

Multifunctional Walker for Stair Navigation via Sliding Front Face Mechanism

Alexandria Bakke, Benjamin Garlow, Sohaib Naim

Department of Biomedical Engineering | Johns Hopkins University | Whiting School of Engineering | Baltimore, MD

Abstract

This walker has been designed to ensure user safety on the stairs while providing ample support through its multi-configuration design. There are two systems working in conjunction that make this device unique: a sliding front face and a set of telescoping legs. The telescoping legs can be set to three different heights: even with the fixed set of legs for flat surface walking, shortened by one step for beginning and ending stairs, and shortened by two steps for the main part of a staircase. The front face of the walker can slide from end to end, changing whether the adjustable set of legs is in front or behind them. This allows the user to ascend and descend stairs. The ascending and descending stair walker is designed to be used within an average home where the stairs have a rise of 7 inches and a run of 11 inches.

Background and Motivation

The population who uses a walker faces many challenges when navigating non-flat terrains. There are additional challenges to using a walker as a mobility aid when there are stairs in the home. There is not a widely used solution for these challenges, and they may lead to falls if the user is not provided the support and extra balance they need. These falls are even more dangerous on the stairs as there is added potential energy which can lead to more severe injuries. Thus a walker for the stairs is needed to provide safe stair walking to this population

Solution Landscape

- Canes
- Stair Chairs
- Railings
- Stair Avoidance
- Hydraulic Stair Walker
- Pulley Stair Walker
- Motorized Stair Walker

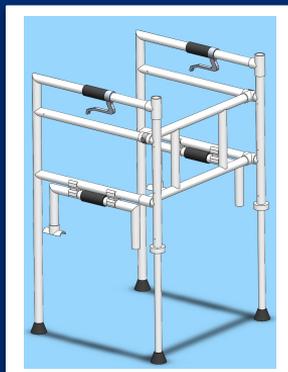


Figure 1: Stair Walker (Isometric View)
The stair walker shown in its ascending configuration.

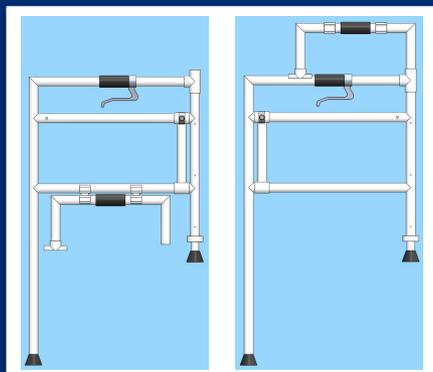


Figure 2: Stair Walker (Side View)
(Left) The stair walker shown in its ascending configuration. (Right) The stair walker in its flat-ground configuration.

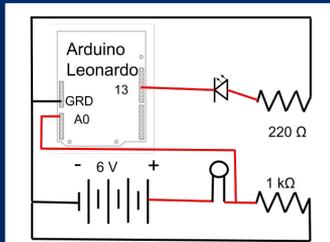


Figure 3: Sensor Schematic
The force sensor and LED circuit for the locking safety feature.

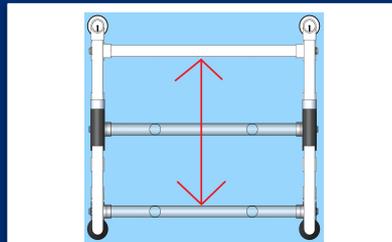


Figure 4: Top View of Sliding Front Face
The sliding front face can be oriented in ascending or descending configuration.

Results

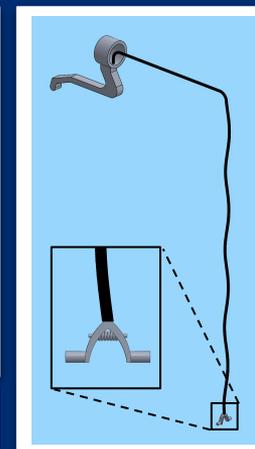


Figure 5: Leg Adjustment
The mechanism used to vary the heights of the legs.



Figure 6: Front Adjustment
The mechanism to lock the front face into a configuration

Future Directions

We wish to continue developing this walker so it can be used safely on the stairs. We hope to continue to develop the sliding mechanism and implementation of the telescoping legs. Once these designs developments have been executed we wish to complete design testing as well as user testing.

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