[0082] **FIG. 4** shows a schematic cross section through a known PDA display;

[0083] **FIG. 5** shows a schematic cross sectional view through a further preferred embodiment of the present invention;

[0084] **FIG. 6** shows a schematic cross sectional view through an TOLED in accordance with a further preferred embodiment of the present invention;

[0085] **FIG. 7** shows a schematic cross sectional view through the embodiment of the present invention shown in **FIGS. 3, 5** and **6**;

[0086] **FIG. 8** shows a schematic cross sectional view through a TOLED in accordance with a further preferred embodiment of the present invention; and

[0087] **FIG. 9** shows a schematic cross sectional view through a TOLED in accordance with a further preferred embodiment of the present invention.

BEST MODES FOR CARRYING OUT THE INVENTION

[0088] **FIGS. 1-7** illustrate preferred embodiments of the present invention in the form of a personal digital assistant (PDA), or parts thereof. However, it should be appreciated that the present invention is equally applicable to a variety of visual display units including portable and/or hand held computing means such as mobile phones, watches, calculators, data loggers, and such like and these are defined for the purposes of the specification as being encompassed by the invention.

[0089] Existing devices incorporating portable visual display units such as PDAs are severely restricted in their power consumption requirements of their components due to the limited battery storage capacities. Consequently, there is widespread adoption of transflective displays and the use of light pipes or light guides as part of the back lighting assembly. **FIG. 1** shows a typical back light assembly **(1)** used in notebook type computers incorporating a light guide **(2)** in the form of a rectangular clear acrylic sheet with a substantially planar upper and lower surface with a diffuser **(3)** and a reflector **(4)** affixed thereto or located adjacent to respectively.

[0090] The light guide has along one peripheral edge, a cold cathode florescent tube **(5)** housed within a parabolic reflector **(6)** which reflects the illumination through the peripheral boundary wall of the light pipe **(2)**, it there being retained by virtue of total internal reflection. Either or both of the planar surfaces of the light guide **(2)** may be provided with a plurality of diffusion dots **(7)**. Essentially, the light guide **(2)** provides an illumination source and is not part of the optical portion of the display.

[0091] As shown in plan view in **FIG. 2** the diffusion dots **(7)** are localised regions whereby the light constrained within the light guide striking the diffusion dots **(7)** 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 **(2)** tapers with respect to distance from the florescent tube **(5)**. The opposing peripheral edge to the florescent tube **(5)** is provided with an end reflector **(8)**.

[0092] The back lighting assembly shown in **FIG. 1** is located at the rear most portion of typical notebook-type computer display screens.

[0093] Display area and/or user input interface area is at a premium in PDAs due to their size. **FIG. 3** shows a cross sectional diagram through an existing PDA **(1)** configuration fitted with a supplementary display **(20)**, which is parallel to and spaced apart from the original display **(10)**.

[0094] Referring specifically to **FIG. 3**, a polarised back light source **(11)** (of known type) located at the rear of the display **(10)** is placed behind a composite series of layers comprised, in sequence, of a half silvered mirror **(12)**, a glass substrate **(13)**, a rubbed conductive ITO ground layer **(14)**, a liquid crystal **(15)**, an ITO layer with an electrode pattern and subsequent rubbed polyimide layer **(16)**, glass substrate **(17)** and an analyser **(18)**. This construction is typical of transflective LCDs as is well known to those in the art and is not discussed in further detail.

[0095] The original display **(10)** may be augmented by attaching a second display **(20)** which is attached over the planar face of the original display **(10)** and is substantially co-terminus with same.

[0096] The second display **(20)** is also comprised of a plurality of layers which in sequence from the front of the original display **(10)** consists of, an emissive transparent refractor **(21)**, a rear analyser/polariser **(22)**, a glass substrate **(23)**, a rubbed ITO conductive ground layer and subsequent polyimide alignment layer **(24)**, a second liquid crystal **(25)**, a rubbed polyimide alignment layer and subsequent ITO electrode pattern **(26)**, a front glass substrate **(27)**, front analyser **(28)**, and a diffuser **(29)**. The diffuser **(17)** may be applied to the surface of a touch screen layer **(30)**. **FIG. 3** shows an embodiment whereby the two display assemblies **(10, 20)** are combined at the manufacturing stage as a homogenous unit.

[0097] Alternatively, the second display **(20)** may be retrofitted as a distinct unit to the front of a PDA display **(10)** as, illustrated in **FIGS. 4 and 5** where identical elements to that shown in **FIG. 3** are like numbered.

[0098] **FIG. 4** shows an existing PDA display **(10)** with the additional layer (to that illustrated in **FIG. 3**) of a touch screen layer **(19)** to which the diffuser **(18)** layer may be affixed. **FIG. 5** shows the secondary display screen **(20)** which is connected to the original screen **(10)** via appropriate mounting clips (not shown) and coupled to the PDA processor via appropriate drive electronics and power supply interfaced via an expansion slot as commonly found in known PDAs. Such interconnections are well known to those in the art and are consequently not discussed further herein.

[0099] The emissive layer, or emissive transparent refractor **(21)** is formed in one embodiment from a sheet of acrylic plastic known as a light guide **(2)** or light pipe as described with reference to **FIG. 1**. A light guide generally consists of a sheet with two substantially planar opposing surfaces on which a number of defined features such as diffusion dots **(7)** are located. The light guide is illuminated by one or more light sources, eg cold cathode florescent tubes **(5)** located about the peripheral edge of the light guide **(21)** in a corresponding manner to that shown in **FIG. 1**.