

Spectacle Frame Bridge Housing Electronics for Electro-Active Spectacle Lenses

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CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims priority from and incorporates by reference in its entirety provisional application U.S. Serial No. 60/796,876, titled "Spectacle Frame Bridge Housing Electronics for Electro-Active Spectacle Lenses", filed on May 3, 2006.

[002] This application is also a continuation-in-part of co-pending U.S. Patent Application Serial No. 11/321,324, titled "Ophthalmic Lens for Correcting Non-Conventional Refractive Error", filed on December 29, 2005, which is hereby incorporated by reference in its entirety and which is, in turn, a continuation of U.S. Patent Application Serial No. 11/091,104, titled "System, Apparatus, and Method for Correcting Vision Using an Electro-Active Lens", filed on March 28, 2005, which is, in turn, a continuation of U.S. Patent Application Serial No. 10/626,973, titled "System, Apparatus, and Method for Correcting Vision Using an Electro-Active Lens", filed on July 25, 2003, which is, in turn, a continuation of U.S. Patent Application Serial No. 09/602,013, titled "Optical Lens System With Electro-Active Lens Having Alterably Different Focal Lengths", filed on June 23, 2000, and which, in turn, claims priority to the following U.S. Provisional Patent Applications:

Serial No. 60/142,053, titled "Electro-Active Spectacles", filed July 2, 1999;

Serial No. 60/143,626, titled "Electro-Active Spectacles", filed July 14, 1999;

Serial No. 60/147,813, titled "Electro-Active Refraction, Dispensing, & Eyewear", filed August 10, 1999;

Serial No. 60/150,545, titled "Advanced Electro-Active Spectacles", filed August 25, 1999;

Serial No. 60/150,564, titled "Electro-Active Refraction, Dispensing, & Eyewear", filed August 25, 1999; and

Serial No. 60/161,363, titled "Comprehensive Electro-Active Refraction, Dispensing, & Eyewear" filed October 26, 1999.

[003] This application is also a continuation-in-part of co-pending U.S. Patent Application Serial No. 11/263,049, titled "Electro-Active Spectacle and Method of Fabricating Same", filed on October 31, 2005, which is hereby incorporated by reference in its entirety and which claims priority to the following U.S. Provisional Patent Applications:

Serial No. 60/623,947, titled "Electro-Active Spectacle and Method of Fabricating the Same", filed November 2, 2004;

Serial No. 60/659,431, titled "Eye Ware with Electro-Active Prisms", filed March 9, 2005;

Serial No. 60/661,925, titled "Electronic Eye Glass Frame Enabler", filed March 16, 2005;

Serial No. 60/666,167, titled "Electronic Eyewear", filed March 30, 2005;

Serial No. 60/667,094, titled "Advanced Electronic Eyewear", filed April 1, 2005;

Serial No. 60/669,403, titled "Advanced Electronic Eyewear", filed April 8, 2005;

Serial No. 60/673,758, titled "Advanced Electronic Eyewear", filed April 22, 2005;

Serial No. 60/674,702, titled "Advanced Electronic Eyewear", filed April 26, 2005;

Serial No. 60/679,241, titled "Combination Dynamic Lens & Fixed Power Lens Spectacles", filed May 10, 2005;

Serial No. 60/685,407, titled "Combination Lens System of a Progressive Addition and or Higher Order Correcting Lens & Fixed Power Lens Spectacles", filed May 31, 2005;

Serial No. 60/687,341, titled "Combination Lens System Consisting of a Progressive Lens and Electro-Active Lens", filed June 6, 2005;

Serial No. 60/687,342, titled "Everyday Fashion Eyewear Comprised of Four Distinct Thin Lenses and a Frame", filed June 6, 2005; and

Serial No. 60/692,270, titled "Electro-Active Spectacle and Method of Fabricating the Same", filed June 21, 2005.

BACKGROUND OF THE INVENTION

Field of the Invention

[004] The present invention relates to a nose bridge for a fashion spectacle lens frame adapted for housing electro-active lenses.

Description of the Related Art

[005] Electro-active spectacle lenses make use of electronic components, which may include electronic circuitry, to alter the optical properties of the lenses. These lenses present new challenges in aesthetically packaging and integrating the electronics within a fashionable spectacle lens frame. The invention disclosed herein describes a practical, cost-effective means for integrating the aforementioned electronics within the nose bridge portion of a fashion spectacle lens frame without disturbing the aesthetics of the overall frame design. The invention disclosed herein also describes a means for using the same nose bridge with a variety of frame sizes, shapes, and styles as well as lenses of a variety of sizes and shapes.

SUMMARY OF THE INVENTION

[006] In an embodiment of the invention a nose bridge for spectacle frames adapted for housing electro-active lenses may include a body which may further include electronic components. The nose bridge may further include a connecting element for connecting the electronic components with the electro-active lenses for altering optical properties of the electro-active lenses. The nose bridge may be adapted for fitting at least one of the following: a plurality of frame sizes, a plurality of frame shapes, a plurality of frame styles, a plurality of lens sizes, and a plurality of lens shapes.

DESCRIPTION OF THE DRAWINGS

[007] Embodiments of the invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which like reference numerals indicate corresponding, analogous or similar elements, and in which:

[008] FIG. 1 shows a complete pair of spectacles comprising an embodiment of a nose bridge portion of a fashion spectacle lens frame for electro-active lenses;

[009] FIG. 2 is a close up view of a first embodiment of a nose bridge portion of a fashion spectacle lens frame for electro-active lenses;

[0010] FIG. 3 is a close up view of a second embodiment of a nose bridge portion of a fashion spectacle lens frame for electro-active lenses; and

[0011] FIG. 4 is a close up view of a third embodiment of a nose bridge portion of a fashion spectacle lens frame for electro-active lenses.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] A complete pair of spectacles **100** shown in FIG. 1 comprises two lenses **101**, two temple stems **102**, and a nose bridge **103**, which joins the two lenses together. Nose bridge **103** may also provide for the placement of nose pads **104** to support the spectacles on the wearer's nose. Nose bridge **103** may be adapted to fit a variety of frame types and styles as well as lens shapes and sizes. Electro-active spectacles differ from conventional spectacles in that the optical properties of a portion of the lenses **105** may be dynamically altered by the application of suitable electrical signals. For example, the focal length or optical transmission of the lenses may be changed. These electrical signals are typically produced by means of electronic components, which may include electronic circuitry, which must be electrically connected to the electro-active portion of the lenses **105**. The electrical circuitry and electronic components can include, by way of example only, one or more of the following: a power source, wires, integrated circuits such as drivers and controllers or the like. The electrical circuitry and electronic components can also include additional hardware that enhances the operation of the electro-active spectacles. For example, one or more of the following may be included: a photovoltaic cell, a tilt switch, a light sensor, a passive range-finding device, a time-of-flight range finding device, an eye tracker, a view detector which detects where a user may be viewing, an

accelerometer, a proximity switch, a physical switch, a manual override control, a capacitive switch which switches when a user touches the nose bridge or the like.

[0013] One method of delivering these electrical signals to the electro-active portion of the lenses **105** is to locate some or all of the electronics within the nose bridge **103**. An electrical connection can then be made between the electronics and electrical contacts **107** within nose bridge **103** at the point where the nose bridge **103** connects to the lenses **105**. From the electrical contacts **107** the electrical connection may be extended to the electro-active portion of the lenses **105** by means of electrical leads **106** within the lens. Electrical leads **106** may be transparent and may be made out of a transparent conductive material such as Indium Tin Oxide (ITO) or the like.

[0014] In a first embodiment of nose bridge **103** shown in FIG. 2, nose bridge **200** is a self-contained unit that is designed to be compatible with many different types of spectacle frames. For example, nose bridge **200** may be used with front eye-wire style spectacle frames and the like. At least a portion of the electronic components and circuitry are concealed within the body **202** of the nose bridge **200**. Electrical connection to the electro-active portion of the lenses **105** may be made by means of connecting element **207**. Connecting element **207** serves to mechanically and electrically connect the body **202** of nose bridge **200** to lenses **101**. Connecting element **207** contains electrical contact points **201**, which are located at the points where the bridge connects to lenses **101**.

[0015] Electro-active lenses may require input from the wearer's environment to operate properly. For example, it may be beneficial to detect the distance to which a wearer is focused by means of a range finding or view detecting device and adjust the optical power of the electro-active portion of the lens **105** accordingly. It may also be beneficial to detect the intensity or level of light and adjust the optical transmission of the electro-active portion of the lens **105** accordingly. The optical transmission of the lens may be altered by means of tinting the lens or other chromatic changes to the lens. In this first embodiment a transmitter **203** and a receiver **204** may be mounted to the body of the bridge **202**. Transmitter **203** and a receiver **204** may be used to perform range finding such as time-of-flight range finding or passive range finding. Multiple transmitters **203**

and/or receivers **204** may also be used. In certain other embodiments, only the transmitter **203** is located on the bridge and the receiver **204** is located on another frame component, such as by way of example only, the temple stems. In other embodiments, only the receiver **204** is located on the bridge and the transmitter **203** is located on another frame component, such as the temple stems. In other embodiments it may be adequate to only receive input from the environment, in which case only a receiver **204** sensitive to the stimulus of interest would be required.

[0016] Transmitter **203** and receiver **204** may transmit and receive various types of energy. For example, transmitters and receivers used for range finding may transmit and receive electro-magnetic or acoustic energy. This energy may or may not be within a frequency or wavelength range normally detectable by the human sense organs. For example, infrared light or ultrasonic noise may be used.

[0017] Electrical power may be supplied by power source **205** contained within the nose pads **104** connected to bridge body **202**. The power source **205** may include, by way of example only, batteries or fuel cells. The power source **205** may be rechargeable, in which case it may be permanently attached to the bridge **200**. The power source **205** may also be disposable, in which case it may be easily removed and replaced as needed. Furthermore, the nose pad **104** which contains the power source **205** may be disposable, in which case as power source **205** is consumed it may be replaced by simply replacing the nose pad **104**. However, in other embodiments, power source **205** is rechargeable in which case it is no longer necessary to dispose of nose pad **104**. Supplemental electrical energy for operation of the electronics or recharging of the power source **205** in situ may be provided by a small photovoltaic array **206** located on the outside of the main body of the bridge **202**.

[0018] In a second embodiment of nose bridge **103** shown in FIG. 3, nose bridge **300** is primarily comprised of a body **302** which contains at least a portion of the electronic components and circuitry. Body **302** may be molded from an organic resin(s). Electrical connection to the electro-active portion of the lenses **105** is made by means of connecting element **307**. Connecting element **307** serves to mechanically and electrically connect the body **302** of nose bridge **300** to lenses **101**. Connecting element **307** contains electrical

contact points **301**, which are located at the points where the bridge connects to lenses **101**. Power source **205** may be encapsulated within the bridge body **302** in which case it may be rechargeable. Alternately, body **302** may open to allow the removal and replacement of power source **205**. Molded body **302** may contain a transmitter **203** and/or a receiver **204** for sensing the wearer's environment. Molded body **302** may also contain a photovoltaic array **206** for providing extra electrical power or for recharging power source **205** in situ.

[0019] In a third embodiment of nose bridge **103** shown in FIG. 4, nose bridge **400** may be comprised of two components. The first component, connecting element **407** is permanently attached to the electro-active lenses **101** and frame. The second component, body **402**, is similar to the molded body **302** in the second embodiment and contains at least a portion of the electronic components and circuitry. In this embodiment the molded body **402** can be easily attached to and removed from the connecting element **407** using appropriate physical and electrical connectors (not shown).

[0020] Electrical connection to the electro-active portion of the lenses **105** is made by means of connecting element **407**. Connecting element **407** serves to mechanically and electrically connect the body **402** of nose bridge **400** to lenses **101**. Connecting element **407** contains electrical contact points **401**, which are located at the points where the bridge connects to lenses **101**. The body **402** may contain a non-rechargeable power source **205** and this may be disposable and replaced as the power source **205** is consumed. Alternately, power source **205** may be rechargeable in which case the body **402** may be removed from the connecting element **407** and placed in an appropriate charging unit as needed. Alternately, body **402** may open to allow the removal and replacement of power source **205**. Molded piece **402** may contain a transmitter **203** and/or a receiver **204** for sensing the wearer's environment. Molded body **402** may also contain a photovoltaic array **206** for providing extra electrical power or recharging power source **205** in situ. Such an approach would be well suited to the plastic of zyle resin frames where the physical and electrical connectors required for such a design could be more easily incorporated and concealed.

[0021] In a fourth embodiment (not shown) of nose bridge **103** an approach such as that illustrated in FIG. 4 may be employed where only the portion of the molded body component that contains the power source **205** can be removed. In such an embodiment the power source **205** may be either disposable or rechargeable as discussed in the third embodiment.

[0022] The above embodiments do not require that all of the electronic circuitry and/or components be contained within the nose bridge portion of the frames. In certain other embodiments other frame components such as the temple stems, temple hinges, and eye-wire may be used to mount and conceal electronic components and/or circuitry.

[0023] The above embodiments of nose bridge **103** may be adapted to be a common platform for a variety of frames and lenses. Nose bridge **103** may be adapted for fashion spectacle frames of various types, sizes, and styles as well as for frames manufactured from a variety of materials. Nose bridge **103** may be adapted to fit a variety of lenses of different sizes and shapes as well as lenses manufactured from a variety of materials. This may be accomplished by having nose bridge **103** be integrated into the frame or by having nose bridge **103** attach to a portion of an existing frame.

[0024] In embodiments in which power source **205** is rechargeable, power source **205** may be recharged within the nose bridge **103**. In another embodiment, power source **205** may be detached from nose bridge **103** and recharged outside of nose bridge **103**. In embodiments in which power source **205** is charged within nose bridge **103**, nose bridge **103** may contain electrical contact points (not shown) which are adapted to fit a charging station. In another embodiment, power source **205** may be inductively charged within nose bridge **103**. In one exemplary embodiment, an eyeglass case may be adapted to be an inductive charger suitable for recharging power source **205** within nose bridge **103**. In such an embodiment, spectacles **100** may be placed within the eyeglass case and power source **205** may be recharged.

CLAIMS

What is claimed is:

1. A nose bridge for spectacle frames adapted for housing electro-active lenses, comprising:
a body comprising electronic components; and
a connecting element for connecting said electronic components with the electro-active lenses for altering optical properties thereof, wherein the nose bridge is adapted for fitting at least one of the group consisting of: a plurality of frame sizes, a plurality of frame shapes, a plurality of frame styles, a plurality of lens sizes, and a plurality of lens shapes.
2. The nose bridge of Claim 1, wherein said body is integral with said connecting element.
3. The nose bridge of Claim 1, wherein said body is adapted for detachably attaching to said connecting element.
4. The nose bridge of Claim 1, wherein said optical property is that of optical transmission.
5. The nose bridge of Claim 1, wherein said optical property is that of focal length.
6. The nose bridge of Claim 1, wherein said electronic components comprises a power source.
7. The nose bridge of Claim 1, wherein said electronic components comprises an integrated circuit.
8. The nose bridge of Claim 1, wherein said electronic components comprises a tilt switch.
9. The nose bridge of Claim 1, wherein said electronic components comprises a photovoltaic cell.

10. The nose bridge of Claim 1, wherein said electronic components comprises a transmitter of electro-magnetic energy not within a range of wavelengths visible to a human eye and a receiver for receiving at least a portion of said electro-magnetic energy.
11. The nose bridge of Claim 1, wherein said electronic components comprises a transmitter of acoustic energy not within a range of frequencies audible to a human ear and a receiver for receiving a reflection of at least a portion of said acoustic energy.
12. The nose bridge of Claim 1, wherein said electronic components comprises a device for determining a distance between a wearer of the spectacles and an object focused upon by said wearer using the spectacles.
13. The nose bridge of Claim 1, wherein said body comprises one or more nose pad that contain a power source.
14. The nose bridge of Claim 1, wherein said body comprises a power source that is rechargeable.