

Alert Device for Walker

Product Design Specifications

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Function:

The device will provide walking assistance along with an integrated safety system that will produce a low pitch frequency as a cautionary mechanism for potential dangers to the stability of the device. The low pitch frequency will emit when objects are within 10 ft of the device and when the walking gradient exceeds that of 2% incline. The device must include a locking mechanism that prohibits movement in any direction if activated.

Client requirements:

- Device should be similar in height to similar walkers on the market assisting people from 5'3ft to 5'11ft
- Device should have wheels at the base of the device that can easily lock and unlock upon patients decision
- Device should have an alert system that emits low frequency noise at a range older patients would be able to hear
- Device should be able to record gradient it rests and moves on along with alerting patients if the incline becomes unsafe
- Device should include the following accessories; seat, basket, handles, wheels, and lock for wheels
- Device should follow FDA regulations
- Budget between \$300 and \$500.

Design Requirements

1. Physical and Operational Characteristics
 - a. *Performance requirements:*
 - i. Device should focus on emphasizing the safety features of the walker

- ii. Device should be able to alert the user if an incline becomes unsteady
- iii. Device should have a low frequency alert system
- iv. Device should emphasize the brake features of the walker

b. *Safety:*

- i. The product must allow the user more comfort during use of their walker
- ii. The product must remind the user to use their walker
- iii. The volume of the alert system will be lower frequency in volume
- iv. The product will provide additional alert for the user to use their brake system
- v. The product will focus on alerting the user of uneven ground that may harm the user

c. *Accuracy and Reliability:*

- i. Due to the time constraints and new nature of the project, a prototype is requested
- ii. The product should be testable on a walker
- iii. The product should follow a list of precautionary tests for safety
- iv. The product should follow a list of accuracy tests in terms of the technology and details to the prototype

d. *Life in Service:*

- i. The device should last throughout the entire use of the user
- ii. If the device breaks there should be replaceable parts so it continues to be usable after repair
- iii. The device is used everyday for up to 10 hours per day
- iv. The device will not be used for long periods of time over long distances, but over short periods of time over short distances.

e. *Shelf Life:*

- i. The device should remain undamaged throughout time in storage

f. *Operating Environment:*

- i. Older adults aged 74-85+ will use this product [1]
- ii. The walker should support a weight of the average adult in independent living up to the higher threshold of weights

- iii. The walker will be used indoors on hardwood, tile, and carpet
- iv. The walker will also be used outdoors on concrete, grass, and gravel

g. *Ergonomics:*

- i. The device will be easy for patients and medical staff to use
- ii. The device will not further hinder the mobility of the patient
- iii. The device will not be loud enough to disturb others patients, staff, or people in the vicinity

h. *Weight:*

- i. The device produced must be light and compact as to minimally increase the weight of the walker. The total weight should be similar to a traditional non-altered walker as to avoid causing injuries to patients while using our walker
- ii. Walkers range from 5-12 pounds depending on the type of walker [6]

i. *Materials:*

- i. All materials used to fabricate the device must comply to FDA guidelines
- ii. Materials used must be easily accessible nationwide and affordable

j. *Aesthetics, Appearance, and Finish:*

- i. The overall size of our smart-walker must be able to accommodate the standard person and be adjustable to different heights
- ii. The device must be minimally intrusive and blend in seamlessly with the walker
- iii. Appearance must be appropriate for use in elderly care facilities

2. Production Characteristics

a. *Quantity:*

- i. The client wants use to create one working prototype in the given timeframe
- ii. Long term goal is to mass produce the device such that several could be in hospitals, retirement homes, and recovery clinics

b. *Target Product Cost:*

- i. The client has provided a budget of \$300-\$500

- ii. The cost of production should be feasible for medical facilities nationwide

3. Miscellaneous

a. *Standards and Specifications:*

- i. Must comply with Sec. 890.3825 of the FDA within Title 21 [4]
- ii. The device must comply with the ADA's restrictions for manually powered devices [2]

b. *Customer:*

- i. The customer highlighted that the design should focus on safety, specifically focused on brakes to prevent the device from slipping out from under the user
- ii. The customer would prefer that the device be light-weight
- iii. The customer wants the device to be modular, to adapt to a variety of needs

c. *Patient-related concerns:*

- i. Device should allow patients to minimize pain while moving.
- ii. Device should enable patients to access any and all areas around their homes and in their daily lives

d. *Competition:* This section covers other devices and patents on the market related to alert devices for walkers.

- i. [5] Collapsible Upright Wheeled Walker Apparatus (Patent No. US 10322056B2) - This is a patent for a walker device with adjustable armrests to support sufficient user upper-body weight to facilitate a natural and upright gait for a wide range of mobility-impaired individuals.
- ii. [3] Electronically Controlled Brakes For Walkers (Patent No. CA2605609C) - This is a patent for an improved electronic braking system for walkers that incorporates one or more electronically operated brakes. The controller is responsive to touch sensitive switches for easy operation, and is adjustable and responsive to the operator patterns. The controller may be used on sloped terrain and may be adjusted to accommodate for the weight of the user to to set limits to the speed at which it can move.

References:

- [1] Place, Buckner Parkway. “At What Age Do Most Seniors Enter Assisted Living?” Buckner Parkway Place, January 23, 2023.
<https://bucknerparkwayplace.org/news-blog/at-what-age-do-most-seniors-enter-assisted-living/>.
- [2] “Ada requirements: Wheelchairs, mobility aids, and other power-driven mobility devices,” ADA.gov, <https://www.ada.gov/resources/opdmids/> (accessed Sep. 21, 2023).
- [3] E. Einbinder, “Electronically Controlled Brakes for Walkers,” Nov. 23, 2010.
- [4] “CFR - Code of Federal Regulations Title 21,” GovInfo, <https://www.govinfo.gov/app/details/CFR-2022-title21-vol8/CFR-2022-title21-vol8-sec890-3825/summary> (accessed Sep. 21, 2023).
- [5] P. J. Fellingham, Y. Pan, D. A. Purcell, and N. Satarici, “Collapsible Upright Wheeled Walker Apparatus,” Jun. 18, 2019.
- [6] Ciancanelli, “How Much Does A Walker Weigh?” Sept. 8, 2019.