

**REFLECTIVE UNIT USING  
ELECTROACTIVE POLYMER AND  
FLEXIBLE DISPLAY EMPLOYING THE  
REFLECTIVE UNIT**

CROSS-REFERENCE TO RELATED PATENT  
APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 10-2007-0050264, filed on May 23, 2007, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] Apparatuses consistent with the present invention relates to a reflective unit using an electroactive polymer and a flexible display employing the reflective unit, and more particularly, to a reflective unit using an electroactive polymer that becomes strained when a voltage is applied thereto and a flexible display employing the reflective unit and having a rapid response to an input signal and high contrast.

[0004] 2. Description of the Related Art

[0005] With the rapid development of communication technologies and display apparatuses, various kinds of portable terminals have been introduced. Examples of portable terminals include personal digital assistants (PDAs), portable multimedia players (PMPs), and digital multimedia broadcasting (DMB) phones. Such portable terminals use light-emitting displays or light-receiving displays.

[0006] Recently, interest is growing on displays that can conveniently display an image using sunlight or external illumination without electrically illuminating the displays. However, displays using sunlight or external illumination have low contrast and slow response to an image input signal, thereby making it difficult to display a high quality moving picture.

SUMMARY OF THE INVENTION

[0007] The present invention provides a reflective unit that can control the reflectance of external light.

[0008] The present invention also provides a flexible display having a rapid response to an input signal and high contrast.

[0009] The present invention also provides a display creating an image using external light.

[0010] According to an aspect of the present invention, there is provided a reflective unit comprising: an electroactive polymer layer which becomes strained when a voltage is applied thereto by an electrode; a light reflecting unit reflecting external light and having reflecting cells arranged on the electroactive polymer layer to be spaced apart from one another wherein a distance between the reflecting cells is changed according to the strain of the electroactive polymer layer; and a light blocking layer preventing external light from being reflected by the light reflecting unit and having blocking cells arranged over the light reflecting unit to be spaced apart from one another.

[0011] The reflecting cells may be reflecting micro mirrors.

[0012] The reflective unit may further comprise sub-blocking cells disposed between the reflecting cells and preventing external light from being reflected between the reflecting cells.

[0013] The light reflecting unit and the light blocking unit may be disposed in the same medium.

[0014] The light blocking unit may be spaced apart from the light reflecting unit.

[0015] The reflecting cells of the light reflecting unit may be arranged to face the blocking cells of the light blocking unit such that the blocking cells can prevent external light from being reflected by the light reflecting unit when no voltage is applied to the electroactive polymer layer.

[0016] The electrode may include a first electrode disposed under the electroactive polymer layer and a second electrode disposed over the electroactive polymer layer.

[0017] The electrode may be formed of a flexible material that is deformed according to the strain of the electroactive polymer layer.

[0018] The electroactive polymer layer may have a thickness of 0.001 to 100  $\mu\text{m}$ .

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The above and other features and aspects of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

[0020] FIG. 1 is a cross-sectional view of a reflective unit using an electroactive polymer according to an embodiment of the present invention;

[0021] FIG. 2 illustrates a circular strain occurring when a voltage is applied to the electroactive polymer used in a flexible display;

[0022] FIG. 3 illustrates a linear strain occurring when a voltage is applied to the electroactive polymer used in the flexible display;

[0023] FIG. 4A illustrates a light reflecting unit and a light blocking unit when no voltage is applied to the flexible display;

[0024] FIG. 4B illustrates the light reflecting unit and the light blocking unit when a first voltage is applied to the flexible display;

[0025] FIG. 4C illustrates an arrangement relationship between the light reflecting unit and the light blocking unit when a second voltage greater than the first voltage is applied to the flexible display;

[0026] FIG. 5 is a cross-sectional view of a modification of the reflective unit using the electroactive polymer of FIG. 1;

[0027] FIG. 6 is a cross-sectional view of a pixel of a flexible display using an electroactive polymer according to an embodiment of the present invention; and

[0028] FIG. 7 is a cross-sectional view of a pixel of a flexible display according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0029] Hereinafter, the present invention will be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, lengths and sizes of layers and regions may be exaggerated for clarity.