

Development of Belt Locking Mechanism for Lumber Assistive Device

Disorders such as the low back pain caused by the physical burden in daily works including nursing is a serious social problem. It has been pointed out that one of the factors which causes the low back pain is the accumulative load to the lumber by working in an unnatural posture such as a stooping posture for a long time.

In this study, we have developed the assistive device to support the user's weight using belts attached on the lumber in order to prevent the low back of the nurses caused by that they keep the stooping posture. For realizing the assistive device which mechanically locks the motion of the lumber using a belt while the user is in the stooping posture and release the constraint after the work is finished, we proposed a novel locking mechanism for a belt. In order to lock the belt, the proposed locking mechanism uses the large frictional forces caused by overlapping the belt on the frictional body as shown in Fig. 1, and the mechanism can cancel out the infinite tensile force applied to the belt in theory. We also proposed the way to unlock the belt by oscillating the belt and reducing the frictional coefficient. The mechanism was experimentally validated using the prototype of the proposed mechanism (Fig. 2). Currently, we are analyzing the efficient displacement of belts to support the user's weight and developing the assistive using this proposed locking mechanism for a belt.

Keywords: assistive device for lumber, locking mechanism for a flat belt

Reference

1. Matsui, Naotaka, Shirafuji, Shouhei, and Ota, Jun. (2016). Locking mechanism based on flat, overlapping belt, and ultrasonic vibration, Proceedings of the 2016 IEEE International Conference on Robotics and Biomimetics (ROBIO 2016), (pp.461-466). Qingdao, China

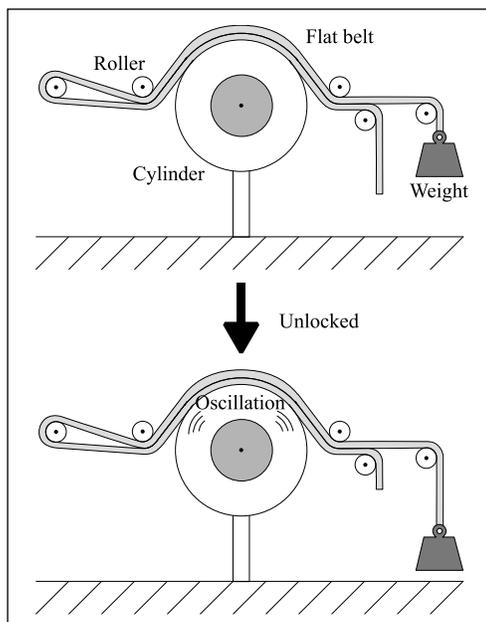


Fig. 1 Mechanism to switch the state the belt is locked or unlocked.

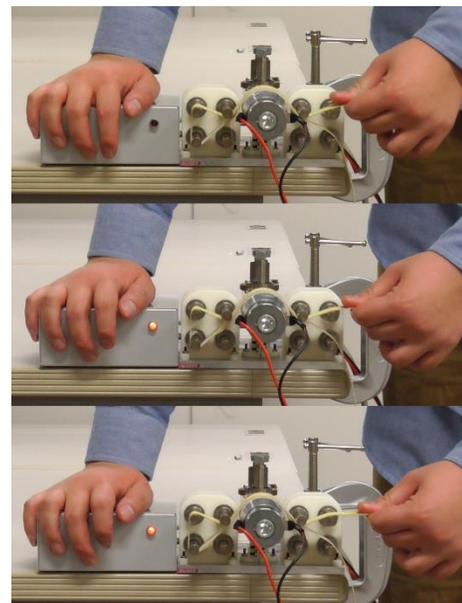


Fig. 2 Demonstration to lock the belt using the developed mechanism.