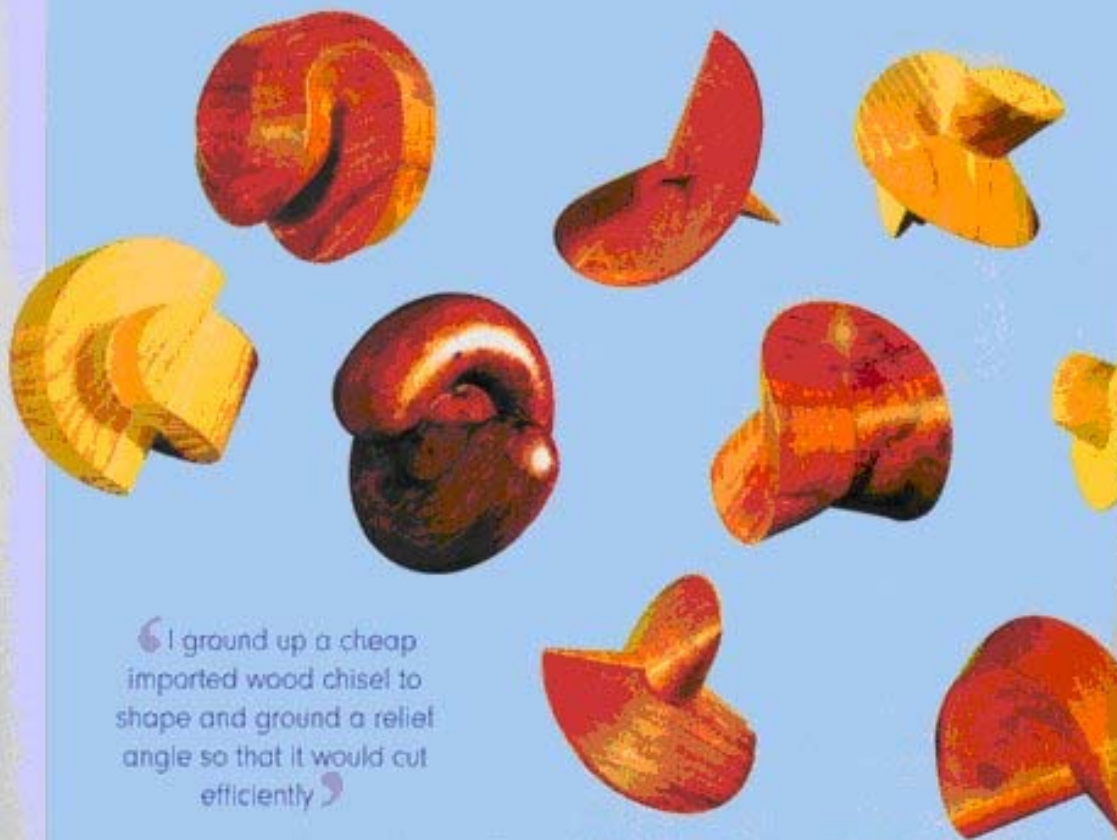


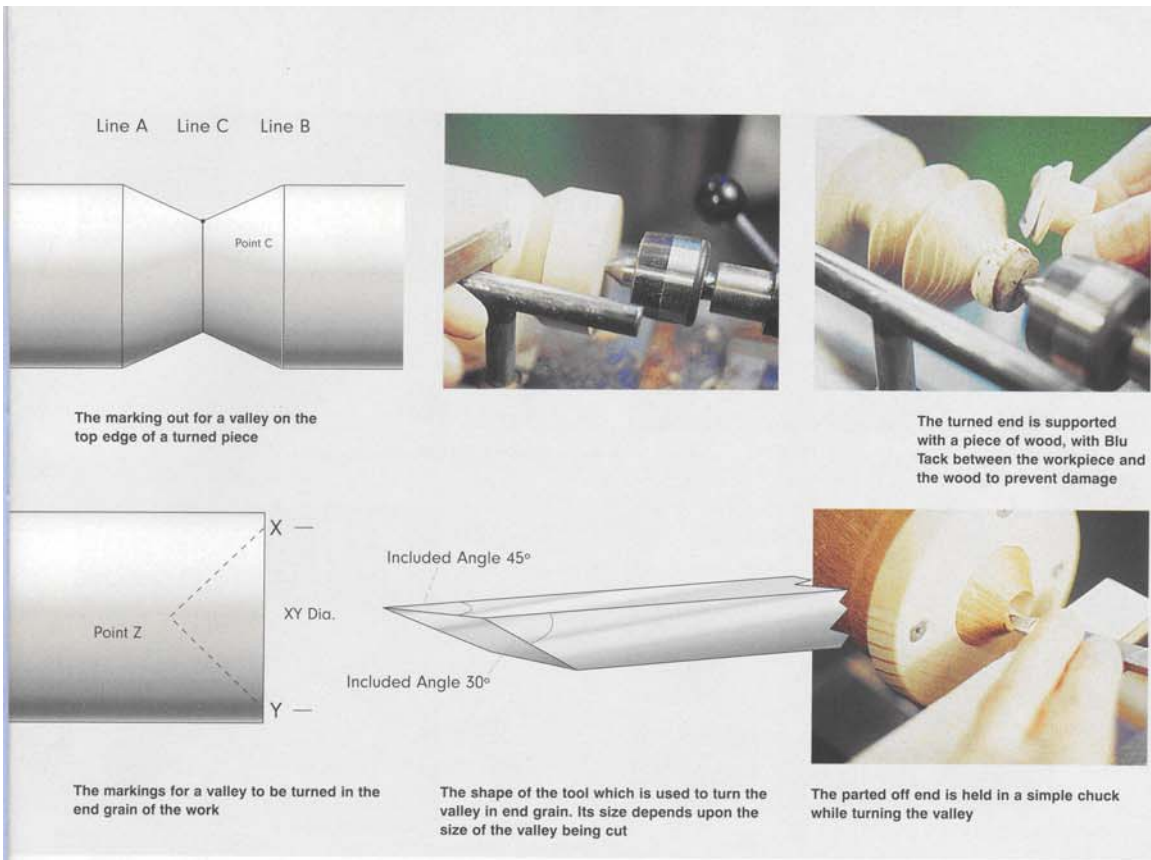


Variety **turn**

Last month **David Springett** turned 'sphericons' into 'streptohedrons'. Now he explains how to turn 'valleys' and how to make a twisted box **Part 2**



⌚ I ground up a cheap imparted wood chisel to shape and ground a relief angle so that it would cut efficiently ⌚



The marking out for a valley on the top edge of a turned piece

The turned end is supported with a piece of wood, with Blu Tack between the workpiece and the wood to prevent damage

The markings for a valley to be turned in the end grain of the work

The shape of the tool which is used to turn the valley in end grain. Its size depends upon the size of the valley being cut

The parted off end is held in a simple chuck while turning the valley

The star shapes require accurate valley shapes to be turned.

There are two forms of valley: those produced on the top edge of the work and those produced in the end of the turned base to form a conical hollow.

Both require an accurate drawing.

Top edge

I'll start by dealing with the valley produced on the top edge of the work.

Measure the distance across the valley and mark those lines, A and B, accurately on the work. Also mark the centre line, C, between those two lines. Using a fine, 1.5mm-wide, square-end tool turn down a thin groove on line C close to the correct depth.

With a straight clean cut join A to C and also B to C. Make sure the depth is correct. Job done.

Having turned the first valley at the tailstock end, a small piece of wood, with Blu Tack to act as a buffer, is

held between that hollow and the live centre so the turning may continue.

End face

The work is held firmly in the chuck with as little overhang as possible. The toolrest is brought across the end face of the work.

Having marked out the correct diameter on the end of the work, positions X and Y will be located on that rim. Position Z is directly beneath the centre point.

I ground up a cheap, imported wood chisel to shape and ground a relief angle so that it would cut efficiently. This I used to turn into the end face of the work until I reached the correct depth, making sure that the rim of the valley and the deepest point were joined with a good, clean, straight cut.

Second valley

If there is a valley in one end of the piece then, if the piece is even sided, there will be a corresponding valley at the opposite end.

And there lies a problem, for the end into which the second valley is to be turned can only be exposed when the piece has been parted off.

The piece, when parted off, is supported in a tight-fitting, hollow, turned-in piece of wood.

The end which is to be turned will be facing out.

A collar is fitted over the turned piece and screwed down to hold it firmly in the hollow.

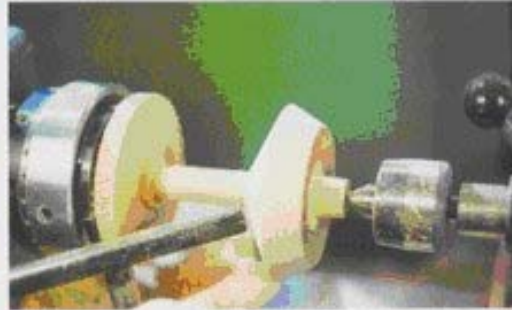
A central opening in the collar allows access to the end so that the valley may be accurately turned. ▶

Geometrical fact

A property of these pieces is that they will fit inside a sphere with their extreme edges and points touching that sphere. They will do this whether in their original form, split and twisted, or as a hybrid.



Turning the cross shape



Beginning to turn the 3-armed streptohedron

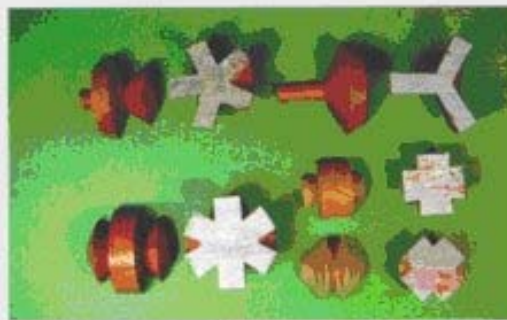


The five-armed piece is partially turned...



... and completed when reversed and held in a simple turned hollow

Six ends



Four-ended piece



Five ends



Three-ended

LEFT Regular square-ended cross-shaped pieces. The turned part is on the left and the corresponding cross section is on the right



A variation on the four-ended piece

Regular square-ended cross-shaped streptohedrons

◀ 'Pentapus'

Having understood that regular polygons and stars could be the base of these turned pieces it then became apparent where the 'Weissflog' cross fitted in. It was a regular shape with four arms with square ends; so I produced a three-armed version which can be seen partly turned in. Next a five-armed (pentapus?) version was turned which can be seen in the photos. The 'valley' turned under the two, more open, arms of this

pentapus was accessed by reversing the piece in the lathe and supporting the majority of the work in a turned hollow. Finally a six-armed piece was turned. All these, of course, were regular shapes. The four- and six-armed versions can be rotated through the centre of the arms or the centre of the valleys between the arms, plus the hybrids of the equal sided pieces, variations-left, right and other variations when setting the twisted half forms together.

Well that's where I am up to at the moment. I have produced some remarkable shapes but what use are these streptohedra? If you want some wonderful sculptural forms you have them. They can be made much larger or smaller, in highly grained woods, they can have many variations and hybrids, they can be made be thicker or thinner, sharply pointed or blunt, and they can be made into boxes. ▶



Half the streptohedron, covered in polythene, is pressed into Isopon car body filler while it sets



With the plastic removed, half a perfect image remains into which any similar pieces will snugly fit



Half the streptohedron is held in the chuck and the hollow turned



The two halves, one with the turned hollow exposed

◀ Twisted box

The box turned here is formed from a hexagon turned with its points on the centre line.

To make it, take the chosen turned part, already split into two halves, and carefully mark diagonal lines, from point to point, on both faces of those halves to locate their true centres.

From the accurate drawing made when producing this piece, measure the circle in which the full profile of the piece fits, 100mm (4in).

Fit a block of wood, 130mm diameter x 60mm deep (5½ x 2½in), to a faceplate and turn it fully round.

Into that face turn a hemispherical hollow 100mm (4in) diameter. One half of the streptohedron will fit into that hemispherical hollow.

To make the hollow a snug fit buy car body filler like Isopon or Plastic Padding.

Take one half of the streptohedron and place it in a plastic bag. Mix the

car body filler as instructed and spread inside the hemispherical hollow.

Push the half-turned part – in the poly bag – with the flat face outwards, bringing the tailstock forward so that the revolving centre can be pushed into the marked centre of the streptohedron face. This will apply pressure while the car body filler sets and also ensure that the piece is held centrally.

In the photographs I have shown a more complex shape being fitted to demonstrate how effective this method is.

Make sure that the edges of the part streptohedron are level with the edges of the hemispherical hollow.

When the car body filler has set, the half streptohedron can be removed, the polythene bag allowing it to be released easily.

Screw a 130mm- (5½in) diameter disc of 6mm- (¼in) thick MDF over the hollow and turn the outer edge true.

Turn a 70mm- (2½in) diameter hole in the centre of this disc. This will lock the half streptohedron in place yet allow access to turn out the central hollow.

Both halves of the streptohedron will fit this bespoke 'chuck' and any further, exactly turned, pieces will also fit.

From the accurate drawing you will be able to work out the maximum depth, 30mm (1½in), and maximum diameter, 35mm (1½in), of the hollow which can be turned in each half.

A small weight glued unobtrusively in the base of one half will keep it sitting upright.

A turned wood sleeve, 35mm- (1½in) diameter by 35mm deep and having a wall thickness of about 3mm (¼in), pushed into that same half will leave about 5mm (¼in) showing above the hollow. This will be sufficient to hold the top part of the streptohedron box in place.

More ideas

Of course, if you make the same form on two centres of rotation with exactly the same footprint – through the points or through the valleys – then one half from one piece can be turned as a box base.

This can be linked with a half from the other to form a lid, producing an unusual hybrid box.

When I first began making these pieces I did not believe I would be able to

turn so accurately by hand. It was surprisingly easy; as long as I worked from an accurate drawing and knew the starting and finishing positions of each cut then the work progressed smoothly. I think that you will be equally surprised at how your skills

improve with the challenge of accurate turning.

It is tremendously satisfying work. The number of variations of these streptohedrons appears to be limitless, so have a go and you may well turn a shape no one has ever turned before. ■



A streptohedron – turned on a lathe!



identical 'footprints' but different outer profiles