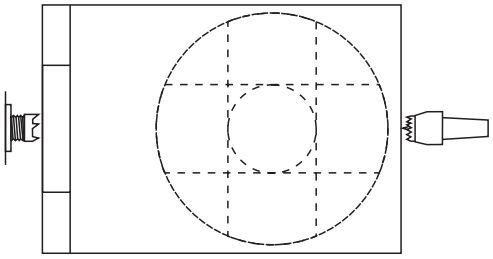
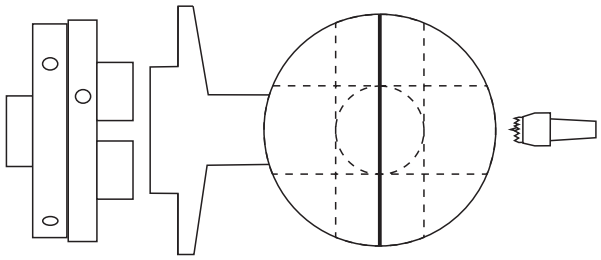
Magic Fidget Toy Smaller

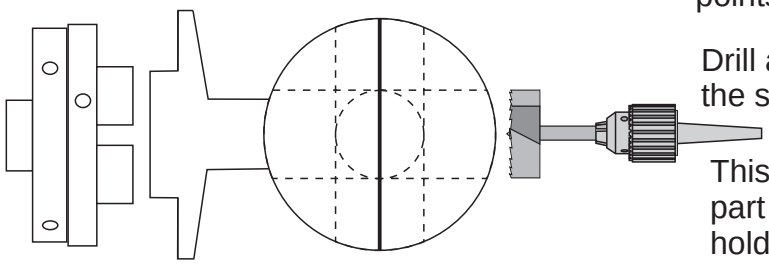
The original toy is from the discontinued Lego Baby line. This toy is as designed by Britt Michelsen who first made it using a 3D printer and then a woodturning lathe.
The basic project is to make a sphere and then three shafts that go through the sphere and then these shafts move in and out of the sphere.



Mount a piece of wood that is at least 120mm long and 70mm square between centres. Round it off and cut a spigot on one end.

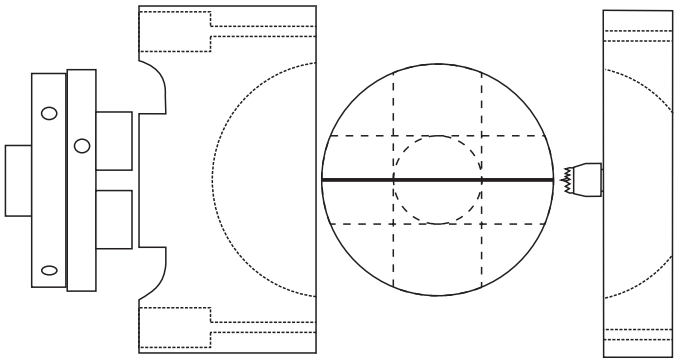


Mount the wood in a chuck. Turn it to exactly 61mm diameter. Mark the wood with a pencil mark at the planned centre of the sphere. Turn the sphere to be exactly 61mm diameter and the shaft holding it to the chuck to 20mm diameter. On the pencil line around the centre of the sphere use an awl to clearly mark 4 points at 90° divisions around the sphere.

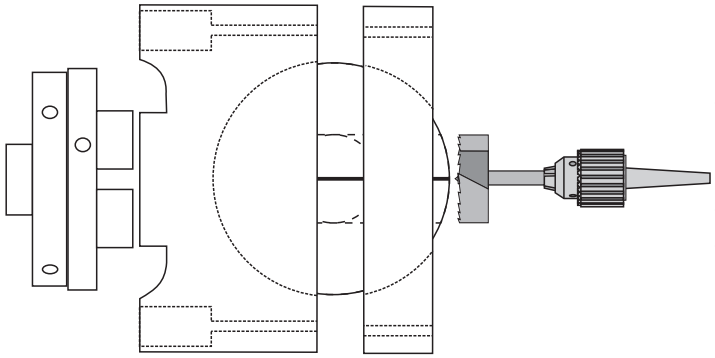


Drill a 23mm hole through the centre of the sphere.

This will remove any tailstock marks and part the sphere off from the spigot holding it in the chuck.



Place the upper part of the sphere holding jig over the tailstock centre. Put the point of the tailstock centre into one of the awl holes on the pencil line around the sphere. Move the tailstock to place the sphere into the lower part of the jig. Bolt the top to the bottom of the sphere jig.



Drill a 23mm hole completely through the sphere. Ease the sphere holding jig and rotate the sphere to get one of the remaining awl holes to the centre. Hold the sphere with the tailstock and tighten the sphere holding jig. Drill a 23mm hole completely through the sphere.

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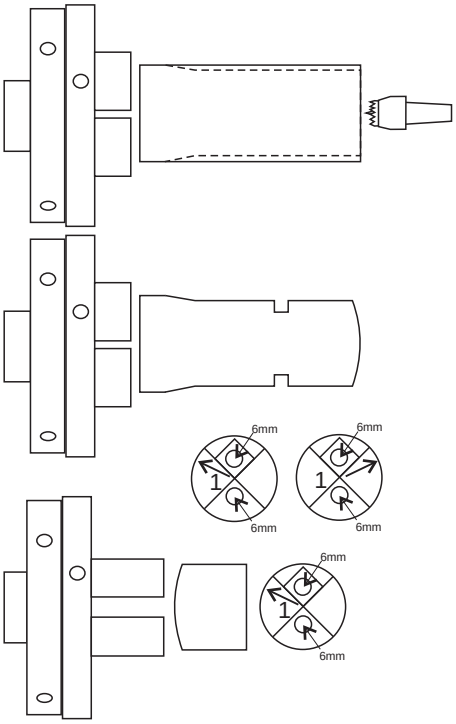
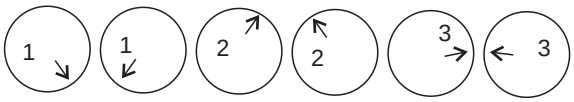
Make six plugs to fit into the drilled holes. These need to be drilled to take a joining rod and a stopper rod. Start with three pieces wood at least 80mm long and 35mm square.



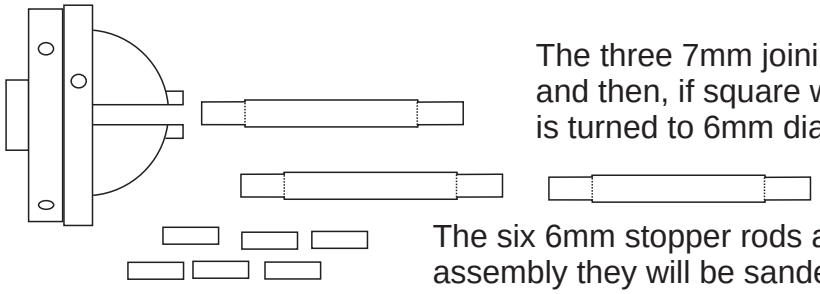
Mount the wood in a chuck and make it round and 22.5mm diameter.

Shape the end of this wood to be the same curve as the sphere. Start a parting cut 17mm from the tailstock end (excluding the curved surface). Sand this area. Complete the parting-off cut. Repeat this for the remaining wood. Mark the undersides so that they can be used as pairs.



Mark the parted-off ends of each pair with an indication of the grain direction so that when they are joined with a joining rod each pair will appear to be a single piece of wood through the sphere.
Drill two holes 12mm deep in the plug. They must be parallel to the sides of the plug. For rods of the 7mm square size shown, use a 6mm hole. The centres of both holes are about 8mm from the centre of the plug.

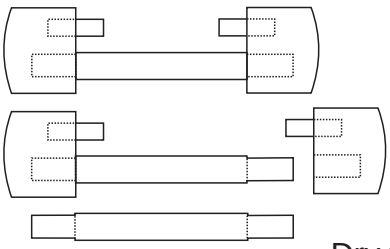
The joining rods and stopper rods can be made from commercially available dowel which needs only to be cut to length. Making the joining rods from square timber makes a better fit for the three rods inside the finished toy.



The three 7mm joining rods are cut to 63mm long and then, if square wood is used, 12mm at each end is turned to 6mm diameter.

The six 6mm stopper rods are cut to 20mm long. After first assembly they will be sanded to a shorter length.

Assembly



Complete a pair of plugs with their joining rod and stopper shafts. These may be glued now but holding the parts with a jam fit is wise until all three rods are fitted.

Prepare two more pairs of plugs with the joining rod and a stopper rod fixed to one plug and the other with only the stopper rod fitted.

Dry fit (none glued) all three rods into the sphere. Use masking tape to label each end of each hole in the sphere with a number and each end of each rod with a corresponding number and the point each rod is rotated to. You will now need to take each rod out to adjust the length of the stopper rods and possibly the length of the joining rods. When one rod is taken out the other two can move to incorrect positions.
When you are happy with the fit and actions, glue the dry fitted components in place.