CLAIMS

1. A system, comprising:

a power source;

a multi-layer device connected to the power source and having two sides: a viewing side and a second side opposite the viewing side, the multi-layer device permitting or preventing light to pass therethrough from the second side toward the viewing side, the multi-layer device comprising:

a coloring layer group comprising a plurality of pixels, each pixel having at least one sub-pixel corresponding to white or to at least one color; and

a shutter layer group comprising a unique sub-pixel corresponding to each sub-pixel of the coloring layer group;

a diffusing layer group comprising a plurality of sub-pixels, each sub-pixel corresponding to a sub-pixel of the coloring layer group and comprising a polymer-dispersed liquid crystal; and

an electronic controller connected to the power source and the multi-layer device, and configured to:

control each combination of a sub-pixel of the coloring layer group , a corresponding sub-pixel of the shutter layer group, and a corresponding sub-pixel of the diffusing layer group to produce a pixel, which, as perceived on the viewing side, can range from transparent to each of: transparent color or colors, transparent white, at least substantially opaque color or colors, at least substantially opaque white, and opaque black;

wherein the multi-layer device is capable of displaying an image in which pixels, which are perceived as any of transparent, transparent color or colors, transparent white, at least substantially opaque color, at least substantially opaque white, and opaque black are displayed simultaneously.

2. The system according to claim 1, wherein the shutter layer group comprises one of:

a liquid crystal layer;

E-ink disposed between substrates;

a suspended particle device (SPD) disposed on a substrate;

microblinds disposed on a substrate; and

an electrochromic coating disposed on a substrate.

3. The system according to claim 1, wherein the coloring layer group comprises a plurality of pixels, each pixel having at least more than one sub-pixel corresponding to a color.

4. The system according to claim 1, wherein the coloring layer group comprises a plurality of pixels, each pixel having at least three sub-pixels corresponding to different colors.

5. The system according to claim 4, wherein three of the sub-pixels are red, green and blue.

6. The system according to claim 1, wherein the coloring layer group comprises a passive color filter.

7. The system according to claim 1, wherein the power source:
is one of:
AC power;
a transparent photovoltaic layer;
a non-transparent photovoltaic cell; or
one or more batteries; or
charges rechargeable batteries.

8. A method of producing an image on a viewing side of a multi-layer device, the multi-layer device being connected to a power source and also having a viewing side and a second side opposite the viewing side, the multi-layer device permitting or preventing passage of light therethrough toward the viewing side, the multi-layer device comprising a coloring layer group comprising a plurality of pixels, each pixel having at least one sub-pixel corresponding to a white or at least one color; a diffusing layer group comprising a plurality of sub-pixels, each sub-pixel corresponding to a sub-pixel of the coloring layer group and comprising a polymer-dispersed liquid crystal; and a shutter layer group comprising a unique sub-pixel corresponding to each sub-pixel of the coloring layer group; the method comprising:

with an electronic controller:

controlling each combination of a sub-pixel of the coloring layer group, a corresponding sub-pixel of the shutter layer group, and a corresponding sub-pixel of the diffusing layer group to produce a pixel, which as perceived on the viewing side, can range from transparent to each of: transparent color or colors, transparent white, at least substantially opaque color or colors, at least substantially opaque white, and opaque black;

wherein the multi-layer device is capable of displaying an image in which pixels, which are perceived as any of transparent, transparent color or colors, transparent white, at least substantially opaque color, at least substantially opaque white, and opaque black are displayed simultaneously.

9. The method according to claim 8, wherein the coloring layer group comprises a passive color filter.

10. The system according to claim 1, wherein the polymer dispersed liquid crystal is white.

11. The system according to claim 1, wherein the multi-layer device further comprises a cut safe zone allowing the multi-layer device to be cut to a desired size.

12. The system according to claim 11, wherein the cut safe zone is located on at least a portion of the perimeter of the multi-layer device.

13. The system according to claim 11, wherein the cut safe zone is located within a central portion of the multi-layer device.

14. The system according to claim 1, wherein the diffusing layer group is substantially opaque without application of power thereto, and is transparent upon application of power.