the temple fit-over fits over at least a portion of the rearward end of the temple.

30. A temple arrangement as recited in claim 28, wherein the temple includes a temple tip, and wherein the temple fit-over is configured to fit over at least a portion of the temple tip.

31. A temple arrangement as recited in any of claims 28-30, wherein the temple fit-over includes a plastic housing.

32. A temple arrangement as recited in any of claims 23-25, wherein said temple arrangement is attachable to a temple of an eyeglass frame, and wherein said temple arrangement is a temple cover that is configured to cover at least a portion of the temple.

33. A temple arrangement as recited in claim 32, wherein the temple includes a rearward end, and wherein the temple cover is configured to cover at least a portion of the rearward end of the temple.

34. A temple arrangement as recited in claim 32, wherein the temple includes a temple tip, and wherein the temple cover is configured to cover at least a portion of the temple tip.

35. A temple arrangement as recited in any of claims 32-34, wherein the temple cover includes a fabric material.

36. A temple arrangement as recited in claim 23, wherein the electrical component is a RFID tag.

37. A temple arrangement as recited in any of claims 23-36, wherein the temple arrangement couples to a pair of eyeglasses and provides an electrical functionality inherein using the electrical component.

38. A pair of glasses comprising:

- a first lens holder for receiving lenses, the first lens holder having a first side and a second side;

- a second lens holder for receiving lenses, the second lens holder having a first side and a second side;

- a bridge element coupling the first side of the first lens holder to the second side of the second lens holder;

- a first temple having a first end and a second end, with the first end pivotally secured to the second side of the first lens holder through a first joint;

- a first temple adapter coupled to the first temple, the first temple adapter including at least a first electrical component; and

- a second temple having a first end and a second end, with the first end pivotally secured to the first side of the second lens holder through a second joint.

39. A pair of glasses as recited in claim 38, wherein the first electrical component is at least partially embedded in the first temple adapter.

40. A pair of glasses as recited in claim 38, wherein said pair of glasses further comprise:

- a second temple adapter coupled to the second temple, the second temple adapter including at least a second electrical component.

41. A pair of glasses as recited in claim 40, wherein the first electrical component is at least partially embedded in the first temple adapter, and wherein the second electrical component is at least partially embedded in the second temple adapter.

42. A pair of glasses as recited in claim 38 wherein the electrical component is selected from the group of: an electrical connector, an electrical switch, a power source,

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a speaker, a frequency receiver, a frequency transmitter, a hearing enhancement device and a sensor.

43. A pair of glasses as recited in claim 38,
wherein the electrical component is a sensor, and
wherein the sensor is selected from the group of: a motion detector, a pressure detector and a radiation detector.

44. A pair of glasses as recited in claim 38 wherein the electrical component is a radiation detector.

45. A pair of glasses as recited in claim 38 wherein the electrical component is a RFID tag.

46. A pair of glasses as recited in any of claims 38-45 wherein the electrical component interacts with another electrical component in the glasses.

47. A pair of glasses as recited in any of claims 38-45 wherein the electrical component interacts with another electrical component in a device tethered to the glasses.

48. A pair of glasses as recited in claim 38 wherein the electrical component is for locating the glasses.

49. A temple adapter, comprising:
a support arm having a first end and a second end;
an attachment member connected to a first end of said support arm;
at least one electrical component provided proximate to the second end of said support arm.

50. A temple adapter as recited in claim 49, wherein said at least one electrical component is a speaker.

51. A temple adapter as recited in claim 50, wherein said temple adapter further comprising an ear bud positioned proximate to the second end of said support arm.

52. A temple adapter as recited in claim 51, wherein said ear bud includes the speaker.
53. A temple adapter as recited in claim 51, wherein said ear bud operatively couples to the speaker by a tube.
54. A temple adapter as recited in claim 49, wherein said at least one electrical component includes at least a speaker and a microphone.
55. A temple adapter as recited in claim 54, wherein said temple adapter further comprises a cord including at least one wire for providing audio signals to said speaker and at least one wire for carrying audio pickup signals from said microphone.
56. A temple adapter as recited in any of claims 49-55, wherein said temple adapter attaches to a pair of eyeglasses, and
wherein said attachment member attaches to a temple tip of the pair of eyeglasses.
57. A temple adapter as recited in any of claims 49-55, wherein said temple adapter attaches to a pair of eyeglasses, and
wherein said attachment member attaches to a temple of the pair of eyeglasses.
58. A temple adapter as recited in any of claims 49-57, wherein said attachment member includes at least one of a clip or clamp.
59. A temple adapter as recited in any of claims 49-57, wherein said attachment member includes an elastic member.
60. A temple adapter as recited in any of claims 49-59, wherein the at least one electrical component being at least partially embedded in said temple adapter.
61. A temple adapter as recited in claim 49, wherein said at least one electrical component includes at least a connector.

62. A temple adapter as recited in claim 61, wherein said temple adapter attaches to a pair of eyeglasses having a pair of temples, and
wherein the connector is placed proximate to an end of at least one of the temples.

63. A temple adapter as recited in claim 49, wherein said at least one electrical component includes at least a connector, a speaker and a microphone.

64. A temple adapter as recited in claim 49, wherein said at least one electrical component includes at least a speaker and a microphone.

65. A temple adapter as recited in claim 49, wherein said support arm includes a first member and a second member, the first member is provided between the first end and an opening, and the second member is provided between the opening and the second end.

66. A temple adapter as recited in claim 65, wherein the opening enables the second member to adjust its length.

67. A temple adapter as recited in any of claims 65-66, wherein said temple adapter further comprises an ear bud at the second end.

68. A temple adapter as recited in claim 67, wherein said ear bud is coupled to said at least one electrical component.

69. A temple adapter as recited in claim 68, wherein said at least one electrical component is a speaker.

70. A temple adapter as recited in claim 49, wherein said support arm includes a first member and a second member, the first end is at the first member, the second end is at the second member, the first member includes an opening, and the at least a portion of the second member is in contact with the opening.

71. A temple adapter as recited in claim 49, wherein said at least one electrical component is a RFID tag.

72. A temple adapter as recited in claim 49, wherein said at least one electrical component is a bone conducting member.

73. A method for providing temple selections, which are temple arrangements and/or temple adapters, for use with a pair of glasses, said method comprising:

providing a plurality of temple selections for a customer to select at least one temple selection, with each of the temple selections having at least one electrical component at least partially embedded therein, and with at least certain of the temple selections providing different electrical capabilities;

coupling the selected at least one temple selection to at least one of the corresponding temples of a pair of glasses after the customer has selected the at least one temple selection; and

providing the pair of glasses with the selected at least one temple selection to the customer.

74. A method as recited in claim 73, wherein said coupling comprises inserting at least a portion of the selected at least one temple selection onto an end of the at least one of the corresponding temples.

75. A method as recited in claim 74, wherein the selected at least one of the temple selection is a temple arrangement.

76. A method as recited in any of claims 73-75, wherein said providing permits the customer to test the electrical capabilities of the pair of glasses with a temple selection.

77. A method as recited in any of claims 75-76, wherein said method further comprises:

repeating said method to select and test another temple selection.

78. A method as recited in any of claims 73-77, wherein said providing comprises selling the pair of glasses with at least one temple selection to the customer.

79. A method as recited in claim 78, wherein said method further comprises:

permitting the customer to return and replace the sold temple selection with another temple selection.

80. A method as recited in claim 79, wherein said permitting operates to permit the customer to return and replace the sold temple selection with another temple selection only for a limited amount of time.

81. A method for providing temple arrangements and/or temple adapters for use with a pair of glasses, said method comprising:

providing a plurality of temple arrangements or temple adapters for a customer to select at least one temple arrangement or temple adapter, with each of the temple arrangements or temple adapters having one or more electrical components at least partially embedded therein, and with at least certain of the temple arrangements or temple adapters providing different electrical capabilities;

coupling the selected at least one temple arrangement or temple adapter to at least one of the corresponding temples of a pair of glasses after the customer has selected the at least one temple arrangement or temple adapter; and

providing the pair of glasses with the selected at least one temple arrangement or temple adapter to the customer.

82. A method as recited in claim 81, wherein said coupling comprises inserting the selected at least one of the temple arrangement or temple adapter onto an end of the at least one of the corresponding temples.

83. A method as recited in claim 82, wherein the selected at least one of the temple arrangement or temple adapter is a temple arrangement.

84. A method as recited in any of claims 81-83, wherein said providing permits the customer to test the electrical capabilities of the pair of glasses.

85. A method as recited in claim 84, wherein said method further comprises:
repeating said method to select and test another temple arrangement.

86. A method as recited in any of claims 81-85, wherein said providing comprises selling the pair of glasses to the customer.

87. A method as recited in claim 86, wherein said method further comprises:
 permitting the customer to return and replace the selected at least one temple arrangement with another temple arrangement.
88. A method as recited in claim 87, wherein said permitting operates to permit the customer to return and replace the selected at least one temple arrangement with another temple arrangement only for a limited amount of time.
89. A method to sell glasses with temple arrangements comprising:
 providing a plurality of temple arrangements for a customer to select, with at least one of the temple arrangements having an electrical component at least partially embedded;
 inserting the temple arrangements to the corresponding temples of a pair of glasses after the customer has identified the glasses and the temple arrangements; and
 selling the pair of glasses to the customer,
 wherein the customer has the option to replace the temple arrangements with another pair of temple arrangements within a preset period of time.

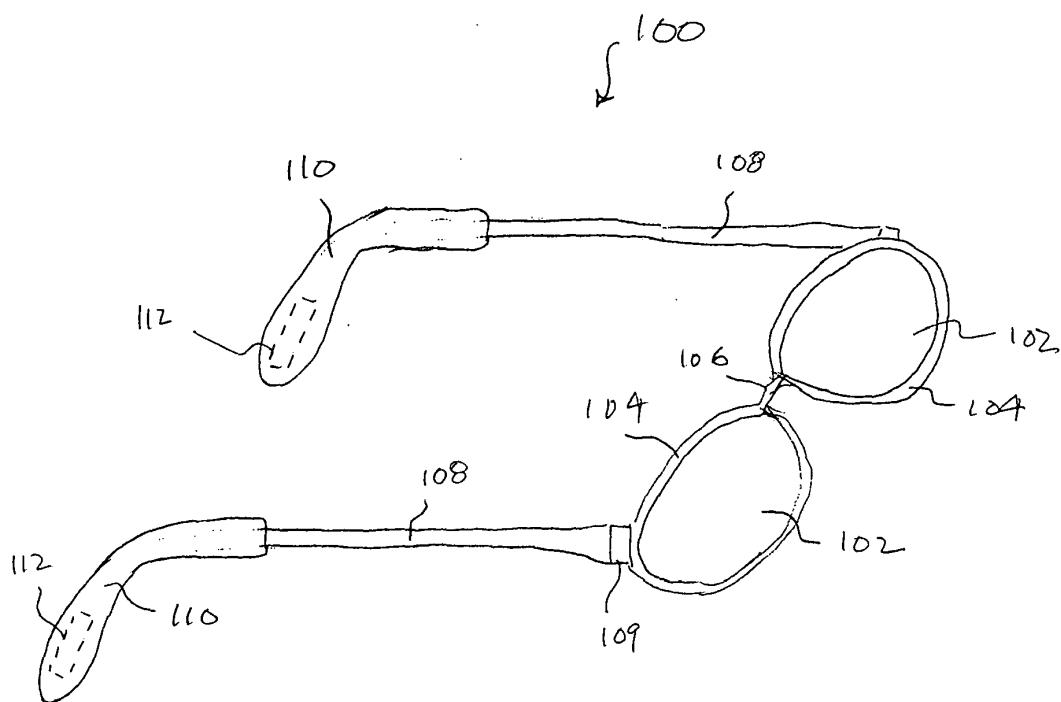


FIG. 1

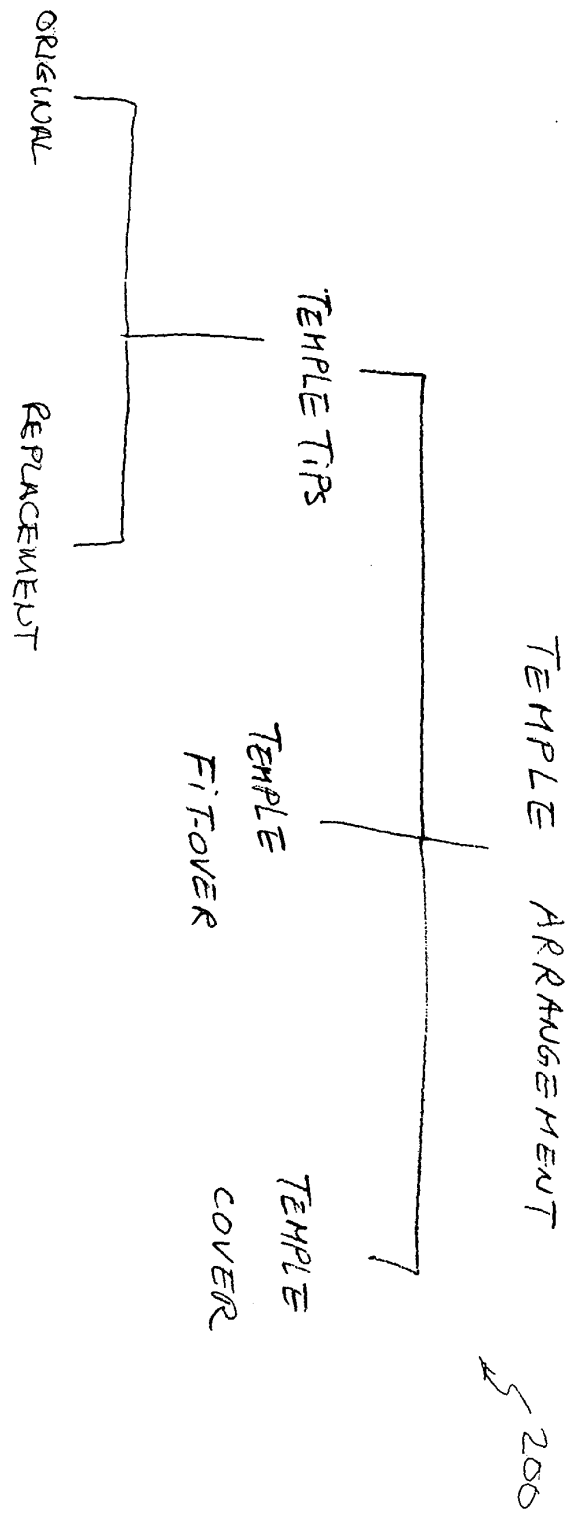


FIG. 2

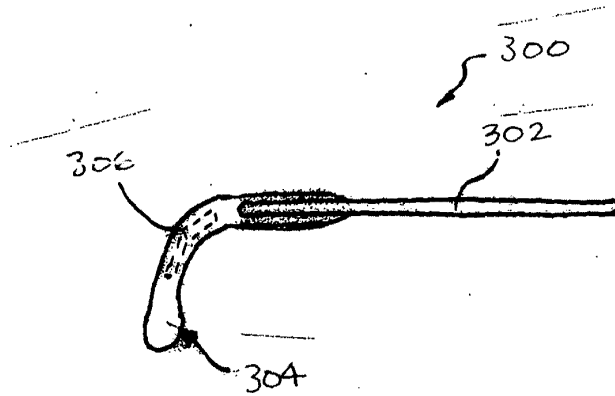


FIG. 3A

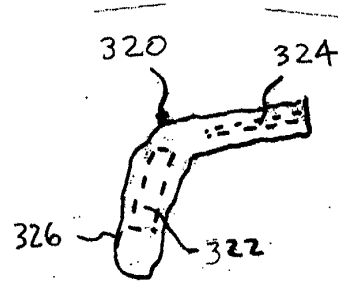


FIG. 3B

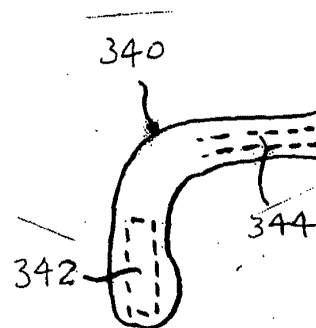


FIG. 3C

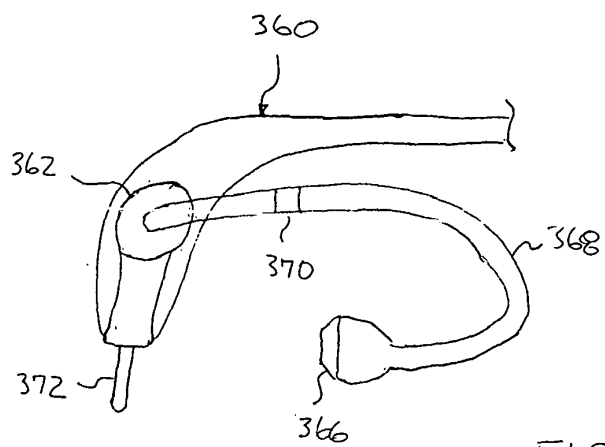


FIG. 3D

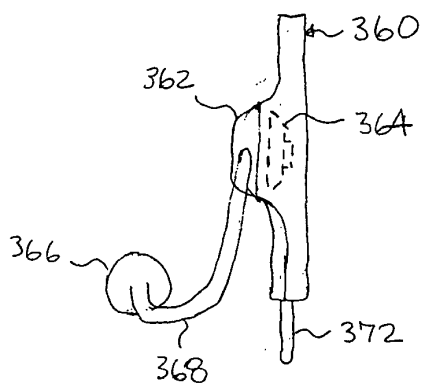


FIG. 3E

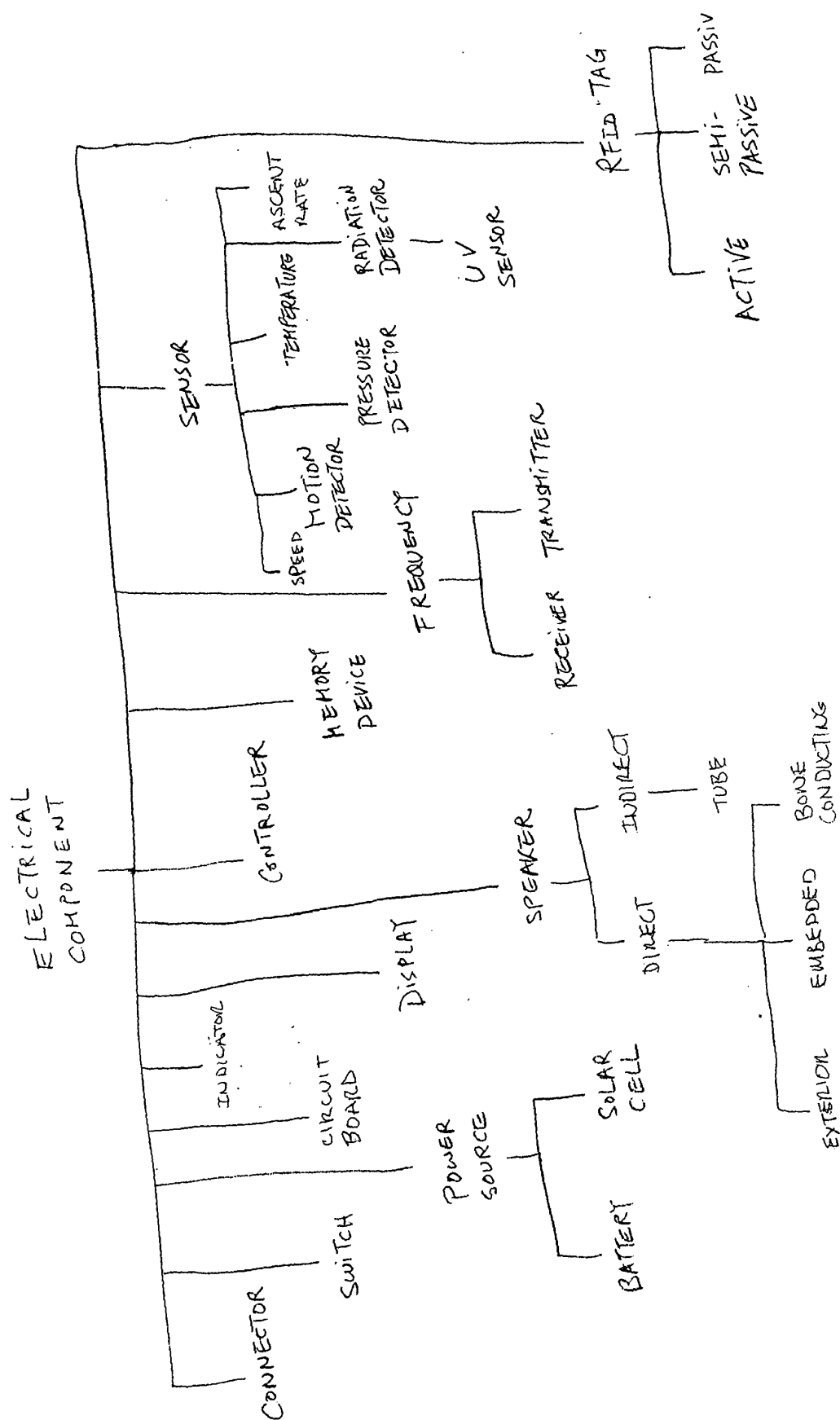


Fig. 4

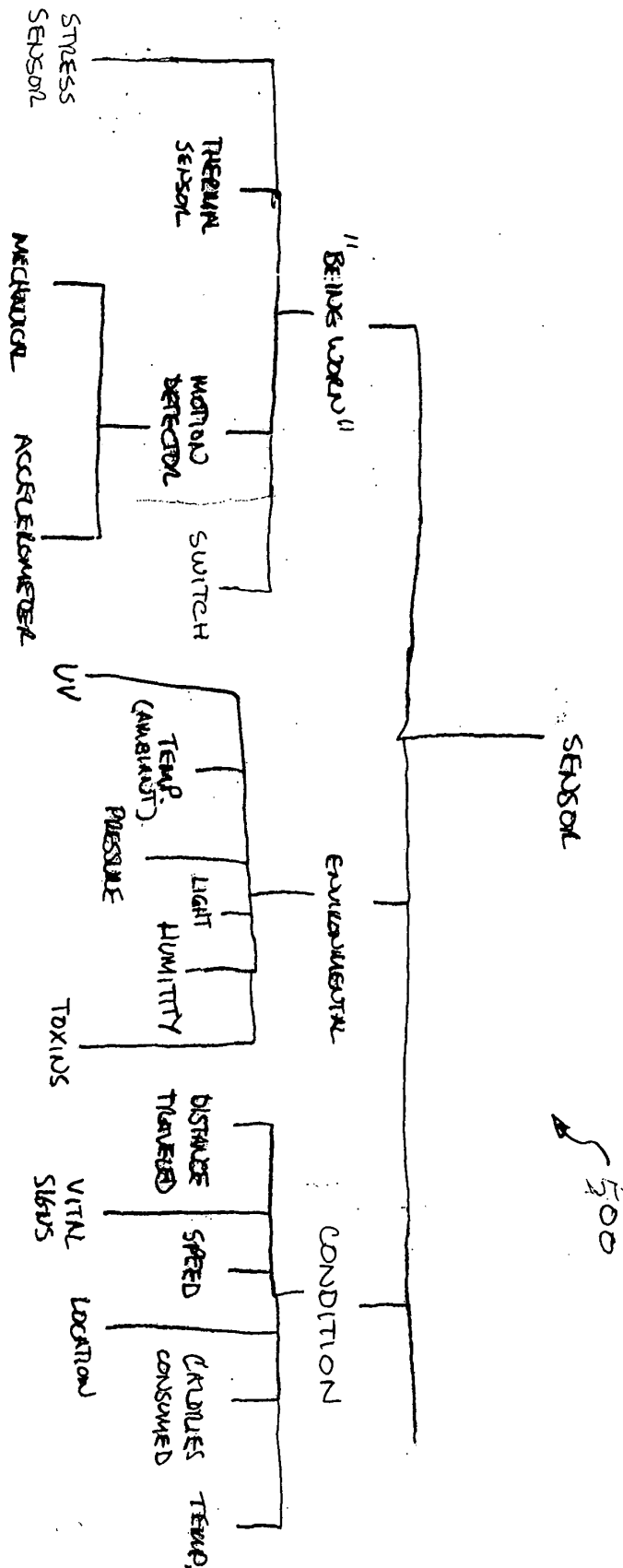


FIG. 5

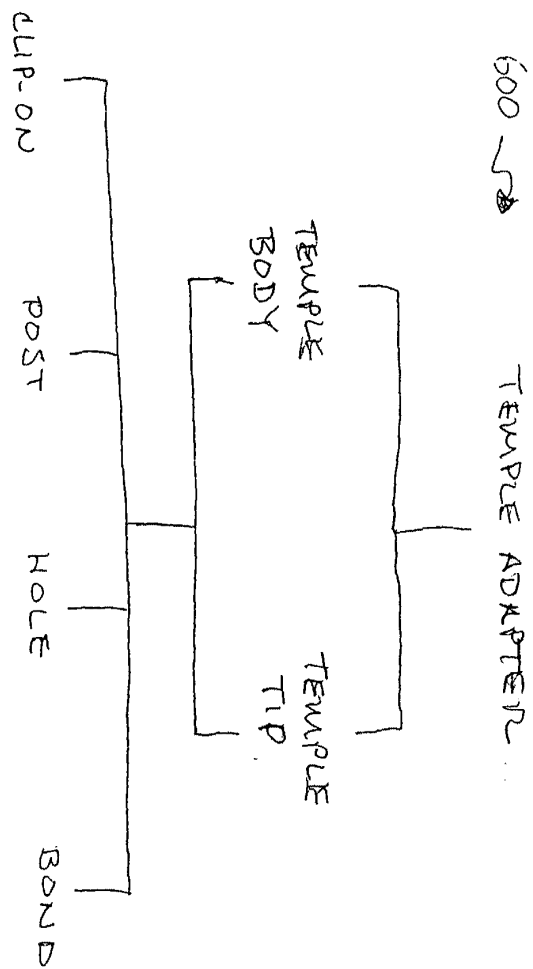
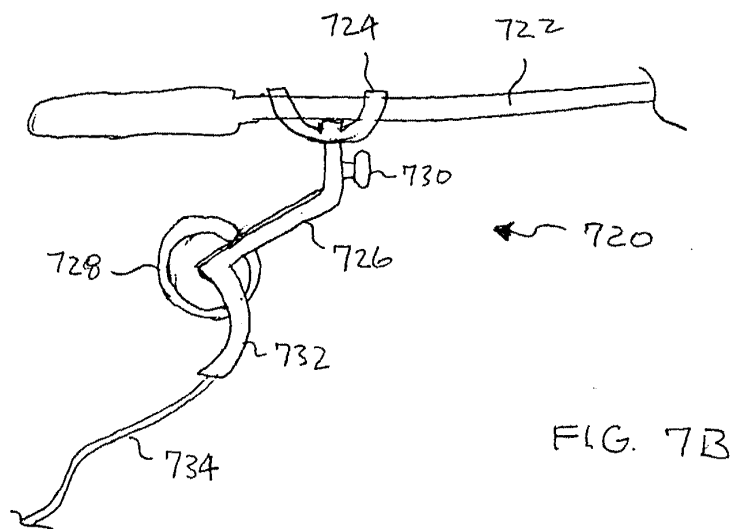
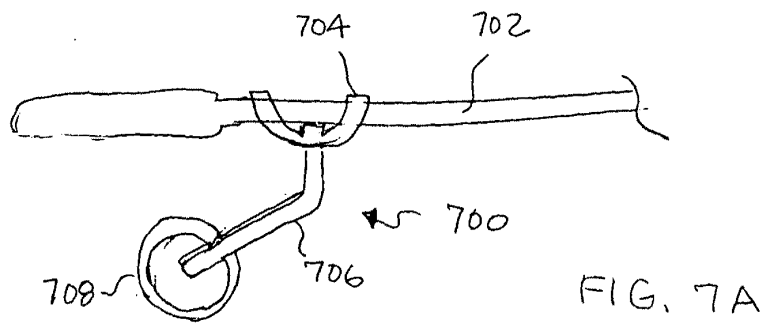


FIG. 6



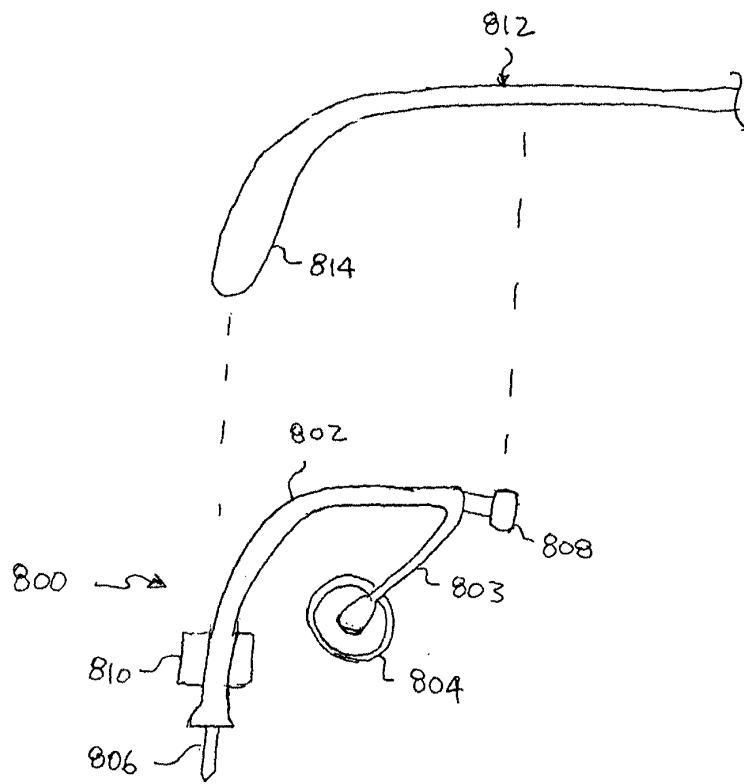


FIG. 8A

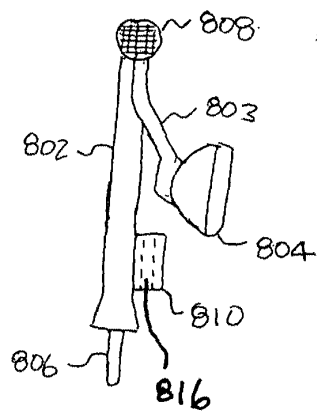


FIG. 8B

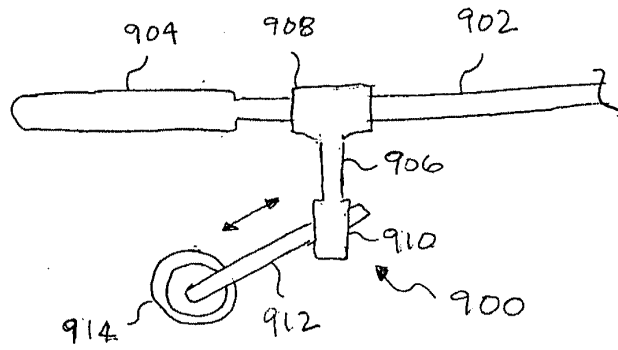


FIG. 9A

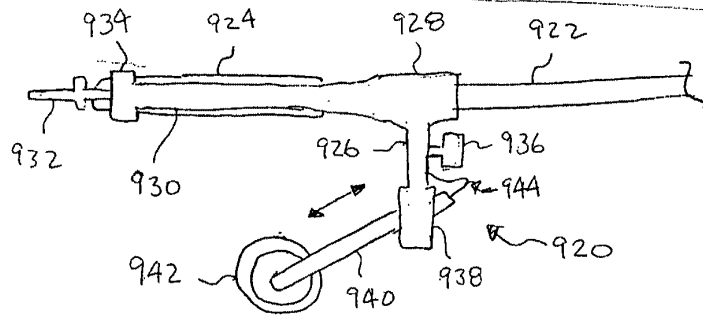


FIG. 9B

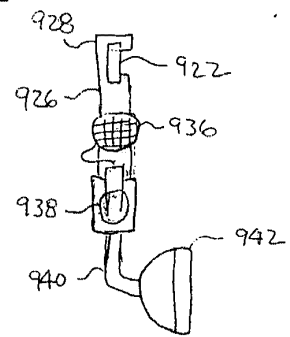


FIG. 9C

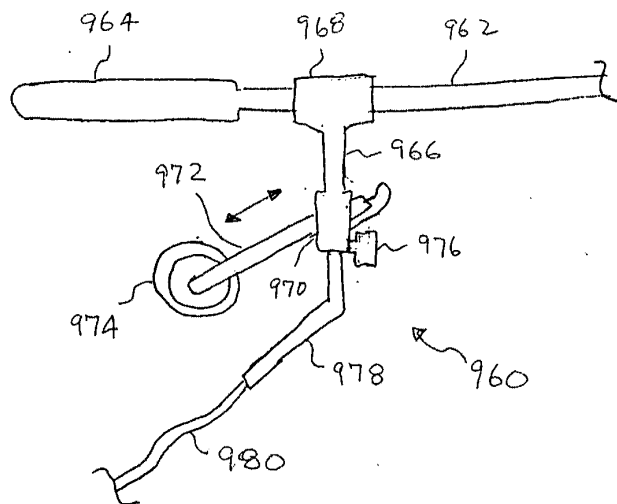


FIG. 9D

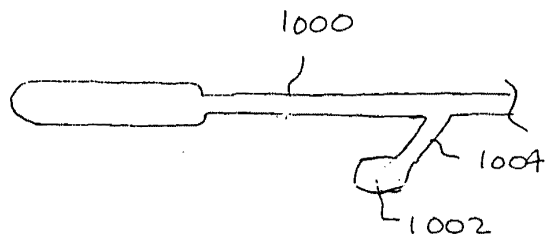


FIG. 10A

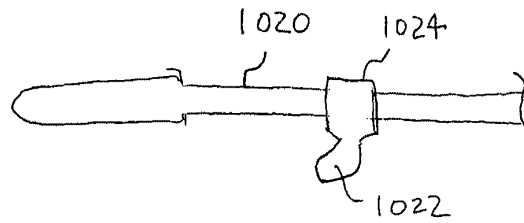


FIG. 10B

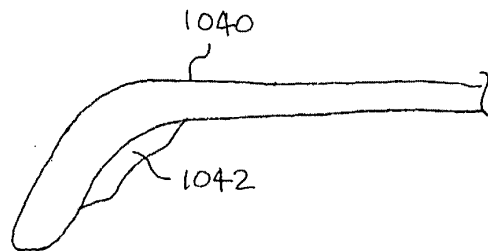


FIG. 10C

D. EYEGLASSES WITH A CLOCK OR OTHER ELECTRICAL COMPONENT

FIELD OF THE INVENTION

[0001] The present invention relates generally to glasses and, more particularly, to a pair of eyeglasses with a clock or other electrical component.

BACKGROUND OF THE INVENTION

[0002] For some people, glasses are indispensable. They have to wear them almost every second of their waking hours. Even for those who do not wear prescription glasses, if they like to be in the sun, sunglasses are essential. In other words, many of us constantly carry at least one pair of glasses with us.

[0003] Many of us also have to regularly wear or carry a watch or other electrical devices. We are beginning to carry too many separate devices and it can be expensive and inconvenient to lose or forget bring them along with us.

[0004] Another interesting aspect in the glasses industry is that once you have bought a pair of glasses, they cannot be altered. Some of these glasses can be quite expensive, particularly those with a famous brand name. After-market enhancements or modifications to a pair of glasses are not readily available.

[0005] It should also be apparent from the foregoing that there is a continuing need to reduce the number of components or gadgets we carry with us, and there is also a need to facilitate after-market enhancements or modifications for a pair of glasses.

SUMMARY OF THE INVENTION

[0006] In one embodiment, the present invention relates to having a clock at least partially embedded in a pair of glasses. With the clock at least partially embedded in the glasses, the wearer does not need to carry a separate watch in order to tell time. For example, the clock can be in one of the temples of the glasses at a region close to the hinge of that temple, with the clock facing the wearer. With the clock in that position, the wearer may be able to see the time or the time may be visible to the wearer, without the need to take the glasses off. In an alternative example, the clock, which can be a digital clock, can be in a temple arrangement of a pair of glasses. A temple arrangement can be a temple tip, a temple cover or a temple fit-over.

[0007] In another embodiment, instead of a clock, the present invention relates to an electrical component at least partially embedded into a pair of glasses or a temple arrangement of a pair of glasses. Due to the miniaturization of electrical components,

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even a physically small electrical component can provide significant and useful functionalities.

[0008] In one embodiment, an electrical component in a pair of glasses is a temperature sensor. In another embodiment, an electrical component in a pair of glasses is an eyewear finder. In yet another embodiment, an electrical component in a pair of glasses is an activity monitor (e.g., pedometer).

[0009] In yet another embodiment, an electrical component in a temple arrangement interacts with another electrical component in the frame of the glasses or in a device tethered to the glasses. For example, a temple of a pair of glasses holds one portion of an electrical circuit. That portion can include generic parts, such as a battery, that are applicable to different applications. Another portion of the electrical circuit is in a temple arrangement. This portion can be application specific, such as an electrical clock without a battery, or a temperature sensor.

[00010] Other aspects and advantages of the present invention will become apparent from the following detailed description, which, when taken in conjunction with the accompanying drawings, illustrates by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[00011] FIG. 1 shows one embodiment of the invention with a clock in one of the temples of the glasses.

[00012] FIG. 2 shows a number of different embodiments of temple arrangements according to the present invention.

[00013] FIG. 3 shows examples of different electrical components partially or fully embedded in a pair of glasses according to the present invention.

[00014] FIG. 4 shows eyewear finder components according to different embodiments of the present invention.

[00015] Same numerals in Figures 1-4 are assigned to similar elements in all the figures. Embodiments of the invention are discussed below with reference to Figures 1-4. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

DETAILED DESCRIPTION OF THE INVENTION

[00016] Fig. 1 shows one embodiment of the present invention. It includes a pair of glasses 10 with a first lens holder 12 and a second lens holder 14. Both lens holders

are for receiving lenses. The first lens holder 12 has a first side and a second side. The second lens holder 14 also has a first side and a second side. The pair of glasses has a bridge element 16. The bridge element is coupled to the first side of the first lens holder 12 and the second side of the second lens holder 14. In one embodiment, the lens holders and the bridge element are not separate pieces, but are an integral piece.

[00017] The pair of glasses 10 also includes a first temple 16 and a second temple 18. The first temple 16 is pivotally secured to the second side of the first lens holder 12 through a joint or a hinge 20. And, the second temple 18 is pivotally secured to the first side of the second lens holder 14 through another joint 22.

[00018] The glasses 10 shown in Fig. 1 also include a clock 24, which is at least partially embedded in the glasses 10.

[00019] In one embodiment, the clock 24 can be in one of the temples 18 of the glasses at a region close to its corresponding joint 22. The clock 24 is facing a user when the user is wearing the glasses. With the clock in that position, the wearer may be able to see the time without the need to take the glasses off.

[00020] The clock 24 can be a digital clock, or a digital alarm clock, with a liquid crystal display (LCD) or other types of electronic display. In another example, the clock is an analog clock, or other type of clock.

[00021] There can also be a switch 26 at the glasses 10 that can be used to adjust the time of the clock 24. The switch can be a push button, or a knob that one can adjust or rotate, similar to the knob in an analog watch. Different types of switches are applicable. In one embodiment, the clock 24 is a digital clock and the switch 26 is an electrical switch. Different types of switches have previously been described in the related patent applications mentioned above and incorporated by reference.

[00022] Fig. 1 also shows a battery 30 in the glasses to power the clock 24. In one embodiment, the glasses 10 include a hatch that can be opened to replace the battery 30. The hatch can be facing the wearer when the glasses 10 are worn. In another embodiment, the glasses do not include a hatch for the wearer of the glasses to change the battery. In this embodiment, the glasses are designed so that once the power in the battery is depleted, the battery cannot be replaced without breaking the glasses. In still another embodiment, the battery can be rechargeable by way of coupling to a charger or by way of a solar cell coupled to or partially embedded in the glasses.

[00023] In the embodiment where the clock is a digital clock, the clock can be programmable.

[00024] In one embodiment, the clock is an alarm clock, and there is also a speaker embedded in the glasses. The speaker can be a beeper. In another embodiment, this clock can be programmable to audibly alert a user at a specific time with the speaker.

[00025] In another embodiment, the clock is a digital clock with a display, and the glasses further include a switch that can turn the display on and off. Sometimes, the wearer may not want to be reminded of time. In this embodiment, the clock itself can be turned off. In another embodiment, the clock is a digital clock with a LCD and an electrical switch. The electrical switch can turn off the LCD, while the clock is still running or is still continuously operating.

[00026] In one embodiment, there is a slidable lid over the face of the clock. One can slide the lid to cover the face of the clock, and the clock can be an analog clock.

[00027] In one embodiment, the clock displays only the time of day. In another embodiment, the clock displays not only time, but also the date and the day of week. The size of the display can be smaller if only the time of day is displayed. Alternatively, the display can cycle through displaying time, date, etc.

[00028] In yet another embodiment, a housing for the clock includes a light source next to the clock to help the wearer see the time. For example, there is a light emitting diode next to the clock, and the light emitting diode can be turned on/off.

[00029] In yet another embodiment, there is a cavity in the glasses and the clock is a self-contained clock with its own battery, i.e., a clock module. The clock module is dropped into the cavity. A cavity is then closed and sealed to keep the clock module inside the glasses. The clock can be a digital clock and the digital clock may only display the time of day.

[00030] FIG. 1 shows an embodiment with a clock facing inside, towards the wearer when the glasses are being worn. Alternatively, the clock could be facing out and the user can temporarily remove the glasses to read the time.

[00031] A clock can be based on display spots. In one embodiment, the clock display is embedded in the lens holders of a pair of glasses. There can be 12 display spots located all around each lens holder. The display spots could be LEDs or LCDs. The spots around the left lens holder can show the hour, and the spots around the right lens holder can show the minutes, which can be rounded to the nearest five minutes. There can be a switch provided with the pair of glasses to temporarily activate the display. For example, the switch can be located at the bridge of the glasses. In one embodiment, the lens holders can be made of translucent materials.

[00032] In one embodiment, a clock can be in a temple arrangement of the glasses.

[00033] Referring back to Fig. 1, each temple has two ends, the first end and the second end. The first end is the end that is pivotally secured to its corresponding hinge. In one embodiment, the second end of each temple has a temple arrangement.

[00034] For some glasses, particularly when a pair of glasses has not been extensively worn, a temple arrangement, such as a temple tip, can be relatively easily removed and re-inserted into the glasses. As result, temple arrangements of different color and/or shape and/or having different electrical components can be applied to the same frame of a pair of glasses. Retailers or distributors can then provide after-market modification or enhancement to a pair of glasses, at the preference of their consumers. This, for example, can be done by replacing existing temple tips with replacement temple tips. Or, a consumer can identify the preferred temple arrangements to be sold with the glasses. Different embodiments on after-market enhancement and/or modification of glasses have previously been described in the related patent applications mentioned above and incorporated by reference.

[00035] FIG. 2 shows a number of different embodiments of temple arrangements according to the present invention. For example, a temple arrangement can be a temple tip, which is usually an enclosure for the temple.

[00036] In another embodiment, a temple arrangement is a temple cover, or a temple fit-over. A temple cover slides over and at least partially covers a portion of the second end of a temple. If the second end of the temple has a temple tip, at least a portion of the temple tip can be covered by the temple cover. A temple fit-over fits over at least a portion of the second end of a temple. If the second end of the temple has a temple tip, at least a portion of the temple tip is fitted over by the temple fit-over. A temple cover is typically made of a material that is more flexible than a temple fit-over. For example, a temple cover can be a fabric or other materials, such as a sock or sleeve; while a temple fit-over can be made of plastic.

[00037] A temple arrangement can be made of the same or different materials than the temple. To illustrate, a pair of glasses with a metal frame can have non-metallic temple tips. A temple arrangement can be of a color that is the same as, or similar to, or different from, that of the temple.

[00038] A temple arrangement can be held onto a temple by frictional force. If the temple arrangement is a temple fit-over, it can be held onto a temple tip by frictional

force. In another embodiment, a temple arrangement is permanently held onto its corresponding temple or temple tip. This can be done by adhesive or glue.

[00039] In different embodiments, the glasses 10 can be, for example, a pair of sunglasses, fit-over glasses, reading glasses, prescription glasses, or safety glasses. In other embodiments, the glasses 10 can be, for example, a pair of sports glasses, protective goggle, ski goggle or swimming goggle. In a further embodiment, one or more electrical components can be in a strap tied to the corresponding eyewear, such as a sports strap tied to the corresponding sports eyewear.

[00040] In a number of embodiments, the temples of the glasses can have a taper profile. Each of the temples is wider or broader when it is close to its corresponding joint. In one embodiment, a wider or broader temple implies that the temple spans across a wider or broader area longitudinally down from the top of the head of the user.

[00041] Depending on applications, a temple arrangement can be of different shapes. The shape can depend on the type of glasses. For example, the temple arrangement for fit-over glasses can be bigger than that of the prescription glasses. The shape can also depend on applications based on the electrical component(s) embedded or partially embedded in the glasses.

[00042] In one embodiment, the glasses include lenses. The glasses through the lens holders with the corresponding lenses, can use a wrap around style to better conform to the profile of the face of the wearer.

[00043] In another embodiment, each lens holder also has a shield at least at one of its edges. The shield can reduce the amount of light or radiation entering, for example, between the lens holders and the wearer's head, and received by at least one of the eyes of the wearer. The shields can be shaped to conform to the profile of the face of the wearer. In an example for fit-over sunglasses, when worn over a pair of prescription glasses, such shields can go over or cover at least a portion of the pair of prescription glasses. The shields can be opaque. Or, there can be transparent or translucent windows on these shields.

[00044] Note that in one embodiment, a pair of glasses does not have to include lenses.

[00045] In one embodiment, one or more electrical components are at least partially or fully embedded in a temple arrangement. Such an embedded electrical component can be an electronic clock. The clock can be facing inside, towards the wearer when the glasses are being worn. FIG. 3 shows examples of different electrical components according to the present invention.

[00046] In one embodiment, an electrical component in a pair of glasses is an electrical connector. The connector can be provided on one of the temples of the pair of glasses. The connector can be a male connector located at a temple tip. In another embodiment, the connector can be a female connector at a temple tip. As that temple tip grabs onto the main body of its corresponding temple, the female connector can make electrical contact with a male connector. Different types of connectors have previously been described in the related patent applications, which have been incorporated by reference.

[00047] In one embodiment, an electrical component in a pair of glasses is an electrical switch, such as one or more of those previously described in the related patent applications, which have been incorporated by reference.

[00048] In one embodiment, an electrical component in a pair of glasses can include a circuit board. The circuit board can be a rigid or a flexible circuit board.

[00049] In one embodiment, an electrical component in a pair of glasses can be a power source. The power source can be a battery, a solar cell or other type of power source.

[00050] In one embodiment, an electrical component in a pair of glasses is a speaker. The speaker can be facing the wearer when the glasses are being worn. The speaker can directly transmit to a user, such as a speaker mounted on an exterior surface of an eyeglass frame, or partially or fully embedded in an eyeglass frame, or a bone-conducting speaker.

[00051] A bone-conducting speaker transfers vibrations from bones in one's head, such as cheekbone, to the inner ear through bone-conduction technology. One advantage of a bone-conducting speaker is that it does not need an ear bud sticking into one's ear, or additional wires to transmit sound. Such wires or ear bud can be inconvenient, such as when one is swimming. Different types of bone-conducting speakers have previously been described in the related patent applications, which have been incorporated by reference.

[00052] Alternatively, the speaker can indirectly transmit sound to a user, such as through the use of a tube to delivery audio signals proximate to a user's ear.

[00053] In one embodiment, an electrical component in a pair of glasses is a memory device and/or processing circuitry. The memory device is for data storage. The processing circuitry controls operation of data acquisition with respect to other electrical components and/or processing of data.

[00054] In one embodiment, an electrical component in a pair of glasses is a frequency receiver or a frequency transmitter. They can be in the radio frequency range.

[00055] In one embodiment, an electrical component in a pair of glasses can be a sensor. The sensor can be a temperature sensor. The temperature sensor can be used to sense the temperature of the wearer, which can be based on heat conduction. In one embodiment, such a temperature sensor is in a temple tip. In measuring the temperature, the user can further press the temple tip towards the head of the user to ensure better connection. One can also stick the temple tip under one's tongue to measure body temperature.

[00056] In other different embodiments, an electrical component in a pair of glasses can be a motion detector, a speed sensor, a rate of ascent detector, a pressure detector, or a detector for radiation, such as an ultraviolet (UV) sensor.

[00057] In one embodiment, an electrical component in a pair of glasses is a radio frequency identification (RFID) tags. RFID tags typically include memory chips equipped with radio antennas. The memory chips usually do not include large amount of information. They may only have a few kilobytes, sufficient to encode, such as a serial number, where and when the product, such as the glasses, was manufactured, and other relevant information. A portion of such information can provide identifying information to the glasses.

[00058] These tags can come in a number of configurations. For example, an active tag uses a battery-powered transponder to constantly emit signals, carrying information programmed into the chip. Active tags are more applicable to situations where readers are not close to the tags. A semi-passive tag likewise has a battery, but may not be activated until it receives a signal from a reader. They are more applicable to situations that do not need continuous connection and accessing. A passive tag has no battery; its antenna extracts power from the reader's radio wave signal to transmit the identifying information on the chip. Passive tags are typically relatively inexpensive, but may have to be within a few feet of a reader to extract power. The electrical component can be a passive RFID tag, or some other type of tag.

[00059] In one embodiment, one or more electrical components in a temple arrangement interact with one or more electrical components in another part of the glasses or in a device tethered to the glasses. For example, there can be two temperature sensors, one in a temple tip and the other close to the hinge of the corresponding temple. The sensor close to the hinge is used to identify the temperature of the environment, while

the sensor at the temple tip is used to measure the temperature of the wearer. In one embodiment, based on the differential output from the two sensors, the temperature of the wearer can be identified. Based on the differential output from the two sensors, the effect of the environment temperature is taken into consideration in identifying the temperature of the wearer of the glasses.

[00060] In another example, a temple of a pair of glasses holds one portion of an electrical circuit. That portion can include generic parts, such as a battery or a solar cell, a display, a memory device, a beeper and/or a controller (or processor), which can be programmable. The one or more electrical components can be on a printed circuit board. They can be generic components applicable to many different types of operations.

[00061] In one embodiment, another portion of the electrical circuit is in a temple arrangement. This portion can be application specific. For example, the battery to run a clock is in a temple, while the digital clock without its battery is in the corresponding temple arrangement.

[00062] In another example, a temperature sensor is in a temple arrangement, while a switch, a display, a processor, a memory device and a battery are in the temple. There can also be a thermal mass in the temple arrangement. With the thermal mass, the temperature of the sensor would not change too quickly. With the switch in the on position, the processor can cause the sensor to measure temperature. The processor keeps track of the temperature of the sensor as it changes. The information is kept in the memory device.

[00063] In another embodiment, the temperature sensing glasses also have a beeper in the temple. When the sensor temperature does not fluctuate by more than a certain threshold within a preset amount of time, the beeper can produce a beeping sound. This indicates that the temperature is now stable.

[00064] One way to use a temperature sensor in a temple of a pair of glasses is as follows. First, one turns the switch on. Assume the person pushes the sensor so that it touches the head at the back of the ear of the user, and the temperature of the sensor starts to go up. A processor or controller keeps track of the temperature of the sensor. If the temperature does not vary by more than, for example, 0.1 degree in, for example, 5 seconds, the temperature is assumed to be in equilibrium. The processor keeps on calculating running averages. Once the fluctuation is below the preset 0.1 degrees, the beeper beeps. After the beeper beeps, the sensor stops measuring temperature, and the last temperature taken by the sensor will correspond to the temperature of the wearer.

The display then shows this last temperature. This process can be re-started by turning the switch on and off.

[00065] In other embodiments, a motion detector, a speed sensor for skiing, a rate of ascent detector for diving, a radiation detector (such as a UV sensor), or a pressure sensor can be in a temple arrangement. Each of these sensors or detectors can work in conjunction with other electrical components in the glasses. Different types of UV or radiation sensing embodiments have previously been described in the related patent applications, which have been incorporated by reference.

[00066] In one embodiment, the glasses include an active RFID tag. Different electrical components can be in different parts of the glasses. For example, the battery is in the temple, and the transponder of the tag can be in the corresponding temple arrangement.

[00067] In one embodiment, the glasses include electrical components for locating the glasses. This is an embodiment of an eyewear finder. Sometimes we do not remember where we placed or misplaced the glasses. This embodiment helps us find the glasses.

[00068] FIG. 4 shows eyewear finder components according to different embodiments of the present invention. In one approach, the glasses include a semi-passive RFID tag, a battery and a speaker, such as a beeper. These components can be in the frames of the glasses. In another embodiment, some of its electrical components can be in the frame of the glasses, and some of its electrical components can be in a temple arrangement of the glasses. For example, its power source and beeper can be in one of its temples, and the tag in the corresponding temple arrangement. The tag is activated when it receives a specific signal from its reader or finder. The reader or finder can be a generator for specific RF signal. By pushing a button on the reader, the specific signal will be transmitted. When the tag gets the specific signal, the tag will activate the beeper, which will generate a beeping sound. As long as the user is within the hearing range of the beeping sound, the user will be able to find the pair of glasses.

[00069] In another approach for an eyewear finder, there is a RF receiver, an ultrasonic receiver or other types of receiver in the glasses, which can couple to a beeper. The receiver is designed to receive a specific signal. The finder can generate the corresponding signal, which can be RF or ultrasonic signals. When the receiver detects the transmitted signals, the receiver will generate a beeping sound, which can then help locate the position of the glasses. Typically, the finder is for short-range

application, and can use technologies can be based on Zigbee, UWB, Bluetooth or WiFi standards.

[00070] In still another embodiment, an electrical component in a pair of glasses can be a pedometer. There are a number of benefits of having a pedometer at the glasses. For one, if the pedometer is in the glasses, one does not need to separately carry a pedometer. When one is exercising, the exercising outfit may not have any pockets. Also, the person may not be wearing any belts. It can be inconvenient to attach a pedometer directly to a pair of pants, or to a swimming suit. A pedometer in the glasses eliminates the need to separately carry another device. Also, according to one embodiment, with the pedometer in the glasses, a user may be able to see his progress just by moving his eyes. For example, the pedometer can have a display and the display can be located close to a hinge of a temple, facing the user when the glasses are worn. The user does not have to move his hands or other parts of his bodies to monitor his progress. He only has to move his eyes to see the display and track his progress while exercising. Similarly, with the pedometer in the glasses, a user can hear his progress without the need for the volume of the audio signals to be high because with a speaker in the glasses, the speaker can be relatively close to the user's ear.

[00071] In one embodiment, an advantage of having a pedometer in the glasses is due to the structure of a typical pedometer. There are different approaches to make a pedometer. Typically, a pedometer includes a weight and a spring. In one embodiment, the pedometer can also include an LED, a photodetector and a controller. The weight is at the end of the spring, which can be a leaf spring. The weight with the spring have a resonant frequency that can be in the range of normal walking pace, such as 60-120 steps/minute. At that frequency, the weight with the spring will resonate. The resonance can be critically damped, such as by allowing the weight to go up and down beyond a threshold, but only once per step of the user. Normally, the photodiode receives light from the LED. When the weight goes beyond the threshold, it can block the light from the LED from reaching the photodiode. By measuring the number of times light is blocked and unblocked, a controller would be able identify the number of steps the user has walked. Based on such a structure, in one embodiment, for optimal performance, the orientation of the up-down motion of the weight should be substantially vertical. If a pedometer is a device you can clip onto a piece of clothing, a user can clip it on such that the orientation of the up-down motion of the weight is horizontal. Then the performance of the pedometer could be substantially degraded.

Glasses are usually worn in a standard position. The position, including the orientation, of the pedometer can thus be fixed relative to the glasses. Then, the orientation of the up-down motion of the weight can be fixed to be substantially vertical when the glasses are worn, or to be substantially perpendicular to the orientation of the bridge of the glasses. This is another advantage of having a pedometer in the glasses in a number of embodiments.

[00072] The pedometer can include a display, such as one of the displays previously described, as an output mechanism. There can be a back light to illuminate the display, with a back light switch to turn on the back light. In another embodiment, the glasses can include a speaker to be the output of the pedometer. The speaker can be in one of the temples of the glasses.

[00073] The pedometer can provide different types of outputs. For example, the display can show the step counts, or a count for the number of steps taken by the user. The glasses can have an on/off switch to activate the pedometer. When the pedometer is turned on, it keeps track of the number of steps taken by the user.

[00074] Another type of output can be distance traveled. The pedometer can include a switch for stride-length adjustment. There can be 3 positions--a long, a medium and a short stride, each with its corresponding distance. The user can set the switch at one of the positions. Then the controller multiplies that distance by the step count to generate the distance traveled. In another embodiment, the user can enter his average stride distance into the glasses to provide a more accurate distance calculation. This can be done directly (e.g., inches or feet) or indirectly (e.g., steps per 10th of a mile).

[00075] The pedometer can include a timer to show time elapsed. With the timer, the controller can also divide distance traveled by time elapsed to provide a speed output.

[00076] In yet another embodiment, the pedometer can be automatically adjusted based on the types of exercise the user is engaging in, such as whether she is walking or jogging. For example, the resonance frequency, stride, or other parameter can be changed to provide a more accurate correspondence to whether the person is walking or jogging. There could alternatively be a switch that allows the person to change the pedometer from the walking mode to the jogging mode.

[00077] In a further embodiment, the person can enter his weight into the pedometer. Based on the weight and the distance traveled, the pedometer can

measure the number of calories burned, which are proportional to the weight and the distance traveled.

[00078] There can also be a memory device to keep track of the above exercise information for a number of days. The controller allows the information to be stored to and retrieved from the memory device.

[00079] In one embodiment, there is also an automatic off feature that allows the controller to automatically turn off or deactivate the pedometer if the pedometer does not sense any steps taken by the user for a pre-determined period of time, such as 2 minutes.

[00080] In one embodiment, at least a portion of the electrical components of a pedometer is in a temple arrangement. For example, a display and a power supply are in the frame of a pair of glasses, and other electrical components of a pedometer are in a temple arrangement.

[00081] In different embodiments, the glasses for a pedometer can be more geared towards sports. The glasses can be a pair of sports glasses, swimming goggles, or protective goggles for playing different types of sports, such as racquetball.

[00082] Based on a number of embodiments described, retailers or distributors can provide after-market modification or enhancement to a pair of glasses. For example, this can be done by replacing existing temple tips with replacement temple tips of a pair of glasses.

[00083] A replacement temple arrangement can include different electrical components for different applications. Alternatively, the replacement temple arrangement can have similar electrical components, but is of different shape or color than the original one.

[00084] In another example, the distributors can have a whole range of temple arrangements in different colors and/or shapes and/or electrical components for a customer to select from. Once the customer has selected one, the distributor will insert that temple arrangements to the glasses and sell the glasses to the customer. The distributor can also permanently fix the temple arrangements to the glasses so that they cannot be removed from the glasses without distorting or breaking the glasses.

[00085] In yet another embodiment, the distributor can allow the customer the option of replacement temple arrangements after the customer has bought the pair of glasses (e.g., as long as the customer returns the glasses within a preset period of time). For example, the preset period of time is one week. The customer has the

option to replace the temple arrangements bought with another set. If the prices are different, the customer will either get a refund or has to pay the extra amount.

[00086] Additional descriptions regarding temple arrangements have been disclosed in the related patent applications, which have been incorporated by reference.

[00087] In a number of embodiments, electrical components have been described to be fully or partially embedded in a temple of glasses, or in a temple arrangement. In other embodiments, the component(s) can be in other parts of the glasses, such as the lens holders, the nose pads, the bridges or the shields.

[00088] A number of embodiments have been described regarding glasses with a number of structural elements. In one embodiment, the glasses can utilize rimless frames. The glasses can include two lenses held together by a bridge. A temple can be attached to each lens through a joint that is connected to the corresponding lens by one or more screws. For example, there can be two screws at each lens to hold onto a temple piece, which includes a joint for a corresponding temple. One or more electrical components can be fully or partially embedded in the glasses, such as in a temple of the glasses.

[00089] In another embodiment, the electrical components, or at least some of the electrical components, in the glasses can be tethered to the glasses instead. A number of tethered embodiments have been described in related patent applications, which have been incorporated by reference.

[00090] As noted above, in one embodiment, the electrical component can pertain to an activity monitor. Here, an activity monitor can be partially or completely embedded in a pair of eyeglasses. Typically, the activity monitor includes an activity sensor and electronic circuitry in the pair of eyeglasses that monitors the activity, manipulates the monitored signals and provides an output of an activity indication to the user or interested party.

[00091] The activity sensor can sense user activity level. As an example, the user activity level can be used to provide a lifestyle indication. For example, a lifestyle indication can indicate to the user whether the user was active today or, alternatively, lazy today. The lifestyle indication can be displayed as a text or graphic symbol to inform the user or others of the activity level. For example, the lifestyle indication can be displayed by an output device (e.g., a LCD or LED display). The output device can be integrated with an eyeglass frame (e.g., at a temple portion of the eyeglass frame).

[00092] The activity level can pertain to a period of time, such as last 5 minutes, last hour, last 12 hours or last 24 hours. In one embodiment, within the time period,

electronic circuitry can measure (e.g., count) motion (e.g. vibrations), such as via an accelerometer or other motion indicators. When motion exceeds a threshold, a count can be increased. The count total for the period of time can then be compared to an index. The index can then provide an activity level, which can be numeral (e.g., 1-10 rating), textual (e.g., lazy, slow, moderate, active) or graphical. For example, in a given day, a count can be accumulated, and then the activity level can be re-determined based on the count at the end of each day. The following table is representative of the correspondence between count value, thresholds (TH), and activity level.

Count	Activity Level
< or = TH1	Lazy
> TH1 but < or = TH2	Slow
> TH2 but < or = TH3	Moderate
> TH3	Active

[00093] These activity levels can also be linked to numerical or graphical indicators which can be displayed on an output device. The output via the output device can provide a current activity and/or a cumulative activity level, which can be a cumulative daily activity level. The output can also be displayed relative to one or more benchmarks.

[00094] When there is no motion or essentially no motion, the monitoring system can power-off or enter a low-power mode, and thus stop performing activity processing or providing any activity indication at an output device.

[00095] In one embodiment, the activity sensor can be implemented using an accelerometer or a vibration sensor. In another embodiment, the activity sensor can be implemented using a pedometer, either mechanical or electrical. In yet another embodiment, the activity can be implemented using a GPS receiver. In still other embodiment, the activity sensor can be implemented using a combination of any of the foregoing. In yet another embodiment, a plurality of activity sensors can be utilized, such multiple activity sensors can be processed separately or in combination.

[00096] In one embodiment, the activity sensor can be used to measure distance traveled. In another embodiment, the activity sensor can acquire a position. The relative change in position over time can be used to determine a distance traveled. Then, the distance traveled over time can be used to correlate to an activity level. The activity level can then be displayed in any of the various ways noted above. In other

embodiment, the activity sensor can be used to measure minimum activity (e.g. while sleeping), velocity or acceleration.

[00097] In one embodiment, an activity monitoring system which provides monitoring and display of activity information can be at least partially embedded in a pair of eyeglasses. In another embodiment, the activity monitoring system can be at least partially embedded in at least one temple of a pair of eyeglasses. Optionally, the pair of glasses can further include one or auxiliary sensors discussed in related applications. At least one of the sensors can be remote from the pair of eyeglasses (and utilize wireless or wired communication to interact).

[00098] In still another embodiment, a pair of eyeglasses can include or utilize a sensor to serve as a stress monitor. For example, stress can be estimated in view of blood pressure which can be evaluated with a blood pressure sensor. As another example, blood pressure together with activity can be used to estimate stress.

[00099] In yet still another embodiment, the activity monitor can operate as a calorie counter. In such case, data from an activity sensor can be converted into estimated calories consumed by the wearer of the glasses. The glasses may permit a user to enter his weight, or there can be a series of glasses each being utilized for different weight ranges. An output device provided with a pair of such glasses can inform the user of the calories consumed, such as throughout the day. The glasses can also include a reset button or on/off switch so that calorie count can be cleared. The glasses might also store calorie information for a plurality of days and permit uploading such data to a computer (wirelessly or via a connector provided with the glasses).

[000100] The various embodiments, implementations and features of the invention noted above can be combined in various ways or used separately. Those skilled in the art will understand from the description that the invention can be equally applied to or used in other various different settings with respect to various combinations, embodiments, implementations or features provided in the description herein.

[000101] A number of embodiments in the invention can be implemented in software, hardware or a combination of hardware and software. A number of embodiments of the invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer

systems so that the computer readable code is stored and executed in a distributed fashion.

[000102] Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the invention may be practiced without these specific details. The description and representation herein are the common meanings used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. In other instances, well-known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

[000103] Also, in this specification, reference to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

[000104] Other embodiments of the invention will be apparent to those skilled in the art from a consideration of this specification or practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

[000105] Other embodiments of the invention will be apparent to those skilled in the art from a consideration of this specification or practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

CLAIMS

1. A pair of glasses comprising:
 - a first lens holder for receiving lenses, the first lens holder having a first side and a second side;
 - a second lens holder for receiving lenses, the second lens holder having a first side and a second side;
 - a bridge element coupling the first side of the first lens holder to the second side of the second lens holder;
 - a first temple pivotally secured to the second side of the first lens holder through a first joint;
 - a second temple pivotally secured to the first side of the second lens holder through a second joint; and
 - a clock at least partially embedded in the glasses.
2. A pair of glasses as recited in claim 1 wherein the clock is located in first temple, close to the first joint, with the clock facing the user when the user is wearing the glasses.
3. A pair of glasses as recited in claim 1 wherein the clock is a digital clock with a liquid crystal display.
4. A pair of glasses as recited in claim 1 wherein the clock is an analog clock.
5. A pair of glasses as recited in claim 1 further comprising a switch, which can be used to adjust the time of the clock.
6. A pair of glasses as recited in claim 5 wherein the clock is a digital clock and the switch is an electrical switch.
7. A pair of glasses as recited in claim 1 further comprising a battery to power the clock, and the battery is at least partially embedded in the first temple.
8. A pair of glasses as recited in claim 7 further comprising a hatch to replace the battery and the hatch faces the wearer of the glasses when the glasses are worn.

9. A pair of glasses as recited in claim 7 wherein once the power in the battery is depleted, the battery cannot be replaced without breaking the glasses.
10. A pair of glasses as recited in claim 1 wherein the clock is a programmable digital clock.
11. A pair of glasses as recited in claim 10 further comprising a speaker, wherein the clock can be programmed to audibly alert a user at a specific time with the speaker.
12. A pair of glasses as recited in claim 1 further comprising a switch, wherein the clock is a digital clock with a display, and wherein the switch can turn the display on and off, with the clock continuously operating.
13. A pair of glasses as recited in claim 1 further comprising a slidable lid that can cover the face of the clock.
14. A pair of glasses as recited in claim 1 wherein the clock only shows the time of day.
15. A pair of glasses as recited in claim 1 wherein the clock shows the time of day, the date and the day of week also.
16. A pair of glasses as recited in claim 1 further comprising a light source that helps to illuminate the face of the clock.
17. A pair of glasses as recited in claim 1 wherein the clock is a standalone device with its battery, and the clock is situated inside a cavity in the glasses.
18. A pair of glasses as recited in claim 1, wherein each temple has a first end and a second end, with the first end being the end that is pivotally secured to its corresponding joint, wherein the second end of each temple has a temple arrangement, and wherein the clock is in one of the temple arrangements.

19. A pair of glasses as recited in claim 18, wherein a temple arrangement is a temple tip, which grabs onto its corresponding temple.
20. A pair of glasses comprising:
a first lens holder for receiving lenses, the first lens holder having a first side and a second side;
a second lens holder for receiving lenses, the second lens holder having a first side and a second side;
a bridge element coupling the first side of the first lens holder to the second side of the second lens holder;
a first temple having a first end and a second end, with the first end pivotally secured to the second side of the first lens holder through a first joint, and with the second end having a first temple arrangement;
a second temple having a first end and a second end, with the first end pivotally secured to the first side of the second lens holder through a second joint, and with the second end having a second temple arrangement; and
an electrical component at least partially embedded in one of the temple arrangements.
21. A pair of glasses as recited in claim 20 wherein the temple arrangements are temple tips, each grabbing onto its corresponding temple.
22. A pair of glasses as recited in claim 20 wherein the temple arrangements are temple fit-overs, each fits over at least a portion of its corresponding temple or temple tip.
23. A pair of glasses as recited in claim 20 wherein the temple arrangements are temple covers, each covering at least a portion of its corresponding temple or temple tip.
24. A pair of glasses as recited in claim 20 wherein the temple arrangements are made of a material that is different from that of the temple.

25. A pair of glasses as recited in claim 20 wherein the temple arrangements are permanently held onto their corresponding temples or temple tips.
26. A pair of glasses as recited in claim 20 wherein the electrical component is selected from the list of an electrical connector, an electrical switch, a power source, an electrical cable, a speaker, a frequency receiver, a frequency transmitter and a sensor.
27. A pair of glasses as recited in claim 20 wherein the sensor is selected from the list of a motion detector, a pressure detector and a radiation detector.
28. A pair of glasses as recited in claim 27 wherein the radiation detector is an ultraviolet detector.
29. A pair of glasses as recited in claim 20 wherein the electrical component is a RFID tag.
30. A pair of glasses as recited in claim 29 wherein the tag is a passive RFID tag.
31. A pair of glasses as recited in claim 20 wherein the electrical component interacts with another electrical component in the glasses.
32. A pair of glasses as recited in claim 20 wherein the electrical component interacts with another electrical component in a device tethered to the glasses.
33. A pair of glasses as recited in claim 32 wherein the another electrical component is selected from the list of a battery, a solar cell, a display, a controller, a memory device and a beeper.
34. A pair of glasses as recited in claim 20 wherein the electrical component is a temperature sensor.
35. A pair of glasses as recited in claim 34 further comprising another sensor located close to the joint of the corresponding temple, wherein both sensors are used to identify the temperature of the wearer of the glasses.

36. A pair of glasses as recited in claim 20 further comprising a switch, a display, a processor, a memory device and a battery, wherein the sensor is a thermal sensor.
37. A pair of glasses as recited in claim 36 further comprising a beeper, which can produce a beeping tone when the temperature measured by the sensor does not change by a threshold value within a preset amount of time.
38. A pair of glasses as recited in claim 20 wherein the electrical component is for locating the glasses.
39. A pair of glasses as recited in claim 38 wherein the glasses include a RFID tag and a beeper.
40. A pair of glasses as recited in claim 38 wherein the glasses include a RF receiver and a beeper.
41. A pair of glasses as recited in claim 38 wherein the glasses include an ultrasound receiver and a beeper.
42. A pair of glasses as recited in claims 1 - 41 wherein the lens holders are shaped to at least partially conform to the profile of face of the wearer of the glasses.
43. A pair of glasses as recited in claim 1 - 41 further comprising a shield that reduces the amount of radiation received by at least one eye of the person wearing the glasses.
44. A pair of glasses as recited in claims 1 - 41 wherein the glasses are selected from the list of sunglasses, fit-over glasses, prescription glasses and safety classes.
45. A method to sell glasses with temple arrangements comprising:
providing a plurality of temple arrangements for a customer to select, with at least one of the temple arrangements having an electrical component at least partially embedded;
inserting the temple arrangements to the corresponding temples of a pair of glasses after the customer has identified the glasses and the temple arrangements;

selling the pair of glasses to the customer,
wherein the customer has the option to replace the temple arrangements with
another pair of temple arrangements within a preset period of time.

46. A temple arrangement, comprising at least one electrical component.

47. A temple arrangement as recited in claim 46, wherein the at least one electrical
component being at least partially embedded in the temple arrangement.

48. A temple arrangement as recited in claim 46 or 47, wherein the temple
arrangement is configured to receive a temple end of a temple of a pair of eyeglasses.

49. A pair of glasses comprising:
a frame having at least a pair of temples; and
a clock at least partially embedded in the frame.

50. A pair of glasses as recited in claim 49, wherein the clock is at least partially
embedded in one of the temples of the frame.

51. A pair of glasses as recited in claim 49 or 50, wherein the clock is visible to a
user of the pair of glasses when the user is wearing the pair of glasses.

52. A pair of glasses comprising:
a frame having at least a bridge and a pair of temples;
a temperature sensing apparatus at least partially embedded in the frame and
operable to measure a temperature; and
a switch to activate the temperature sensing apparatus.

53. A pair of glasses as recited in claim 52, wherein the temperature sensing
apparatus is at least partially embedded in one of the temples of the frame.

54. A pair of glasses as recited in claim 52, wherein the temperature sensing
apparatus is at least partially embedded in a temple arrangement.

55. A pair of glasses as recited in claim 52, 53 or 54, wherein the temperature pertains to a user of the pair of glasses.
56. A pair of glasses as recited in any of claims 52-55, wherein the pair of glasses further comprises an output display that displays an output indication of the temperature.
57. A pair of glasses as recited in claim 1, wherein the clock is made of display spots located around the lens holders of the glasses.
58. A pair of glasses as recited in claim 26, wherein the speaker is a bone-conducting speaker.
59. A pair of glasses comprising:
a frame having at least a bridge and a pair of temples;
a pedometer at least partially embedded in the frame and operable to measure steps taken by a user of the pair of glasses; and
a switch to activate the pedometer.
60. A pair of glasses as recited in claim 59, wherein the pedometer also measures the distance traveled by the user.
61. A pair of glasses as recited in claim 59, wherein the pedometer also measures the speed traveled by the user.
62. A pair of glasses as recited in claim 59, wherein the pedometer can be adjusted based on the type of exercise the user is engaging.
63. A pair of glasses as recited in claim 62, wherein the pedometer can be adjusted from the walking mode to the jogging mode.
64. A pair of glasses as recited in claim 59, wherein the pedometer also measures the number of calories burnt by the user.

65. A pair of glasses as recited in claim 59, wherein the glasses include a memory device to keep track of the measured information for a number of days.
66. A pair of glasses as recited in claim 59, wherein the pedometer is automatically deactivated if the pedometer does not sense any steps taken by the user for a pre-determined duration of time.
67. A pair of glasses as recited in claim 59, wherein at least a portion of the pedometer is in a temple arrangement.
68. A pair of glasses as recited in claim 59 further comprising a display for displaying information on the inside of one of the temples of the glasses.
69. A pair of glasses as recited in claim 59 further comprising a speaker for outputting audio information, with the speaker located in one of the temples of the glasses.
70. A pair of glasses as recited in claim 59 wherein the pedometer includes a spring and a weight, with the orientation of the up and down motion of the weight being substantially perpendicular to the orientation of the bridge.
71. A pair of glasses comprising:
a frame having at least a bridge and a pair of temples;
an activity monitor at least partially embedded in the frame and operable to measure activity associated with a user of the pair of glasses.
72. A pair of glasses as recited in claim 71 further comprising a display for displaying information on the inside of one of the temples of the glasses.
73. A pair of glasses as recited in claim 72 wherein the information being displayed on the display pertains to an activity level.
74. A pair of glasses as recited in claim 72 wherein the information being displayed on the display pertains to a distance traveled.

75. A pair of glasses as recited in claim 72 wherein the information being displayed on the display pertains to a count.

76. A pair of glasses as recited in claim 72 wherein the information being displayed on the display pertains to a calorie count.

77. A pair of glasses as recited in claim 71 further comprising a speaker for outputting audio information.

78. A pair of glasses as recited in claim 72 wherein the audio information being output pertains to an activity level.

79. A pair of glasses as recited in claim 72 wherein the audio information being output pertains to a distance traveled.

80. A pair of glasses as recited in claim 72 wherein the audio information being output pertains to a count.

81. A pair of glasses as recited in claim 72 wherein the audio information being output pertains to a calorie count.

82. A pair of glasses comprising:
a frame having at least a bridge and a pair of temples;
at least one electrical circuit component embedded in one of the temples; and
a connector attached to the one of the temples, the connector being electrically connected to the at least one electrical circuit component.

83. A pair of glasses as recited in claim 82 wherein the at least one electrical component is at least one of a sensor, a battery, a memory or a processing circuit.

84. A pair of glasses as recited in claim 82 wherein the connector is a USB connector.

85. A pair of glasses as recited in claim 82, 83 or 84 wherein the connector is at a temple tip of the one of the temples.

86. A device, apparatus, system or method as described herein or illustrated in the drawings.

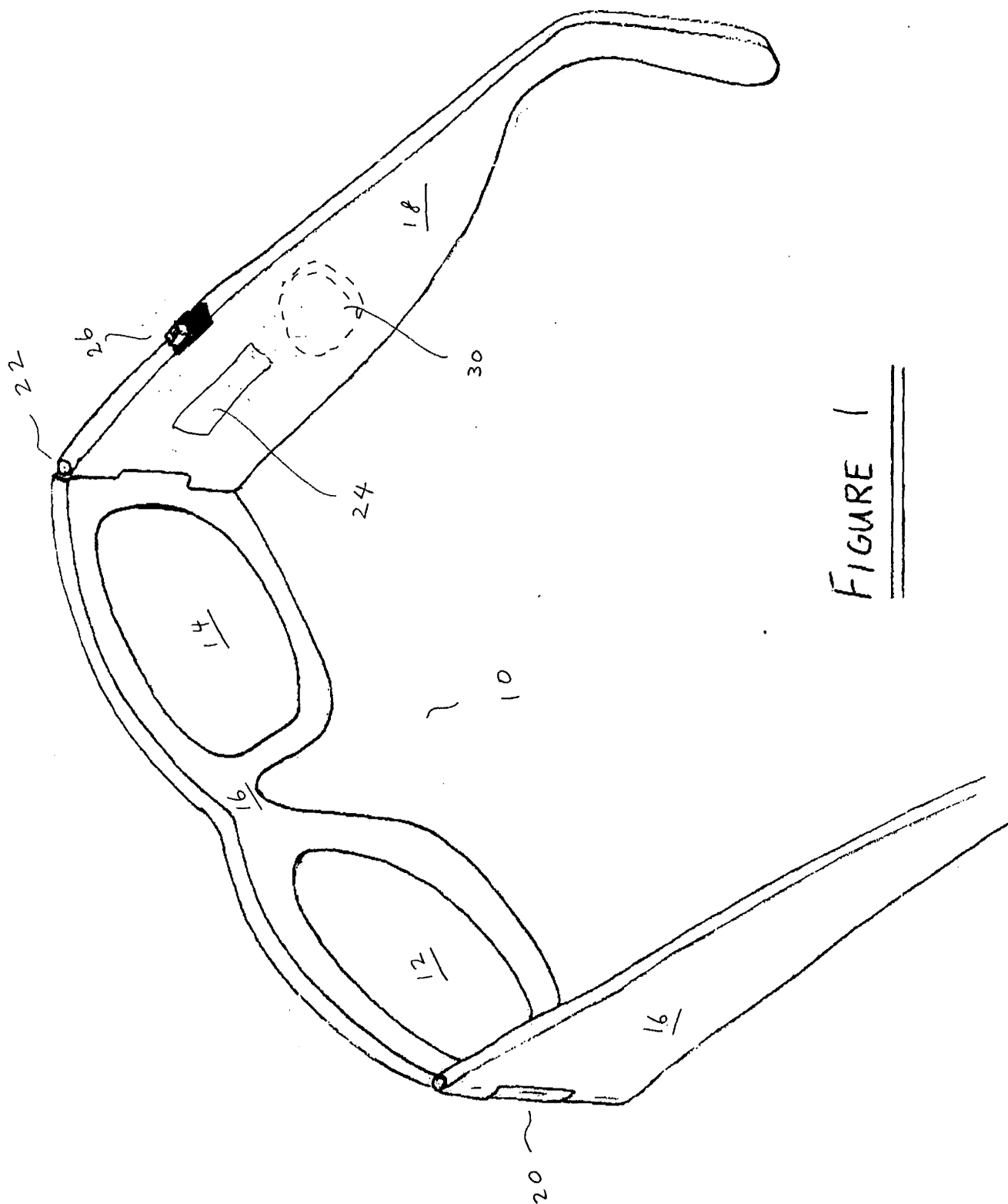


FIGURE 1

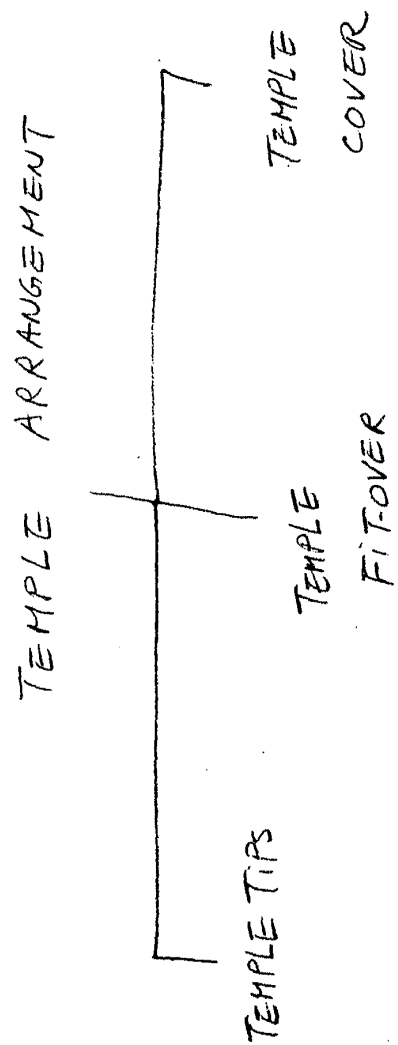


FIG. 2

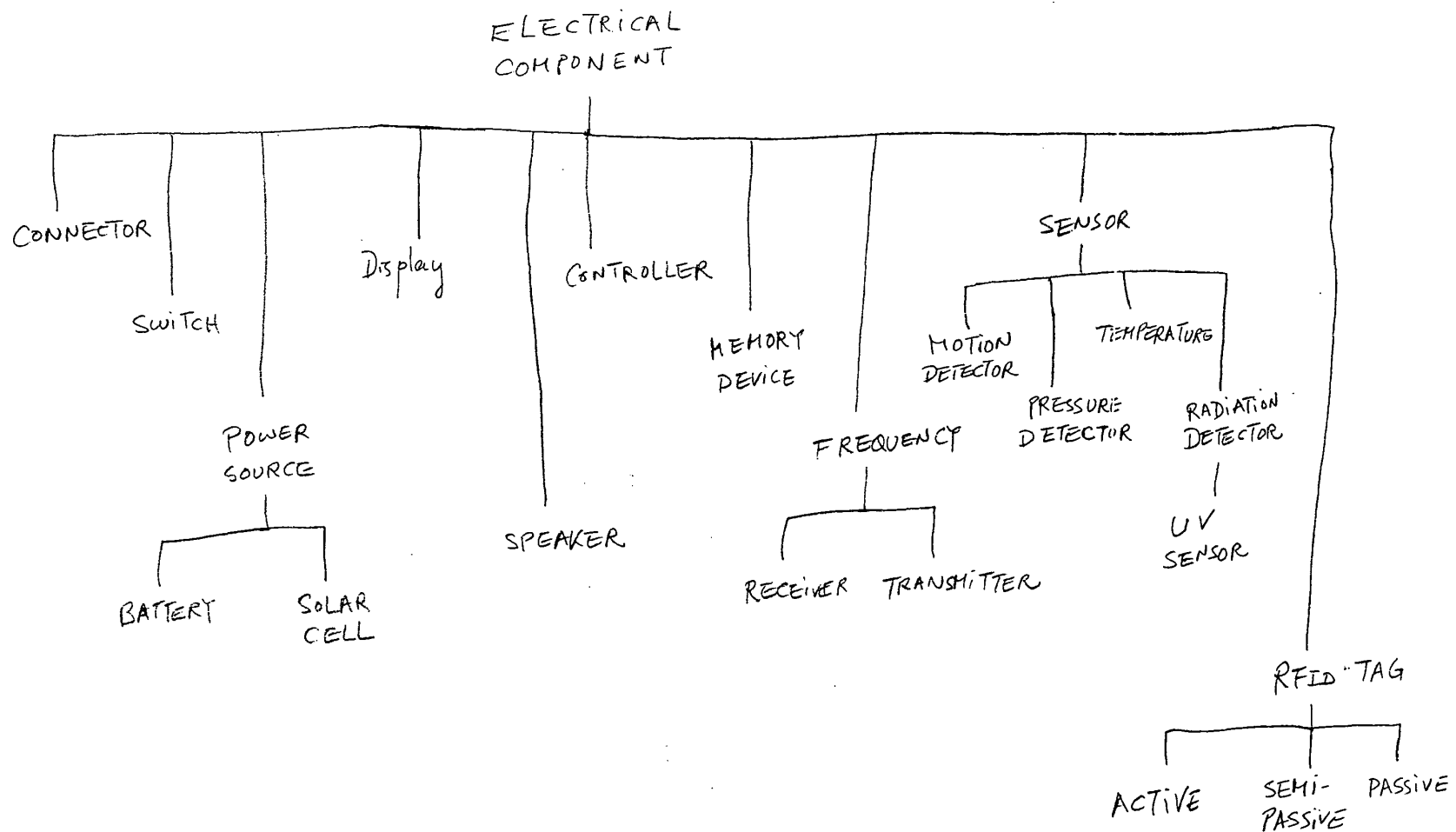


FIG. 3

EYEWEAR FINDER COMPONENTS

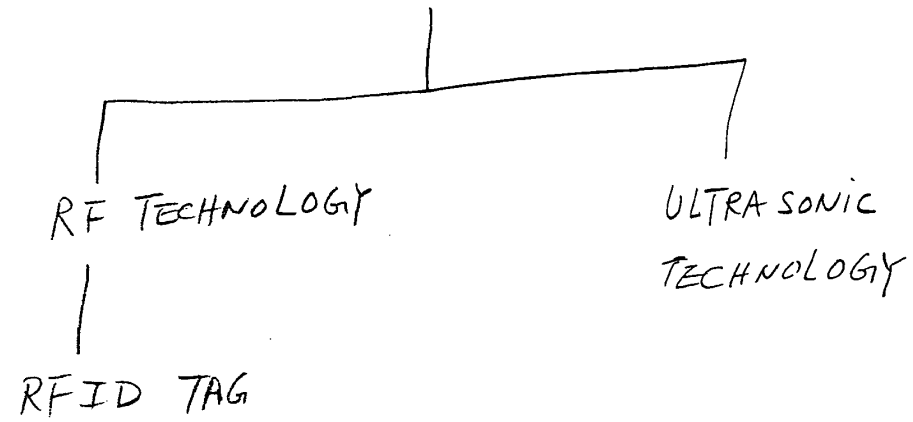


FIG. 4

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