ME 302 Fidget Spinner Final Report

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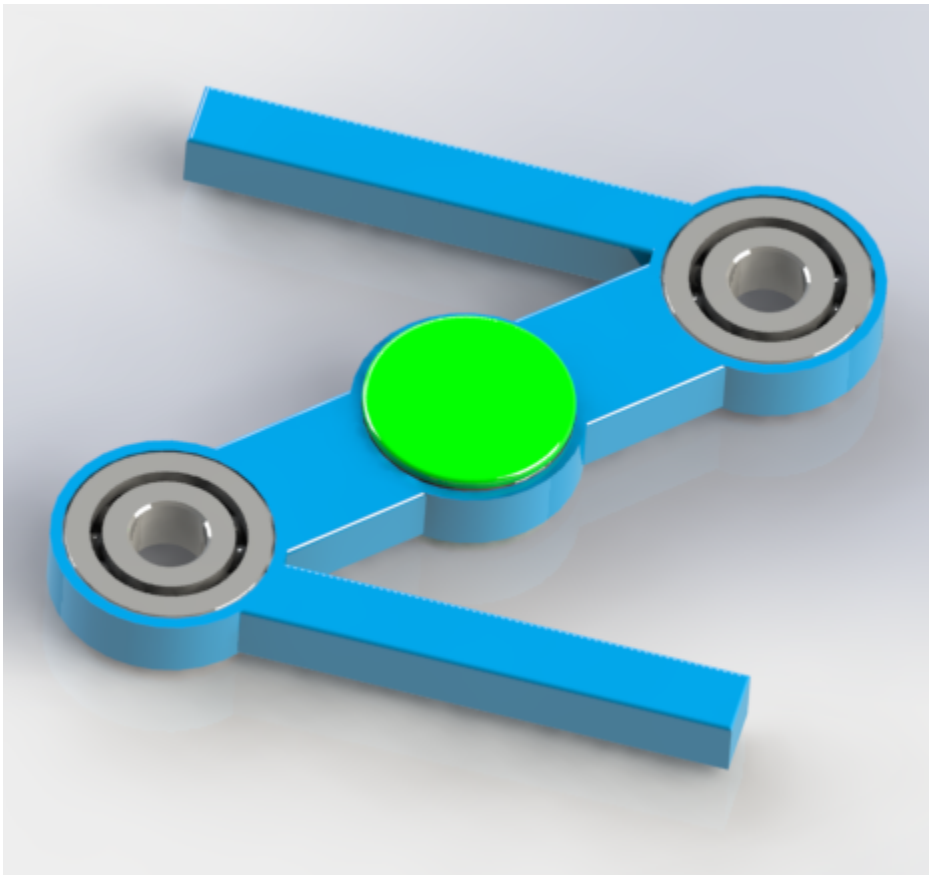


Executive Summary

This project included designing a fidget spinner body, and then modeling it with CAD, creating a mold, and injection molding the body. First a basic design had to be created, which was done with hand sketching. From there a simple 3D model was made using Solidworks, along with bearing caps. Next we utilized Autodesk to CAM the design for a CNC machine, and chose one design from a team of other students which we were grouped with to conserve resources. Finally we created this mold and injection molded a spinner and assembled our 3D printed caps and bearings. This ended up being a success and a fully functional spinner was created.

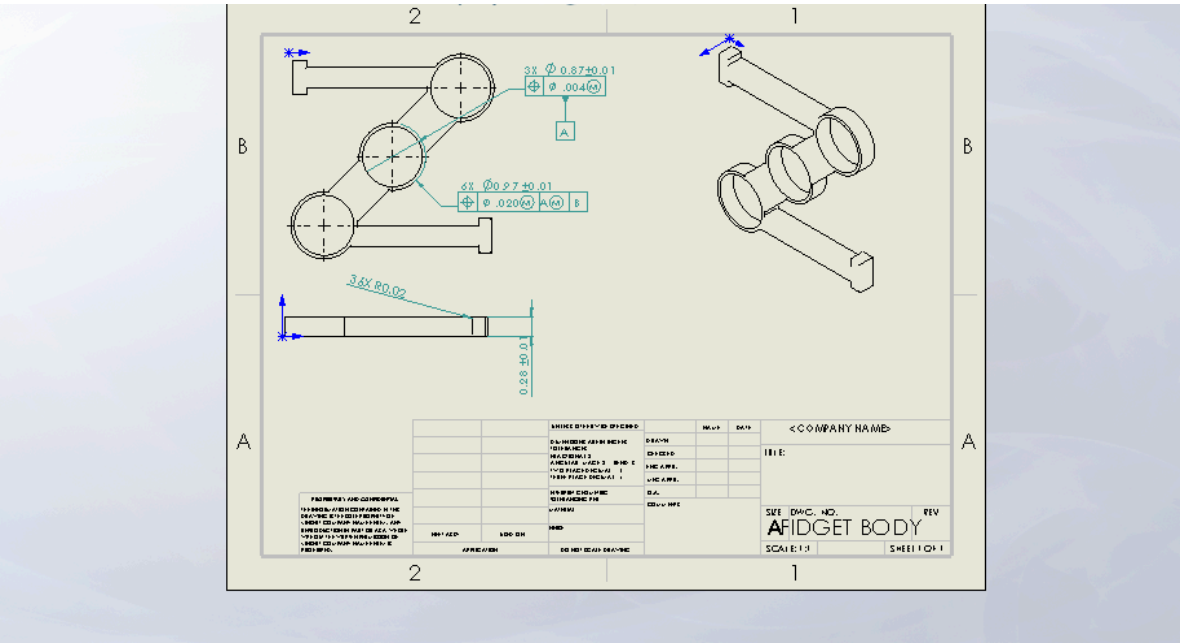
Table of Contents

Design Problems and Objectives

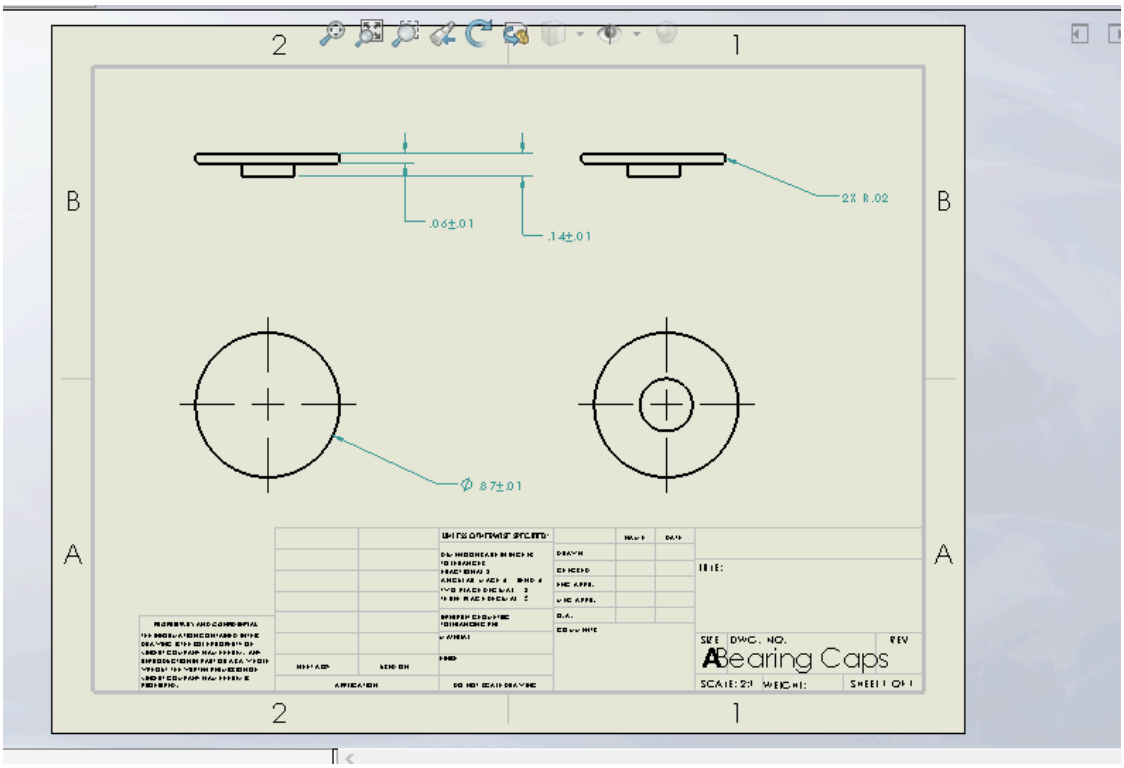
The goal of the project was to create a mold of a fidget spinner that could be produced in an industrial manner that 3D printing was incapable of. As such one of the final deliverables was a prototype of the spinner to test the viability of the mold itself. The specific constraints provided included that the design must fit within a 4in x 4in square, where the spinner body didn't conflict with 4 bolt holes located in the corners. This design specification was to ensure that the mold designs could be cut on previously designed panels to maximize both the time and space required to CNC all of the molds. Other goals on the path of the project included delivering a drop test analysis of the spinner to ensure that it would survive a 2m fall, GD&T dimensioned drawings, and a decision matrix from our team to decide which design would be created as a mold.

Solidworks Drawings of the Designs

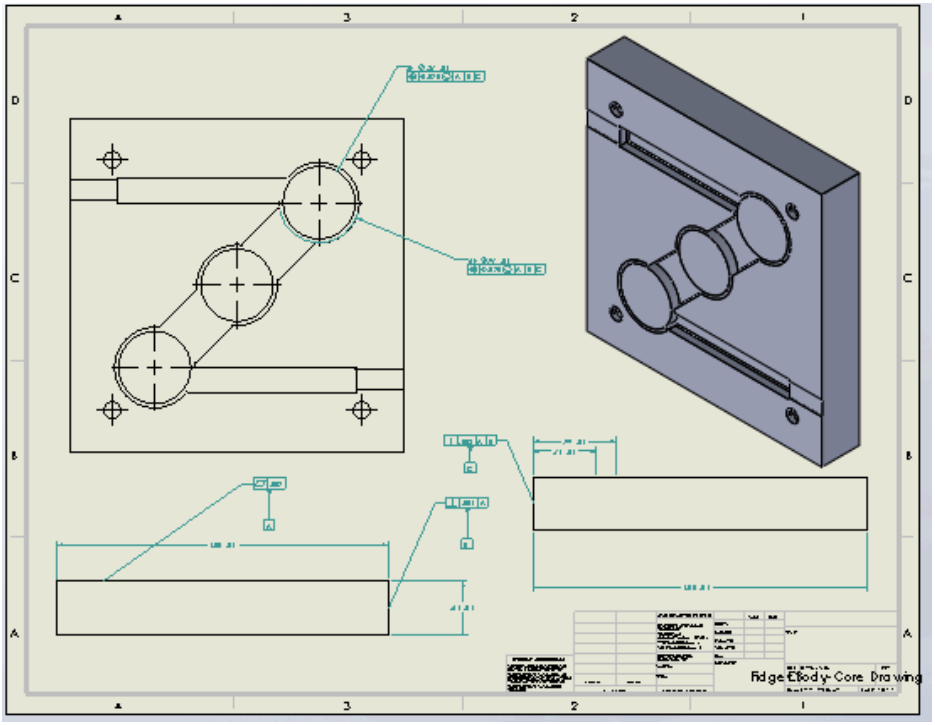
1.) Dimensioned drawing of the main spinner body



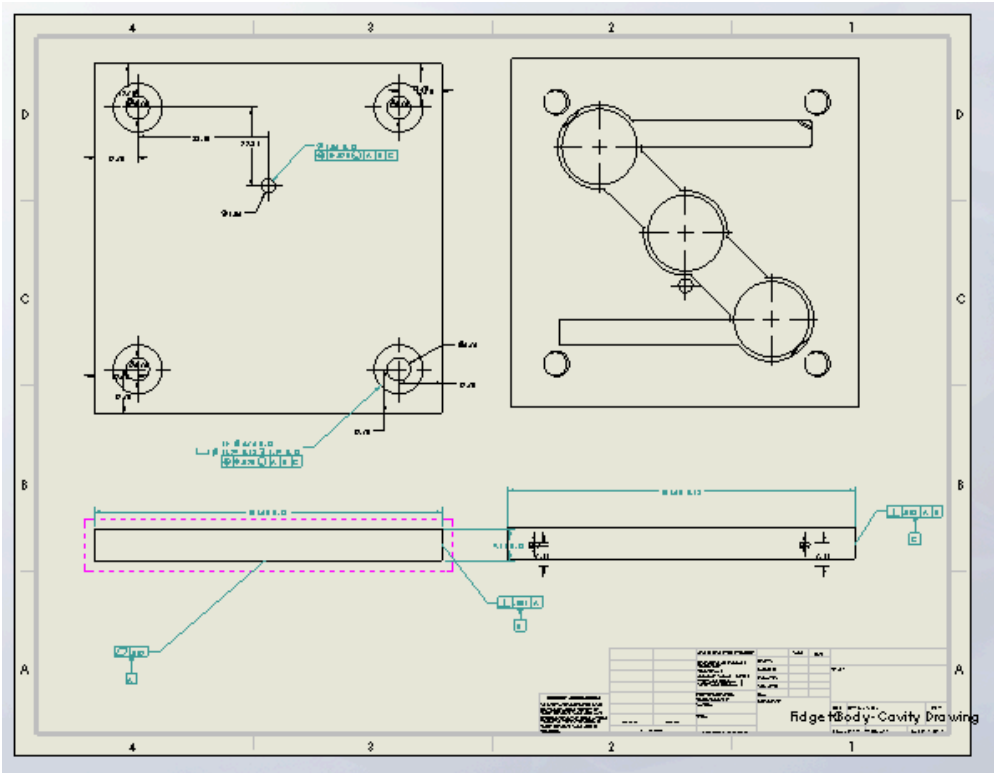
2.) Dimensioned drawing of the bearing caps



3.) Dimensioned drawing of the mold core



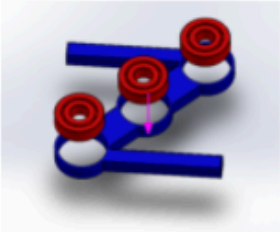
4.) Dimensioned drawing of the mold cavity



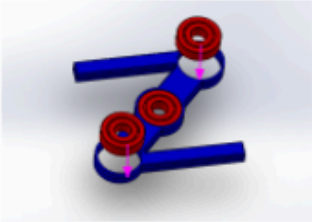
Bill of Materials

Part Name	Function	Material	Source
Main Body	To look radical	Polypopelene	ETC Machine Shop
Bearings	To allow spin	Stainless steel	McMaster Carr
Bearing Caps	To grip and spin	PPG	TIW

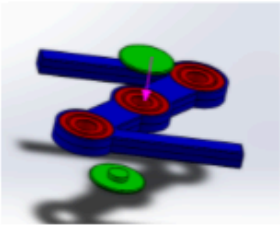
Assembly Plan



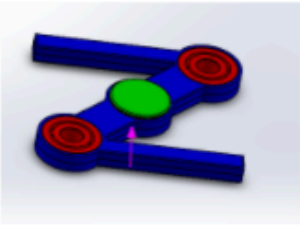
Step 1: Insert a bearing into the center hole of the spinner. There will be an interference fit so you will need to press firmly.



Step 2: Repeat the first step on the other two bearing into the other two holes, using the same pressure.



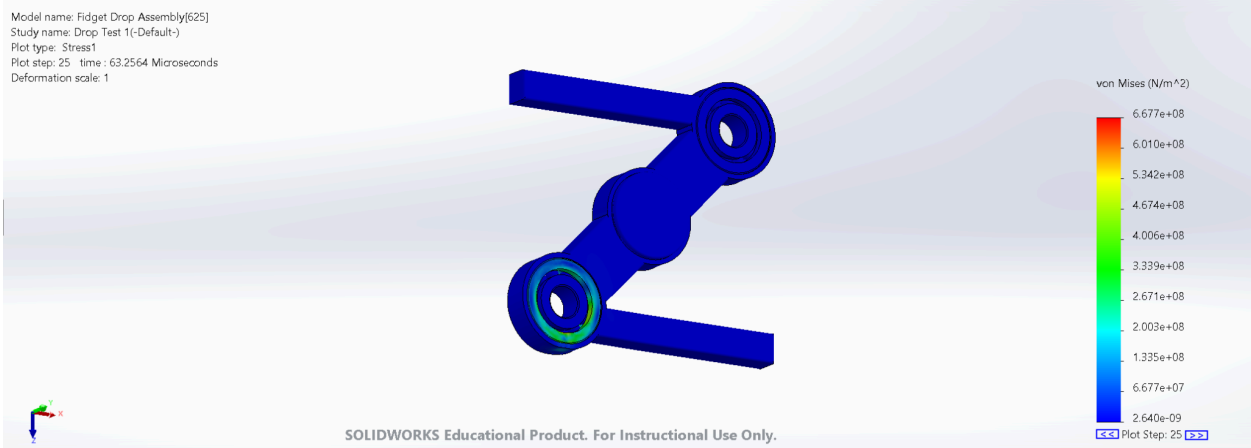
Step 3: Insert the female bearing cap into the bottom of the middle bearing, once again using moderate pressure on the interference fit.



Step 4: Insert the male bearing cap into the top of the middle bearing, making sure that it connects with the female bearing cap.

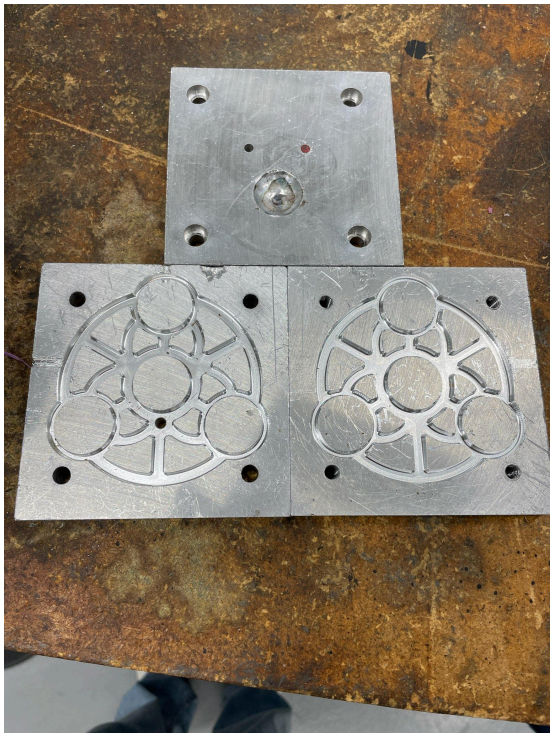
Computational Model

Results of the FEA drop test



Physical Model

1.) The mold of the spinner design that was created



2.) The final spinner with bearings installed

Conclusions

As a whole, the design and manufacturing of the spinner was a success. On the design portion my spinner was not chosen primarily because it had a narrow appeal, being based on the letter Z which very few people have in their names. If I had been designing a spinner to pitch and create on a wider level I would have chosen a design to appeal to a broader group of people. Further into the design process I realized that the ledges that jutted off of the end of the arms came too close to the bolt holes in order to be produced, leading to a late project rework of the design where I removed those ledges. If I went back I would have paid better attention to the placement of the bolt holes during the initial design stage and created a workaround from the beginning instead of changing it at the mold stage. The final change I would have made is to give it rounded edges, making it both easier to remove from the mold as well as making it ergonomically nicer to hold. These various changes come from the insight after going all the way through the process, but in the end I not only created a good design but also manufactured a different but equally interesting end product.