

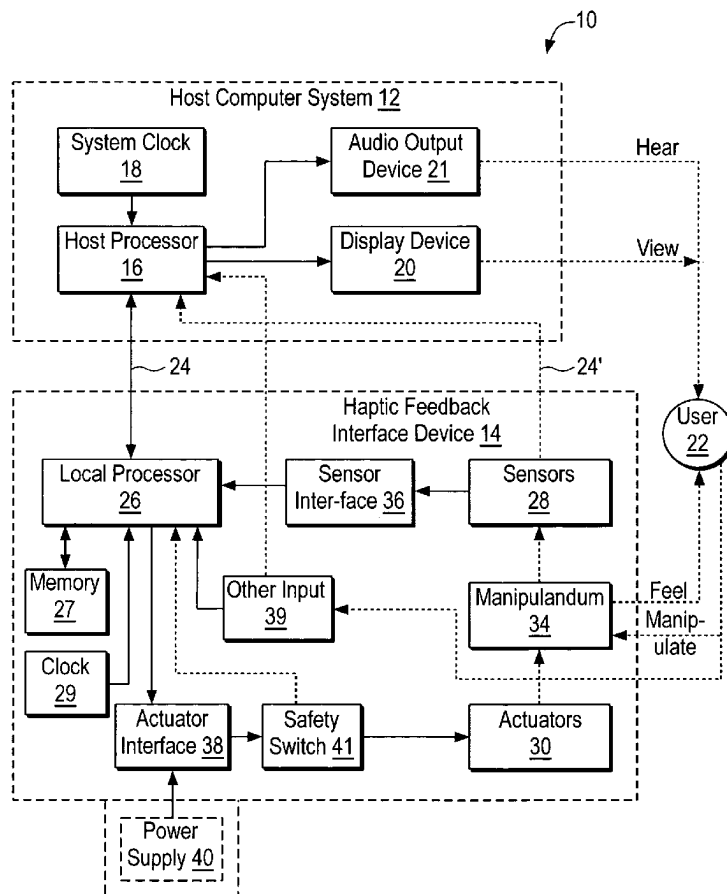


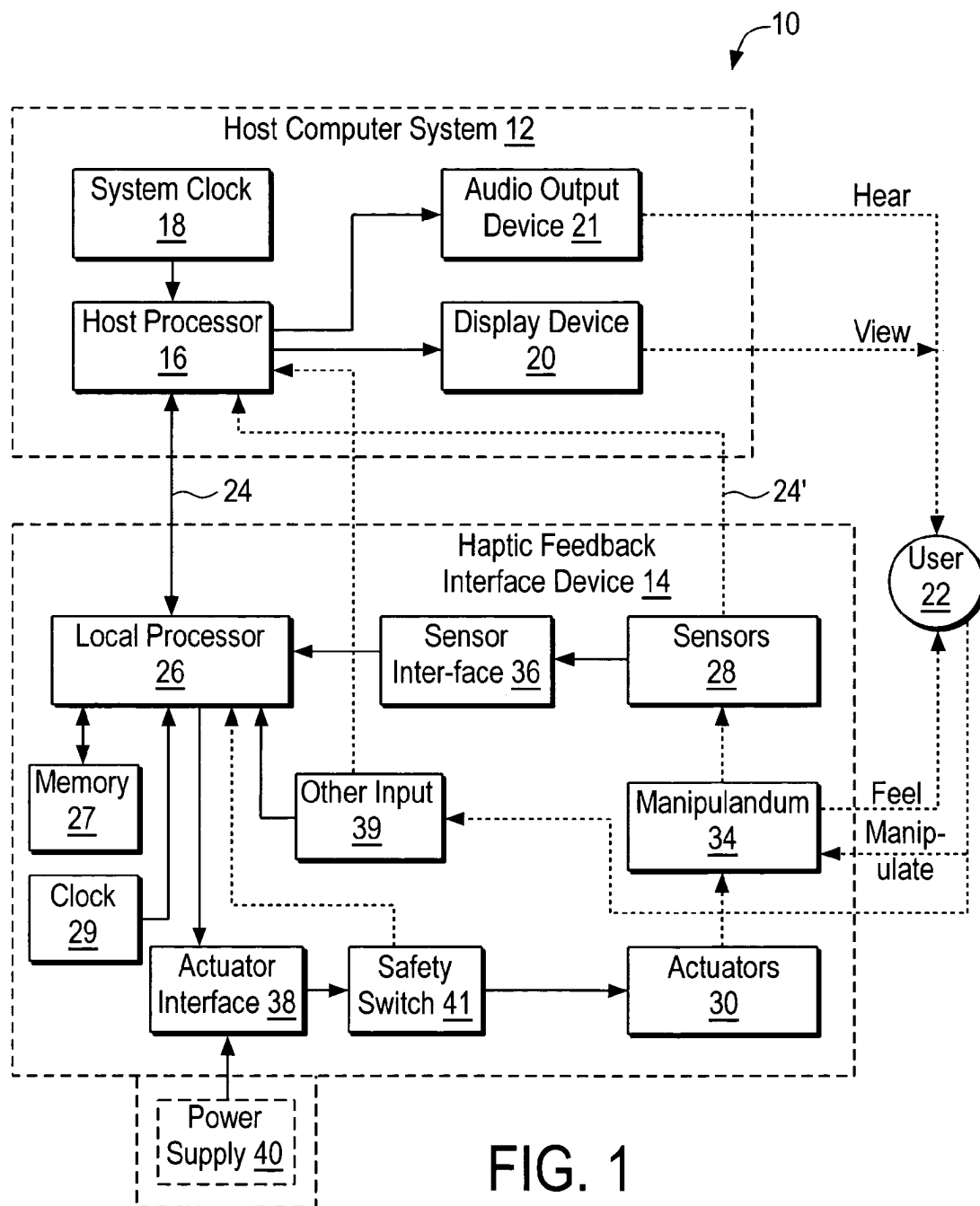
US 20050219206A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0219206 A1**
(43) **Pub. Date:** **Oct. 6, 2005**(54) **CONTROLLING VIBROTACTILE
SENSATIONS FOR HAPTIC FEEDBACK
DEVICES**(60) Provisional application No. 60/142,155, filed on Jul.
1, 1999.**Publication Classification**(76) Inventors: **Bruce M. Schena**, Menlo Park, CA
(US); **Erik Shahoian**, San Ramon, CA
(US)(51) **Int. Cl.⁷** **G09G 5/00**
(52) **U.S. Cl.** **345/156**(57) **ABSTRACT**

Method and apparatus for controlling vibrotactile sensations for haptic feedback devices. An actuator in a haptic feedback device includes a rotatable eccentric mass, and information is received at the haptic feedback device causing a drive signal. The drive signal controls the actuator to oscillate the mass in two directions about an axis of rotation of the actuator such that the oscillation of the mass induces a vibration in the haptic feedback device. The magnitude and frequency of the vibration can be independently controlled by adjusting a magnitude and a frequency, respectively, of the drive signal. The vibrations can also be provided in a bi-directional mode or uni-directional mode to provide the most efficient magnitude of the vibrotactile sensations. The haptic feedback device can be, for example, a gamepad controller receiving commands from a host computer providing a graphical environment.

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COOLEY GODWARD LLP**ATTN: PATENT GROUP****11951 FREEDOM DRIVE, SUITE 1700****ONE FREEDOM SQUARE- RESTON TOWN****CENTER****RESTON, VA 20190-5061 (US)**(21) Appl. No.: **10/949,467**(22) Filed: **Sep. 27, 2004****Related U.S. Application Data**(63) Continuation-in-part of application No. 09/608,125,
filed on Jun. 30, 2000, now abandoned.



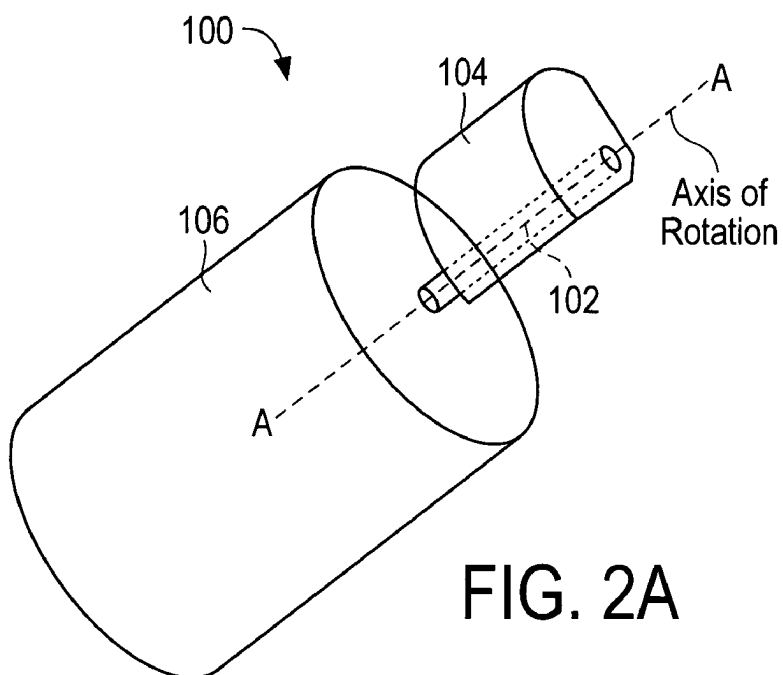


FIG. 2B

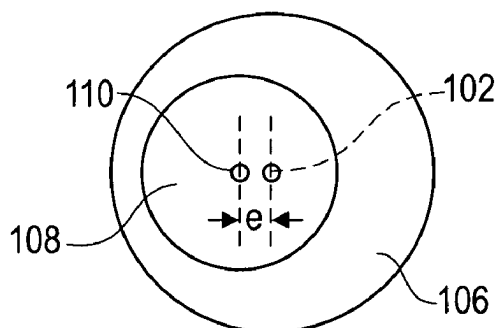
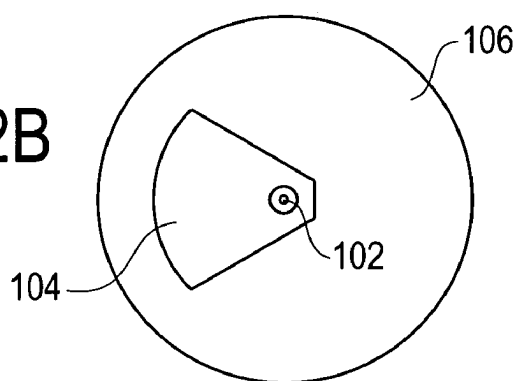


FIG. 2C

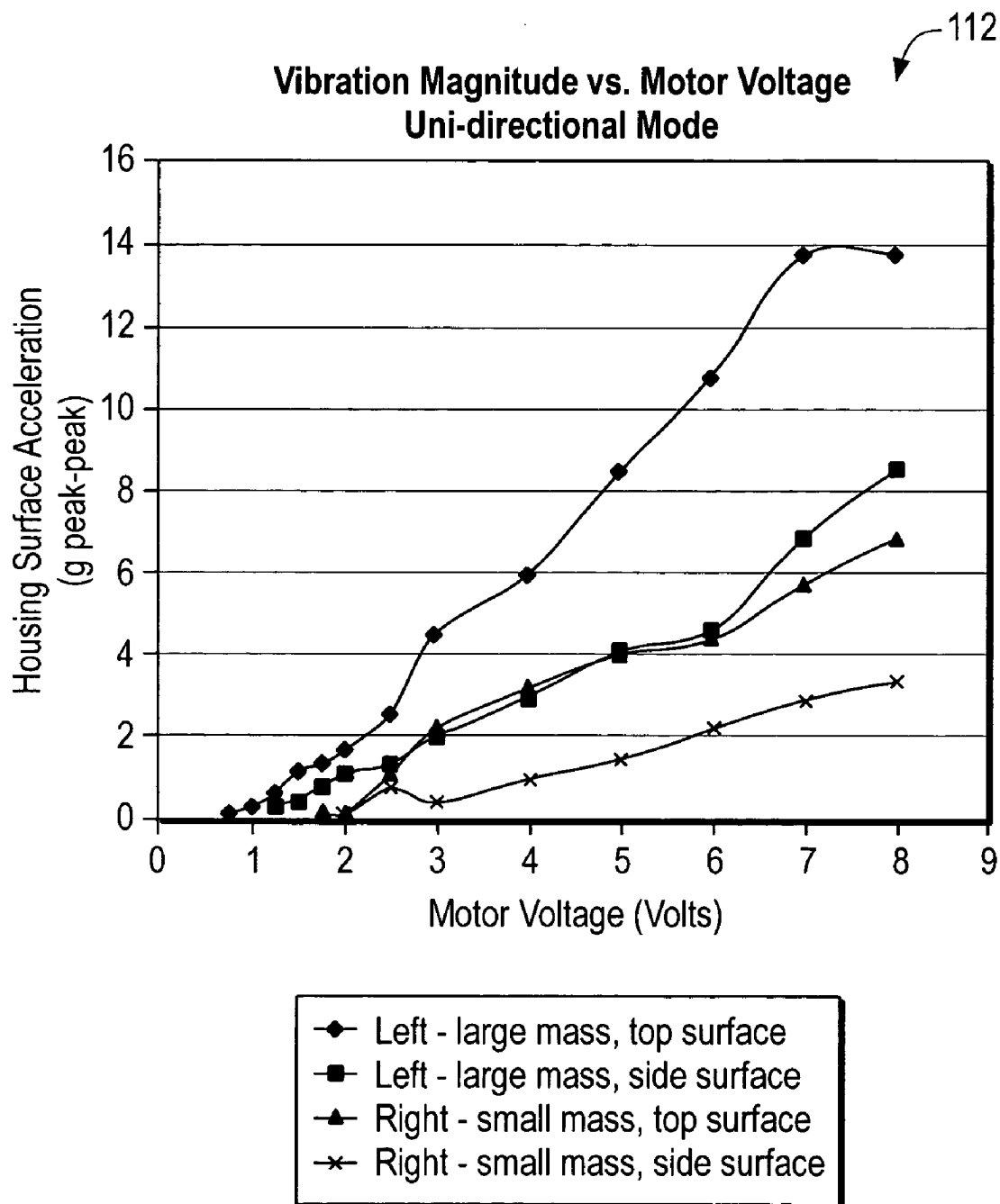


FIG. 3

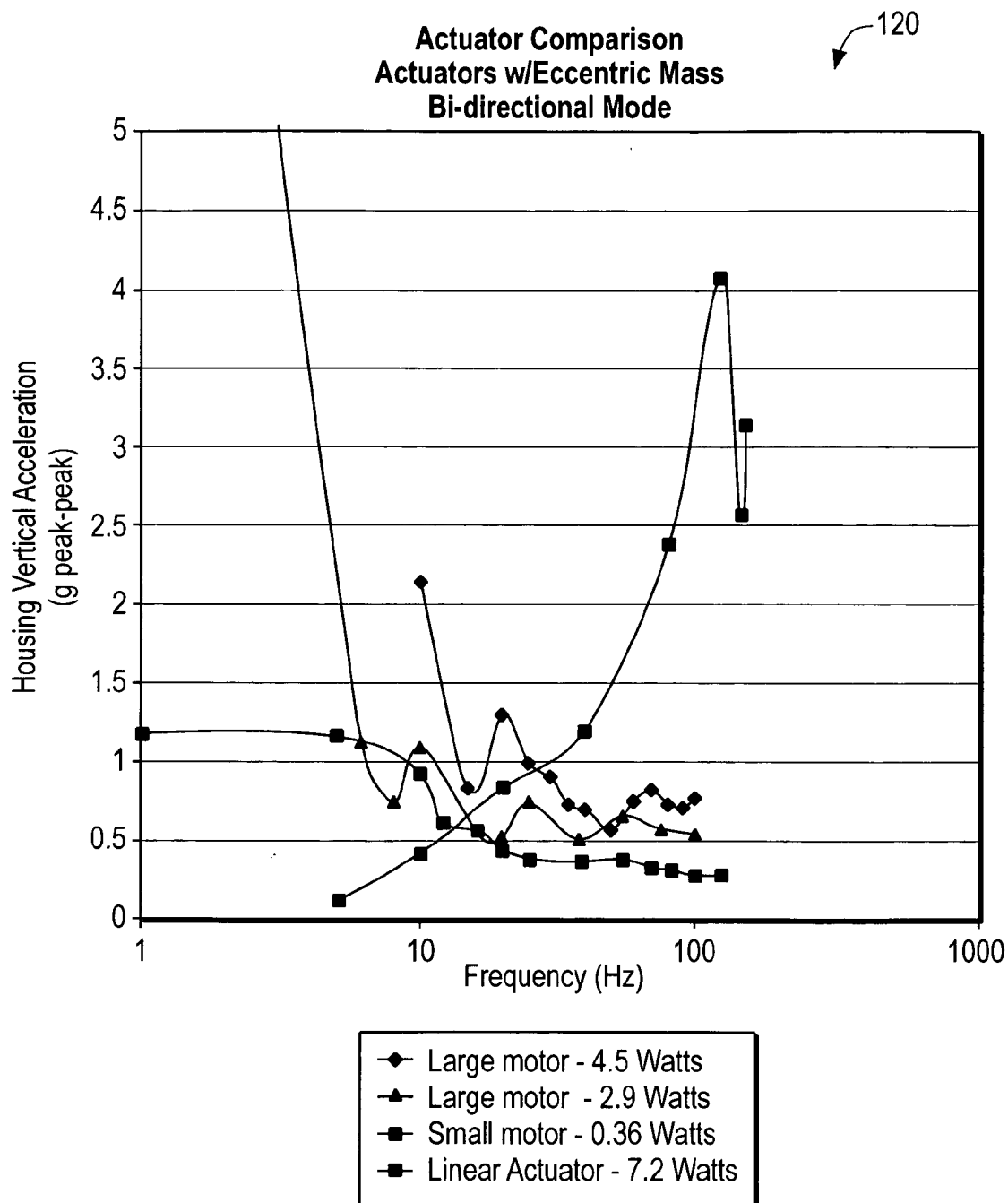


FIG. 4

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