sectional view, the addition of separate multilayer dielectric optical filters **280** for each color pixel (red: **281**, green: **282**, blue: **283**) in a black matrix display device. Since typical ambient light has a broad spectrum of wavelengths, the wavelength selective multilayer optical filters can be designed as a narrow-band pass filter as well as a omnidirectional absorber in order to absorb all but a narrow band of spectrum, allowing only the selected laser light to pass through. Such measure would reduce the reflected ambient light to almost zero. By contrast, most traditional emissive or non-emissive display technologies emit lights of broad wavelength spectrum, rendering narrowband optical filtering ineffective in improving contrast ratio of the displays in ambient light environments.

[0141] By affixing column fibers and black matrix blocks directly to the black backing material, and the row fibers and optical switching elements to the column fibers/black matrix, a very thin display can be constructed. If the backing material is in the form of a thin glass fiber, Kevlar, or carbon fiber reinforced film of sufficient strength, then a flexible, light weight display device can be made.

[0142] Laser diodes have very high light emission efficiencies. Both Red and Green laser diodes have illumination efficiencies in the 50% range, and the best blue laser diodes also have better than 30% efficiency. These efficiency figures are much higher than that of fluorescent lights and incandescent lights and orders of magnitude higher than those of CRT, OLED, LED, etc. The overall optical efficiency of the proposed laser display device is primarily determined by the laser diode efficiency, the optical coupling efficiency of the optical switches, losses in column fibers and row fibers, absorption of stray laser lights by black matrix and the back layer, the transmission coefficient of the multilayer dielectric optical filters with respect to the selected laser wavelength, etc. The optical transmission losses in column and row fibers can be minimized by using low loss fibers as well as by proper design to ensure optical leakage to keep to a minimum. Laser diode efficiency also includes optical coupling efficiency from laser diodes to column fibers, which can be improved by using high numerical aperture optics. The optical coupling efficiency between column and row fibers during addressing is a function of the coupling length as well as how deep the coupler can intercept the evanescent field of the laser wave of the column fiber. Overall optical transmission efficiency of the proposed system should be lower than that of the OLED display as the latter has more direct transmission architecture. However, this is more than compensated for by the orders of magnitude higher light generation efficiency of the laser diodes. Compared to LCD displays, which use light robbing polarizers and color filters to generate color images, both the light generation and light transmission efficiency is much higher. The use of polarizers remove more than half of the light energy, and each color filter remove roughly ⅔ or more of the light spectrum, which reduces the overall optical transmission efficiency of a LCD display to well under 16%.

[0143] It is to be appreciated that although the present invention addresses the techniques as applied to large display devices, the techniques in accordance with the present invention equally can be utilized for the construction of small size display devices in most cases with minor modifications. It is also appreciated that although the present invention does not explicitly address display devices using light sources other than laser diodes, the teachings of the present invention can readily be applied for the construction of such devices, albeit with lower efficiencies. It is equally to be appreciated that the inventive optical switching techniques disclosed above can be applied to time division multiplexing of multi-node high-speed optical fiber networks.

[0144] The foregoing detailed description of method and apparatus of the present invention have been made with reference to specific exemplary embodiments thereof. It will be self-evident that various alterations and extensions may be made thereto without departing from the broader spirit and scope of the present invention. The present specification and figures are accordingly to be regard as illuminating the principles rather than restrictive in nature. It is, furthermore, not intended that the scope of the invention in any way be limited by the above description, but instead should be determined in its entirety by reference to the following claims.

What is claimed is:

1) An apparatus comprising:

a first layer having a distal end comprising column fibers of non-touching optical fibers arranged in a column, each respective optical fiber to be illuminated at one end by at least one laser diode, and

a second layer substantially parallel to said first layer comprising row fibers optical fibers arranged in rows; and

a third layer between the first and second layer, the third layer comprising optical switching elements.

2) The apparatus of claim 1 wherein each said switching element can be optically coupled to optical fibers in said first layer and optical fibers in said second layer simultaneously.

3) The apparatus of claim 1 wherein each said laser diode is able to emit at least one of narrowband light wave of substantially one wavelength, and two or more single wavelength colors.

4) The apparatus of claim 3 wherein a proximal face of each said fiber of the second layer is coupled to a multitude of wavelength specific narrow pass band optical filters.

5) The apparatus of claim 4 wherein each said narrow pass band optical filter is at least one of to pass tnansmission of laser light, absorptive relative to wavelength not within the pass band of said optical filter, and a multilayer dielectric optical filter.

6) The apparatus of claim 1 wherein each fiber of said fiber comprises an optical fiber sheath and a non-concentric optical fiber core.

7) The apparatus of claim 6 wherein each said optical fiber core has a portion of a core boundary substantially uncovered by said optical fiber sheath on a proximal side.

8) The apparatus of claim 2 wherein said optical switching element is capable of intercepting a laser wave field of the column fiber of the first layer when said switching element is actuated.

9) The apparatus of claim 1, further comprising an ambient light absorbing fourth layer.

10) The apparatus of claim 1, wherein said apparatus is to provide a display.

11) The apparatus of claim 1, further comprising an ambient light absorbing matrix of light absorbing material to block inter-pixel crosstalk.