SYSTEM AND METHOD FOR FIBER OPTICS BASED DIRECT VIEW GIANT SCREEN FLAT PANEL DISPLAY

DESCRIPTION OF THE RELATED ART

[0001] Displays are the pivotal components of modern information technology systems, ranging from large wall-mounted TVs and projection TV systems, through desktop flat-panel monitors and the ubiquitous notebook and laptop computers, to mobile phones, PDAs and wearable computing systems.

[0002] The cathode ray tube (CRT) was the prevailing display technology roughly ten years ago; it was used in large and small screen TVs, projection TVs, desktop computer monitors, etc. Today the majority of the computer monitors, both for desktops or laptops, digital TVs, cell phones, PDAs, are dominated by technologies other than that of CRT. Only low end analogue TVs, and professional studio quality TV monitors, still employ CRT technology because of its low cost and superior picture quality for displaying images.

[0003] Currently, LCD (liquid crystal display) is the predominant technology for displays. It is widely deployed in computer monitors, laptop computers, projection TVs, ED (enhanced definition) and HD (high definition) digital TVs, cell phones, and PDAs. LCD displays have a slim design and a flat viewing surface, and its high dynamic contrast ratio, flicker free images, and precise pixel (picture element) registration make it inherently a superior display for computers. However, LCD displays fall short in several areas when compared with the older CRT technology. First of all, LCD technology cannot match the accuracy of color reproduction of the CRT technology, because of its smaller color gamut, defined as the area inside the triangle formed by connecting its three primary colors. Second, the LCD tends to have much smaller viewing angles, and thirdly, the LCD's dynamic range falls far short of that of the CRT technology. However, the LCD technology is still progressing at a rapid pace. Recent advances in flat panel LCD technology now allow for larger screens, wider viewing angles, and higher-quality video images.

[0004] LCD display works the following way; two sheets of glass substrates coated with transparent electrodes and polymer alignment films on the inner sides, are used to sandwich the liquid crystal material inside. The liquid crystal molecules will line themselves up at the alignment layer boundaries. The directions of alignment between the upper glass plate and the lower one are orthogonal, thus forcing the liquid crystals into a twisted structural arrangement. The twist could be a simple 90° twist or a 270° twist (the latter is called "super-twisted"). Light that travels through the twisted liquid crystal structure is also twisted as it passes by following the twists of the molecules. When voltage is applied across the liquid crystal sandwich, the polar molecules of the liquid crystal realign themselves along the direction of the electric field. A light that passes through the realigned liquid crystal sandwich is no longer twisted. Hence if a pair of mutually orthogonal polarizing filters are added on each side of the liquid crystal sandwich, the light that passes through the first polarizer will passes through the second polarizer if no external electric field is applied across the sandwich, but it will not be able to pass through the second polarizer if a strong enough electric field is applied. For weaker electric field, the liquid crystal molecules will only be partially realigned with the direction of the electric field, hence the light that passes through it will be twisted to a greater or less degree depending on the strength of the electric field, thus the strength of the electric field determines the intensity of the light that passes through the sandwich, creating a gray scale. Additional color filters are needed for each pixel, or picture element, if full color display is desired. The crystals themselves do not produce light, so the technology is non-emissive and therefore does not give off radiation like an older TV does. Fluorescent tubes housed behind the transparent material are used to illuminate the image, so they require less power to operate than CRT televisions and plasma displays.

[0005] For a large display, it is clearly impractical to address the individual pixel separately because of the number of pixels involved. Currently, the addressing is done with two sets of electrodes called X-electrodes and Y-electrodes, both made of transparent conducting material, usually indium tin oxide (ITO). The X-electrodes are laid on the lower glass of the liquid crystal sandwich, say, and the Y-electrodes on the upper glass panel. Switching transistors or diodes are attached to each pixel to switch the pixel on or off. Pixel addressing using X-Y matrix and individual switching transistors for each pixel is called active matrix addressing scheme. In the X-Y matrix addressing scheme the Y-electrodes are used to select the row of pixels for addressing, and the X-electrodes are fed with voltages corresponding to the gray scale value of each pixel. The switching transistors are typically thin film transistors, hence such addressing is often called TFT, or thin film transistors addressing.

[0006] LCD displays have excellent image stability and sharpness. They are relatively light weight and thin, and consume little power in comparison with CRT screens that they displaced. LCD screens are also bright, exceeding CRT in brightness. Even though LCD displays tend to have lower static contrast ratio than that of CRTs, the dynamic contrast is actually higher. However, LCD displays can't compete with CRTs when it comes to chromatic range, and response time. Recent advances such as the conversion from passive matrix display drive technique to active display drive technique have made LCD screens more responsive, and acceptable speeds have been reached to allow video and TV viewing.

[0007] Plasma display technology works much the same way a household fluorescent light works. It uses a network of red, green and blue phosphors mounted between two layers of glass separated by an approximately 100 micron spacing within a vacuum envelope. A small alternating current electric pulse of several hundred volts for each pixel is used to ionize the rare gas of argon, neon, or xenon to produce the plasma, which emits ultraviolet light. Plasma is a gas that made up of free electrons and mostly positive ions as well as neutrals. It is inherently unstable since the ions and electrons have a tendency to recombine into neutrals. Color phosphors, acting as scintillation agents, convert the plasma discharge light into red, green and blue lights. Plasma screens have excellent memory effect; once the plasma is created by the electric pulse, it will decay back into