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(54) **HAPTIC FEEDBACK FOR TOUCHPADS AND OTHER TOUCH CONTROLS**

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(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

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(51) **Int. Cl.**[7] **G09G 5/00**
(52) **U.S. Cl.** **345/156**; 345/173; 345/179
(58) **Field of Search** 345/156, 157, 345/163, 169, 173, 179, 184; 361/680, 681, 682, 683, 684, 685, 686, 687

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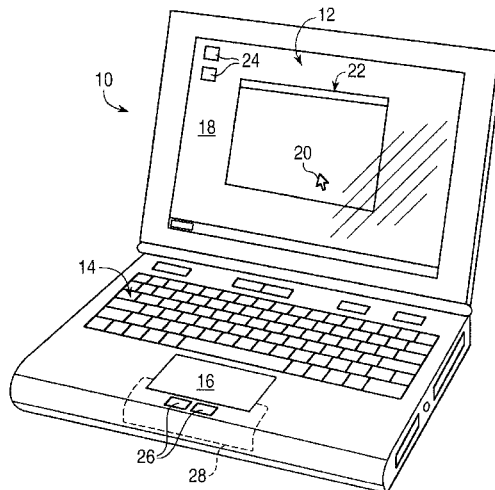5,625,576 A * 4/1997 Massie et al. 318/628

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(57) **ABSTRACT**

A haptic feedback planar touch control used to provide input to a computer. A touch input device includes a planar touch surface that inputs a position signal to a processor of the computer based on a location of user contact on the touch surface. The computer can position a cursor in a displayed graphical environment based at least in part on the position signal, 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 contacting the touch surface. The touch input device can be a touchpad separate from the computer's display screen, or can be a touch screen. Output haptic sensations on the touch input device can include pulses, vibrations, and spatial textures. The touch input device can include multiple different regions to control different computer functions.
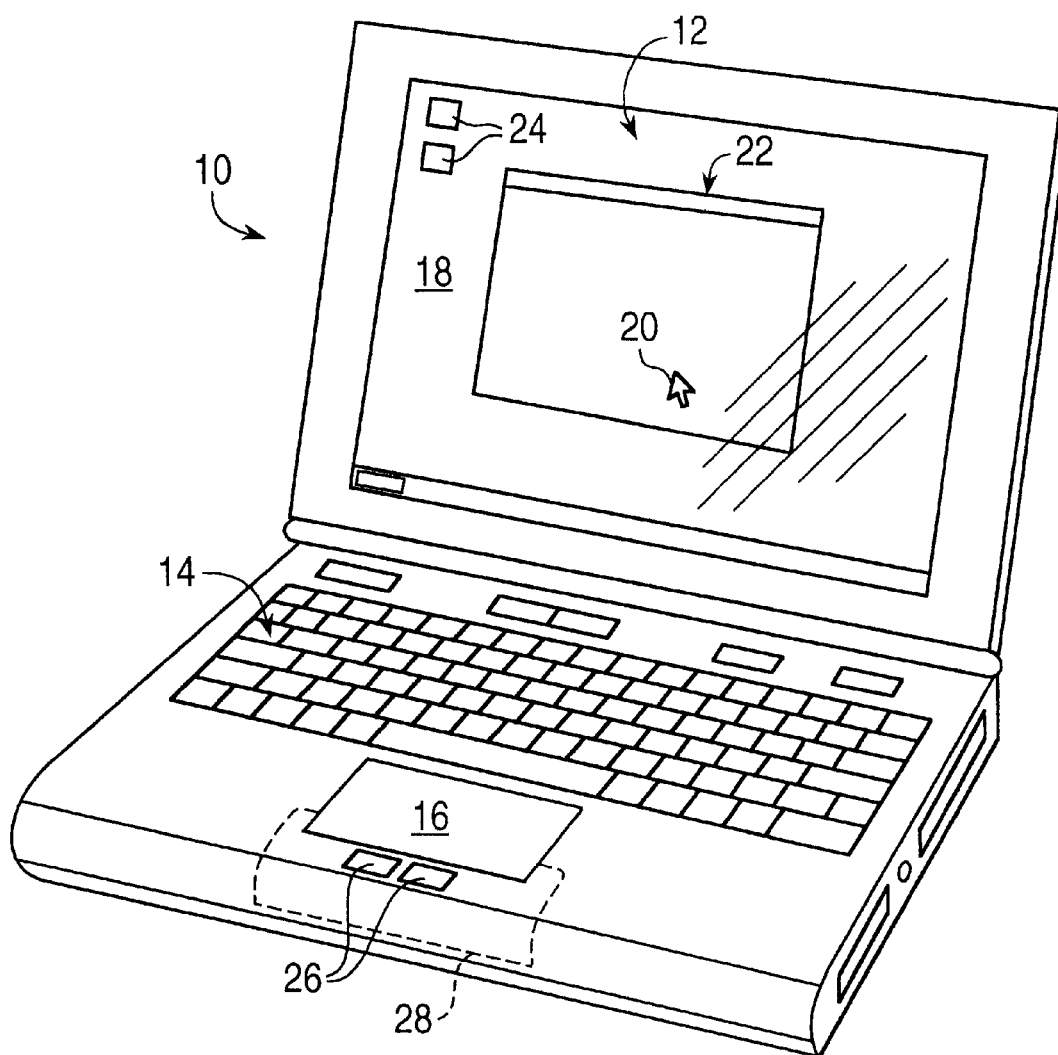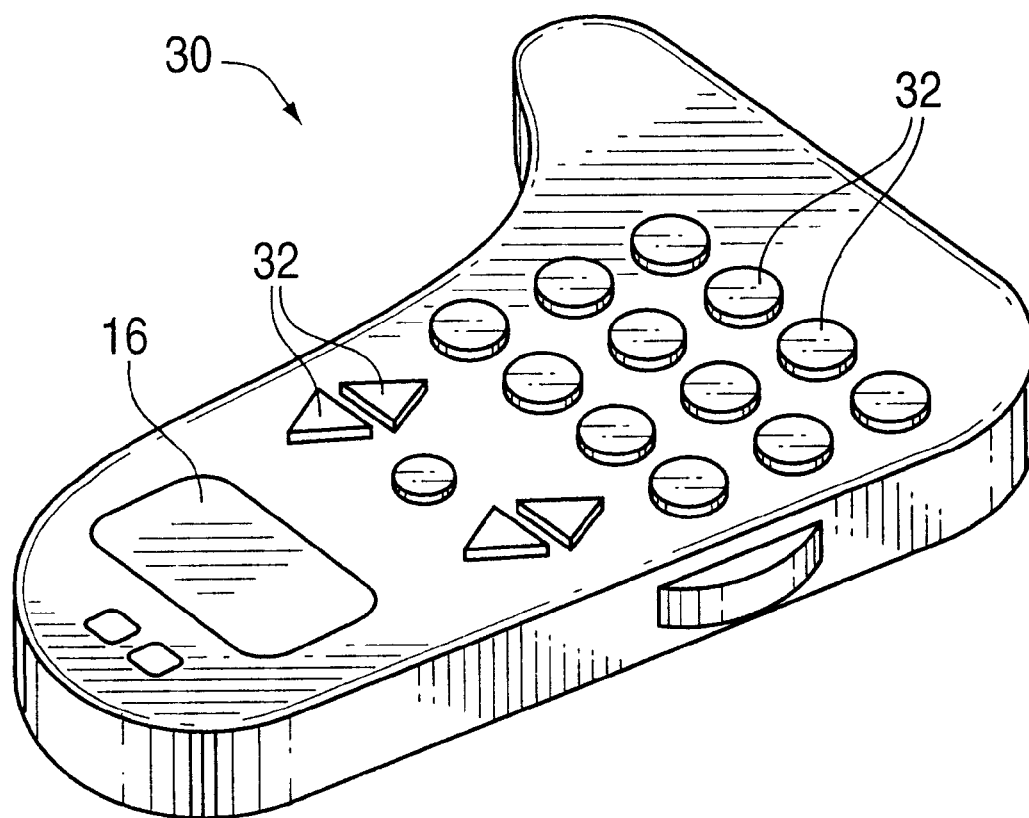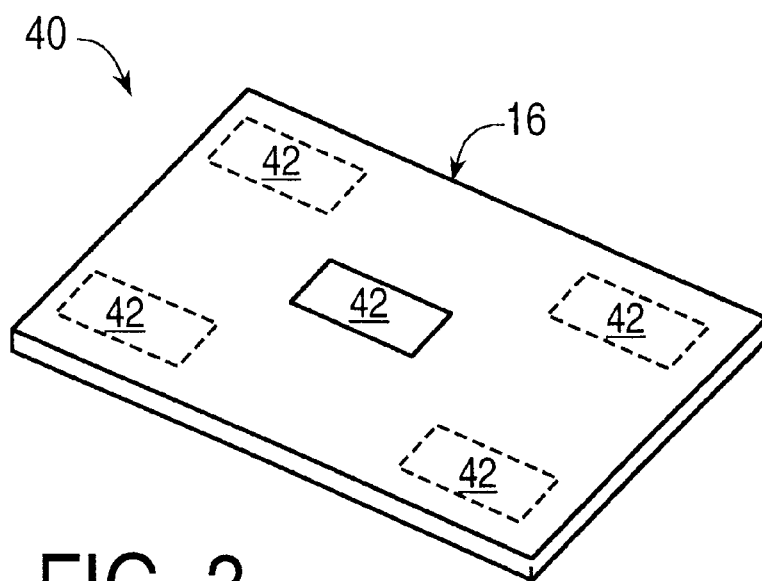
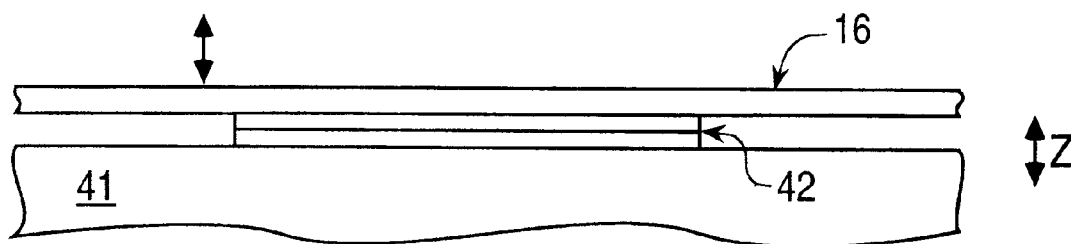**43 Claims, 5 Drawing Sheets**

FIG. 1
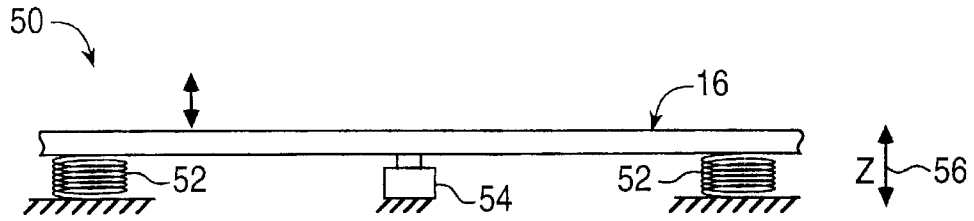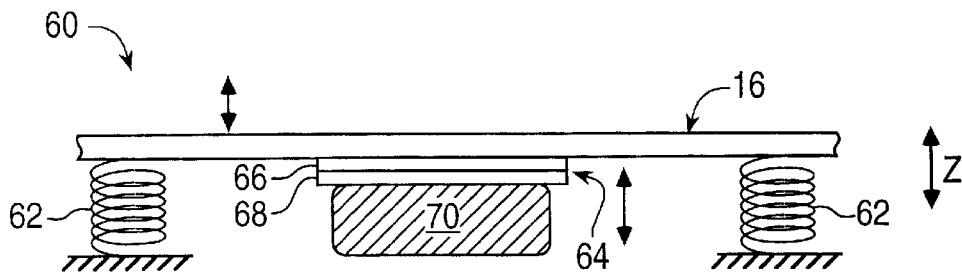
FIG. 2

FIG. 3
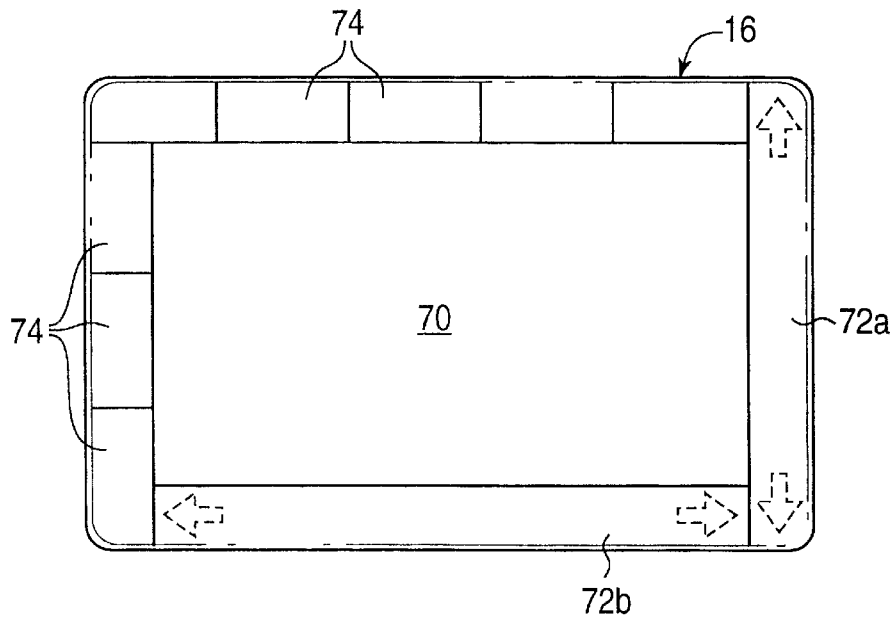

FIG. 4

FIG. 5

FIG. 6

FIG. 7

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