

(12) **United States Patent**
Epstein et al.

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(54) **OPTICAL ELEMENT FOR LATERAL LIGHT SPREADING IN BACK-LIT DISPLAYS AND SYSTEM USING SAME**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1323 days.

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This patent is subject to a terminal disclaimer.

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(57) **ABSTRACT**

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A display system has a controlled transmission mirror disposed between the light sources and the display panel. The controlled transmission mirror includes a light-diverting input coupling element facing the light sources, a light-diverting output coupling element facing the display panel and a multilayer reflector between the input and output coupling elements. The controlled transmission mirror laterally spreads the light, making the illumination of the panel more uniform. The controlled transmission mirror may include a transparent substrate between the input and output coupling elements for additional light spreading. The light sources may be positioned within the controlled transmission mirror, rather than behind it. The output coupling element can be insensitive to polarization, so the light passing out of the controlled transmission mirror is unpolarized, or the output coupling element can be polarization sensitive so that the output light is polarized.

(51) **Int. Cl.**

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(52) **U.S. Cl.** **349/62; 349/61; 349/64**

(58) **Field of Classification Search** **349/61-67**
See application file for complete search history.

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10 Claims, 10 Drawing Sheets

