

SEPARABLE BACKLIGHTING SYSTEM

TECHNICAL FIELD

[0001] The present disclosure relates generally to lighting systems for displays. In particular, the present disclosure relates generally to back lighting systems for displays that require a source of high intensity illumination.

BACKGROUND

[0002] Liquid crystal displays (LCDs) require a source of high intensity illumination for the images generated on the LCD display panel to be visible to an observer. The panels are customarily illuminated from the sides or from behind the panel, and the panel and illumination system are integrated and embedded together within a single sealed enclosure. This provides a fully functional display system which is suitable for both industrial and consumer use in a wide variety of applications. This is also beneficial as LCDs are being made thinner to use up less real estate.

[0003] Multi-Layered display (MLD) systems which employ more than one LCD panel require considerably more illumination than do single panels, due to the limited transmissivity of LCD panels. While a single panel will permit approximately 10% of the incident illumination to reach the observer, use of two panels effectively in series will reduce the transmitted illumination to only 1% ($0.10 \times 0.10 = 0.01 = 1\%$). As a result, considerably more illumination is required to achieve satisfactory results. Such lighting dramatically increases the heat generated by both the lighting devices and their supporting electronics and necessitates the use of extreme cooling measures to reduce the temperature of the MLD unit. The performance of the back-lighting system has been identified as one of the most critical aspects of MLD design and implementation.

OVERVIEW

[0004] The invention provides for a back lighting system for displays that require a source of high intensity illumination. The invention provides for an optical module and a lighting module to be separate but complementary structural modules. In one embodiment, a gaming machine may have a cabinet defining a first interior region of the gaming machine, the cabinet adapted to house a plurality of gaming machine components. The gaming machine may have an optical module positioned within or about the first interior region having a first display device configured to output a visual image in response to a control signal and including one or more controllably transparent portions and a second display device, arranged relative to the first display device such that a common line of sight passes through a portion of the first display device to a portion of the second display device and a lighting module positioned within or about the first interior region having an enclosure defining a second interior region, the enclosure having a light film defining a first surface, a plate defining a second surface, a plurality of light sources positioned between the light film and plate to provide light to the optical module, and a cooling component adapted to flow a cooling medium within the lighting module to transfer heat generated from the plurality of light sources, wherein the lighting module is removably coupled to the optical module such that the lighting module may be replaced or serviced without disturbing the optical module.

[0005] In another embodiment, the gaming machine may have a cabinet defining a first interior region of the gaming machine, the cabinet adapted to house a plurality of gaming machine components. An optical module may be positioned within or about the first interior region, the optical module having a first display device configured to output a visual image in response to at least one control signal and a lighting module may be positioned within or about the first interior region, having a light film, a plate, a plurality of light sources positioned between the light film and plate, and at least one conduit positioned between the plurality of light sources and plate, the conduit designed to receive a cooling medium to transfer heat generated from the plurality of light sources, wherein the lighting module is removably coupled to the optical module such that the lighting module may be replaced or serviced without disturbing the optical module.

[0006] In yet another embodiment, a method for displaying a game of chance on a gaming machine may comprise outputting a first visual image to play a game of chance on a first display device in response to a control signal from a logic device, the first visual image including one or more controllably transparent portions, outputting a second visual image to play the game of chance on a second display device such that a common line of sight passes through a transparent portion of the first display device to a portion of the second display device, the first and second display devices forming an optical module, emitting light from a lighting module to the optical module to view the first and second visual images, the lighting module having a plurality of light sources, flowing a cooling medium through the lighting module to transfer the heat generated from the plurality of light sources, and servicing the lighting module without disturbing the optical module.

[0007] The present invention provides other hardware configured to perform the methods of the invention, as well as software stored in a machine-readable medium (e.g., a tangible storage medium) to control devices to perform these methods. These and other features will be presented in more detail in the following detailed description of the invention and the associated figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings, which are incorporated into and constitute a part of this specification, illustrate one or more example embodiments and, together with the description of example embodiments, serve to explain the principles and implementations.

[0009] In the drawings:

[0010] FIGS. 1A-1C illustrate in exploded perspective view, various components of a separable backlighting system according to one embodiment of the present invention.

[0011] FIG. 1D is a perspective view of an exemplary flow diagram of a cooling medium through the lighting module of FIGS. 1B and 1C.

[0012] FIG. 1E is a back perspective view of the separable backlighting system of FIGS. 1A-1D.

[0013] FIG. 1F is a block diagram of an exemplary logic device of the separable backlighting system of FIGS. 1A-1E.

[0014] FIGS. 2A and 2B illustrate right and left side views of the separable backlighting system of FIGS. 1A-1C.

[0015] FIG. 3 illustrates a flow diagram of a method for displaying a game of chance on a gaming machine.

[0016] FIGS. 4A, 4B, and 4C illustrate an exemplary MLD system positioned in a gaming machine.