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[54] METHOD AND APPARATUS FOR CONTROLLING FORCE FEEDBACK INTERFACE SYSTEMS UTILIZING A HOST COMPUTER

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[73] Assignee: Immersion Human Interface Corporation, San Jose, Calif.

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Related U.S. Application Data

(List continued on next page.)

[63] Continuation-in-part of Ser. No. 461,170, Jun. 5, 1995, Pat. No. 5,576,727, and Ser. No. 534,791, Sep. 27, 1995, said Ser. No. 461,170, is a continuation of Ser. No. 92,974, Jul. 16, 1993, abandoned.

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[57] ABSTRACT

[52] U.S. Cl. 345/161; 345/163; 463/30; 463/38

A method and apparatus for controlling and providing force feedback using an interface device manipulated by a user. A microprocessor is provided local to the interface device and reads sensor data from sensors that describes the position and/or other information about a user object moved by the user, such as a joystick. The microprocessor controls actuators to provide forces on the user object and provides the sensor data to a host computer that is coupled to the interface device. The host computer sends high level host commands to the local microprocessor, and the microprocessor independently implements a local reflex process based on the high level command to provide force values to the actuators using sensor data and other parameters. A provided host command protocol includes a variety of different types of host commands and associated command parameters. By providing a relatively small set of high level host commands and parameters which are translated into a panoply of forces, the protocol further shifts the computational burden from the host computer to the local microprocessor and allows a software developer to easily create force feedback applications.

[58] Field of Search 345/156, 157, 345/161, 163; 318/568.11, 568.25; 74/471 Y; 463/37, 38, 30; 434/45; 395/99; 244/223

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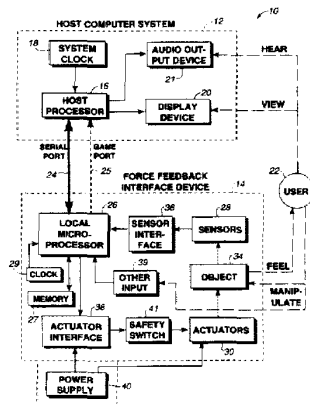
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111 Claims, 21 Drawing Sheets



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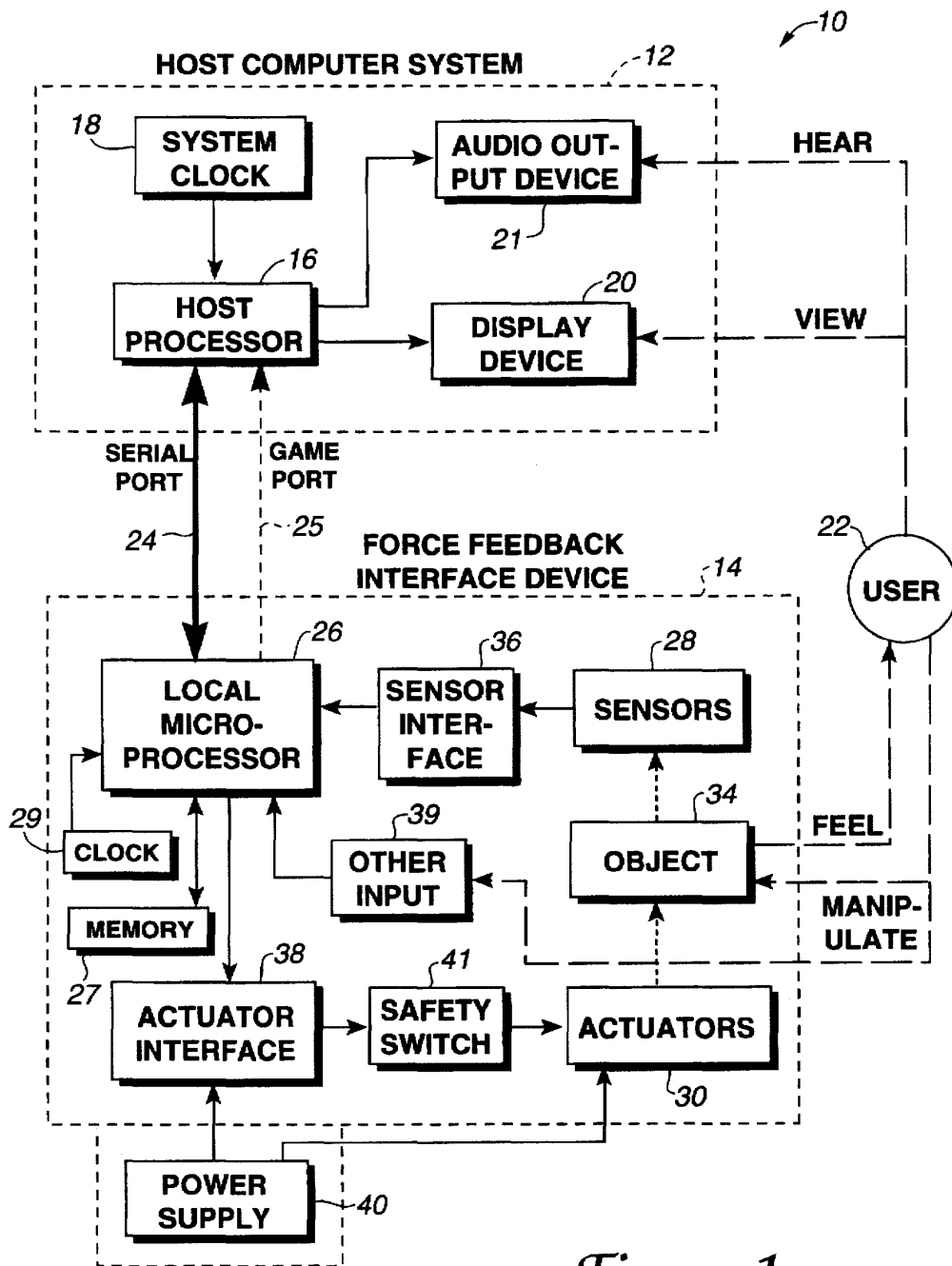


Figure 1

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