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.

**[0026]** It will be understood that when an element or layer is referred to as being "on" another element or layer, the element or layer can be directly disposed on another element or layer with or without intervening elements or layers. In contrast, when an element is referred to as being "directly on" another element or layer, there are no intervening elements or layers present. Like numbers refer to like elements throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

**[0027]** It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

**[0028]** Spatially relative terms, such as "below" or "lower" and the like, may be used herein for ease of description to describe the relationship of one element or feature to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation, in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

**[0029]** The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

**[0030]** Embodiments of the invention are described herein with reference to cross-section illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of the invention. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments of the invention should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing.

**[0031]** For example, an implanted region illustrated as a rectangle will, typically, have rounded or curved features and/or a gradient of implant concentration at its edges rather than a binary change from implanted to non-implanted region. Likewise, a buried region formed by implantation may result in some implantation in the region between the buried region and the surface through which the implantation takes place. Thus, the regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of the invention.

**[0032]** Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

**[0033]** The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

**[0034]** A display apparatus according to the present invention reflects external light as color light using an electroactive polymer.

**[0035]** FIG. **1** is a cross-sectional view of a subpixel of a display apparatus according to an embodiment of the present invention. A plurality of pixels each including a plurality of subpixels are arranged in a matrix and output different color light according to input signals to display a color image. Each of the plurality of subpixels includes an electroactive polymer layer **107**, a diffraction grating **115** disposed on the electroactive polymer layer **107**, and a liquid crystal layer **120** disposed on the diffraction grating **115** and controlling gradation.

**[0036]** The electroactive polymer layer **107** may be formed on a substrate **100**. A thin film transistor (TFT) electrode **103** applying a voltage to the liquid crystal layer **120** and an insulating layer **105** may be disposed between the substrate **100** and the electroactive polymer layer **107**. The TFT electrode **103** may include a TFT bottom electrode disposed under the electroactive polymer layer **107** and a TFT top electrode disposed over the electroactive polymer layer **107**. The diffraction grating **115** is formed of a conductive material and is used as the TFT top electrode of the TFT electrode **103**. The TFT bottom electrode and the diffraction grating **115** are electrically connected to each other. The electroactive polymer layer **107** and the diffraction grating **115** may be disposed in the liquid crystal layer **120**, and more specifically may be disposed in middle and lower parts of the liquid crystal layer **120**.

**[0037]** A transparent substrate **125** is disposed on the liquid crystal layer **120**, and a quarter wave plate **127** and a polarization film **130** are disposed on the transparent substrate **125**. The transparent substrate **125** may be formed of glass or polyethylene terephthalate (PET). A black matrix **123** may be disposed between adjacent pixels. The black matrix **123** absorbs light emitted from an adjacent pixel to prevent light reflected by the diffraction grating **115** from traveling to the adjacent pixel and from resulting in color blending. The black matrix **123** may be disposed in a side of an upper part of the liquid crystal layer **120**.

**[0038]** According to the present embodiment, the displacement of the electroactive polymer layer **107** causes or induces the deformation of the diffracting grating **115**. Thus deformed