

## FLEXIBLE ELECTRONIC DISPLAY AND WIRELESS COMMUNICATION SYSTEM

[0001] This application claims the benefit under 35 USC §119(e) of provisional application 60/457,115, filed Mar. 21, 2003 and of provisional application 60/460,353 filed Apr. 3, 2003. Moreover, this application is a continuation-in-part of application Ser. No. 10/682,435, filed Oct. 10, 2003. Application Ser. No. 10/682,435 is a continuation-in-part of application Ser. No. 10/438,923, filed May 16, 2003, and claims the benefit of under 35 U.S.C. § 119(e) of U.S. provisional applications identified as follows: application Ser. No. 60/418,626, filed Oct. 12, 2002; application Ser. No. 60/428,387, filed Nov. 21, 2002; and application Ser. No. 60/429,044, filed Nov. 22, 2003. Application Ser. No. 10/438,923 is a continuation-in-part of co-pending application Ser. No. 10/285,639, filed Nov. 1, 2002, which is a continuation of application Ser. No. 10/137,357, filed May 3, 2002, and issued as U.S. Pat. No. 6,507,285 on Jan. 14, 2003. Application Ser. No. 10/137,357 is a continuation of application Ser. No. 09/767,846, filed Jan. 24, 2001, and issued as U.S. Pat. No. 6,417,778 on Jul. 9, 2002. Application Ser. No. 09/767,846 is a continuation of application Ser. No. 09/418,752, filed Oct. 15, 1999, and now abandoned. Application Ser. No. 09/418,752 is a continuation-in-part of application Ser. No. 09/304,051, filed May 4, 1999, and issued as U.S. Pat. No. 6,219,876 on Apr. 24, 2001. Each of the above-identified applications is fully incorporated herein by reference.

### BACKGROUND

[0002] Various applications for electronic display technology are known for conveying information such as advertising messages. However, there exist many potential applications for electronic display technology that are as yet unexploited. Whereas known applications typically place electronic displays in "vertical space" in that the displays are oriented more or less vertically, there is much promise in less traditional applications. For example, "horizontal space" is largely untapped in terms of use for electronically conveying information.

[0003] One obstacle to exploiting horizontal space and other non-traditional applications is that electronic display technology can be expensive. This may discourage the use of electronic display technology in non-traditional ways. Accordingly, there is a need for a low-cost electronic display technology that can be easily adapted for use in non-traditional applications.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIGS. 1A and 1B show an example of an electronic display system comprising a flexible carrier material and associated electronic display device according to embodiments of the present invention;

[0005] FIG. 2 shows a block diagram of an electronic display system according to embodiments of the present invention;

[0006] FIGS. 3, 3A, 3B and 3C show details of an active matrix display device according to embodiments of the present invention;

[0007] FIGS. 4 and 4A show a top view and a cross-sectional view, respectively, illustrating details of an electrochromic cell according to embodiments of the present invention;

[0008] FIGS. 5 and 5A show a top view and a cross-sectional view, respectively, illustrating details of an electrochemical transistor according to embodiments of the present invention;

[0009] FIG. 6 shows details of implementation of an organic light-emitting diode according to embodiments of the present invention;

[0010] FIGS. 7, 7A, 7B, 8-12, 12A and 13 show examples of applications of embodiments of the present invention; and

[0011] FIG. 14 shows a flexible electronic display system according to alternative embodiments of the present invention.

### DETAILED DESCRIPTION

[0012] Embodiments of the present invention relate to a low-cost and adaptable electronic display system comprising a flexible carrier material associated with an electronic display. The electronic display system may further comprise a power source, a controller, a memory and at least one communication port. To provide for low cost and adaptability, the flexible carrier material may be constructed of a low-cost material and the electronic display may be formed using a low-cost fabrication technique. Because of its low cost, the electronic display system could be used in various applications wherein it is treated as being essentially disposable. For example, the system could be used and then be disposed of after a few months, weeks, or days, depending on the application. Moreover, because of its flexibility, the carrier material and associated display device may conform to many different surfaces, including horizontal and curved surfaces, thus allowing the system to be used to inexpensively convey information in horizontal space and other non-traditional ways.

[0013] Embodiments of the present invention further relate to methods for forming an information medium and distributing the information medium publicly, where the information medium comprises a flexible carrier material, an electronic display device associated with the flexible carrier material, a controller coupled to the electronic display device and programmable to cause the electronic display device to display arbitrary content, a memory coupled to the controller to store the content, and at least one communication port coupled to the controller. The information medium may be used for any of a number of non-traditional applications for conveying information electronically, such as in restaurant menus, on place mats, in periodicals such as magazines, in maps, on floor mats, on posters, and the like.

[0014] An example of a low-cost adaptable electronic display system 100 according to embodiments of the present invention is illustrated in FIG. 1A. The system 100 includes a flexible carrier material 110. The carrier material 110 could be at least partly formed from an inexpensive, flexible material such as paper or plastic film. The flexible nature of the carrier material 110 is illustrated in FIG. 1B. An electronic display device 130 may be associated with the carrier material 110. For example, the electronic display device 130 may be formed in or on the carrier material 110.

[0015] Low-cost processes to form the electronic display device 130 include printing by means of, for example, ink jet, laser, or silkscreen. Such printing techniques can be used to apply image-forming elements such as pixels and asso-