

DEVELOPMENT OF A DEVICE TO ASSIST IN PACKING AND UNPACKING BAGS: HANGING BAG ASSISTANT

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ABSTRACT

The purpose of this project was to develop a device to assist a stroke victim who lost control of the left side of her body with packing and unpacking various sized bags. The developed device hangs from a door and holds various sized bags, providing the client a simple way of holding the bags open while they are packed and unpacked. The lightweight device consists of an aluminum frame with one free-standing upright and one adjustable upright. Two hooks bolted to individual uprights were used to support the handles of the bag. The adjustable upright is controlled by a motor turning an aluminum wheel lined with a rubber O-ring, which in turn drives a threaded rod. The motor runs off a rechargeable battery pack mounted on the frame. Two proximity sensors attached to the frame of the device were used to prevent the motor from expanding or contracting the uprights past its limits. This setup allows the client to vary the width of the uprights in order to accommodate small and large bags. A three-way toggle switch is used to operate the motor. The device is set-up and operated with one hand as illustrated in figures 1 and 2.

need for a device to assist her with the process of packing various sized bags. After searching the United States patent and Trademark database [1] and multiple consumer websites, it was determined that such a device does not exist in the market.



Figure 1. Client setting-up the Hanging Bag Assistant

KEYWORDS

Assistance in Packing and Unpacking Bags;
Assistive Devices

BACKGROUND

An individual has lost much use of the left side of her body because of a stroke. Packing and unpacking a bag was difficult for her, since most bags require one hand to hold it open and one hand to load it. With the use of her right hand, the client struggled to keep a bag open in order to pack items into it. She expressed her

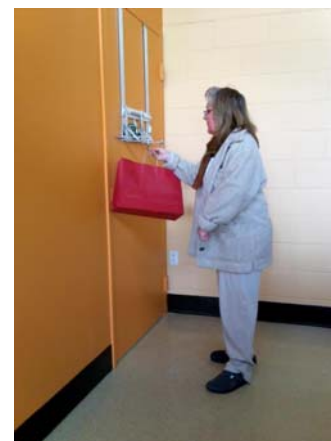


Figure 2. Client using the Hanging Bag Assistant.

DESIGN OBJECTIVES

The objective of this project was to develop a device that would assist an individual who lost much use of the left side of her body, with the process of packing various sized bags. The main design criteria were to have a lightweight and mobile unit that is safe, portable, adjustable, reliable, and easy to setup and use.

METHODOLOGY/DESIGN

Several design concepts were developed including using a tripod bag opener and a table top bag opener, both having multiple telescoping arms and legs and both controlled by linear actuators. However these designs were disregarded mostly because of their costs and their heavy weight.

The adopted design concept was modeled after a towel rack that hangs on the back of a door. The unit includes two steel hooks, that hook over a door, and attach to two vertical frame uprights. A plastic slider acquired from Spiratex Company and two small vertical uprights were mounted on the vertical frame uprights. Hanging rods are attached to the two small vertical uprights for a bag to hang on for loading. The distance between the two small vertical uprights is controlled by a driving apparatus. The driving apparatus consists of square tube aluminum (aluminum housing) with a hollowed out piece of UHMW plastic inserted inside the tubing. A threaded rod was placed inside the hollowed-out plastic insert and is attached to the adjustable upright. Mounted on the aluminum housing is dc motor (rated at 15 rpm and produced 26.8 N-cm of torque at max efficiency) with an aluminum wheel attached. The aluminum wheel was outlined by a rubber o-ring and was to drive the threaded rod. Powering the motor was a rechargeable battery pack rated at 800 mAh and a toggle switch. The toggle switch allows for the polarity of the motor to be reversed in order to operate the motor in reverse. In order to limit the minimum and maximum distance of the adjustable upright, proximity sensors were installed. The sensors cut power to the motor when the maximum or minimum limits are met in order to prevent over extension. Figure 3 shows a 3-D model of the device and figure 4 depicts a close up view of the finished unit. A structural analysis was conducted using SolidWorks and the unit was found to be safe.

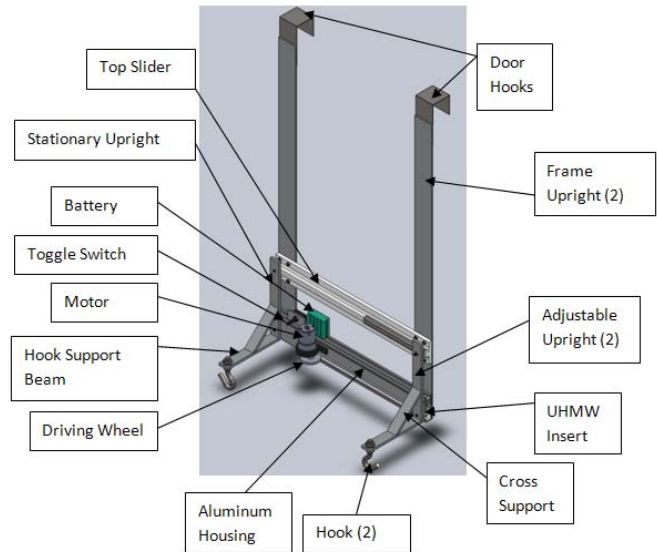


Figure 3. 3-D model of the device.



Figure 4. Close up view of the unit.

RESULTS/EVALUATION

A device to assist an individual with packing and unpacking various sized bags was developed. The unit was set-up to be operated with one hand. It also allows the user to pack and unpack bags using one hand. Figures 1 and 2 depict the “client” using the unit.

The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0) tool was used as an outcome measurement instrument to measure satisfaction with the unit [2]. The eight QUEST items that were assessed include comfort, dimensions, simplicity of use, effectiveness, durability, ease in adjusting, safety and weight. Each item was scored with a 5-point satisfaction scale ranging from a score of 1 denoting “not satisfied at all” to a 5 indicating “very satisfied”. A score of 5 was attained for each of the 8 items. The “client” was very satisfied with the unit.

CONCLUSION

An individual has lost much use of the left side of her body because of a stroke. Packing and unpacking a bag was difficult for her, since most bags required one hand to hold it open and one hand to load it. The developed “Hanging Bag Assistant” allows this individual to independently pack and unpack various sized bags with one hand. She was able to easily lift the prototype off of a table and hang it on the back of a door as shown in figure 1. Once hung, she could suspend multiple sized bags from the two hooks and operate the motor using the three-way toggle switch as shown in figure 2. Once packed, she was able to remove the bag from the hooks and also remove the prototype from the door. Overall, she was very pleased with the prototype.

ACKNOWLEDGEMENTS

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REFERENCES

- [1] United States patent and Trademark Office Search Engine. <http://www.uspto.gov>
- [2] Demers, L., Weiss-Lambrou, R., & Ska, B. (2002). The Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0): An Overview and Recent Progresses. *Technology and Disability*, 14, 101-105.

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