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INTELLIGENT MULTI-MEDIA DISPLAY COMMUNICATION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to co-pending U.S. patent application Ser. No. 10/313,678, filed Dec. 6, 2002.

FIELD OF THE INVENTION

This invention relates to display systems. More particularly, the invention relates to interactive, low power, collapsible, intelligent, multi-media display systems for use as hand-held, portable communications devices.

BACKGROUND OF THE INVENTION

As the demand increase for hand-held, portable communications devices such as telephones, personal digital assistants (PDAs), and the like, so does the demand that such devices provide increased capabilities. For example, consumers are demanding hand-held devices that include telephone capability, paging, fax, wireless internet access, data storage, and so forth. At the same time, however, consumers are demanding that manufacturers continue to decrease the size of such devices.

Such hand-held devices typically include displays. A problem manifested by the decreased size of these devices is that the displays are often too small to provide much information, and the information that can be provided is usually not provided in a visually appealing manner. For example, a typical light emitting diode (LED) display or liquid crystal display (LCD) on a small, hand-held telephone or PDA can be unclear and might not be able to display an adequate amount of information. For example, such a display typically cannot display an entire Web page. Additionally, such displays are typically not full-color displays.

Typical prior art hand held communications devices include a housing that contains the processing electronics for the device. The housing is the part of the device that the user holds in his hand and, accordingly, is typically designed to fit comfortably into a human hand. The display is typically integrated into the housing. Consequently, the size of the display is limited by the size of the housing. Additionally, the manufacturer's ability to decrease the size of the device is impeded because such displays typically require a relatively large amount of electrical energy and, therefore, that the housing contain a relatively large power supply.

FIGS. 1A–1C depict several typical prior art hand held communications devices. FIG. 1A depicts a hand held telephone **10** having a housing **12** and a display **14** that is integrated into the housing **12**. As shown, the display **14** is smaller than the housing **12**. The telephone **10** includes a keypad **16** that includes a plurality of buttons that the user can use to operate the device. The keypad **16** is separate from the display **14**.

Similarly, FIG. 1B depicts a personal digital assistant **20** having a housing **22** and a display **24** that is integrated into the housing **22**. Again, the display **24** is smaller than the housing **22**. The PDA **20** includes a keyboard **26** that the user can use to operate the device **20**. The keyboard **26** is separate from the display **24**.

FIG. 1C depicts a so-called flip phone **30** having a housing **32** and a display **34** that is integrated into the housing **32**. As shown, the display **34** is smaller than the housing **32**. When the flip cover **31** is closed, it covers a

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portion of the display **34**. The flip cover **31** can be opened to reveal the covered portion of the display **34**. Alternatively, the display **34** could be integrated into the flip cover **31** of the phone **30**. As the flip cover **31** has a surface area that is no bigger than the surface area of the housing **32**, the display **34** is smaller than the housing **32** in any event. The flip phone **30** includes a keypad **36**, which is separate from the display **34**.

In each case, the display is merely one of several elements that is integrated into (or otherwise coupled to) the housing of the device. In each case, the display is small, rigid, fixed in size, and generally rectangular in shape. Consequently, the displays are of limited utility in providing meaningful information to the user. Thus, there is a need in the art for intelligent multi-media display communications systems.

SUMMARY OF THE INVENTION

These needs in the art are satisfied by an interactive, low power, collapsible, intelligent, multi-media display system according to the invention. Such display systems can be used as hand-held, portable communications devices. A display communications device according to the invention is an interactive, bi-directional communications device that can include a housing that contains a processor; radio transceiver means, coupled to the processor, for transmitting and receiving radio signals; and a collapsible display that is mechanically coupled to the housing and electrically coupled to the processor. The display can have a surface area that is larger than any cross-sectional area of the housing. The processor can be adapted to extract display data from the input radio signals, and to provide a representation of the display data to the display. The housing can contain a low voltage power supply, such as a thin film power supply.

The processor can be further adapted to receive commands from the display and to form the output radio signals based on the received commands. The display can be adapted to process touch commands, and the received commands can be based on the touch commands. A speaker can be coupled to the processor for transmitting output audio signals, and the processor can be adapted to extract audio data from the input radio signals, and to provide to the speaker output audio signals that are representative of the extracted audio data. A microphone can be coupled to the processor for receiving input audio signals, and the processor can be adapted to form output radio signals based on the input audio signals. The processor can be adapted to form the output radio signals by modulating a carrier signal with a representation of the input audio signal.

The device can be voice activated. The processor can be adapted to determine whether the input audio signals are telephone signals or commands. The processor can initiate a connection between the display communications device and a remote network device, such as by a connection to the internet. The processor is adapted to determine whether the device is in a telephone mode or a command mode. If the device is in command mode, the processor is adapted to respond to voice activation commands. The display can be a flexible display. The communications device can include a rod that is rotationally coupled to the housing and fixedly coupled to a first end of the display such that the display can be wound around the rod. The rod can be coupled to the interior or the exterior of the housing. The device can include a locking mechanism for holding the display in an extended position. The display can be a foldable display. A first end of the display can be coupled to the housing such that the display can be folded into or onto the housing.