touches). Furthermore, the power supply and the control electronics could be installed in the screen housing. This would enable a simple data link that inputs directly to the host computer.

[0033] In another preferred embodiment, a dielectric film is applied to surface of the touch sensor, and capacitive coupling is employed between finger touches and the touch sensor. In this case, the bands are energized with an oscillating or switched voltage. Current delivered to each end of each band is monitored. If a capacitive load is present due to the touch of a finger over the band, then a touch to that band is ascribed and the x-position of the touch is recorded. The proportion of current delivered to each end of the activated band is used to determine the y-position. Additional bands are activated to test for other contacts. The process is continued until the entire touch screen or region-of-interest has been examined. In this embodiment, an electrically conductive guard layer, for example on the opposing side of the touch sensor, may be usefully employed to avoid capacitive loads to adjacent objects. A guard layer is commonly used in commercial capacitive touchscreens.

[0034] There are a number of general areas of applications of MultiTouch screens where the Digalog method might be advantageously employed to replace conventional keyboards. For example, one might expect a convenient remedy for the right-click deficiency of a conventional touchscreen "mouse." Using the index finger to move the screen mouse, the drop of the middle finger, for example, would signal a right-click. Elimination of separate keyboards would prove very useful for many applications. The layout of a notebook computer could be totally revised. Another hardware advantage is the use of a keyboard that could be sanitized for use in dental or medical environments. An optical keyboard, based on the Digalog principle would be much easier to sanitize than a conventional mechanical system with its many keys.

[0035] Telephone dialing is another specific example of the Dialog MultiTouch. In situations of dim visibility where a number pad cannot be clearly seen, the advantage of finger inputting at any place on a reasonable size screen is clear. Furthermore, MultiTouch is far more practical than would be single-touch, as it requires less time and is less prone to errors.

[0036] These hands-on input techniques could be extended to home appliances. As a trivial example, a microwave-oven setting of 25 seconds is made by simply touching a screen two times with all 10 fingers and one time with five fingers. (This procedure is far better than finding small number pads, especially in the dark!) The use of appliances by the military under very difficult circumstances would also be facilitated by simplifying input commands.

[0037] Moreover, if the appliance code is written in a binary system, the use of fingers is advantageous. Suppose the appliance uses a binary code and that the thumb on the right hand is a reference point of value 0, then the index finger is 1, the middle 2, the ring 4, and the little finger is 8. Then all fingers touching could mean 15 seconds for example and the same on the left hand could mean up to 15 minutes. Rapid use of the right hand three times could quickly program 45 seconds. And on the left hand four separate placements of all four fingers could be a command for 1 hour. And, if fine tuning is needed, the combinations of fewer than all four fingers could be used. For example, 3 minutes would use the left thumb and the index finger with the middle finger; 7 seconds would be the right thumb, along with the next three fingers. Note that it is not necessary to know the location of the hands on the touch sensor, since all necessary information is contained in the relative positions of the touch points.

[0038] It is especially interesting that with the "hands-on-screen" method using Digalog MultiTouch principles in the design of sensors would have useful secured-entry features. For instance in point-of-sales, menus would not be open to anyone not having the information on how the hand (combination of fingers, or gesture) must first touch the screen to get a menu response. Applications in more important areas could include vaults, safes, limited-access work areas, and home security. It is natural to consider a wide spectrum of security applications. This follows from the fact that there are a large number of possible combinations in codes that are easy to remember and to use rapidly in emergencies.

[0039] One interesting application of multitouch will be described in more detail. **FIG. 6** illustrates a Send and Receive Unit (SRU) that incorporates a MultiTouch screen to communicate with local and remote systems using schemes such as the Internet. The controller sends signals from operator interactions with the touch screen to the processor. Typing, for example, could be done without regard for absolute positioning of the keys. The processor would convert these coded signals to an audio output unit and/or to a visual display unit before transmission to the internet. The audio and video provides confirmation to the operator that his instructions were properly understood. These encoded instructions could then be communicated to another SRU. As an example of such a facility, an individual working in total darkness uses fingers to input a coded message. An audio signal is available to monitor the message, if desired or a visual message could be created on a display or printed onto paper. The message is then received by another individual with either the visual or audio option. As a specific example, assume that the sending individual is blind, in which case the code might advantageously be in Braille. As Braille is a two-column by three-row coding system, a MultiTouch system could incorporate a two-handed method of input using three fingers (rows) on each hand (columns). Alternatively, a one-handed method that uses two successive strokes with the thumb indicating the column could also be used. The receiving individual could be blind also and could receive the voice translation made by the processor. If sighted, either voice or visual translations are alternatives.

[0040] While an example has been given where the blind could use a Braille code, other applications are easily imagined, using Braille or other codes. In a wide variety of security systems, the SRU could communicate information directly to a secured vault, for example. Military operations and other environments do not allow illuminated displays or voice to be used. A MultiTouch SRU could facilitate such applications by allowing noiseless operations be done in total darkness.

[0041] Operations on two-dimensional images or data could be conveniently performed using MultiTouch to select regions-of-interest with one or more fingers, while selecting operations using menu buttons or gestures with other fin-