the input from the user to move up and down the displayed image is perhaps the most frequently performed input motion.

[0130] In contrast, thepointing device according to the present invention uses pivotal motion of the thumb to position the cursor. (See **FIG. 6**.) While other devices have suggested the use of the thumb to provide input or suggested the use of the tip of the index finger to provide input, applicant's device teaches the use of the thumb tip **124**. Although the tip of the thumb is not generally considered adroit, the anatomy of the thumb allows for precise movement of the straightened thumb in a x-y motion (pivotal). Thus, with practice, thumb tip **124** may be used for input with reduced fatigue and damage associated with extended use of other input devices using either the thumbpad **128** or the movement of the other fingers in flexural motions.

[0131] As shown in **FIG. 6**, the thumb **104** is held naturally straight as it would be at rest, and orbits easily in a more neutral position. If you try to replicate the motions shown in **FIGS. 5 and 6** with your own thumb, you will notice that pivotal motion in **FIG. 6** is fluid and natural even when moved in a diagonal line or in the shape of a circle. The gentler pivotal motion involves fewer joints with less tendon travel and employs thumb muscles located in the hand causing less tendon motion and stress within the carpal tunnel. The preferred embodiment of the pointing device uses a touchpad. However, an alternative embodiment of the pointing device can use a track ball as shown in **FIG. 9**.

[0132] Edge Motion Feature

[0133] The preferred embodiment of the pointing device has a feature that greatly reduces repetitive stroking with the thumb tip **124** when propelling the cursor across the screen. At the end of the thumb stroke, pointing device **200** allows the user to continue movement of the position icon **316** effortlessly in any of the predefined directions.

[0134] **FIGS. 7, 8**, and **9** illustrate some of the variations of pointing device so that the input process for extended position icon movement can be discussed in context of variants of x-y input device **212** (first shown in **FIG. 3**).

[0135] One way is to incorporate a touchpad with "edge motion". Edge motion is a touchpad feature where the x-y input continues as along as the user's finger or thumb is sensed in an edge motion zone. Synaptics Incorporated of San Jose Calif. is one supplier of touchpads with an "edge motion" feature.

[0136] The x-y input device **212** of the pointing device **200** in **FIG. 7** would appear to the user as shown in **FIG. 2**. **FIG. 7** shows the x-y input device **212** with added lines distinguishing between various predefined areas of the touchpad. The area for traditional touchpad x-y input is defined by area **260**. Moving the thumb tip **124** to right edge motion area **264** provides a signal to continue movement to the right. Thus, panning to fields off the screen in a spreadsheet with many columns can be achieved by moving the thumb tip to right edge motion area **264** and waiting until the image of the spreadsheet has moved sufficiently to make the desired columns visible. Panning back to the first column in the spreadsheet would be achieved by placing the thumb tip **124** in left edge motion area **272**. Vertical scrolling would be achieved by moving the thumb tip into either upward edge motion area **276** or downward edge motion area **268**. In all cases the thumb tip **124** may not need to actually touch the areas if the touchpad is set to sense the thumb tip **124** when it is very close to the surface of the touchpad.

[0137] The size of the various edge motion areas can be changed by configuration software to accommodate the user, and thus may vary from one pointing device to another. Likewise, the perimeter around area **260** may be set to have diagonal edge motion areas in the four comers of the touchpad (not shown), or have the corners inoperative as glide input (not shown) so that glide commands are not based on somewhat ambiguous placement of the thumb tip for example in both the upper and right corner.

[0138] One embodiment uses a trackball in place of the touchpad. The trackball is ringed with a plurality of semicircular buttons, which may be nudged by the thumb tip **124** to provide the desired edge motion command as would the edges of the touchpad described above. The trackball variation of the device gives the user a more visual and tactile method of cursor navigation and edge motion capability.

[0139] **FIG. 9** illustrates that the edge motion areas (**264**, **268**, **272**, and **276**) can be placed in a ring around a trackball **280**.

DETAILS ON THE ZERO FORCE TOUCH SWITCHES

[0140] As discussed above, the problem of small exertions associated with conventional mouse buttons is minimized by the use of zero force touch switches.

[0141] In one embodiment of the present invention, the zero force touch switches for index and middle fingers (**224** and **228**) are immovable metal or composite contacts that detect finger contact from the fingertips or the proximity of the fingertips instead of requiring a forced click as with other pointing device buttons. Note that in the case where actual touch from the user, rather than proximity is required by the sensing mechanism, the actual force applied will be near zero and not zero. This distinction does not alter the fact that the zero force touch switch virtually eliminates the stress imposed on the user's hand by the repetitive action to actuate the zero force touch switch. The positions of the zero force switches may be designed to be adjustable within their respective channels to better accommodate variations in finger length.

[0142] As a less desirable, yet economical alternative to one or all of the zero force touch switches, a mouse button type micro-switch with a very light activation force may be used. A micro-switch with performance characteristics equal to or better than those found in the original Microsoft® mouse would suffice.

[0143] As with most pointing devices, a controller chip located within the housing of the device converts x-y input signals and "mouse button" inputs into digital information for the computer. **FIGS. 14 and 5** illustrate the interaction of the controller chip with other components for a touch screen pointing device and a trackball based pointing device. With the zero force touch switches, circuitry known to the art detects finger capacitance or conductance in the buttons and supplies the "click" or "drag" signal to the mouse controller chip. The unique touch controls can help reduce soreness in fingers, tendons and muscles commonly associated with "clicking" conventional mouse buttons. The zero