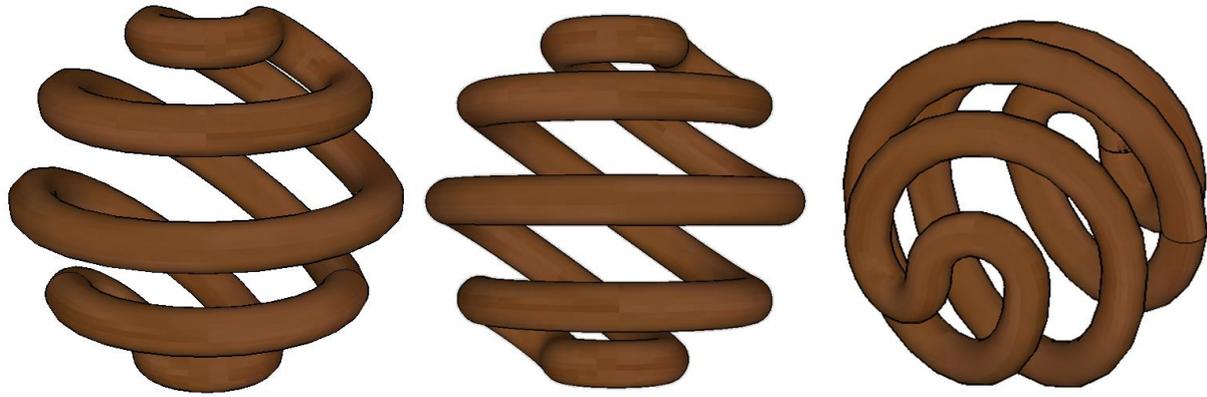


Endless Loop Forming Sphere

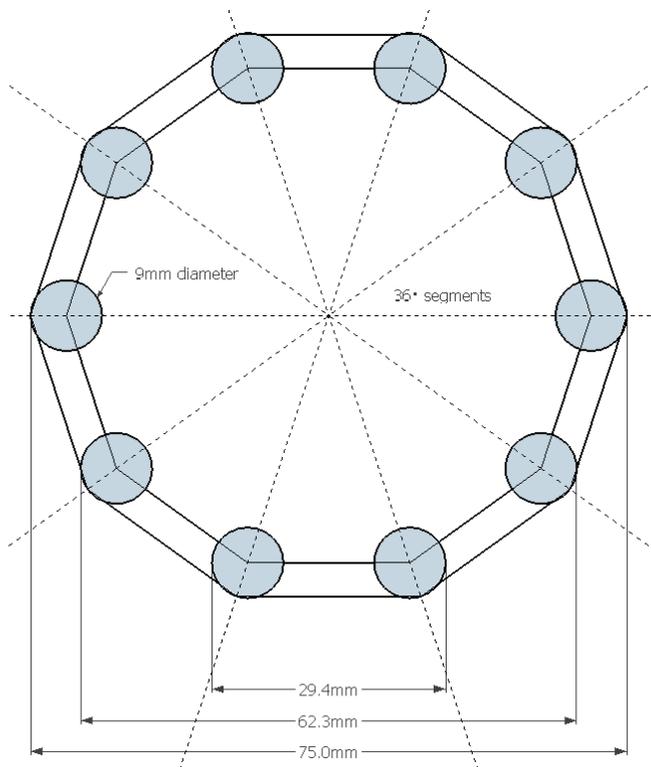
This is not an original idea and I received my inspiration from Yuval Lahav¹ and Malcolm Tibbetts² on YouTube.

There are several variations of this idea from introducing more or less rings³ to changing the cross-section shape of the loop and using segments. This article covers the basic concept using a loop with a circular cross-sectional area and only 5 rings as used in my Christmas ornament project.



Design

The finished size could be as big as you wish, but I was aiming for a size that would work well with my Christmas decoration choosing a sphere size as large as I could get away with as working with small rings is very fiddly and difficult to sand and finish properly. I aimed for a finished sphere of about 75mm / ~3inch \varnothing diameter.



For larger spheres 7 rings may be better, but the concept is the same. The thickness of the individual rings is also important, I decided on a size slightly smaller than half of each wedge opposite end to obtain the right balance of solid to gap in the spiral and decided on 9mm. (approx. circumference ($\pi \times 75\text{mm}$) divided by 20 (5 rings times 4))

In my opinion making the ring thicker makes it look less elegant and chunkier, but this does compromise on strength.

Start by creating a circle with the finished diameter (75mm \varnothing / 2.95 inches) and an inner circle less the diameter of the rings (75 - 9 = 66mm \varnothing / 2.5 inches).

As there are 5 rings divide the circle by 10 (2 x 5 rings) which makes 10 x 36° wedges (360 / 10).

The rings will need to be as follows:

- 1 x 75mm / 2.95 inches \varnothing outside diameter
- 2 x 62.3mm / 2.45 inches \varnothing outside diameter
- 2 x 29.4mm / 1.16 inches \varnothing outside diameter

¹ Yuval Lahav Woodturning (YouTube movie entitled: Woodturning 2017 Christmas Ornament Challenge)

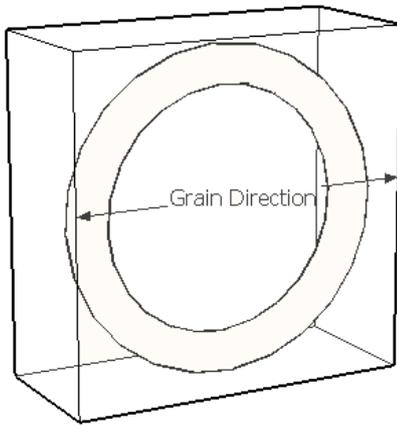
² Malcolm Tibbetts (YouTube movie entitled: The Power of Seven)

³ These are technically referred to as a torus (plural tori) or a donut, but for our purposes will refer to them as "rings"

****Note the diagram is not to scale**

Wood selection and making the rings

I recommend a dark dense wood where the grain is not that visible so that grain misalignment is not obvious and glue joints are less visible. For ease I used Danish Oil as the finish which made the wood even darker. If you intend colouring your finished item, then almost any wood will do. I used some reclaimed mahogany from an old fireplace mantel. Because of the small cross-sectional area of the circular rings, I went for cross grain wood for additional strength. I had a board that was approximately 35mm thick that I was able to salvage several rough circular disks using a bandsaw.



****Warning this is quite a wasteful project and not much to show from the initial stock size.**

I created twice the amount rings I needed, so I could use the best set for the final project and have some spares in case I have any breakages.

Making the rings was a challenge, which essentially required creating a bead around the face and sides, hollowing the centre and extending the bead as far as I could inside the ring, sanding and then parting off.

I used a 9mm drill to remove the centre for the small rings.

I repeated this for all rings before completing the back of the rings.

I struggled to achieve an accurate and uniform 9mm circular cross section especially on such small rings, even using a cardboard template was fiddly. In the end I made my own beading tool by drilling a 9mm hole in an old thick hacksaw blade and cutting it in half and creating a cutting edge.

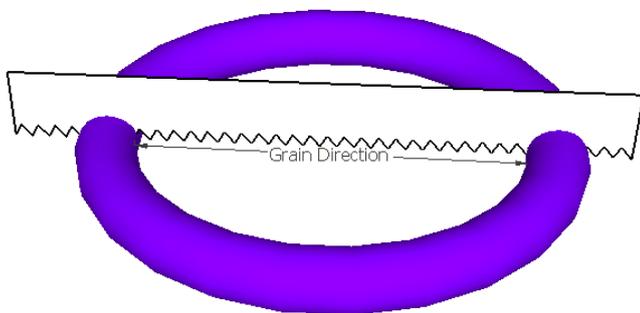
(Be sure to either blunt or cover the blade teeth) You could also use an old spanner to make the beading tool. This made beading much easier and provided a consistent circular shape. There are beading chisels available commercially.



I finished off the back of the rings by using a female jam chuck to press the rings into that exposed the back and inside of the rings for finishing. If you start with the small rings first and go up a size each time you can use the same jam chuck for all. There are several ways to make the rings, experiment and see what works for you.

Cutting the rings and assembly

Use a centre finder, orientating the centre line with the grain, to mark the cut lines for cutting the rings in half.



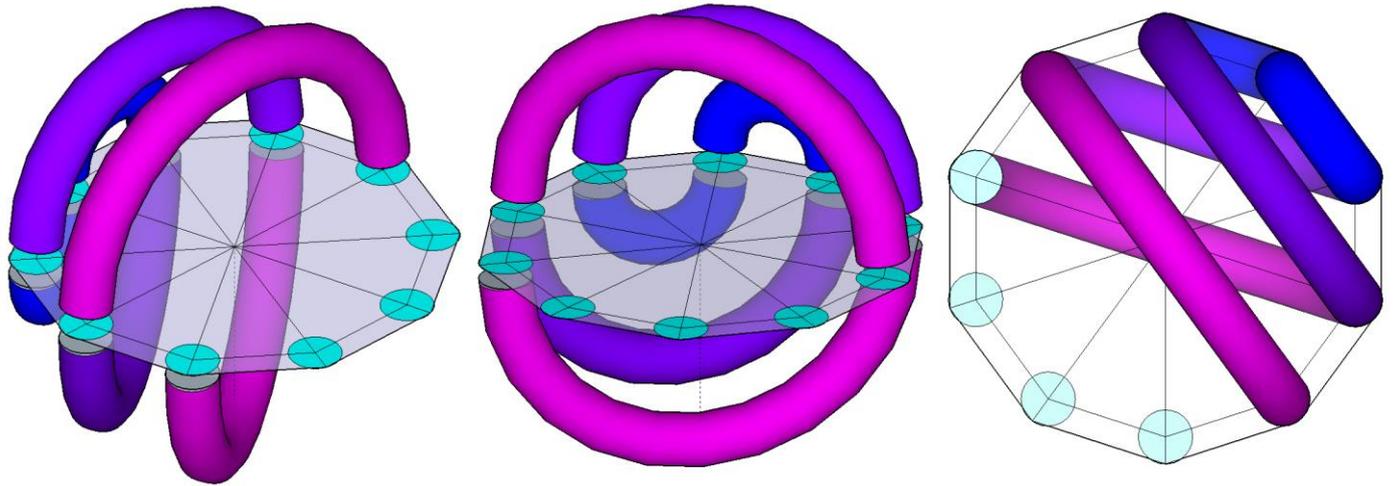
Gluing end grain is not as strong, and the glue line is more obvious.

I used Google sketch-up online to create and print my templates and to visualise the finished proportions.

Print out a few copies of the template and carefully cut out the ring circles for the rings to pass through.

On my first assembly attempt I used CA adhesive because of the fast-drying time but ended up gluing my fingers to the template instead and the bond was instant, so if you did not line the rings up properly in time the error could not be undone, and the final ends will not meet up. So, for my second attempt I used normal wood glue and took my time to line the rings up with the template but had to wait 6-12 hours between glue-ups. I found the wood glue (Titebond II) was easier to work with and sand and the glue did not soak into the wood making the glue joints less conspicuous. I used a hand screw clamp to lightly hold the large ring whilst the glue dried. Complete the glue-up in 2 parts, so the assembly goes faster and bring the last 2 assembled parts

together for the final glue-up. It's almost impossible to achieve a perfect assembly, but some coaxing (there is some flexibility in the wood) and light sanding can usually fix this.



The assembly is followed by blending all the joints with sand paper and removing glue marks and then working through the grits to 400.

**** Be careful though – the sphere is very delicate and breaks quite easily if dropped or you are too vigorous with sanding.**

I finished the sphere by soaking it in Danish oil for 10 minutes and then wiping off the excess and allowing it to dry in a warm place for 24 hours. I did this twice to be thorough.

Application

The finished sphere can be an item in it owns right and I used mine as a feature on my Christmas decoration project and attached it at the small ring ends of the sphere using a short spindle that fits inside the small ring and gluing it in place.

