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(54) CONTRAST ENHANCEMENT FOR AN ELECTRONIC DISPLAY DEVICE BY USING A BLACK MATRIX AND LENS ARRAY ON OUTER SURFACE OF DISPLAY

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(57) **ABSTRACT**

A display device having features which enhance the contrast of displayed images includes a pixel structure that defines an active pixel area and an inactive pixel area. The display device may be an emissive device such as an OLED or electroluminescent device, a transmissive device such as a liquid crystal light-valve device or a reflective device, such as a Bistable, Reflective Cholesteric (BRC) liquid crystal device. The ratio of the active pixel area to the total pixel area is less than 50 percent. The display device includes a transparent cover plate having a black matrix formed on the viewer side of the cover plate. The display device may be a tiled display in which case the black matrix is formed on an integrator plate to which the individual tiles are bound to form the complete display device. For reflective or emissive display materials, the display device includes an electronics section including a circuit board which provides driving signals for the pixels of the display device. The electronics section is bound to the display section by an adhesive. To provide a light-absorptive background for the active pixel elements, the circuit board or the adhesive are colored black. The individual pixel elements of the display device include four sub-pixel components separated by portions of the inactive pixel area, which four sub-pixel components together define the active area of the pixel. A lens system is provided on the viewer surface of the display to concentrate light emitted by the active area of the pixel elements into a smaller area, thus decreasing the aperture of the display. Areas between the lenses on the viewer surface of the display are coated with a black material to form a black matrix. A black material is selectively deposited on the front cover plate before applying the metal row electrodes to prevent the row electrodes from providing a reflective surface to the viewer.