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(71) Applicant *(for all designated States except US)*: IMMERSION HUMAN INTERFACE CORPORATION [US/US]; 2158 Paragon Drive, San Jose, CA 95131 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: ROSENBERG, Louis, B. [US/US]; 849 Palamino Drive, Pleasanton, CA 94566 (US).

(74) Agent: RIEGEL, James, R.; Hickman Beyer & Weaver, P.O. Box 61059, Palo Alto, CA 94306 (US).

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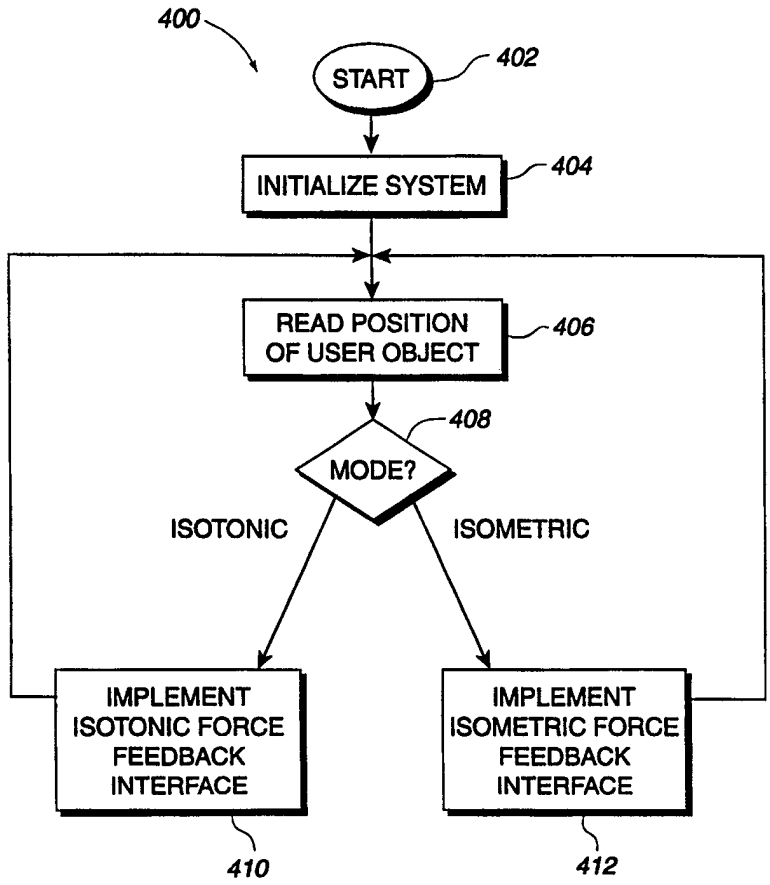
(54) Title: FORCE FEEDBACK INTERFACE HAVING ISOTONIC AND ISOMETRIC FUNCTIONALITY

(57) Abstract

An apparatus and a method of implementing a force feedback interface having isotonic and isometric control capability. The apparatus is coupled to a computer that displays a graphical environment. The interface includes a physical object (12) movable in physical space, such as a mouse. A sensor (51, 52) detects the object's movement, and an actuator (48) applies output force on the physical object. A mode selector (250a, 408) selects isotonic and isometric control modes of the interface from an input device or from an interaction between graphical objects. Isotonic mode provides input to the computer based on a position of the physical object and correspondingly updates a position of a cursor, and applies force sensations to the physical object. Isometric mode provides input to the computer based on an input force applied by the user to the physical object, where the input force is determined from a sensed deviation of the physical object. The input force opposes an output force applied by the actuator and is used to control a function of an application program, such as scrolling.



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INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H03K 17/94; H03M 11/00; G09G 5/08; G06F 1/00
US CL : 341/20, 27; 345/163, 167, 145; 364/709.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 341/20, 27; 345/163, 167, 145; 364/709.01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,576,727 A (ROSENBERG et al) 19 November 1996	1-71
A	US 5,438,529 A (ROSENBERG et al) 01 August 1995	1-71
A	US 5,457,479 A (CHENG) 10 October 1995	1-71
A	US 5,355,148 A (ANDERSON) 11 October 1994	1-71
A	US 5,280,276 A (KWOK) 18 January 1994	1-71
A	US 5,398,044 A (HILL) 14 March 1995	1-71
A	US 5,530,455 A (GILLICK et al) 25 June 1996	1-71
A	US 5,374,942 A (GILLIGAN et al) 20 December 1994	1-71

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