

ELECTRONIC DOCUMENT READING DEVICE

[0001] This invention generally relates to an electronic document reading device, that is to a device such as an electronic book which presents a document to a user on a display to enable the user to read the document.

[0002] An example of an electronic reading device is described in US2006/0119615. The device uses an electrophoretic display screen divided horizontally into two display regions so that one can be changed whilst the other remains displayed. This document also shows (in FIG. 4c) an example with separate display screens.

[0003] Further background prior art can be found in U.S. Pat. No. 6,124,851, US2004/0201633, US2006/0133664, US2006/0125802, US2006/0139308, US2006/0077190, US2005/0260551, U.S. Pat. No. 6,124,851, U.S. Pat. No. 6,021,306, and US20050151742.

[0004] There is, however, a desire for improved electronic document reading devices.

[0005] According to a first aspect of the present invention there is therefore provided an electronic document reading device, the device comprising: an electronic page having at least one display surface; a page support, said page being attached to said page support such that said page is physically turnable; a memory to store at least part of a document to be read; a page driver coupled to said memory, to drive said page display surface to display a first stored portion of said document; a sensing system to sense turning of said page; and an update control system coupled to said sensing system to control update of said display surface with a second stored portion of said document responsive to sensing of said page turning; and wherein said update control system is configured to control said updating such that said updating is at least partially hidden from a viewpoint of a user of the device.

[0006] Thus in embodiments of the device the sensing system and update control enables the display surface of a page to be updated when partially or substantially hidden from a user of the device, more particularly from a viewpoint of a user viewing the display surface of a page prior to turning of the page.

[0007] In general a display surface is updated whilst another is being viewed, but the updated display surface is either partially or wholly turned away from the viewer or is partially or substantially wholly hidden behind another page.

[0008] The sensing system may sense the initiation or completion of a turning movement or movement of a page into a turned position. In the case of a double-sided electronic page, however, the sensing system may sense a turning over of the entire reading device. In general, however, a page is turnable or rotatable about the page support and it is this turning which is sensed.

[0009] Preferred embodiments of the reading device have two electronic pages each attached to the page support. The sensing system may then sense a relative turning of one page with respect to the other. In this way when a user has completed reading a page and turns the page the turned page may be updated when its display surface (or for a double-sided page, a relevant display surface) is partially or substantially completely hidden. Thus in embodiments the sensing system is configured to sense i) substantial completion of the page turning; and/or ii) when one of said display surfaces is at least partially hidden from a viewer of the other said display sur-

face. The update control system may then be configured to update the at least partially hidden display surface in response to this sensing.

[0010] In embodiments of the device the electronic page has two display surfaces on opposite sides of the page to thereby provide a double-sided electronic page. In this case the reverse side of a double-sided page may be updated when a page has been turned over so that the new front side (former reverse side) is viewed. Depending on how far open the book is when the pages are read, this may occur when a page is turned through an angle of at least 90°, 100°, or at least some large angles such as 135° or 170°, for example substantially 180°. Embodiments of the reading device have two double-sided pages in which case the reverse side of a double-sided page (after the page has been turned over) may not be updated immediately on turning the page over. Instead the “reverse” side may be updated when it is once again facing the viewer/user but hidden behind the other page, that is when it has turned through substantially 360°. In this way a user may turn back the page to view again the previously viewed material, the page only refreshing when it has turned through 360° rather than 180°.

[0011] In some preferred embodiments as previously mentioned the reading device comprises at least two electronic pages, and each of these may be attached to a respective mount. The mounts may be configured to enable rotation of one page with respect to the other. In embodiments the page mounts may (but need not be) generally tubular or cylindrical; a central axle may or may not be provided. In other arrangements a mount for a page may be, for example, magnetic to, say, allow pages to be detached and turned; or hinged like a “magic wallet”.

[0012] In embodiments with two electronic pages the sensing system is preferably configured to sense rotation of one page with respect to the other. In some preferred embodiments each page mount includes electronics associated with its respective page, and the electronics in the two mounts is connected by means of a flexible electrical interconnect such as a flexible cable, configured to allow relative rotation of the pages, more particularly of the mounts, by at least 300°, more preferably substantially 360°. Optionally a limiting device may be included to prevent one mount to be turned by more than 360° with respect to the other (although in embodiments the pages themselves substantially prevent this).

[0013] The skilled person will understand that in embodiments the reading device may include three, four or more pages, optionally but preferably each with a respective mount, for example to enable rotation about a common axis.

[0014] In embodiments of the device a page may be detachable, either from its mount or, with its mount, from the device. More particularly the device, and a page, may each be configured to allow a user to detach and re-attach a page, for example by means of an electrical/mechanical interface. In preferred embodiments the display on a page, such as a detached page is non-volatile. For example in the case of an electrophoretic type display such as E-ink™ the display technology is inherently non-volatile and the detached page may simply comprise the display, including associated driver circuitry, in particular TFT transistors, and an electrical edge connector, but without any associated power supply.

[0015] In some preferred embodiments the page support comprises at least one user control, preferably a wheel, which