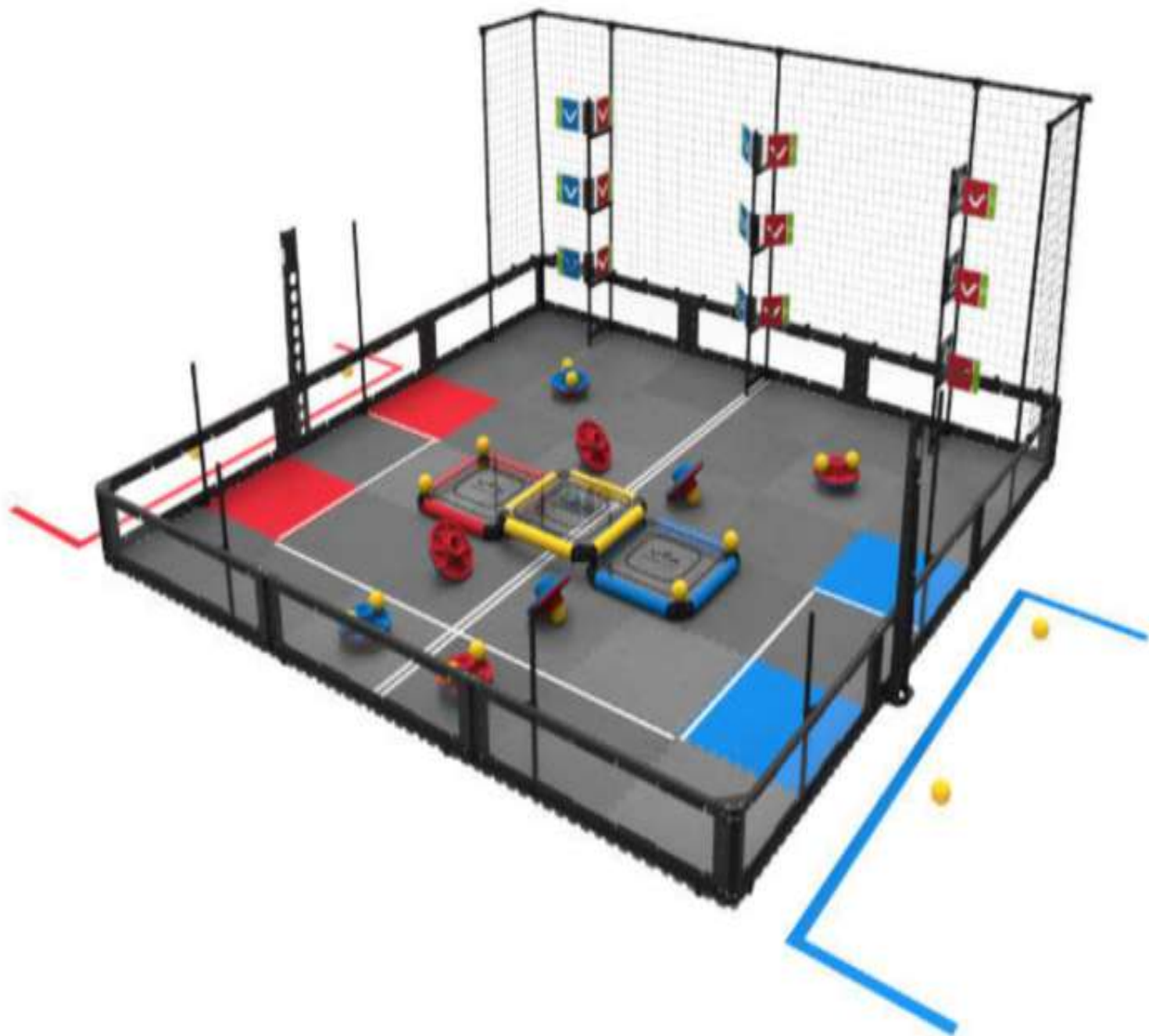




VEX

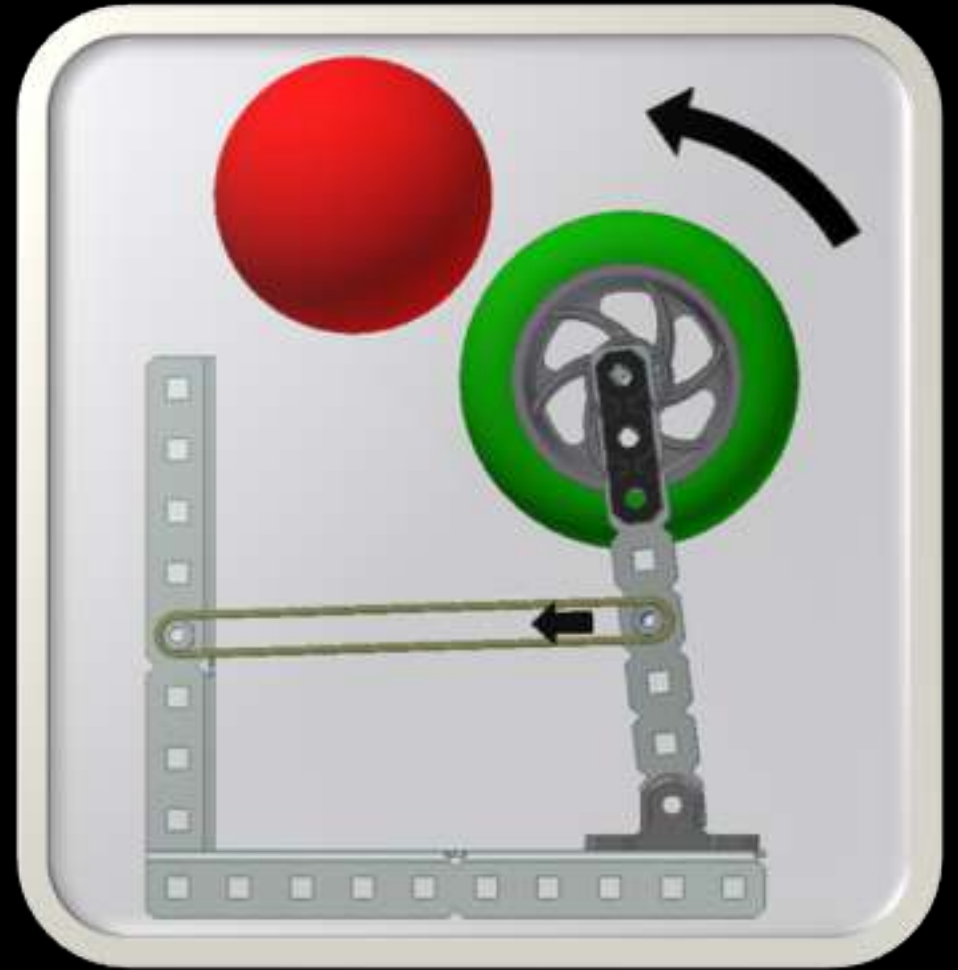
ROBOTICS
COMPETITION

Flywheel-Ratchet
Mechanism



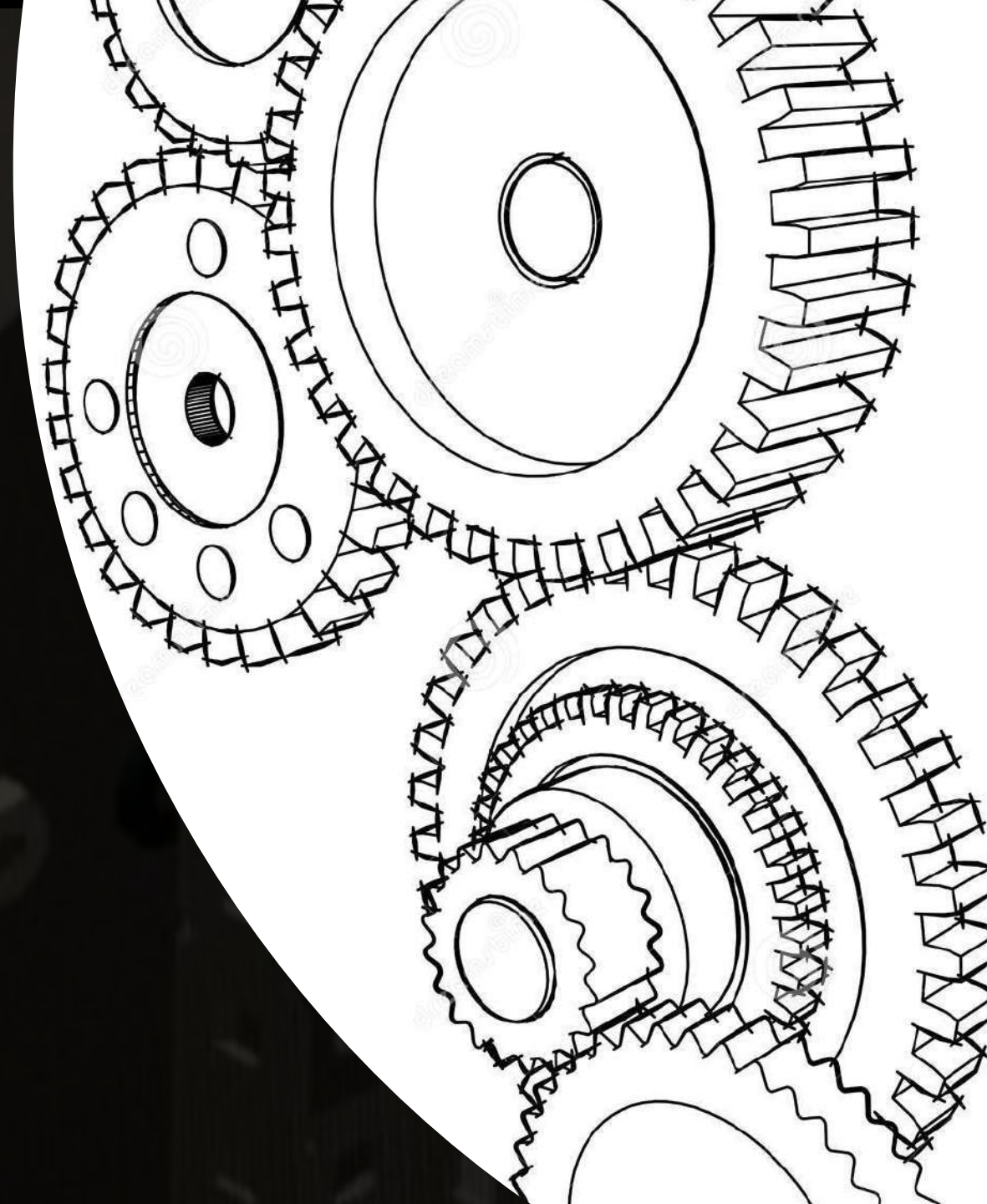
Introduction

After the release of 2018-2019 Game, Turning Point, we realized a flywheel mechanism might be one of the best choices to launch the balls in the game. This system accelerates a rotating component and when in contact with an object it spins it causing it to be launched at full speed. In VEX some people use wheels as this rotating component and they connect to a set of gears that are ultimately directly driven by a motor.



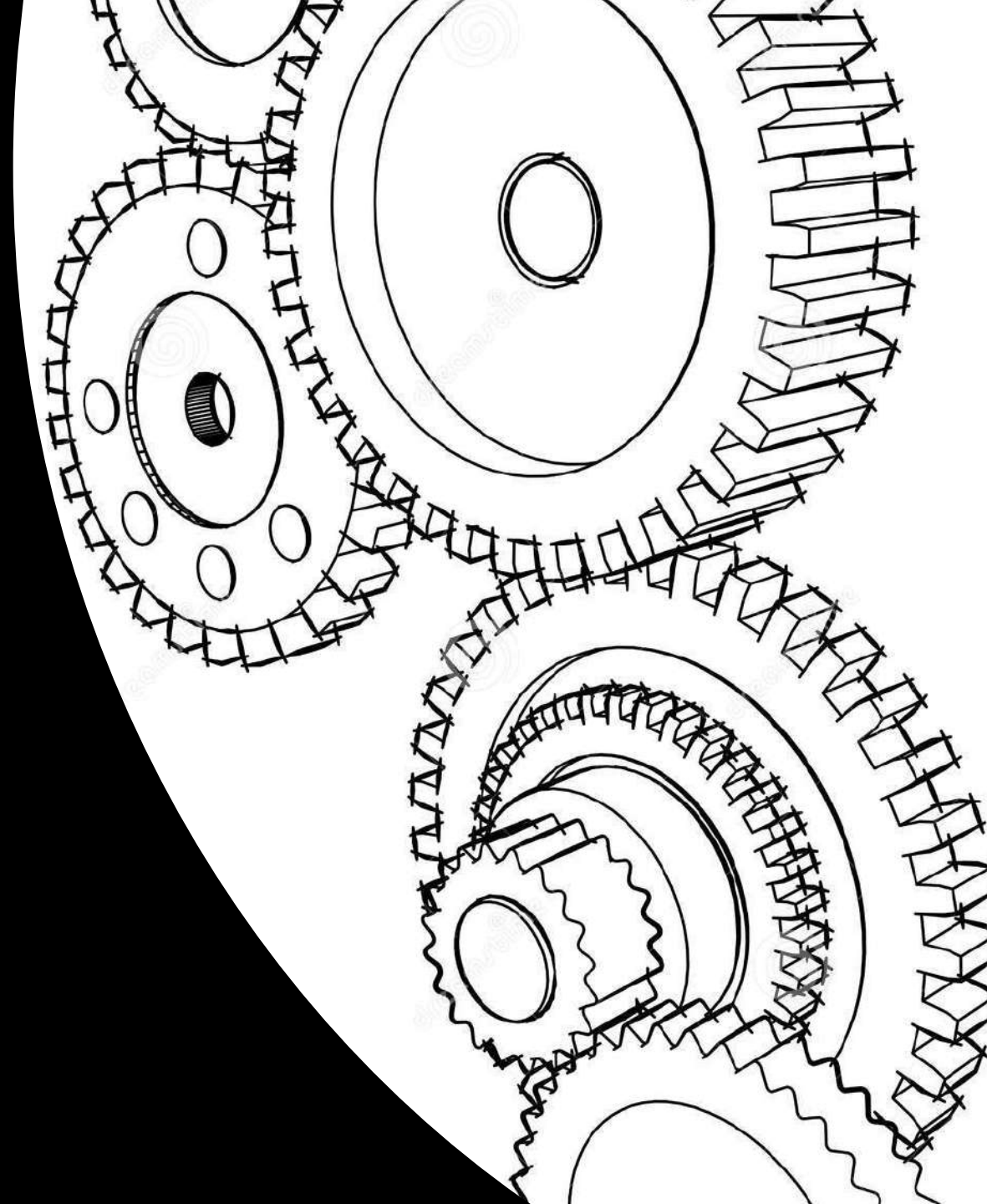
Finding the problem

However, with the flywheel spinning at full speed when activated, and then suddenly stopping it continuously in a match, might put the motors at risk by putting too much stress on the motors when slowing down, eventually causing overheating and the worn out of the motors.



Solving the problem

To help protect the motors from the movements and the dynamic forces that are created within the flywheel mechanism, we decided to create a part that acts as the flywheel and contains an integrated ratchet mechanism in order to help. This way the motor's capability to produce force won't be damaged easily and our motors could last longer.



What is it?

The Flywheel-Ratchet Mechanism can be produced using PLA or ABS, and a 3D printer. It is designed to be compatible with VEX Drive shafts, VEX 8-32 Screws and Nuts, VEX Squared Shaft Inserts and VEX Pro Radial Bearing.

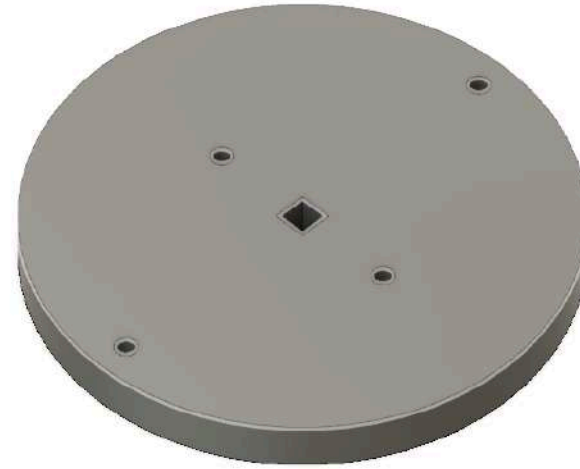
How does it work?

Once the flywheel is deactivated, the energy produced by the motor through the transmission won't go back to motor. With this design instead of the energy coming back to the motor it will dissipate into movement.

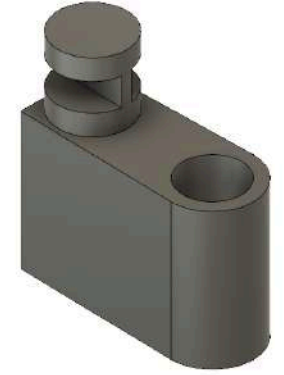
Main Components

1. Secondary Cap (2)
2. Main body
3. Ratchet pin (2)
4. Ratchet Gear

1



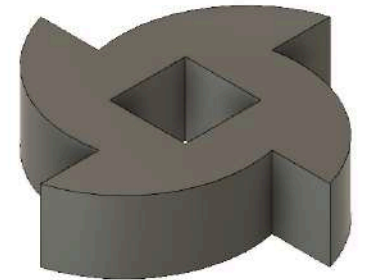
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2



4



External Components

5. Bearing Holder

6. VEX Pro Radial Bearing

Attachment Components

7. 8-32 Screws, of approx. 2-3/4" long (4)

8. 8/32 Nuts (4)

9. Square Shaft Inserts (2)

10. Shaft

5



6



7



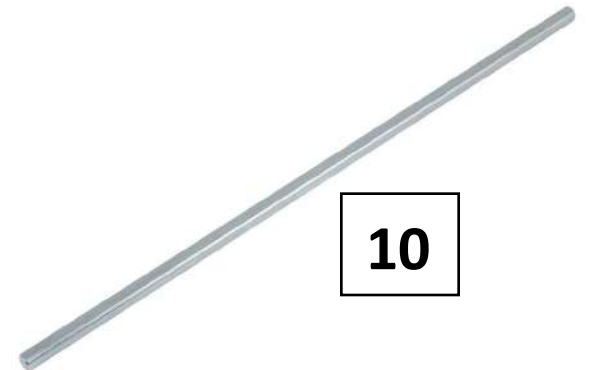
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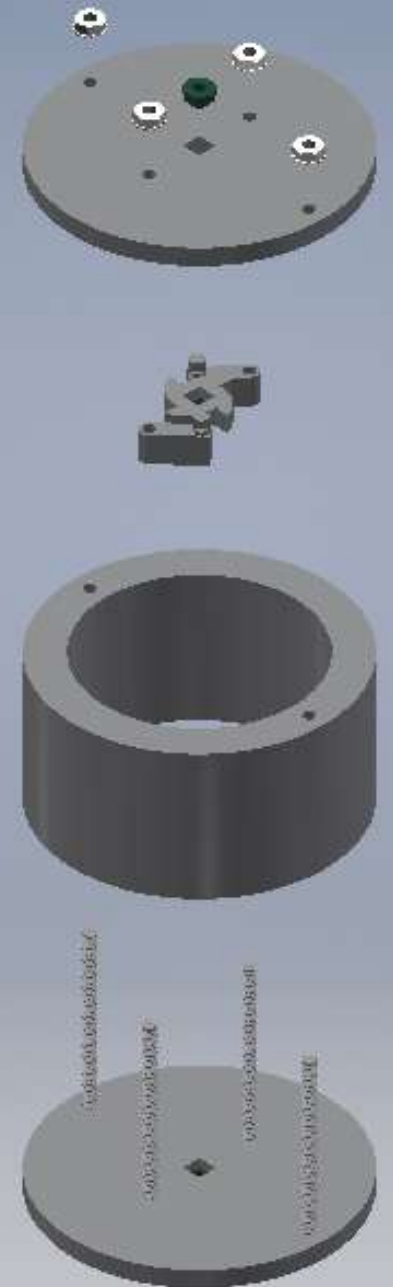


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Assembly Process

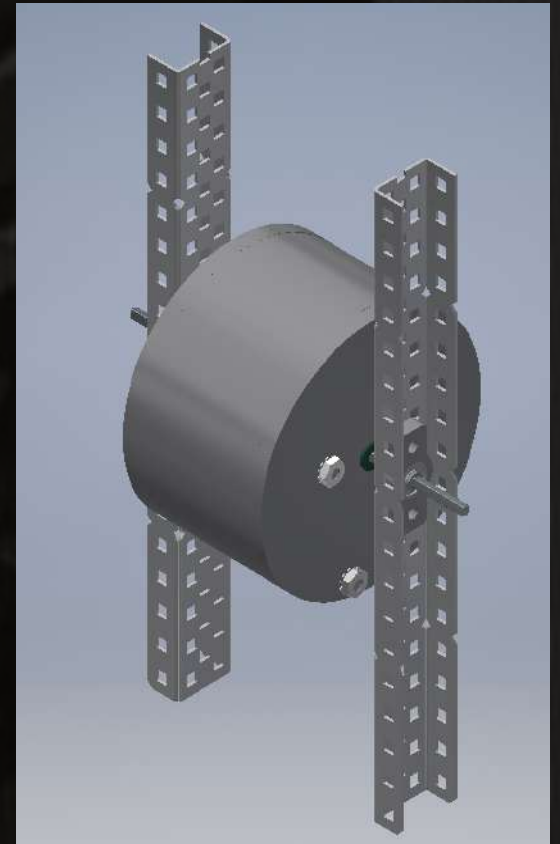
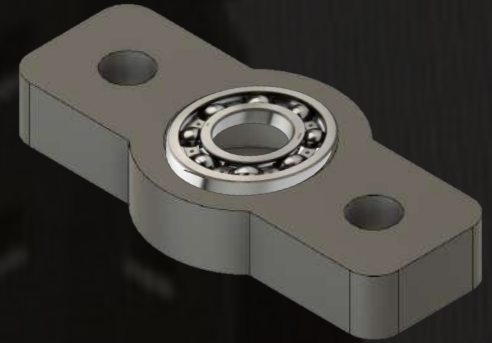
The first 5 components were 3D printed. Once the components are printed, it's time to assemble. First, add the four 8-32 screws to the rounded holes in one of the secondary caps. Then, insert the main body's holes in the respective screws. To the screws that are placed in the center of the secondary cap attach a ratchet pin on each of them. Attach a VEX Squared Shaft Insert on the secondary cap, pass the shaft through it, and now pass the ratchet gear through the shaft. Attach the VEX Squared Shaft to the other secondary cap. Lastly, close the mechanism; attach the secondary cap to the rest of the already assembled system by tightening the nuts to the screws.



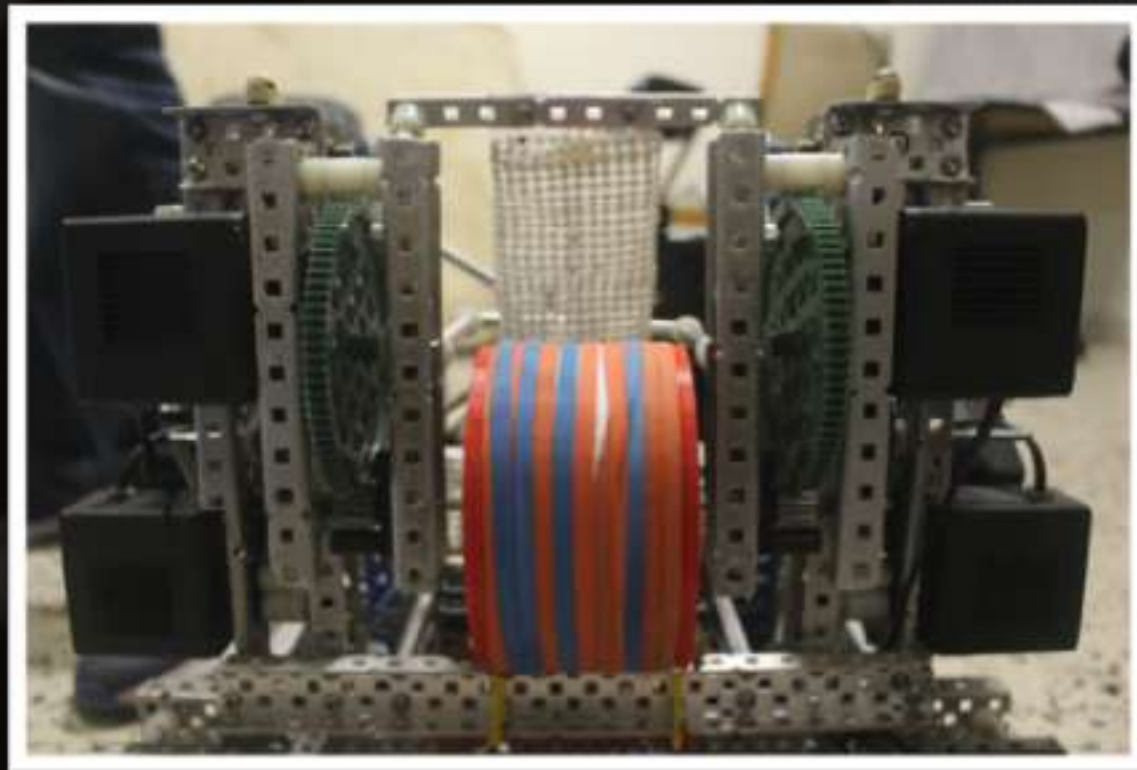
Assembly Process

Once the mechanism is assembled, mount the VEX Pro Radial Bearing to the Bearing Holder by inserting it into the middle hole of the Bearing Holder.

Now you can start mounting the Flywheel-Ratchet Mechanism anywhere you want! Remember to use the assembled bearing for this mechanism to guarantee a longer efficiency.



Making It Real



Fusion 360

For the development of this part the program used was FUSION 360 2.0.5119. With this program, it was easy to take the idea and make it a reality; first designing it in the program, and then 3D printing it for the use of the robot. Even though FUSION 360 isn't our main CAD Software, it was actually a very user friendly program, and it allows you to do everything needed to design a part.

Conclusion

Designing this part was a big learning experience. By doing it, we were able to learn a new CAD Software, developing and broadening our CAD skills.

Additionally, it helped develop and practice critical-thinking and analytical skills to solve a problem that could directly affect the performance of our robot, and that could potentially help the VEX Community.

Our team has always used 3D Software to develop our ideas, but this project reaffirmed how important and helpful it is to use such programs to better visualize an idea and reduce and margin of error before actually bringing a part to life.