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(54) **HAPTIC INTERFACE FOR LAPTOP COMPUTERS AND OTHER PORTABLE DEVICES**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 821 days.

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G09G 5/00 (2006.01)

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(58) **Field of Classification Search** **345/156-179; 715/700-702; 178/18.01, 18.03-18.11**

See application file for complete search history.

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(57) **ABSTRACT**

A haptic feedback touch control used to provide input to a computer. A touch input device includes a planar touch surface that provides position information to a computer based on a location of user contact. The computer can position a cursor in a displayed graphical environment based at least in part on the position information, or perform a different function. At least one actuator is also coupled to the touch input device and outputs a force to provide a haptic sensation to the user. The actuator can move the touchpad laterally, or a separate surface member can be actuated. A flat E-core actuator, piezoelectric actuator, or other types of actuators can be used to provide forces. The touch input device can include multiple different regions to control different computer functions.

47 Claims, 19 Drawing Sheets

