
Subject: Triple gear

Posted by [henryseg](#) on Tue, 04 Dec 2012 07:03:30 GMT

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In this unusual mechanism three gears mesh together in pairs, and yet they can turn!

If you take three ordinary gears and put them together so that each gear meshes with the other two, then none of the gears can turn because neighbouring gears must turn in opposite directions. Triple gear avoids this problem by having the three "gears" arranged like linked rings - the gears then rotate along skew axes, and the opposite direction rule no longer applies (although see also Oskar van Deventer's Magic Gears for another possible solution).

This is joint work with Saul Schleimer. We were inspired by another of Oskar's designs, his Knotted Gear, which consists of two linked rings that gear with each other, and of course we wondered if it would be possible to do three linked rings!

Youtube video.
Shapeways shop.

File Attachments

1) [triple_gear_hand_650.jpg](#), downloaded 383 times

Subject: Re: Triple gear

Posted by [henryseg](#) on Thu, 20 Dec 2012 05:09:21 GMT

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Here's a smaller, less expensive version of Triple Gear. It seems to work pretty well at this scale!

Youtube video.
Shapeways shop.

File Attachments

1) [triple_gear_small_hand_650.jpg](#), downloaded 334 times

Subject: Re: Triple gear

Posted by [bartv](#) on Thu, 20 Dec 2012 09:25:15 GMT
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Yes, this is a truly amazing design.

Subject: Re: Triple gear
Posted by [henryseg](#) on Thu, 20 Dec 2012 09:26:30 GMT
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Thanks Bart!

Subject: Re: Triple gear
Posted by [henryseg](#) on Thu, 27 Dec 2012 09:28:35 GMT
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Here's an animated gif showing how the gears mesh into each other:

File Attachments

1) [triple_gear_animation_300x240.gif](#), downloaded 294 times

Subject: Re: Triple gear
Posted by [henryseg](#) on Tue, 01 Jan 2013 05:02:59 GMT
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Many people have wondered if it might be possible to drive the triple gear with some sort of external mechanism. Here is a partial solution...

Subject: Re: Triple gear
Posted by [henryseg](#) on Wed, 24 Apr 2013 07:39:09 GMT
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Here is a real solution to the problem of powering the triple gear, using a central helical axle and a baseplate to keep the gears in position. Thanks to Adrian Goldwaser and Stuart Young for prototyping and construction of the motorised base shown in the video. This will be shown in the

art exhibition at the Bridges conference on Mathematics, Music, Art, Architecture, Culture in Enschede, the Netherlands in July.

Youtube video.

Baseplate and axle for Triple gear.
15cm axle for Triple gear.
30cm axle for Triple gear.

File Attachments

1) [powered_triple_gear_650.jpg](#), downloaded 201 times

Subject: Re: Triple gear
Posted by [henryseg](#) on Tue, 14 May 2013 14:50:36 GMT
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Here is a paper on the arXiv (an electronic repository for research papers) describing how we designed the Triple gear:

<http://arxiv.org/abs/1304.6859>

Subject: Re: Triple gear
Posted by [henryseg](#) on Tue, 04 Jun 2013 13:10:48 GMT
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Another animated gif, this time of the powered version:

Also, here is a video showing how to loosen the gears if they arrive somewhat fused together.

File Attachments

1) [powered_triple_gear_animation.gif](#), downloaded 110 times
