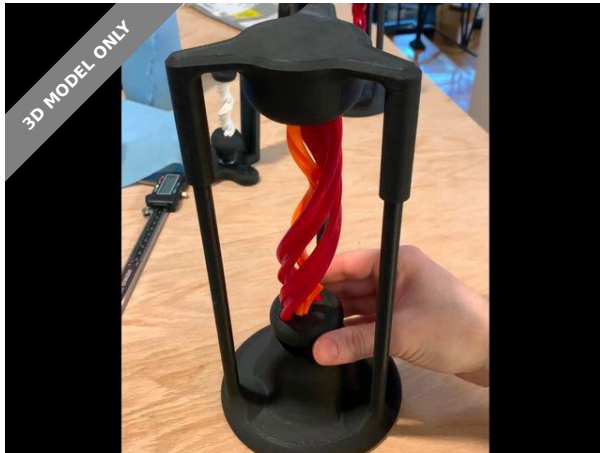




Dual Portal Desk Toy



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Summary

A desk toy that creates the illusion of strange rippling strands sliding between two portals

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Tags: [toy](#) [fidgettoy](#) [magic](#) [desktoy](#) [opticalillusion](#)
[desktoptoy](#) [illusion](#)

Update: There is now a [third version of this model](#) with more moving components, and only printed components.

This is a followup to the simpler [Magic Portal Desk Toy](#). This introduces a second screw element threaded in the reverse direction to help obscure how the illusion works.

Differences from the first version:

- Stronger illusion
- Somewhat quieter
- You can rotate the center assembly and see that it is not a simple screw
- The slider cannot fall freely to the bottom when you let go.
- Stricter print requirements; you need at least a 246mm build height
- More difficult to print

- More difficult to assemble. I had to trial and error a lot of the assembly, but I'll do my best in the description below
- May require some glue

How it works

The fundamental illusion is just the [barberpole illusion](#) with some window dressing. Using a strangely shaped revolution with gaps in it makes it harder to read it as a screw.

This version includes a second twist: there are two independently rotating screws with opposite threads and different pitch. As the slider moves, it ensures that the screws each rotate at the correct speed and in the right direction to produce the illusion.

Requirements

- Four skateboard bearings (8x7x22mm)
- 246 mm build height

If you don't have skateboard bearings, you can use this [this print-in-place model](#). If you want to scale the model down, you can figure out the bearing dimensions you need and use [my bearing generator](#) to print the right size bearings.

Printing tips

For printing, you want the Dual Portal Toy.oriented file, which has everything flipped the right way for printing. You'll want to pull the two "screw" pieces out separately, so you can print them in different colors.

Print the screws and nut at .12mm maximum for best results. You can use larger layers for the other parts if you want..

I recommend printing the inner and outer screws first to get those right, then print the nut. That way, you can adjust XY compensation on the nut to make sure it's nice and loose. You do not want a tight fit on the nut.

The screws are probably going to get pretty wobbly toward the end of the print. You may need to slow things down or even add in some support structures, but be mindful of the surface finish.

Assembly

Again, I'm going to do my best, but you might have some trial and error here. My recommendation is that if something doesn't want to fit easily onto the screws, reprint it with looser tolerances and glue if necessary.

Note that it is not necessary for the end caps to be glued on, or to fit tightly; they will be held in place by the frame.

Axles should fit tightly into bearings, but they do not have to fit tightly into the printed pieces. But if they're loose, you may find it easier to glue them anyway.

Please consult the 3mf for the part names in bold below:

1. Thread the **inner screw** into the **nut** first, and then the **outer screw**. This is easier than going the other way around. The important thing is to make sure that the outer screw “encompasses” the inner screw, rather than the inner screw trying to wind around the outer screw. This may take some fiddling.
2. Insert the longer side of each **axle** into a bearing. The axles are all identical
3. Snap a bearing into the ring on the **outer screw**, then push the hole in the base of the **inner screw** onto that bearing's **axle**
4. Press the **outer screw** down onto the **axle** in the **base** bearing
5. Thread the **inner cap** onto the end of the **inner screw**
6. Snap a bearing into the ring on the **outer cap**
7. Thread the **outer cap** onto the **outer screw**, at the same time, pushing the outer cap's bearing **axle** into the hole on the **inner cap**
8. Snap a bearing into the **top**
9. Add a drop of CA glue to each of the arm sockets on the **top**.
Optionally, spray some CA accelerator onto the arms of the **base**
10. Press the **top** down onto the **base**, making sure to line up so that the **axle** in its bearing pushes down into the hole of the **outer cap**

See? Easy.

That sounded awful. Will you just sell me one?

I mean, you read the instructions. What makes you think I want to do all that again?

Can I sell these?

I'm licensing the design as CC SA-BY, so you can pretty much do whatever you want so long as you share any modifications and include attribution.

If you do decide to sell these, I'd recommend figuring out how to modify the design to make assembly easier. Just make sure to also share your modifications!

Wouldn't the effect be even cooler if you had more bearings, and more threads at different pitches?

Yes, and I'm trying very hard not to think about that. [Update: I couldn't resist]

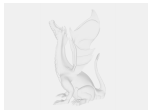
Model files

dual-portal-toyoriented.3mf

☐ All components oriented for printing

dual-portal-toy.3mf

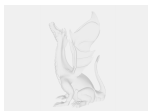
☐ All components in final assembled position



dual-portal-toy.step

☐ STEP file, best for CAD other than Shapr3D

Other files



dual-portal-toyshapr.zip

☐ Original Shapr3D file

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