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**Yasutake**

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(54) **METHODS AND APPARATUS FOR PROVIDING TOUCH-SENSITIVE INPUT IN MULTIPLE DEGREES OF FREEDOM**

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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 0 days.

**OTHER PUBLICATIONS**

(21) Appl. No.: **09/216,663**

Myron W. Krueger; Artificial Reality; Perceptual Systems; 1983.

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**Related U.S. Application Data**

(63) Continuation-in-part of application No. 08/696,366, filed on Aug. 13, 1996, now abandoned, which is a continuation-in-part of application No. 08/509,797, filed on Aug. 1, 1995, now Pat. No. 5,729,249, which is a continuation of application No. 08/238,257, filed on May 3, 1994, now abandoned, which is a continuation-in-part of application No. 07/798,572, filed on Nov. 26, 1991, now Pat. No. 5,335,557.  
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(57) **ABSTRACT**

Disclosed is a multiple coordinate controller device having a three-dimensional body with a first surface portion and a second surface portion where the second surface portion is not coplanar with the first surface. A first transducer with a first sensing surface is coupled to the first surface portion of the body and capable of detecting both positions and a range of pressure forces at positions on the first sensing surface. The first transducer is further capable of providing a first range of z coordinates at a detected x,y coordinate in response to the range of pressure forces on said first sensing surface. A second transducer having a second sensing surface is coupled to the second surface portion of the body and capable of detecting both positions and a range of pressure forces at the positions on the second sensing surface. The second transducer is further capable of providing a second range of z coordinates of opposite polarity to the first range of z coordinates in response to the range of forces on second sensing surface.

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(52) **U.S. Cl.** ..... **345/173; 345/157; 345/174; 345/177; 178/18.01**  
(58) **Field of Search** ..... **345/173, 174, 345/177; 178/18.01**

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**16 Claims, 57 Drawing Sheets**

