Electromechanically Actuated Valve for Controlling Flow Rate

A proposed valve for controlling the rate of flow of a fluid would include an electric-motor-driven ball-screw mechanism for adjusting the seating element of the valve to any position between fully closed and fully open. The motor would be of a type that can be electronically controlled to rotate to a specified angular position and to rotate at a specified rate, and the ball screw would enable accurate linear positioning of the seating element as a function of angular position of the motor. Hence, the proposed valve would enable fine electronic control of the rate of flow and the rate of change of flow.

The uniqueness of this valve lies in a high degree of integration of the actuation mechanism with the flow-control components into a single, relatively compact unit. A notable feature of this integration is that in addition to being a major part of the actuation mechanism, the ball screw would also be a flow-control component: the ball screw would be hollow so as to contain part of the main flow passage, and one end of the ball screw would be both an actuator and a flow-control component.

Marshall Space Flight Center, Alabama

The Rate of Flow Through This Valve would be determined by the axial position of the hollow ball screw relative to the valve seat.
Plumbing Fixture for a Microfluidic Cartridge

Lyndon B. Johnson Space Center, Houston, Texas

A fixture has been devised for making the plumbing connections between a microfluidic device in a replaceable cartridge and an external fluidic system. The fixture includes a 0.25-in. (6.35-mm) thick steel plate, to which the cartridge is fastened by two 10-32 thumb screws. The plate holds one plumbing fitting for the inlet and one for the outlet of the microfluidic device. Each fitting includes a fused-silica tube of 0.006-in. (≈0.15-mm) inside diameter within a fluorinated ethylene-propylene (FEP) tube of 0.0155-in. (≈0.39-mm) inside diameter and 0.062-in. (≈1.57-mm) outside diameter. The FEP tube is press-fit through the steel plate so that its exposed end is flush with the surface of the plate, and the silica tube protrudes 0.03 in. (≈0.76 mm) from the plate/FEP-tube-end surface. The cartridge includes a glass cover plate that contains 0.06-mm-wide access ports. When the cartridge is fastened to the steel plate, the silica tubes become inserted through the access ports and into the body of the cartridge, while the ends of the FEP tubes become butted against the glass cover plate. An extremely tight seal is thereby made.

This work was done by Kevin Francis of Johnson Space Center. For further information, contact the Johnson Innovative Partnerships Office at (281) 483-3809. MSC-23335

Camera Mount for a Head-Up Display

Langley Research Center, Hampton, Virginia

A mounting mechanism was designed and built to satisfy requirements specific to a developmental head-up display (HUD) to be used by pilots in a Boeing 757 airplane. This development was necessitated by the fact that although such mounting mechanisms were commercially available for other airplanes, there were none for the 757. The mounting mechanism supports a miniature electronic camera that provides a forward view. The mechanism was designed to be integrated with the other HUD instrumentation and to position the camera so that what is presented to the pilot is the image acquired by the camera, overlaid with alphanumeric and/or graphical symbols, from a close approximation of the pilot’s natural forward perspective. The mounting mechanism includes an L-shaped mounting arm that can be adjusted easily to the pilot’s perspective, without prior experience. The mounting mechanism is lightweight and flexible and presents little hazard to the pilot.

This work was done by Wayne George, Monica Barnes, Larry Johnson, and Kevin Shelton of Langley Research Center. Further information is contained in a TSP (see page 1).

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Langley Research Center, at (757) 864-3521. Refer to LAR-16380-1.