Make It Real

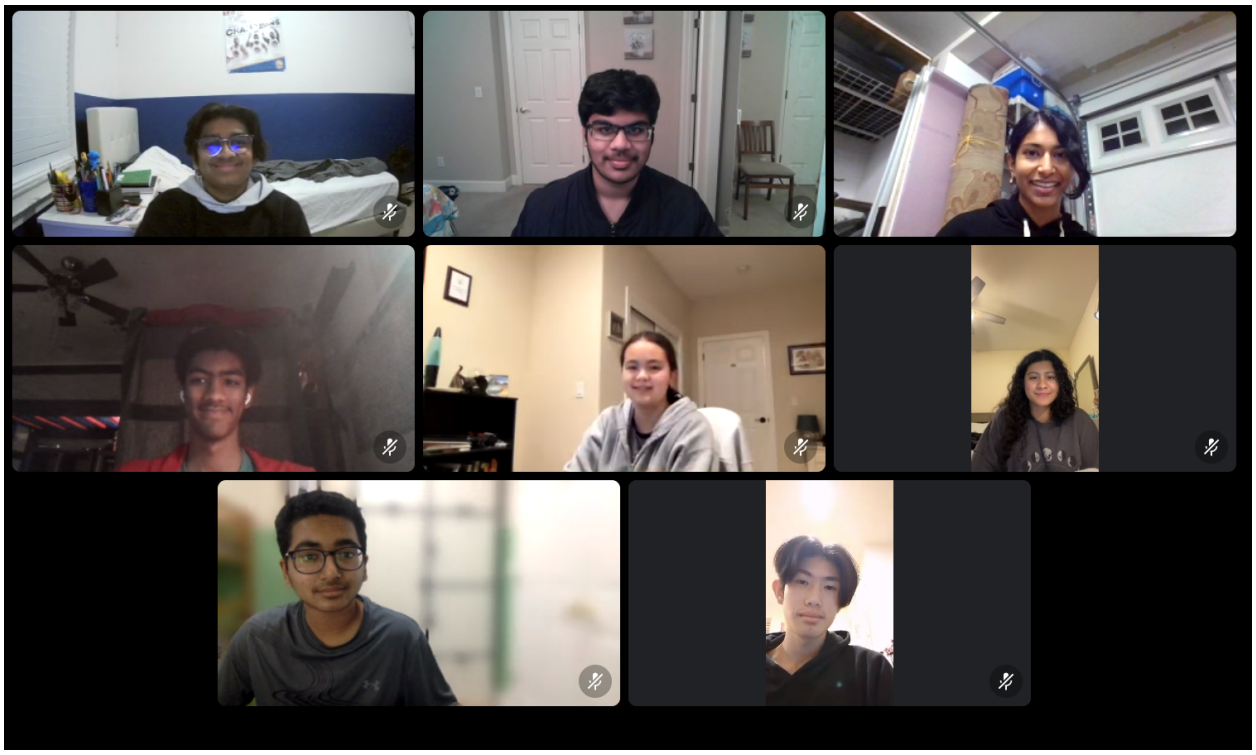
Project Name: Button Collar

Designer's names: Diya Menon, Prisha Nag, Ayush Garg, Jayin Sampeur, Katherine Pask, Sky Huang, Amrith Krishnakumar, Sahil Sandasani

Team: 5327D

Location: North California

Team Photo:



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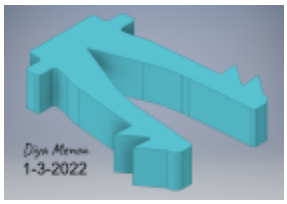
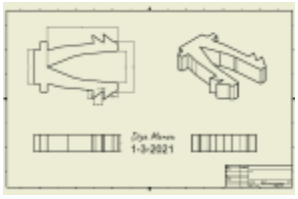
Design Brief:

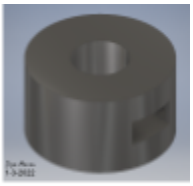
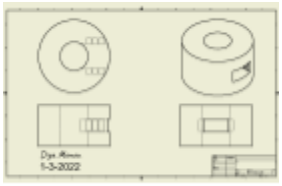
Client	Our clients are Vex clients who are looking for a more efficient drive shaft collar.
Designer's names	Diya Menon, Prisha Nag, Ayush Garg, Jayin Sampeur, Katherine Pask, Sky Huang, Amrith Krishnakumar, Sahil Sandasani
Problem Statement	As a team that often uses drive shaft collars, we know how difficult and frustrating it is to use them. If the user doesn't screw the insert in all the way, the collar can easily come loose. The efficiency of the current collar is dependent on the strength of the user, which is an extremely variable from consumer to consumer. Our job is to formulate a solution to this problem that makes the collar more efficient and consistent in performance.
Constraints	Although our team was able to model and simulate our product on Autodesk Inventor, we do not have access to a 3D printer, and so were not able to print and test the product in real life.

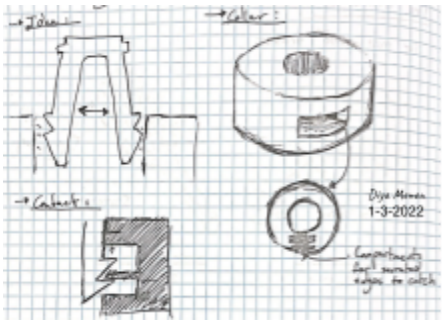
Brainstormed Ideas

Diya and Prisha:





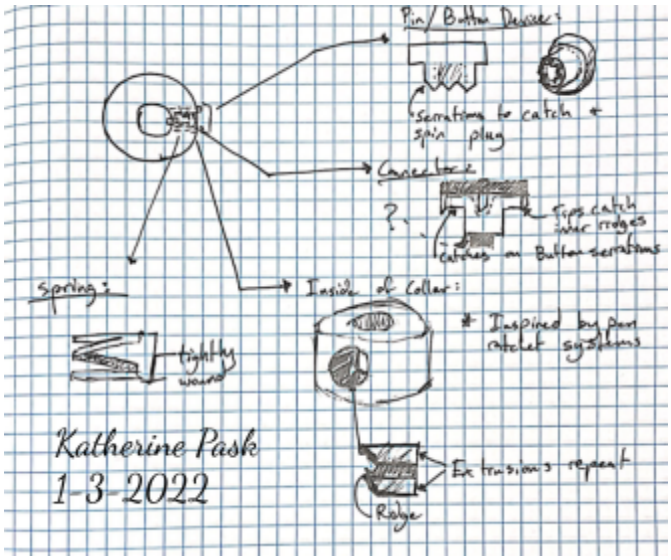


In their design, Diya and Prisha decided to use a button and ratchet system to fasten the pressure on the drive shaft instead of a screw. Where the screw fails in staying completely fastened, the ratchet system succeeds - it can reach the level of pressure needed to fasten the collar around the drive shaft and use a mechanical block to stay there.

Their design encompasses a tweezer-like flexible plastic piece with a flat button joint and two triangular prisms on the outer faces of each tine. The triangular prisms are the teeth used to lock the button in place in the ratchet system. Just like tweezers, this button mechanism uses elastic deformation to mechanically lock into notches inside a hole in the collar. The button piece, when supplied to consumers, will be preloaded into a first notch - this first notch does not yet apply pressure on the drive shaft, but only keeps the product organized and easy for the consumer to keep track of. To fasten the ratchet system, the consumer need only to push the outer button, which forces the triangular prisms to lock into the second ratchet notch, successfully applying pressure on the flat face of the drive shaft. To release this pressure, simply squeeze the portion of the button remaining outside of the hole (squeeze this portion parallel to the circular face of the collar) and pull the button back to its first notch position.

Because this design takes up too much space and needs an additional tool at times to release pressure from the drive shaft, we decided not to use this design.

Katherine:



In her design, Katherine decided to use a ratchet and spring mechanism - similar to that of a ball-point pen - to lock the collar to the drive shaft. This design used the spring mechanism of a pen cap to apply and release pressure on the drive shaft. A single press down (two heard clicks) applies the pressure, and another press (two more heard clicks) relieves the pressure. To explore how the spring mechanism works, please refer to this video.

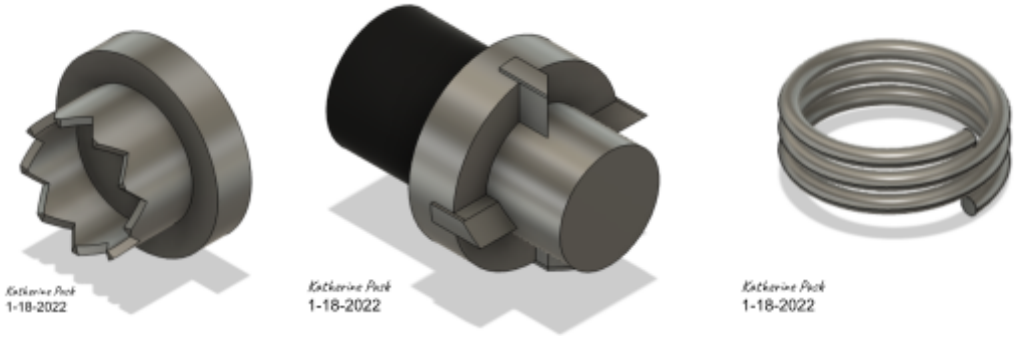
This is the design that our team finalized on.

Final Design Description

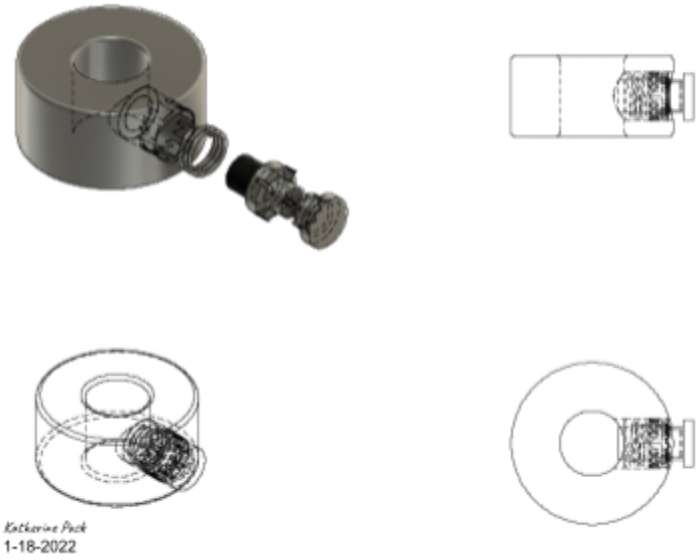
Our team decided to use Katherine's idea as our final design, as it is less bulky on the outside and is simple and intuitive for the consumer to use. A few changes, however, were made to the original design: an extra serration was added to the inner ridges of the collar in order to provide a mechanical lock for both pressure and no-pressure positions. The tip contacting the axle was changed from styrofoam to a more durable plastic.

Here are a few pictures of our CAD model:

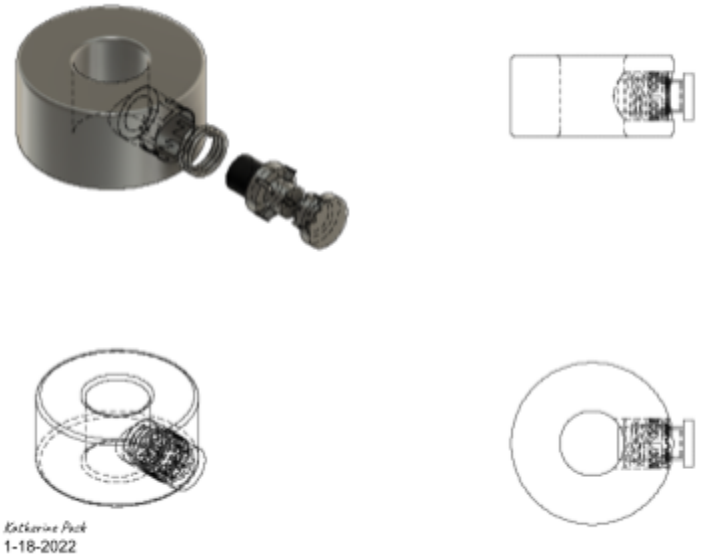
Button Pieces:



Assembly:



Final Design Evaluation



Regarding materials, our team plans to use the same metal material for the collars as currently used. The button piece will be made out of inexpensive steel, such as carbon steel and iron, whilst our contact tip will be made of a more durable plastic to minimize friction.

As part of a recent study on gender norms, the University of Maryland sociologist, Philip Cohen, asked nearly 2,000 men and women a simple question: “What’s your favorite color?” Blue turned out to be most popular across the board. In light of this information, our team plans to make the plastic button piece blue, therefore increasing the product’s general interest for consumers and attracting more customers.

Although our team did not have the resources necessary to 3D print our product, from diligent simulation and calculations done on our CAD model, it seems that the design is successful in applying pressure on the drive shaft and releasing this pressure.

In the future, our team will consider adding rubber tips to the tines of the plastic piece, as this would allow for increased variability in drive shaft alignment and will also give the contact tip more grip on the drive shaft.

Citations

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