Walk On – A Stable Walker for Stairs

Objective

There are currently no safe and easy methods for users of walkers to climb up and down stairs.

Customer Requirements
- Portability
- Ease of Movement
- Sturdiness
- Adjustable Height
- Comfort

Market Size
In 2008, almost 25% of Americans aged 65+ reported having an ambulatory disability. An aging population ensures the need for walking-assistance devices. [1]

Engineering Characteristics
- Weight
- Ease of Actuation
- Collapsed Dimensions
- Base Area
- Maximum Moments

Physics
Note: this calculation represents only one side of a walker (e.g. the left)

\[ F_1 + F_2 = 0.375 \times W \times \cos(\theta) \]
\[ F_p > 0.375 \times W \times \sin(\theta) \]
\[ \Sigma M = 0.375 \times W \times \sin(\theta) \times l_1 + F_2 \times h_1 - 0.375 \times d \times W \times \cos(\theta) = 0 \]

Prototype and Testing

Prototype
- Constructed of aluminum pipes, disks, and pins.

Stability Test
- Walker is extended on three stairs.
- Lateral forces are applied and handle displacement is measured.

Prototype withstood 150 lbs. Target value: 200 lbs

Test Results and Future Work

Summary of PDP
- Surveyed customers to define stair-climbing difficulties.
- Generated and evaluated designs for stair stability.
- Performed embodiment design to refine "Angled Legs" concept.
- Ensured robustness of the walker with FEA.
- Fabricated walker to test the final design.

Recommendations for Future Design
- Refine DFM/ DFA to make ideal actuation method feasible.
- Perform life-cycle tests to verify design reliability and safety.
- Eliminate areas of overdesign to reduce weight.
- Begin marketing to create customer awareness, address concern

Process Reflection
- Extensive concept generation and rigorous concept selection led to very strong design.
- Fabrication provided understanding of DFM, DFA concerns.

Decision

Added stability
Base Area
Portability
Stability Test
Lateral forces are applied and
Perform embodiment design to refine
Prototype and Testing
Fabricated walker to test the final design.

Actuation Force

Summary of PDP

CONS
- Adjustable Height
- Weight

0.492"

0.591"

PROS
- Weight
- Collapsible
- Ease of Actuation

25.9%

6%

Other Free Design Variables

TOP CONCEPT WEIGHTS

Nested, Angle Adjust 26.3%
Screws, Telescoping 25.5%

Final Concept