and is converted to linearly polarized light, making it suitable for use in a display which uses twist nematic or super twist nematic to turn the light from the color filter pixels on and off in conjunction with a linear analyzer. The ability to automatically include a black matrix improves the color contrast, and eliminates layers for reflective masking or other means of blocking light to form a black matrix as used in prior art devises.

[0416] The modifications described above are merely exemplary. It is understood that other modifications to the illustrative embodiments will readily occur to persons with ordinary skill in the art. All such modifications and variations are deemed to be within the scope and spirit of the present invention as defined by the accompanying Claims to Invention.

Claims to invention:

1. A reflective cholesteric liquid crystal color filter comprising:

a first layer of reflective cholesteric liquid crystal color filters of one handedness having at least a first light reflecting portion reflecting a first bandwidth around a first center wavelength and a second light reflecting portion reflecting a second bandwidth around a second center wavelength and,

a second layer of reflective cholesteric liquid crystal color filters of the same handedness as the first layer having at least a third light reflecting portion reflecting a third bandwidth around a third center wavelength, and a fourth light reflecting portion reflecting a forth bandwidth around a forth center wavelength, the second layer of reflective cholesteric liquid crystal color filters adjacent the first layer of reflective cholesteric liquid crystal color filters such that adjacent first and second layer reflecting portions reflect different wavelengths of incident light of the same handedness and transmit the remaining wavelengths.

2. A reflective cholesteric liquid crystal color filter as in claim 1 wherein, the first reflecting portion overlaps the third and fourth reflecting portions and the fourth reflecting portion overlaps the first and second reflective portions,

the second reflecting portion and the third reflecting portion do not overlap each other and reflect the same wavelengths, such that three bands of wavelengths are transmitted through the two layers.

3. A reflective cholesteric liquid crystal color filter as in claim 2 wherein,

the three center wavelengths are for the colors red, green and blue.

4. A reflective cholesteric liquid crystal color filter as in claim 3 wherein,

the bandwidths are narrow such that they are matched to the bandwidths of the incident light.

5. A reflective cholesteric liquid crystal color filter as in claim 1 wherein, the two layers of reflective cholesteric liquid crystal color filters are replaced with one layer having a top portion of cholesteric liquid crystals polymerized to reflect a different wavelength and band width of light than the bottom portion.

6. A reflective cholesteric liquid crystal color filter as in claim 2 wherein,

third and forth layers of cholesteric liquid crystals are added, the third layer matching the first layer except with opposite handedness and the forth layer matching the second layer except with opposite handedness such that any incident light with a selected color is transmitted through the color filters and incident light for all other colors is reflected.

7. A reflective cholesteric liquid crystal color filter as in claim 1 wherein,

the first bandwidth includes the colors blue and green, and the third bandwidth includes the colors green and red,

the second bandwidth includes the color blue and the fourth bandwidth includes the color red,

a clear transparent portion in the second layer is paired vertically with the first bandwidth,

a clear transparent portion in the first layer is paired vertically with the third bandwidth,

and the fourth reflective portion in the second layer is paired vertically with the second reflective portion in the first layer,

such that red is transmitted through the first bandwidth, blue is transmitted through the third bandwidth and green is transmitted through the second and forth bandwidths to provide the primary colors for a display.

8. A reflective cholesteric liquid crystal color filter as in claim 7 wherein,

the third reflective portions overlap the first reflecting portions and the second reflecting portions and the first reflective portions overlap the third and forth reflective portions, such that a black matrix is formed by reflecting all light in the overlapping portions.

9. A reflective cholesteric liquid crystal color filter as in claim 7 wherein,

third and forth layers of cholesteric liquid crystals are added, the third layer matching the first layer except with opposite handedness and the forth layer matching the second layer except with opposite handedness such that any incident light with a selected color is transmitted through the color filters and incident light for all other colors is reflected.

10. A reflective cholesteric liquid crystal color filter as in claim 8 wherein,

third and forth layers of cholesteric liquid crystals are added, the third layer matching the first layer except with opposite handedness and the forth layer matching the second layer except with opposite handedness such that any incident light with a selected color is transmitted through the color filters and incident light for all other colors is reflected.

11. A reflective cholesteric liquid crystal color filter as in claim 2 wherein,

a circular polarizer of opposite handedness of the cholesteric liquid crystals in the first and second layers polarizes unpolarized light incident thereon,

a black matrix layer blocks light from the polarizer before it is transmitted to the first and seconds layers,