In an aging society, the maintaining and the improvement of the quality of life (QOL) of elderly are an important issue. In this situation, the development of a high functional rehabilitation device is desired not only to support recovery of physical abilities, but also to reduce the total cost of medical care in Japan due to the possibility of home health care with them. Absolute safety is required for the actuator of the rehabilitation devices, since they come into contact with the human body directly. Therefore, we developed a flexible spherical actuator (Fig. 1) using a flexible pneumatic cylinder. The actuator can give a passive exercise for user’s shoulders and arms while they hold both handling stages with hands (Fig. 2). We are also investigating the development of inexpensive displacement sensors that can be applied to such flexible devices (Fig. 3) and the control of soft actuators with built-in controllers (Fig. 4).

Generally, the control valves are required to drive the pneumatic actuator. However, a continuous flow type servo valve is expensive compared with other elements in the pneumatic driving system. In this research, we also develop an inexpensive servo valve which can control the flow rate by changing the bending angle of a buckled tube (Fig. 5).

Keywords: soft actuator, rehabilitation device
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