area **1402** responds to finger touch to enter a Chinese character. In this application, the touch screen sensing technology advantageously senses pens as well as fingers; although handwriting with fingers has been shown to work quite well, many users prefer to write with a pen. Pen or finger motions in area **1402** can leave an "ink" trail **1408** on the touch screen display to allow the user to see the character as it is being drawn. Once a character is drawn in area **1402**, the software attempts to recognize it as a valid Chinese character. The software creates an ordered list of possible matches, which are displayed in area **1404**. The user can touch one of the match characters in area **1404** to "type" the selected character into the application running on the main display. Area **1406** contains touch-sensitive buttons to control the character recognition software in various ways.

[**0104**] Handwriting with "inking" is also useful in applications such as signature capture, signature recognition, and sketching, all of which are enhanced by the touch screen of the present invention.

[**0105**] Another useful class of pop-up screen applications is in the area of security. Portable computers are especially vulnerable to theft, so many portable computers include some kind of password or biometric interlock. For maximum effectiveness, the interlock should validate the user's identity before the main processor of the computer is even allowed to run. Because the main display is operated by the main processor of the computer, the security interlock would need to use alternate output mechanisms to interact with the user. The touch screen of the present invention provides an excellent user interface device for a security interlock. The software that manages the interlock can be implemented in the touch screen controller itself, or in another peripheral controller within the computer. This implementation fits well with the architecture of many portable computers today, where a peripheral controller is already present in between the main processor and the touch pad, and this peripheral controller is also already tasked with power management and system reset control for the main processor.

[**0106**] **FIG. 15A** illustrates a pop-up screen **1500** that appears when the computer system is first switched on. The user must enter a correct personal identification number (PIN) on keypad icons **1502** before the main computer processor will operate. In an alternate embodiment, the user enters a signature on the touch screen or uses some other mechanism such as a smart card or fingerprint to authenticate himself or herself to the system.

[**0107**] **FIG. 15B** illustrates an exemplary hardware architecture implementing the security interlock of **FIG. 15A**. Computer system **1520** includes touch screen module **1522**, which in turn contains the hardware and control circuitry illustrated in **FIG. 2**. Touch screen **1522** communicates to peripheral controller **1524**. Controller **1524** also manages other peripherals **1526** such as keyboards, external pointing devices, and optional biometric authentication devices. During operation of the computer, controller **1524** serves as a conduit between touch screen **1522** and central processor **1528**. Central processor **1528** in turn operates other devices **1530** such as the main display and hard drive. Power supply **1532** powers central processor **1528** as well as all other components of the system. At system start-up, power supply **1532** withholds power from processor **1528** until it receives a signal from controller **1524** by direct connection **1534** stating that the user has been authenticated and system start-up can proceed. Alternatively, controller **1524** holds processor **1528** in reset, or it simply withholds access to the keyboard, touch sensor, and other user interface peripherals, hence rendering the computer system useless until the user is authenticated. In yet another alternative, controller **1524** could participate in higher-level security functions such as delivering a decryption key for data stored on a hard disk.

[**0108**] The security interlock of **FIG. 15A** and the debugging screen disclosed previously are examples of the general class of applications that use the touch screen to communicate with the user when the rest of the computer system is indisposed due to special circumstances. Another example of this class would be the reporting of information about hardware failures in vital system devices such as the keyboard and the hardware of the main display.

[**0109**] Many other applications of pop-up screens are supported by the touch screen of the present invention. For example, pop-up games could be implemented entirely on the touch screen, leaving the main display unobstructed.

[**0110**] Referring back to **FIG. 2**, touch screen assembly **200** may advantageously include a backlight **206** or an equivalent. Backlights draw more power than the other components that make up a touch screen, so it is advantageous to switch the backlight off when it is not needed. In an illustrative embodiment, backlight controller **212** is capable of dimming or extinguishing the backlight at the request of controller **216** or host computer **214**. Controller **216** and host computer **214** may use heuristics to switch the backlight on and off without explicit direction by the user. For example, the backlight could be switched on if an application installs an auxiliary screen image that replaces the default iconic image, and then switched off if the touch screen goes a certain amount of time without being used. Similarly, the backlight could be switched on whenever the touch screen is in the activated state.

[**0111**] Switching on the backlight when the touch screen is activated has the added benefit of reminding the user that the behavior of the touch screen has changed. The backlight can serve more generally as an attention mechanism for software applications and for the operating system. For example, the backlight can be flashed on or off to notify the user of the arrival of new e-mail or of an impending appointment. Many computer operating systems use sounds to alert the user of a variety of errors and events, but portable computers are sometimes used in public places where the sound must be turned off. The backlight can serve as a replacement alert in this situation. This feature is especially useful when alert dialogs are moved onto the touch screen from the main screen as disclosed in relation to **FIG. 10A**. Alert dialogs obstruct the view of the application data or interaction that may have raised the alert; by moving the alert to the touch screen and calling the user's attention to it by flashing the backlight, the present invention can improve the effectiveness of alert dialogs throughout the operating system.

[**0112**] If display **204** is a color display, then the system can flash backlight **206**, or color display **204** itself, in different colors to signal different types of alerts to the user. In this alternative, the use of color is analogous to the use of different sounds for audible alerts, and the touch screen may implement a mapping from standard sounds supplied by the operating system to standard color alerts.