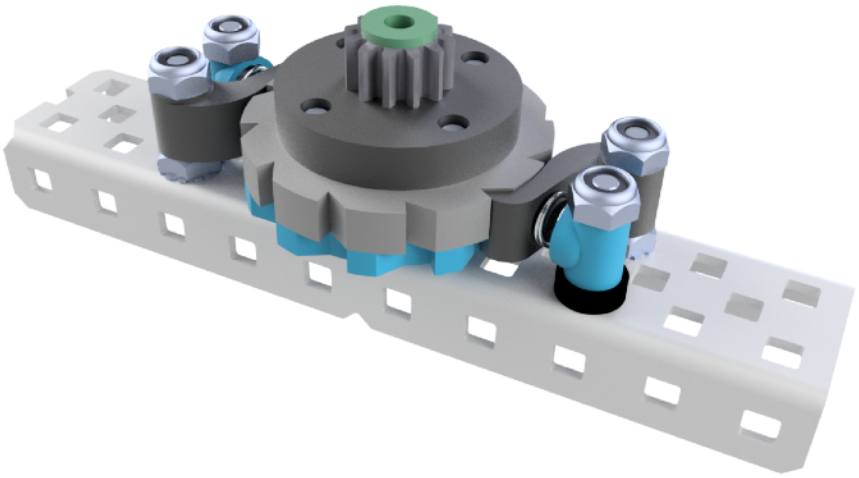
Make It Real CAD Challenge Submission

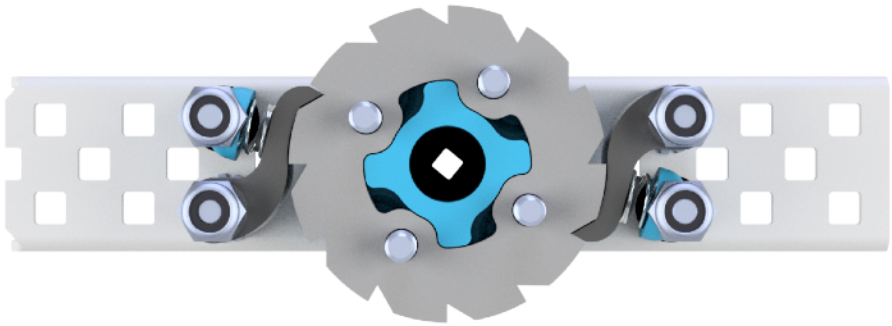
Unlocking Ratchet

By Team NXS



Summary

The unlocking ratchet allows for the functionality of a standard ratchet by only allowing external forces to rotate the mechanism in one direction, but allows for the mechanism to be powered in both directions. This opens up a large amount of functionality for designs to have, such as holding lifts up when unpowered or holding claws shut when fighting an opponent.

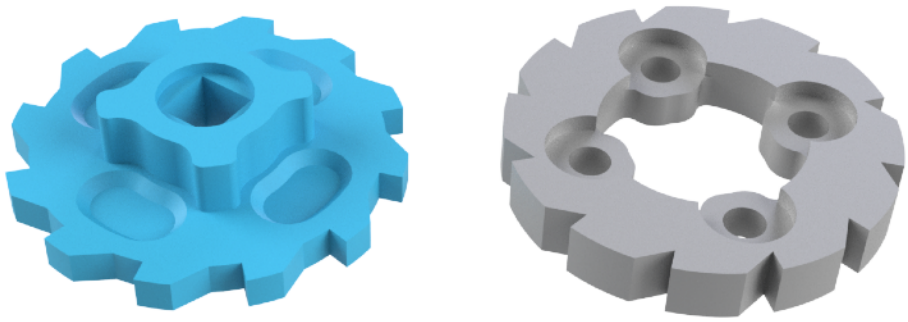


Introduction

Ratchets work by having slanted teeth that catch on a pawl when the ratchet spins in a certain direction. The main benefit of this functionality is being able lift or winch something and hold it in place without needing to be constantly putting in energy. They are especially useful in challenges where hanging is necessary, such as Toss Up and Starstruck, as robots are not able to use their own motor power to hold them up after the match ends. However, these ratchets are only able to turn in one direction, which make them inconvenient on anything that isn't able to spin infinitely, such as a lift. If the pawl was able to temporarily disengage, there would be plenty more use cases.

How It Works

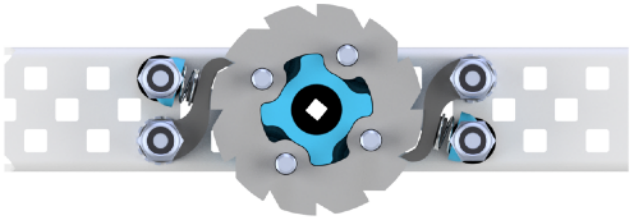
The Unlocking Ratchet works by having two main components, the ratchet and the unlocking plate.

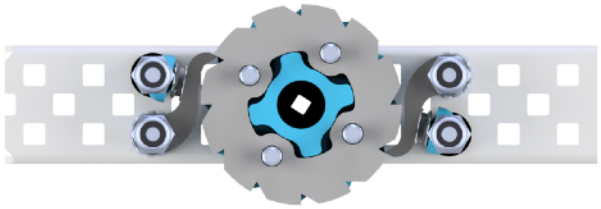


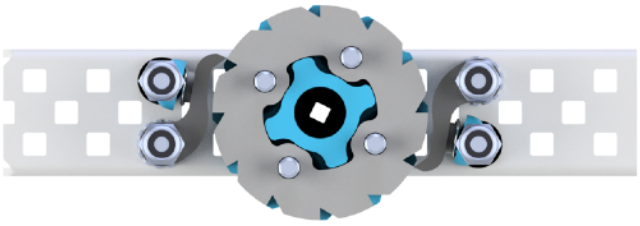
Unlocking Plate (Left) and Ratchet (Right)

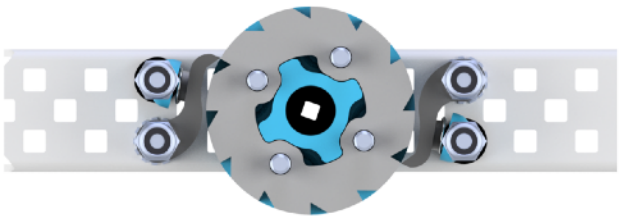
The Unlocking Plate is directly connected to the driven axle, and transfers force to the ratchet using the four nubs. There is 20 degrees of slop between the plate and the ratchet, which allows for the plate to switch between locked and unlocked modes, depending on which way the slop has gone. When it is in the fully unlocked mode, the Unlocking Plate will cover up the teeth in the ratchet, making it effectively fully circular.

The following images show how the unlocking plate covers the gaps as it is powered counter-clockwise.





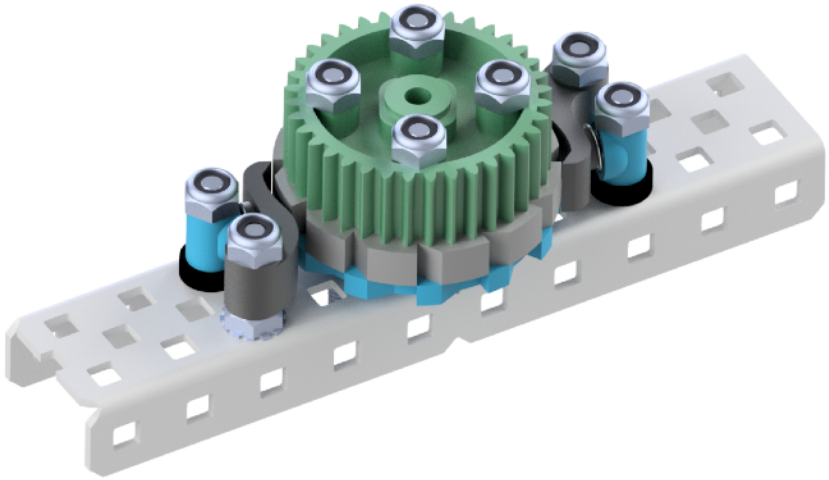




How We Use It

The unlocking ratchet is designed to be used in lifts, as it allows the bot to hold in mobile goals without needing to constantly power the lift up. We will also use it in our hanging mechanism so that we can have one robot on the platform lift up another robot off of the side.

The ratchet was designed to be compatible with multiple gears and sprockets.



How We Created It

I created it using Inventor, by basing its size off of the 36 tooth gears. We then 3D printed it, and used a set of springs we had in our lab to engage the pawls.

The ratchet and unlocking plate mechanism took several iterations to work, as more constraints arised the further it came along.

Created by Team NXS from Hamilton, Ontario