PROJECTILE BALL PUNCHER

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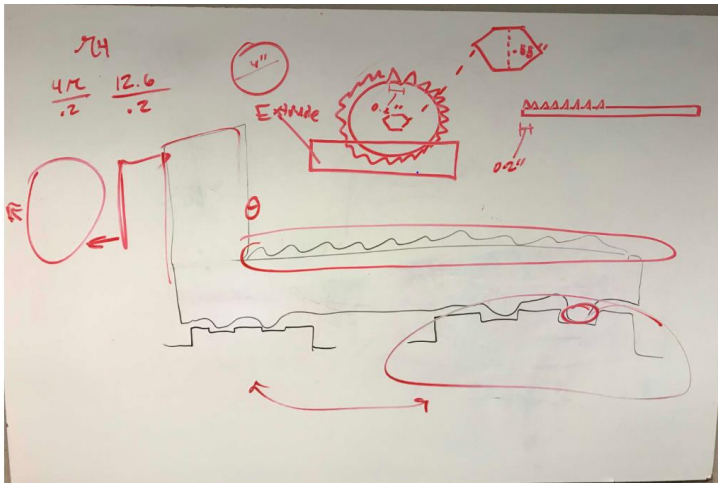
TEAM 3176 | Design (Offseason Mechanisms)

Abstract

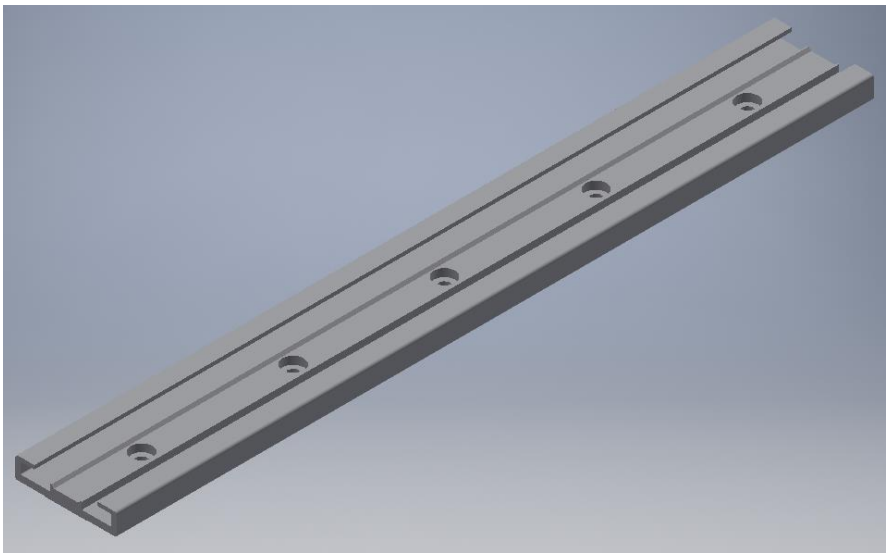
During the off-season, the design team was looking into the past of certain types of ball launchers/throwers used by other robotics teams, so that we could have a potential one in the future whenever needed. This white paper will specifically talk about something called the 'Projectile Puncher'. The ball puncher as a whole simply 'punches' a ball that can range in size to a certain spot.

Prototyping

Before we started our CAD concepts, we first went into the shop and tested different aspects of our ideas. We needed something that could move smoothly up and down a track and could punch a ball with enough force to shoot it an understandable distance. We tested in the shop using an Igus track and Igus slider. Originally, we had just a bolt screwed into the slider with an elastic band wrapped around it. This caused many problems. When the ball hit it, unless it was at a perfect angle it would go off in any direction with little punch. After talking with others about the function of our original ideas, we figured out that the more surface area we had hitting the ball, the more controlled the ball would become and more power would be behind the punch. We changed our prototyping design to have a bracket on it instead, covering more of the ball's diameter. In the end, this was the idea we went with and because the ball shot out at a much greater distance, at a straight angle, and with much more force, so this was the basic design that we ended up going with.



Track - The track is what contained the sliders, and allowed them to move back and forth. This was especially important for when we pulled back and launched the system, so that it would travel forward at a good speed.



Divet - Holds the ball in place before being launched so that there isn't any error to where the ball is supposed to land. At first, we had a divet that held the ball in place, but we then realized that if we needed to angle the puncher, that the ball wouldn't be kept in place nearly as well (Image 1). We then added a curve that goes up the backside of the ball so that whenever the launcher is lifted up, that the ball won't fall out of the divet whatsoever (Image 2).

Image 1

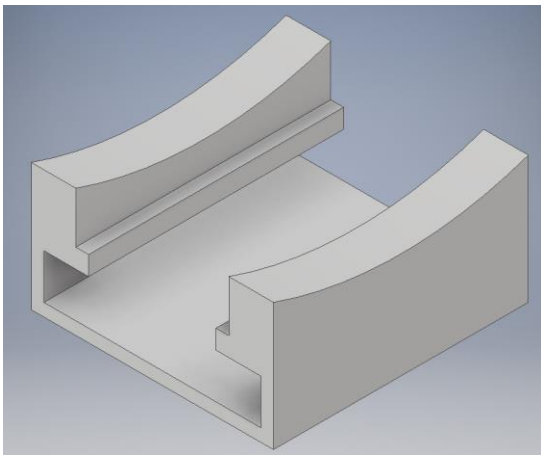
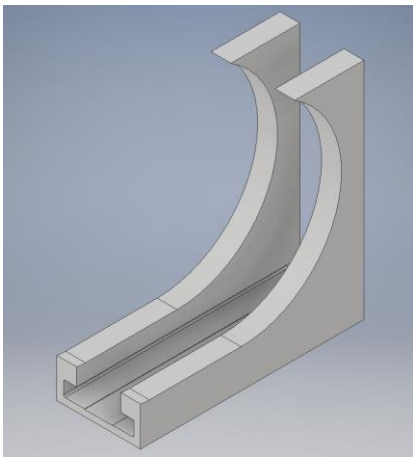
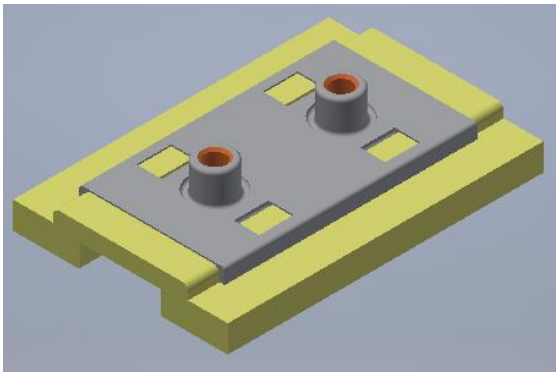


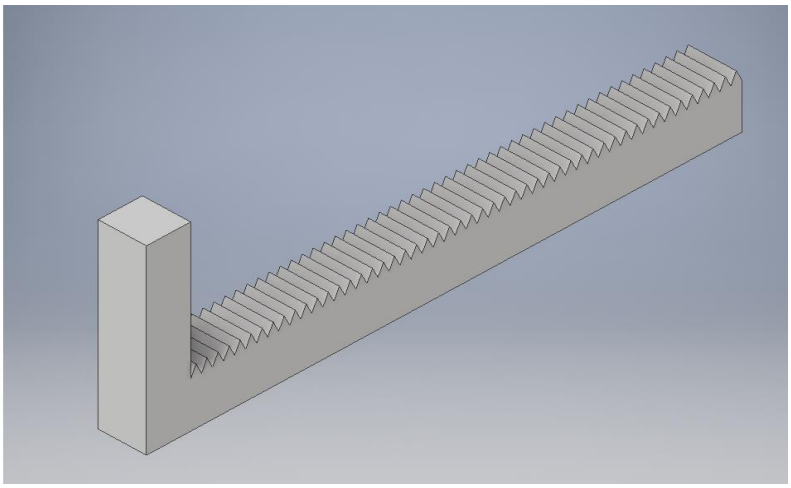
Image 2



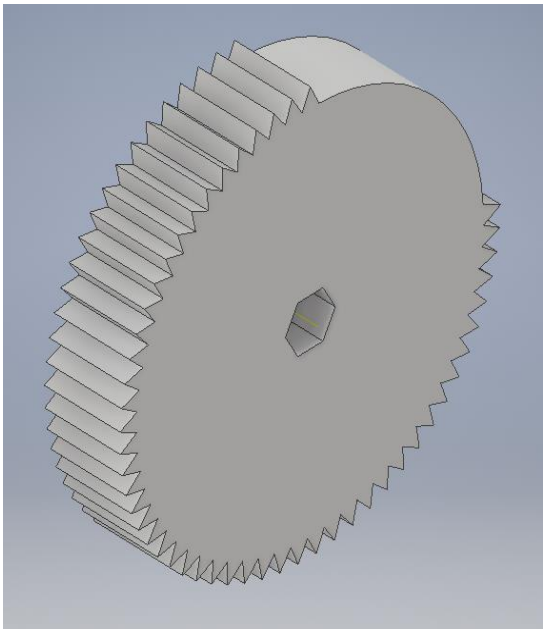
Sliders - The sliders are what allowed the mechanism to function in the way we needed it to. The sliders perfectly fit into our track, and had little friction against it. The sliders were easily able to move back and forth on the inside of the track, which is one of the main reasons we used them.



Actual Puncher - The puncher was designed so that a gear which would be mated to a hex shaft so that the actual puncher would move forward and backward, depending on the gear. The actual puncher would be mounted onto 2 of the sliders, which is how it was able to move so quickly.



Gear - When first conceptualizing our puncher, we knew we needed something that would pull the puncher back in place at a steady pace and be able to release it so that the puncher would fly forward. The part in the gear where there's no teeth allows the puncher to fly forward, since there is no gear teeth to hold it back.



How it all works: In the time that we did have to design this mechanism, we had a mostly finalized idea on how all the parts would work together to assemble a final product. When a ball was loaded into the divot at the front, the actual puncher would be rolled back by the custom gear we made. The custom gear would be operated by a motor that would function when a sensor recognized that a ball was in the divot. When a ball was ready to be shot, the gear would reach the point where there were no teeth, releasing the entire puncher section so it would hit the ball with enough force to be able to get it to its destination.

Conclusion

When all put together, the puncher worked very efficient. It obviously, as seen, is not the most professional look. Unfortunately, this design never made it past off season. Although, the concepts and thoughts learned over different types of punchers was carried over to build season, in which we were able to design and prototype a new puncher that was more professional, had a better concept, and functioned much better than our off-season design.

Video Concept:

https://www.youtube.com/watch?v=1hLg6Xyh3sc