

[0033] FIG. 16 is a perspective diagram of a remote control utilizing an input device, in accordance with one embodiment of the present invention.

[0034] FIG. 17 is an exploded perspective diagram of a media player and input device assembly, in accordance with one embodiment of the present invention.

[0035] FIG. 18 is a side elevation view of the bottom side of a media player containing an input device, in accordance with one embodiment of the present invention.

[0036] FIG. 19 is a simplified block diagram of a remote control, in accordance with one embodiment of the present invention.

[0037] FIGS. 20A and 20B are side elevation views, in cross section of an input device, in accordance with an alternate embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0038] The present invention will now be described in detail with reference to a few preferred embodiments thereof as illustrated in the accompanying drawings. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other instances, well known parts and methods have not been described in detail in order not to unnecessarily obscure the present invention.

[0039] FIG. 2 is a simplified perspective view of an input device 30, in accordance with one embodiment of the present invention. The input device 30 is generally configured to send information or data to an electronic device in order to perform an action on a display screen (e.g., via a graphical user interface). For example, moving an input pointer, making a selection, providing instructions, etc. The input device may interact with the electronic device through a wired (e.g., cable/connector) or wireless connection (e.g., IR, bluetooth, etc.). The input device 30 may be a stand alone unit or it may be integrated into the electronic device. When a stand alone unit, the input device typically has its own enclosure. When integrated with an electronic device, the input device typically uses the enclosure of the electronic device. In either case, the input device may be structurally coupled to the enclosure as for example through screws, snaps, retainers, adhesives and the like. In some cases, the input device may be removably coupled to the electronic device as for example through a docking station. The electronic device to which the input device is coupled may correspond to any consumer related electronic product. By way of example, the electronic device may correspond to a computer such as desktop computer, laptop computer or PDA, a media player such as a music player, a communication device such as a cellular phone, another input device such as a keyboard, and the like.

[0040] As shown in FIG. 2, the input device 30 includes a frame 32 (or support structure) and a touch pad 34. The frame 32 provides a structure for supporting the components of the input device. The frame 32 in the form of a housing may also enclose or contain the components of the input device. The components, which include the touch pad 34,

may correspond to electrical, optical and/or mechanical components for operating the input device 30.

[0041] The touch pad 34 provides an intuitive interface configured to provide one or more control functions for controlling various applications associated with the electronic device to which it is attached. By way of example, the touch initiated control function may be used to move an object or perform an action on the display screen or to make selections or issue commands associated with operating the electronic device. In order to implement the touch initiated control function, the touch pad 34 may be arranged to receive input from a finger (or object) moving across the surface of the touch pad 34 (e.g., linearly, radially, rotary, etc.), from a finger holding a particular position on the touch pad 34 and/or by a finger tapping on a particular position of the touch pad 34. As should be appreciated, the touch pad 34 provides easy one-handed operation, i.e., lets a user interact with the electronic device with one or more fingers.

[0042] The touch pad 34 may be widely varied. For example, the touch pad 34 may be a conventional touch pad based on the Cartesian coordinate system, or the touch pad 34 may be a touch pad based on a Polar coordinate system. An example of a touch pad based on polar coordinates may be found in patent application Ser. No. 10/188,182, entitled "TOUCH PAD FOR HANDHELD DEVICE", filed Jul. 1, 2002, which is herein incorporated by reference. Furthermore, the touch pad 34 may be used in a relative and/or absolute mode. In absolute mode, the touch pad 34 reports the absolute coordinates of where it is being touched. For example x, y in the case of the Cartesian coordinate system or (r, θ) in the case of the Polar coordinate system. In relative mode, the touch pad 34 reports the direction and/or distance of change. For example, left/right, up/down, and the like. In most cases, the signals produced by the touch pad 34 direct motion on the display screen in a direction similar to the direction of the finger as it is moved across the surface of the touch pad 34.

[0043] The shape of the touch pad 34 may be widely varied. For example, the touch pad 34 may be circular, oval, square, rectangular, triangular, and the like. In general, the outer perimeter of the touch pad 34 defines the working boundary of the touch pad 34. In the illustrated embodiment, the touch pad is circular. Circular touch pads allow a user to continuously swirl a finger in a free manner, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Furthermore, the user can rotate his or her finger tangentially from all sides thus giving it more range of finger positions. Both of these features may help when performing a scrolling function. Furthermore, the size of the touch pad 34 generally corresponds to a size that allows them to be easily manipulated by a user (e.g., the size of a finger tip or larger).

[0044] The touch pad 34, which generally takes the form of a rigid planar platform, includes a touchable outer surface 36 for receiving a finger (or object) for manipulation of the touch pad. Although not shown in FIG. 2, beneath the touchable outer surface 36 is a sensor arrangement that is sensitive to such things as the pressure and motion of a finger thereon. The sensor arrangement typically includes a plurality of sensors that are configured to activate as the finger sits on, taps on or passes over them. In the simplest case, an electrical signal is produced each time the finger is