Fidget Spinner Design Project

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ME 210 #18610

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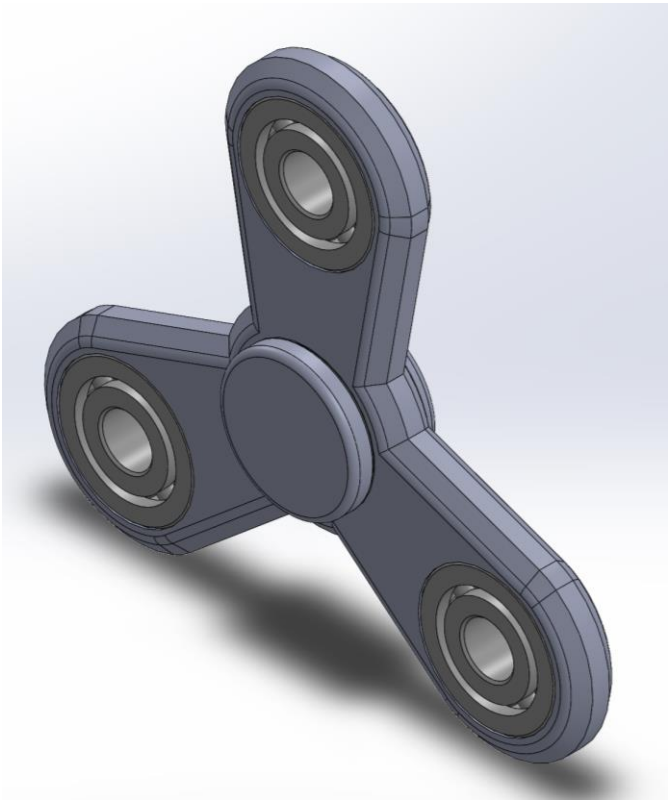
12/13/2021



Executive Summary

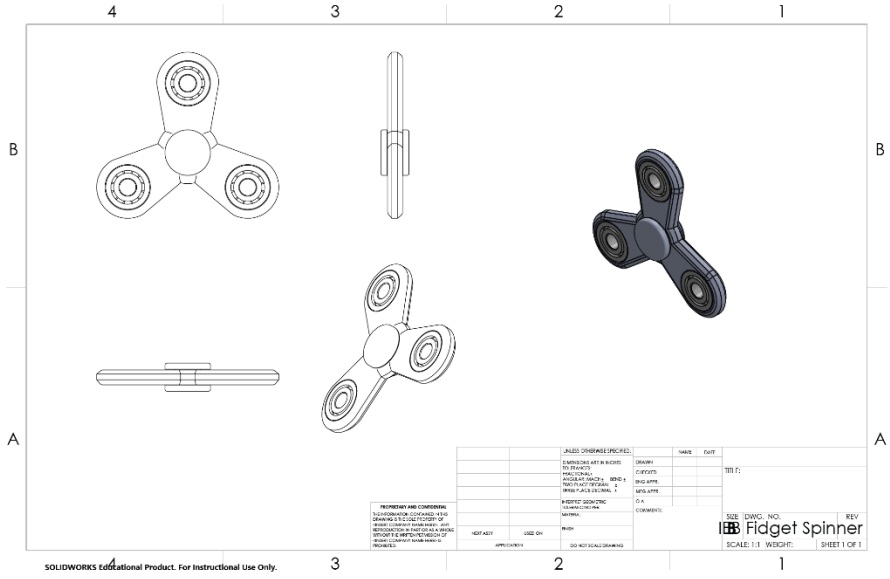
In the engineering design graphics class, the students will design, test, and manufacture a fidget spinner toy from scratch. Throughout this process the students will first learn the essential technologies and skills to be able to perform the expected results such as to be able to use SolidWorks to design and create molds for their fidget spinner, learn an introduction to GD&T, create molds and the machining process through Fusion 360 for their fidget spinner, conduct drop test simulations, create drawings of their 3D designs, and complete the manufacturing process by assembling and creating the fidget spinner. Due to time limitations students will be separated into groups and teaching assistants will attempt to manufacture the molds for the groups. In my designs I was able to complete all these steps but unfortunately my group's fidget spinner design was not successful after manufacturing, and we were not able to create our intended fidget spinner.

Table of Contents

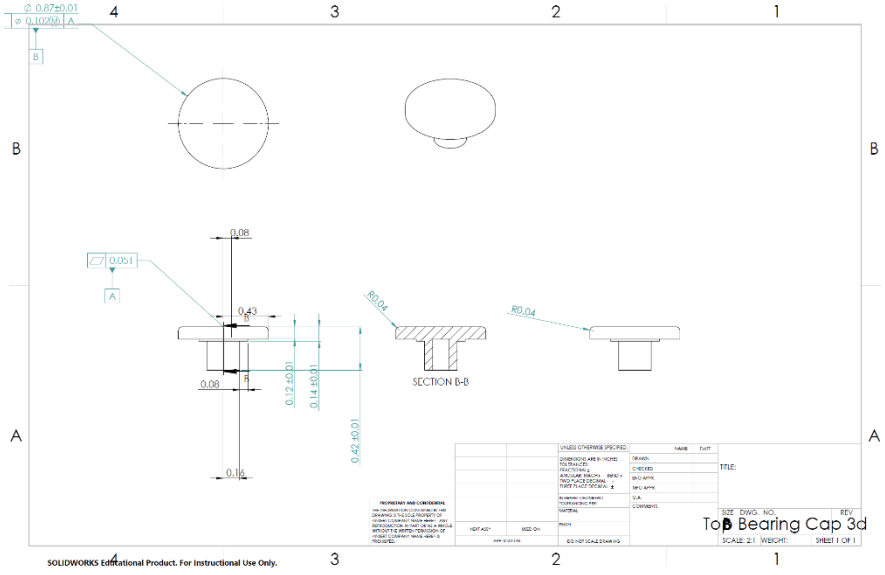
Design problem and Objectives

Task	Detailed Activities	Software/Machine	Time
Create the 3D design of the fidget spinner body	After using construction geometries and creating a 2D sketch of the fidget spinner body convert the sketch into a 3D body.	Solidworks 2020-21	2 weeks
Create 3D body of the bearing caps	After creating the 2D sketch designs of the bearing caps create the 3D bodies of the caps.	Solidworks 2020-21	1 week
Create assembly with the body of the fidget spinner	Combine all of the files that you have created; fidget spinner body, bearing caps, and ball bearing. In order to be able to create a assembly of the fidget spinner you will need to use basic assembly operations.	Solidworks 2020-21	1 week
Create drawings of the fidget spinner using GD&T	Create a drawing of each individual part using GD&T along with a drawing of the completed assembly be sure to add multiple angles of view including isometric.	Solidworks 2020-21	2 weeks
Conduct basic FEA operations	Implement basic FEA operations in order to conduct a drop test on your spinner (This will allow you to assess the weak points of your fidget spinner).	Solidworks 2020-21	1 week
Create the mold assembly and CNC operation for your mold.	Create the two halves of your mold for your fidget spinner and use Fusion 360 to create CNC milling operations	Solidworks 2020-21 / Fusion 360	3 weeks
3D Print bearing caps	3D prints your fidget spinner bearing caps in Texas Inventionworks.	Solidworks 2020-21	
Document assembly plan and BoM	Create a drawing of the assembly with a exploded view and give assembly instructions along with another drawing that includes the bill of materials.	Solidworks 2020-21	1 week
Assemble the Fidget Spinner	After creating the main body of the fidget spinner in the machine shop assemble the fidget spinner to complete the project.	Solidworks 2020-21	1 week

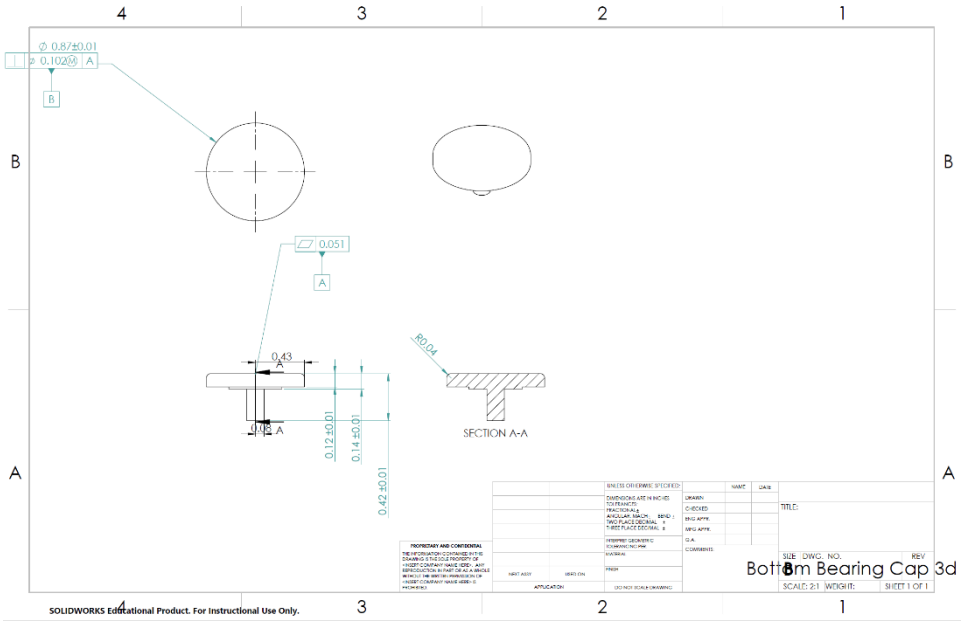
Fidget Spinner Assembly Drawing



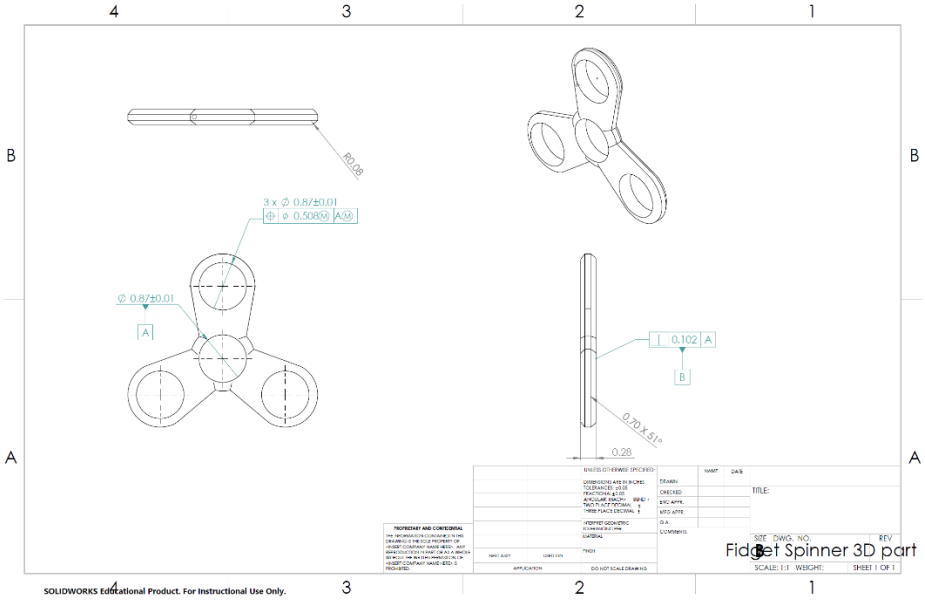
Top Bearing Drawing



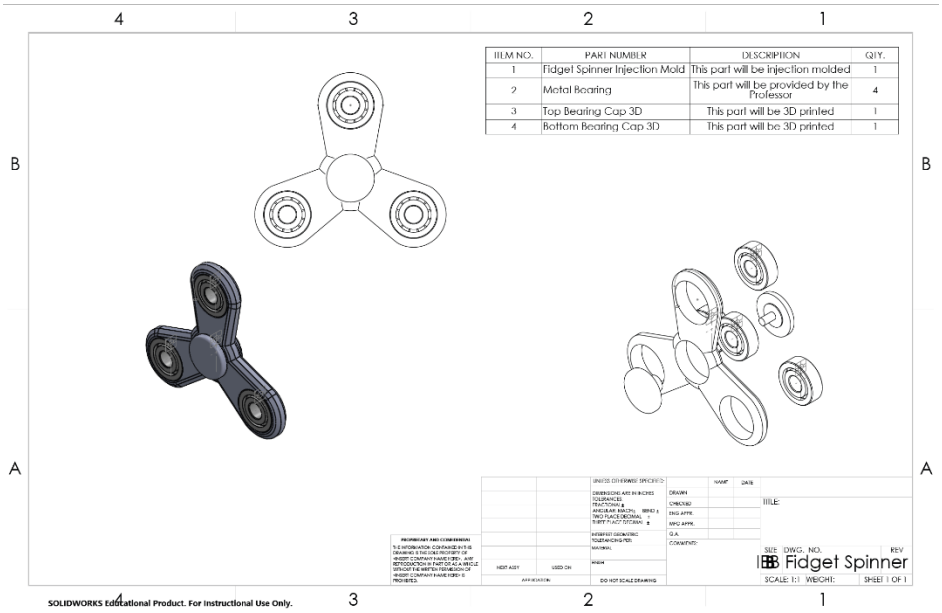
Bottom Bearing Drawing



Fidget Spinner Body

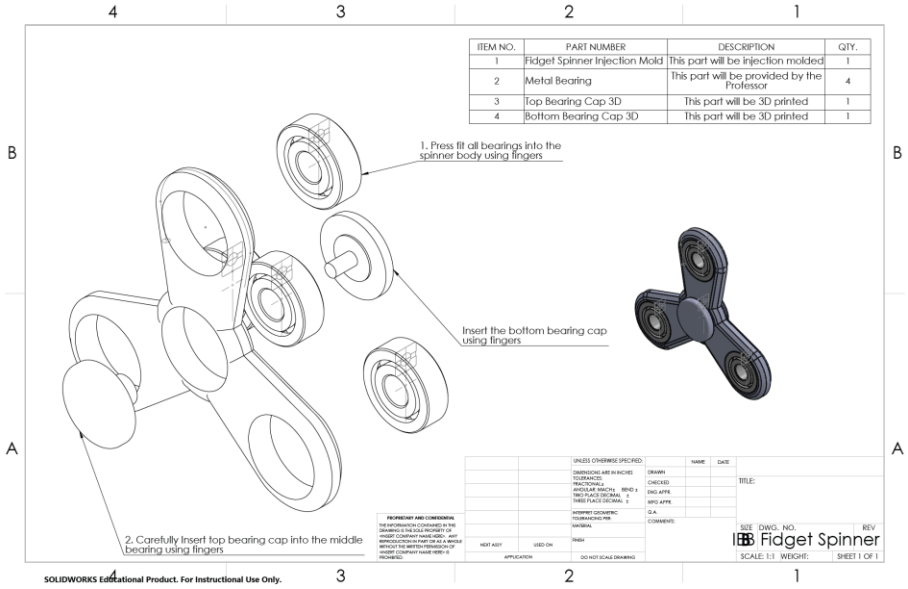


Bill of Materials

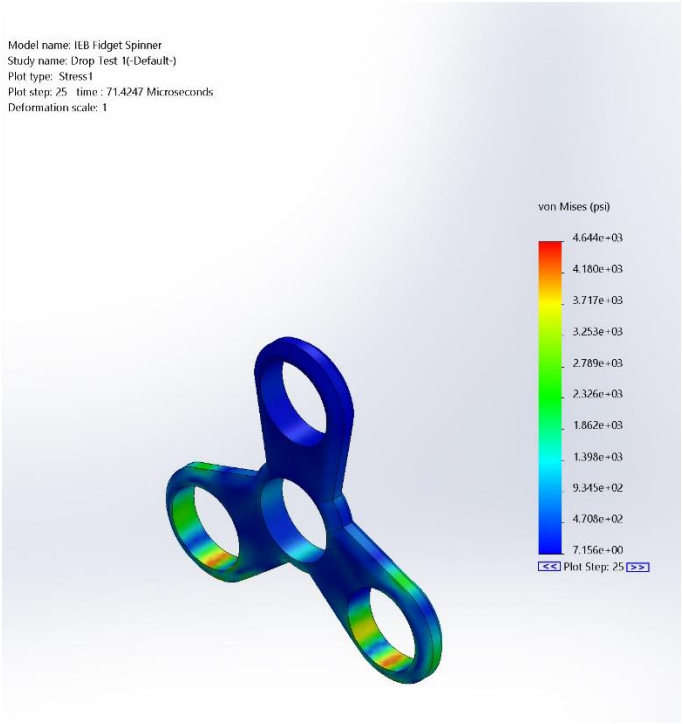


Item no	Part Number	Manufacturing Process	Description	Qty.	Supplier
1	Fidget Spinner Injection Mold	The student will create a aluminum mold and use injection molding to create the fidget spinner main body.	This injection Molded Part is the main body of the fidget spinner	1	Student
2	Metal Bearing	This part will be provided by the supplier.	This part will allow the spinner to freely turn in its center of rotation.	4	Dr. Rylander
3	Top Bearing Cap 3D	This is the top half of the bearing cap.	This part will be designed by the student and manufactured at Texas InventionsWorks Using 3D printers.	1	Student
4	Bottom Bearing Cap 3D	This is the bottom half of the bearing cap.	This part will be designed by the student and manufactured at Texas InventionsWorks Using 3D printers.	1	Student

Assembly Instructions



FEA Drop Test Result

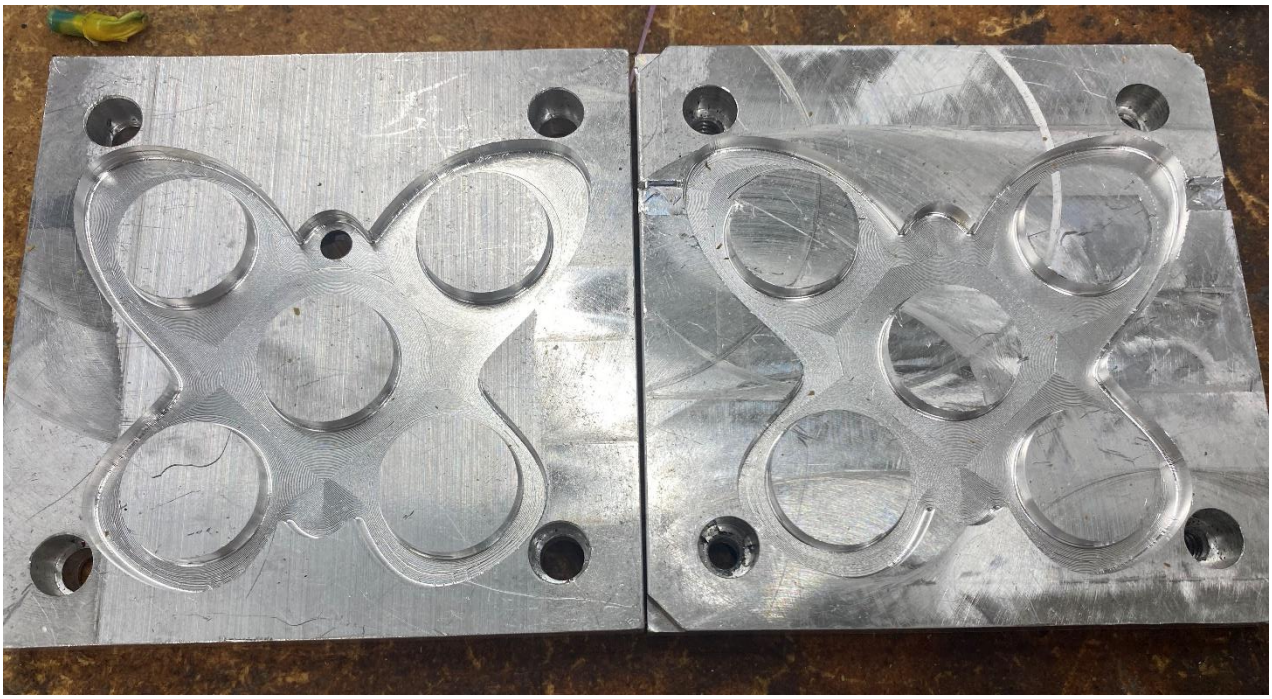


Physical Model

Fidget Spinner Main Body

Bearings

Mold



Conclusion

Throughout this process of manufacturing a fidget spinner through the technique of injection molding I have gathered various results. I have learned that when we transfer our designs into the real world, we need to spend a lot of time to make sure it is readable by other people and understandable. Secondly if we want to manufacture something it takes a lot more time and thought to make it manufacturable. Thirdly you need to compensate for possible discrepancies like shrinkage of your plastic how much time it needs to cool and etc., in your designs. If I were to restart the projects again instead of dividing the mold in half, I would do one part of the mold as the fidget spinner body and the other part as a cap, this way I would get a more even shrinkage as well as easier decoupling of the molds. The second thing that I would do to save time would be instead of using a four ball bearing design I would use a three ball bearing design.

References

"Fidget Spinner Physics Sites." *American Association of Physics Teachers*, American Association of Physics Teachers AAPT, 1 Jan. 1970, https://aapt.scitation.org/doi/abs/10.1119/1.4999745?journalCode=pte.

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