# Robust Digital Valve for Prosthetic Finger, Microsurgery, Robotics

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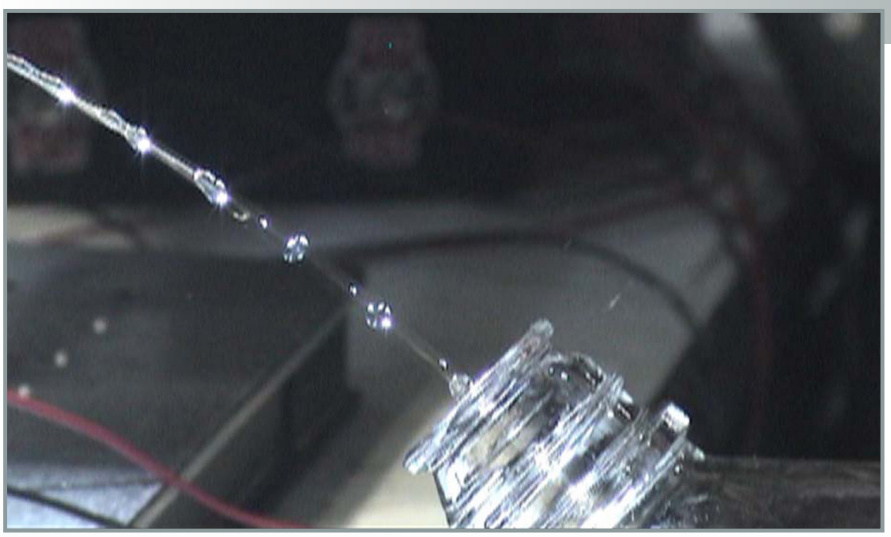

## Technology Summary

To address problems in traditional prostheses, ORNL researchers developed a prosthetic finger powered by fluid through a miniature valve. The invention offers a compact, powerful, noise-free, and low-cost solution. The device will attract makers of miniature robotics, tools for microsurgery, prosthetics, orthotics, and tactile feedback devices.

The unique kinematic structure for the ORNL finger features a very small fluid control digital valve that is easy to make, has only three moving parts, and has tested to be very robust. Currently, there are no commercial flow control valves that can achieve the fine control of very low flow rates associated with prosthetic devices. Existing powered prosthetic fingers use cable drive mechanisms as tendons with drive motors remote from the finger. These are bulky, complex, costly, and have relatively low actuator forces. The ORNL finger's joints are operated by antagonistic pistons that provide flexion and extension motions.

The device controls very low flow at high pressures. This permits the invention to have finer control of fluid power at a level not currently available. The invention enables a broad array of new devices in the area of miniature robotics; active prosthetics and orthotics; and, small, high performance haptic interfaces.

## Advantages

- Eliminates the need for many seals, high pressure tubing, and other moving parts.
- Cylinders are fixed in the finger joints, reducing the need for flexible tubing connections or rotary unions.
- Design can be made substantially smaller, if desired.

## Potential Applications

- Miniature robotics
- Biomedical tools
- Prosthetics

## Patent

Patent application in preparation.

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