Passive Mechanical Exoskeleton to Reduce Hand Fatigue for Astronauts

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ABSTRACT

Researchers at the University of California, Davis have developed an apparatus that passively allows an astronaut to keep their hand closed while gripping an object, thereby reducing hand fatigue during extravehicular activities.

FULL DESCRIPTION

Grip strength is important in any working condition that requires excessive hand labor, especially for astronauts who experience immense hand fatigue during extravehicular activities. Much of the hand fatigue comes from needing to grip handrails for long periods of time, and fighting the pressure in the glove and its tendency to return to a neutral position. A mechanism that helps astronauts grip handrails, or any operator who needs to physically grip objects for long periods of time, would greatly increase productivity and safety.

Many systems have attempted to improve grip strength and reduce fatigue in the hands of operators. However, these systems have either added bulk to the hand and palm making the system difficult to operate, or introduced the need for complicated external power sources and computer control.

Researchers at the University of California, Davis have developed a mechanical gripping device that reduces the need for physical grip strength in hands without requiring external power sources or computer control. The gripping device uses a tendon drive and ratchet mechanism integrated into a user’s glove that incorporates a locking cable retract mechanism, allowing the wearer's hand to lock in position. Once an object is gripped, the tendon drive and ratchet mechanism locks the grip in place. The gripping force can be easily disengaged with a toggle switch located on the gripping device. This invention addresses the need for reducing fatigue by mechanically taking the load when the hand is in a closed position, but without introducing the complexity of electromechanical systems. The lack of complexity provides ease-of-use and improved safety during use.

APPLICATIONS

- Extravehicular activities performed by astronauts
- Industries that require extended grip strength of workers: safety equipment, sporting equipment, binding equipment, mining, agriculture

FEATURES/BENEFITS

- Reduces hand fatigue when gripping objects for prolonged periods
- Easy locking and quick release of hands from lock position
- No need for external power sources or computer control

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,750,290	09/05/2017	2016-142

INVENTORS
- Carey, Alan
- Robinson, Stephen K

OTHER INFORMATION

KEYWORDS

grip assist, tendon drive, ratchet system, artificial tendons, fatigue prevention, retract mechanism, fatigue, finger digits, sporting, safety, equipment, exoskeleton

CATEGORIZED AS
- Engineering
- Other

RELATED CASES

2016-142-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Efficient UAV Flight Mechanism with Vertical Take-Off and Landing (VTOL) Capability
- Astronaut-Powered Laundry Machine

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