operating time of the cell phone, and is only visible over a limited range of orientations. Also, a light emitting diode covers only a few square millimeters, and thus may not be visible when the phone is placed in certain positions relative to the user.

[0012] This invention seeks to provide a visual indicator for a cell phone which does not suffer from the aforementioned disadvantages.

SUMMARY OF INVENTION

[0013] In one aspect, this invention provides a portable electronic device having an internal screen for the display of information, the electronic device also having an external screen arranged to receive information from the electronic device and being capable of displaying this information on an electro-optic medium. This invention is especially, though not exclusively, intended for use with cell phones and PDA's. This device of the invention may hereinafter be called an "external screen device".

[0014] In another aspect, this invention provides a cellular telephone having a visual indicator comprising an electro-optic medium having at least two different display states, the electro-optic medium being arranged to change its display state when a call is received by the telephone. This cell phone may hereinafter be called a "visual indicator cell phone".

[0015] Finally, this invention provides an external display for use with a portable electronic device having a data output port, the external display comprising data transmission means for transmitting data from the portable electronic device to the external display, the data transmission means having at least one connector arranged to engage the data output port of the portable electronic device, the external display further comprising an electro-optic medium arranged to display data received by the external display via the data transmission means.

BRIEF DESCRIPTION OF DRAWINGS

[0016] **FIG. 1** of the accompanying drawings is a schematic front elevation of an external screen device of the invention with its external screen in its extended position;

[0017] **FIG. 2** is a front elevation similar to that of **FIG. 1** but showing the external screen in its retracted position;

[0018] **FIG. 3** is a schematic end elevation of a second external screen device of the invention with its external screen in its retracted position;

[0019] **FIG. 4** is a schematic front elevation of a visual indicator cell phone of the invention;

[0020] **FIG. 5** is a three-quarter view, from behind and to one side of, the visual indicator cell phone shown in **FIG. 4**; and

[0021] **FIG. 6** shows an external display of the invention in use with a cell phone.

[0022] The accompanying drawings are not strictly to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

DETAILED DESCRIPTION

[0023] As already mentioned, in a first aspect this invention provides a portable electronic device, such a cell phone or PDA, having an internal screen for the display of information, the electronic device also having an external screen arranged to receive information from the electronic device and being capable of displaying this information on an electro-optic medium.

[0024] The external screen should be portable, and will typically be from about 2 to about 14 inches (51 to 355 mm.), measured diagonally and preferably from about 4 to about 10 inches (101 to 254 mm.) so measured. The external screen is desirably less than about one half inch (13 mm.) in thickness and preferably less than about one quarter inch (6 mm.). The external screen should generally weigh less than about one pound (454 g.) and desirably less than about 6 ounces (170 g.).

[0025] To be a useful improvement over conventional internal cell phone displays, the external screen should have a larger number of pixels than the internal screen in at least one, and preferably both, dimensions. However, this is not absolutely essential; for example, a color external screen could be used for Internet access to supplement a monochrome internal screen to ease comprehension of material, such as electrical wiring diagrams, in which color is essential for full understanding. The external screen will typically have a resolution of at least 64×120 pixels and desirably half-VGA (320×240) or full-VGA (640×480) resolution or better.

[0026] As discussed in the various patents and applications mentioned below, electro-optic materials can be formed into flexible displays, and the resultant ability to form flexible external screens is an important advantage of the present invention. Using a flexible external screen has the important advantage that the external screen can be movable between a retracted position, in which less than the full display area of the external screen is displayed, and an extended position, in which substantially the full display area of the external screen is displayed, the external screen extending a greater distance from the housing of the device in its extended position than in its retracted position. Such a retractable external screen renders the screen less likely to be damaged when the cell phone is not in use, and also makes the stored cell phone less bulky to carry.

[0027] In one form of such a device, in its retracted position a major portion, and preferably substantially all, of the external screen may lie within the housing. For example, the external display could have the form of a scroll which could would around a rotatable member, the scroll lying flat against the side of the cell phone, or within the housing of the cell phone, when retracted, but extensible to form a flat external screen. Alternatively, the retracted external screen could have a folded (for example, concertina form) or serpentine configuration (the latter may be preferred because it is easier to form electrical conductors which are flexible enough to withstand bending of the screen into a serpentine configuration than it is to form conductors which will withstand sharp folds) so that it folds tightly against the side of the cell phone when not in use, but can be extended to form a flat screen.

[0028] In either case, the cell phone is desirably provided with one or more support members arranged to support the external screen in its extended position. Conveniently, the support member or members are themselves retractable, being movable between an extended position, in which they