modulation and spectral filtering functions associated with each and every subpixel structure of the LCD panel are carried out using the polarization/wavelength dependent transmission and reflection properties of CLC-based filters.

[0026] Another object of the present invention is to provide such a color LCD panel having a multi-layer construction with multiple optical interfaces, at which non-absorbing broad-band and pass-band (i.e. tuned) polarizing reflective panels are used to carryout systemic light recycling within the LCD panel such that light produced from the backlighting structure is transmitted through the LCD panel with a light transmission efficiency of at least %90.

[0027] Another object of the present invention is to provide a novel LCD panel, in which both non-absorbing broad-band and pass-band (i.e. tuned) polarizer filters are used to avoid absorbing or dissipating any of the spectral energy produced from the backlighting structure during image production in order that high-brightness images can be produced using low-intensity backlighting structures.

[0028] Another object of the present invention is to provide such a color LCD panel, in which an array of pass-band CLC polarizing filter elements and an array of electrically-controlled liquid crystal elements are disposed between a pair of broad-band CLC polarizing filter panels used to realize the LCD panel.

[0029] Another object of the present invention is to provide such a color LCD panel, in which the spectral components of light produced from the backlighting structure are recycled (i) between the spectral filtering array and the backlighting structure, (ii) within the backlighting structure itself, and (iii) among adjacent subpixels within the LCD panel in order to improve the overall light transmission efficiency of the LCD panel.

[0030] Another object of the present invention is to provide such a color LCD panel, in which the array of liquid crystal elements can be realized using an array of electrically-controlled birefringent (ECB) elements which rotate the linear polarization state of the transmitted light, or invert the polarization state of circularly polarized light being transmitted through the LCD panel.

[0031] Another object of the present invention is to provide such a color LCD panel, in which the backlighting structure thereof can be realized using a light guiding panel based on the principle of total internal reflection, a holographic diffuser based on the principle of refractive index matching and first order diffraction, or other suitable edge-lit backlighting structure which follows in general accordance with the physical principles of the present invention.

[0032] Another object of the present invention is to increase the brightness of a LCD panel.

[0033] Another object of the present invention is to match the color of the cholesteric color filters in a display to the light input color distribution for effective color separation.

[0034] Another object of the present invention is to provide a reflective cholesteric liquid crystal (CLC) color filter with only two different color portions in each CLC layer.

[0035] Another object of the present invention is to provide a reflective color filter made from cholesteric liquid crystals that transmits red, green and blue light from different pixels with a two layer configuration, where each layer has only two reflection bandwidths.

[0036] Another object of the present invention is to improve the contrast between the colors.

[0037] Another object of the present invention is to provide a black matrix by overlapping two layers of reflective color filters.

[0038] Another object of the present invention is to provide a color filter which contains red, green, blue and transparent sub-pixels.

[0039] Another object of the present invention is to use cholesteric liquid crystal reflective color filters to transmit any polarization light of desired colors.

[0040] Another object of the present invention is to eliminate the quarter wave plate in a reflective color filter display.

[0041] Another object of the present invention is to more easily make reflective Cholesteric Liquid Crystal color filters.

[0042] Another object of the present invention is to increase the patterned color section size thus making the pixels easier to make by using only two colors per layer without losing the display resolution.

[0043] Another object of the present invention is to reduce the boundary effects of pixels by having larger size patterned color sections per layer.

[0044] Another object of the present invention is to tune the color filter to the desired center wavelength and bandwidth for better color control.

[0045] Another object of the present invention is to eliminate a layer in a display solely for creating a black matrix.

[0046] Another object of the present invention is to reduce the cost of making reflective color filters.

[0047] Another object of the present invention is to improve the performance of reflective color filters.

[0048] Another object of the present invention is to produce pitch gradient broadband reflective cholesteric liquid crystal materials with different central bandwidths.

[0049] Another object of the present invention is to reliably and cost effectively produce broadband reflective cholesteric liquid crystal materials with different central bandwidths.

[0050] Another object of the present invention is to make layers of reflective cholesteric liquid crystal materials with two separate portions having two separate bandwidths and central wavelengths.

[0051] Another object of the present invention is to have one layer of cholesteric liquid crystal materials with each side of the layer reflecting a different band of wavelengths around a different central wavelength.

[0052] Another object of the present invention is to expose one half of a layer to UV light which is absorbed by attenuation in the cholesteric liquid crystal materials by the time it is one half way through the layer, thus polymerizing one half of the layer.