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**Kokonaski et al.**

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(54) **ELECTRONIC EYEGLASS FRAME**

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This patent is subject to a terminal disclaimer.

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**G02C 1/00** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **351/158**

(58) **Field of Classification Search**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,437,642 A 3/1948 Henroleau  
2,576,581 A 11/1951 Edwards

(Continued)

FOREIGN PATENT DOCUMENTS

CN ROC89113088 10/2001  
DE 4223395 1/1994

(Continued)

OTHER PUBLICATIONS

Kowel, Stephen T., et. al; Focusing by electrical modulation of refraction in a liquid crystal cell; *Applied Optics*; Jan. 15, 1984; vol. 23, No. 2.

Thibos, Larry N., et. al.; Vision through a liquid-crystal spatial light modulator; *Adaptive Optics Conference*; 1999; Durham, UK.

Donald T. Miller, Xin Hong, and Larry N. Thibos, "Requirements for segmented spatial light modulators for diffraction-limited imaging through aberrated eyes." G.D. Love, ed. *Proceedings of the 2nd International Workshop on Adaptive Optics for Industry and Medicine*, World Scientific, Singapore, 63-68 (Jul. 1999).

(Continued)

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(57) **ABSTRACT**

The present invention generally relates to integrating electronic components into an electro-active frame for driving electro-active focusing lenses. This is accomplished in a cosmetically pleasing manner that allows a platform of frame systems to be built from a single electronic module. Specifically, the present invention discloses controlling an electro-active lens in a deliberate, hands free manner that gives the user control of the electro-active lens.

**37 Claims, 18 Drawing Sheets**

