

A Coffee Mug for the Disabled

Alexis B. Perri, Joseph R. Lesso, Lance W. Brosious, Brennan Trussell

Team 6

Introduction to Engineering Design

Junfeng Ma

The Pennsylvania State University

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### **Abstract**

The product is a cylindrical mug with a handle on the bottom. The handle breadth is 95 mm to accommodate large average hands (Georgia Tech Research Institute, n.d.). There are thumb positioning/mug stabilizers coming from both sides. These were developed to position the users thumb in a mug stabilizing zone, if the user has thumbs. These were placed on both sides making the mug ambidextrous. They are 25 mm wide to accommodate most thumbs (Georgia Tech Research Institute, n.d.). It is also 60 mm deep to accommodate long thumbs (Georgia Tech Research Institute, n.d.).

**Key Words:** Mug, Missing fingers, Disability, Drinking Aid, Safety

### **Introduction**

There are many reasons to lose a finger. There are weather related issues with body parts. Frostbite is not uncommon for outdoor adventurers. These brave men and women explore the world on adventure after adventure and ran on coffee. After losing their fingers their adventuring days may be over, but their coffee drinking days should not be. There are also many other reasons why a person may have only one finger such as; birth defects, accidents, medical complications, and many others. These people all have difficulty performing everyday activities such as drinking. We recognized this problem and began thinking what we could do to help people in this situation. We came up with the idea to develop a mug catered to the needs of these people. With our mug we hope to make the lives of people with one finger much easier. Our mug will allow people with one finger to consume their favorite beverages with ease.

### **Literature Review**

US patent 20100102070 features a drinking apparatus uniquely designed to reduce dropping. This product takes the shape of a conventional mug, while the exterior surface includes a depression in the shape of a hand wrapping around the mug the way one would hold a standard cup or glass, including the thumb and each of the other four fingers. This suggests that the user will hold the mug while their hand is partially enclosed by the exterior surface. The description mentions sizing the depression specific to gender, age, and left or right hands. The main purpose is stressed as being a unique design that allows enhanced grip for the user, in the hope of reducing dropping.

Though this patent attains lose relevancy to this design project, it can be considered a sister product of what was designed in this challenge. With the constraint of making a mug for a user with one finger, unique design measures were necessary to accommodate such a fate. However, this design carries such small dimensions for the depression that it could arguably be more uncomfortable for the consumer of this market. Supporting a mug with only a wide squeeze of the hand and one unknown finger could be quite stressful on the user.

The author of this full text patent maintains little credibility as the description only offers one purpose, that of which to reduce dropping. No other significant benefits were mentioned of this product, other than the weak additive of a unique design.

### **Design Process**

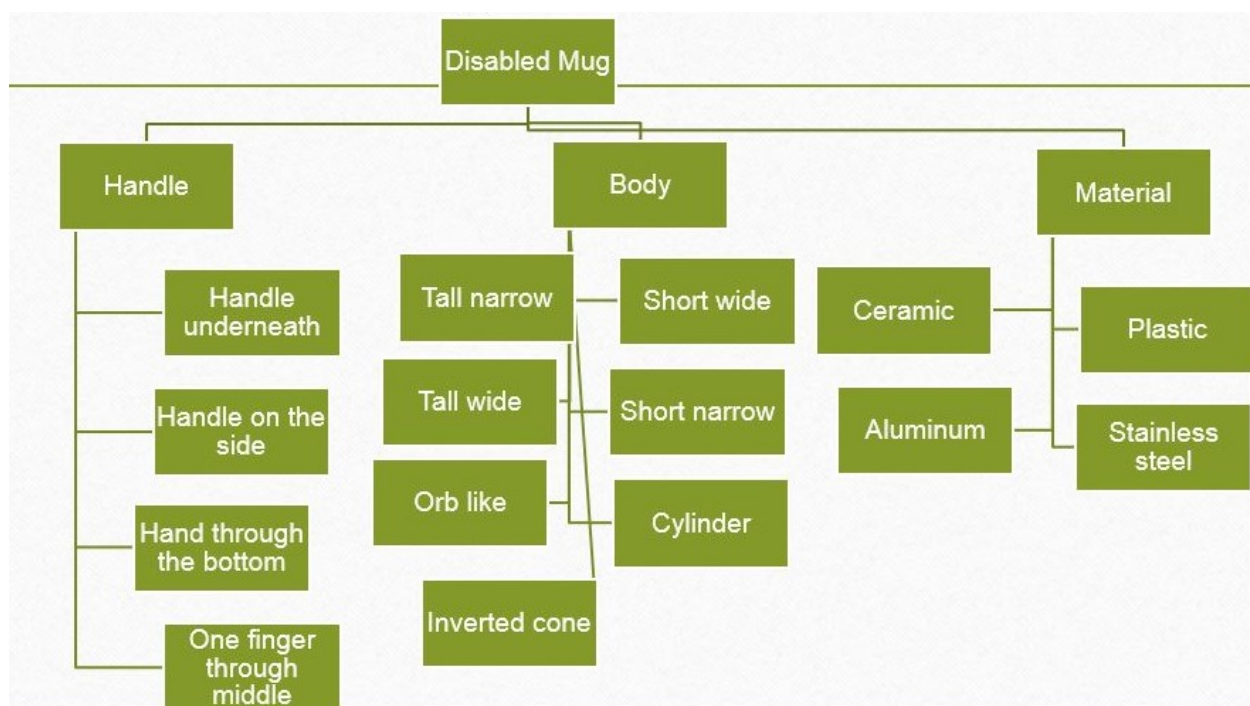
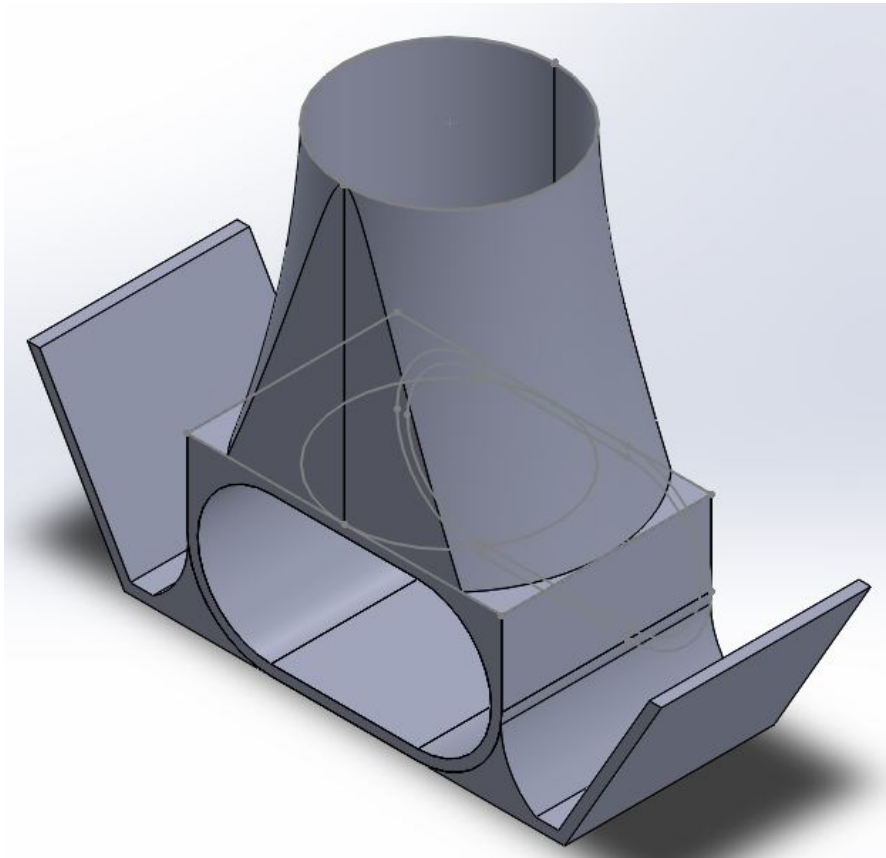
A lot went into consideration while designing the product. The criteria for the mug was broken down into four main categories: user friendly, durable, manufacturer friendly, and practical. Each of those had subcategories which were ranked in order of importance. Under the user friendly category, safety was marked as most important (41% weight) followed by

balance(19%), spill proof(13%), ease of cleaning(12%), ambidextrous(10%), and insulation(5%).

This process was done for each category, then the four categories themselves were weighted by importance. The more heavily weighted categories were taken into more consideration while designing the mug.

After the criteria was ranked by importance, a design had to be decided on. The body, handle, and material are the three main parts that make up the mug. The choices for the body were tall and wide, short and wide, tall and narrow, short and narrow, cone-shaped, orb-like, and cylindrical. Cylindrical was the most reasonable choice because it holds a large amount of water and is easily balanced in the hand. The most appropriate handle for a person with one finger is the handle at the bottom of the mug. This makes it easy for someone to balance the mug on their palm and not have to worry about having all five fingers for support. Plastic and ceramic were the top two materials, however plastic's benefits outweighed those of ceramic. Plastic is microwave and dishwasher safe, provides a significant amount of insulation, and is lighter than ceramic.

## Design Result



The resulting mug accomplished all the user criteria. It will be produced from plastic in order to achieve maximum insulation, microwave safe, dishwasher safe, and lightweight. The cylindrical shape allows for ease of cleaning, 12oz carrying capacity, and shock proof. The handle is designed to support a portable, balanced, and ambidextrous hold. The simplicity of the design makes it cheap and easy to produce. All of these categories together make up the best mug for people with only one finger.

### **Conclusion**

Using basic engineering design methods, the task of creating a coffee mug for a person with a disability of one finger was reached successfully. By using AHP methods to organize attributes and constraints, criterion were developed to aid in the design of a safe and effective mug. A concept generation tree was used to define each possible design. Each concept was evaluated by the team members through a concept screening table, and the chosen model was created through Solidworks software. A rough prototype was made from clay. Though few similar patents were found to this design, the challenge of creating a safe, fully functional, one-finger accessible coffee mug was overcome.

### **References**

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