REVERSE CANTILEVER ASSEMBLY FOR INPUT DEVICES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

REFERENCE TO MICROFICHE APPENDIX

[0003] Not Applicable.

BACKGROUND OF THE INVENTION

[0004] This invention relates to actuating mechanisms for hand or foot activated devices and more particularly to external buttons used to actuate electromechanical switches inside of computer pointing devices such as is what is commonly called a "computer mouse" and similar devices.

[0005] Pointing devices for controlling cursor movement and entering commands into a computer are well known in the art. Pointing devices typically include some sort of positioning element, such as a rotatable ball or photonic scanner in the device or a track ball manipulated by the hand. Additionally, there are typically one or more keys or "buttons" on the input device. A computer user selects actions (i.e. provides user input to the computer) by pressing ("clicking") a button after manipulating the positioning element. The external surface of the button and its associated internal components inside the device make up what is referred to as the button assembly.

[0006] The button assembly typically actuates an electronic switch that is electrically coupled to the computer. The button assembly usually has a spring-like character since its lever arm, usually made of molded plastic or other suitable material, is deformed when depressed by the finger, then returns to its undeformed or default position when the pressure from the finger is released. The electronic switch under the button assembly often consists of rigid plastic housing with a separate spring-loaded mechanical switch protruding from the top of the housing. When the button assembly is depressed and displaced by the force from the finger, the electronic switch moves and "clicks" when displaced the minimum required distance to actuate the switch.

[0007] A button assembly can be mechanically modeled as a plastic beam with a fulcrum on one end, this arrangement in known as a cantilever design. Many finger-actuated devices/switches on computer pointing devices employ some sort of cantilever design. However, not all computer users have the same size hand. Thus, it might be more difficult for some computer users, e.g. with short fingers, to actuate a button of a pointing device designed for users with longer fingers because their fingers do not reach sufficiently far onto the button.

[0008] Therefore, it is desirable to provide a computer pointing device with a button assembly design that accounts for differences in user hand size and strength.

SUMMARY OF THE INVENTION

[0009] A reverse cantilever beam button assembly provides a selectable force profile along the length of the button in a computer pointing input device. In a particular embodiment, the force profile increases as one moves from the palm end to the fingertip end of the button. This embodiment provides a lower force required for actuation of the input device for users with smaller hands and increased tactile feedback for users with larger hands. In another embodiment the force profile is constant along the length of the button. The button assembly can be assembled into the housing or body of a computer pointing device, or can be made in an integrated fashion, typically using molded plastic, with the housing or body.

[0010] In one embodiment the computer pointing device is a mouse that has a body configured to accept the user's palm, with the user's fingers extending away from the palm portion. The finger depresses an external surface of the button assembly to actuate an electro-mechanical switch. In another embodiment the computer pointing device is what is commonly known as a "track ball". In one embodiment the button assembly includes two cantilever beams and two fulcrums. A first cantilever fulcrum is essentially at one end of the button assembly, and a second cantilever fulcrum is toward the opposite end of the button assembly. The second cantilever and fulcrum has a stiffness that is less than the stiffness making up the first cantilever and fulcrum, although the designations of "first" and "second" is arbitrary. This way the button assembly will bend primarily about the second fulcrum and can reverse or neutralize the force profile of a conventional cantilever button assembly. Stiffness about one fulcrum compared to the stiffness about the other fulcrum can be selected to achieve a decreasing, constant or increasing force profile along the external surface of the button assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1** is a simplified representation of a conventional mouse button and electronic switch.

[0012] **FIG. 2** is a simplified representation of a mouse button and electronic switch according to an embodiment of the present invention.

[0013] **FIG. 3** is a simplified partial cross section of a mouse with a reverse cantilever button according to an embodiment of the present invention.

[0014] **FIG. 4** is a simplified top view of a button assembly inside a conventional trackball pointing device.

[0015] **FIG. 5** is a simplified top view of a button assembly inside a trackball pointing device according to another embodiment of the present invention.

[0016] **FIG. 6** is a simplified section of a trackball pointing device according to another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] 1. Introduction

[0018] A computer pointing device with a reverse cantilever or reverse lever button assembly provides a button requiring decreasing force to actuate ("click") the electronic switch with decreasing distance from the palm portion of the device. This design allows users with smaller, and presumably weaker, hands/fingers, to more easily click the button,