[0098] However, there are a number of practical considerations need to be addressed to produce a functional displays utilising multiple overlapping LCD screens, including the reduction or elimination of moire interference effects, coloured fringes, and crossed-polarisers, which are addressed in a number of ways including the use of diffusers, optical retarders and other optical materials and/or material finishes.

[0099] To aid understanding and for the sake of clarity, the display (1) and associated display screens (3, 4) are shown in simplified, schematic form in the drawings.

[0100] Although the rear screen (4) may also be an LCD screen, it will be apparent that alternative, non-transparent display technology may be employed.

[0101] **FIG. 2** shows a perspective view of a simplified dual screen display (1), whereby physical image (6, 7) is displayed on the front and rear screen (3, 4) respectively.

[0102] The images (6, 7) are substantially identical in configuration and are aligned and dimensioned on their respective screens (6, 7) such that the two images appear to overlap exactly (i.e., they are coterminous) to an observer (8) viewing the display (1).

[0103] By altering the luminance distribution between the two images (6, 7) the resultant image (2) perceived by an observer (8) appears to be located on an illusory plane (9) between the image planes of the two screens (6, 7).

[0104] It will be apparent that this precise overlapping condition between the two images (6, 7) only occurs along a particular optical axis. This axis is known as the fixation axis (10) and extends (equidistantly to the retinal foveas) from the image (6, 7) being observed to the mid point between the observers (8) eyes.

[0105] **FIG. 3** shows the variation in luminance distribution for images (6, 7) displayed at the two screens (3, 4). It will be appreciated that in addition to varying the relative luminance between the two images (6, 7) the luminance of the display screen area (11, 12) adjacent to the images (6, 7) may also be varied.

[0106] **FIG. 4** shows four combinations of luminance variation between the images (6, 7) and surrounding screen areas (11, 12) respectively such that the front and rear images have an opposite sign of luminance difference between the images (6, 7) and the surroundings (11, 12). To aid visualisation of the differing luminance levels, the two screens (3, 4) are illustrated in the same plane;—in practice, the screens (3, 4) would overlap.

[0107] **FIG. 4**(*a*) and **4**(*b*) show luminance levels whereby the resultant perceived image (2) is positioned in front of the display (1) in an front illusory plane (13) (as shown in **FIG. 1**) whilst FIGS. **4**(*c*) and **4**(*d*) illustrate the situation where the perceived image (2) is positioned behind the rear screen (4) in a rear illusory plane (14).

[0108] As previously indicated, an emissive source is required between the two screens (3, 4) if the front image (6) or surrounding screen area (11) is to have a higher luminance than the corresponding portions of the rear screen (4). The schematic representation of a display (1) illustrated in **FIG. 1** show the addition of an emissive layer in the form of a light guide (15) located between the screens (3, 4). **FIG. 5** shows an expanded view of the light guide (15) in the form of a rectangular clear acrylic sheet (16) with a substantially planar upper and lower surface with a diffuser (17) affixed thereto or located adjacent to respectively. The light guide has along one peripheral boundary a cold cathode florescent tube (18) housed within a parabolic reflector (19) which reflects the illumination through the peripheral boundary wall of the light pipe (15), it there being retained by virtue of total internal reflection. Either or both of the planar surfaces of the light guide (15) may be provided with a plurality of diffusion dots.

[0109] The diffusion dots are localised regions whereby the light constrained within the light guide striking the diffusion dots exceed the critical angle for total internal refraction and are emitted from the planar surface. To maintain an even distribution of luminosity, the cross sectional profile of the light guide (15) tapers with respect to distance from the florescent tube (18). The opposing peripheral boundary to the florescent tube (18) is provided with an end reflector (20).

[0110] **FIG. 6** schematically shows the incorporation of a refractor (21) between a front screen (3) and a rear screen (4) and the effects on an observer (8) viewing the display from a position (A) substantially orthogonal to the plane of the screens (3,4), and a position (B) subtending an acute angle θ with the screens (3, 4).

[0111] When the observer (8) is in position (A), i.e., the conventional viewing position, there is no parallax error between a substantially identical images (notwithstanding the difference in luminance) located on the screens (3, 4) at points P1 and P2 respectively.

[0112] In the case of air (of refractive index n1) being the medium in front of and between the screen (3, 4), an observer at position B would see points P1 and P2 as being separated by a distance D1, which varies from zero to a value equal to the separation D3 of the screens (3, 4) for values of θ varying from 90-0 respectively.

[0113] Inserting the refractor (21) between the screen (3, 4) causes an alteration of the light rays (R1 and R2) to the observer (8) from P1 and P2 respectively. The refractor (21) has a refractive index n2 (where n2>n1) and thus, the light R2 passing through the refractor (21) from the image at point P2 is refracted towards the light R1 from the image at P1. Consequently, the two images appear to be separated by a closer distance D2 than the distance D1 apparent without the refractor (21) and parallax is thus reduced.

[0114] The refractor (21) may be a distinct component in the display (1) or form part of the emissive layer such as the light guide assembly (15).

[0115] Whilst the theoretical explanation for the phenomena of depth fusion differ amongst the scientific/engineering community, the benefits of employing such techniques with multi-focal plane displays utilising the applicants technology yield undeniable advantages over the prior art, particularly the use of combination displays.

[0116] Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof.