

## What Is Oval Turning? (Johannes Volmer)

Ovalturning is an old challenging woodturning art. It was applied until the middle of the 20th century in frame manufactories. There were many such factories in European countries but nothing remained. In the USA the Old Schwamb Mill - a frame factory founded in 1864 by German immigrants - has been well preserved. It is a working museum with the 19th century machines in action. For turning oval pieces - or more accurately elliptical pieces - on the lathe you need an oval chuck but those devices are not commercially available anymore. They were produced up until 1950. If one finds an antique oval chuck or a complete ovalturning lathe headstock it will be expensive.

Ovalturning requires skill when guiding the tools. Therefore the ovalturner was the best paid among the woodturners. You must have some interest in the ellipse geometry and in its motion although no great theory knowledge is necessary. Ovalturning is of increasing interest for designers, artisans and restorers and for fans of woodturning looking for new challenging techniques. The ellipse is a curve of traditional charm. Classical applications are elliptical picture frames and mirror frames but also plates, bowls, boxes and keyhole plates (escutcheons). For the design of these and other objects with elliptical cross section the creative turner has one dimension more than the turner of round pieces.

Ovalturning shows, in comparison with normal turning – in the following called circular turning – essential differences. These differences are caused by the ellipse motion of the work piece. This motion influences the cutting of the work piece material, the guiding of the cutting tools, and the design of the work piece shape. The drawing in figure 1101 shows the ellipse motion. The elliptical work piece is drawn in eight positions. It is guided to these positions by the oval chuck or the ellipse mechanism. Point C is the cutting point of the fixed tool T on the tool rest TR. While the ellipse is going through its position the ellipse midpoint runs along a circle

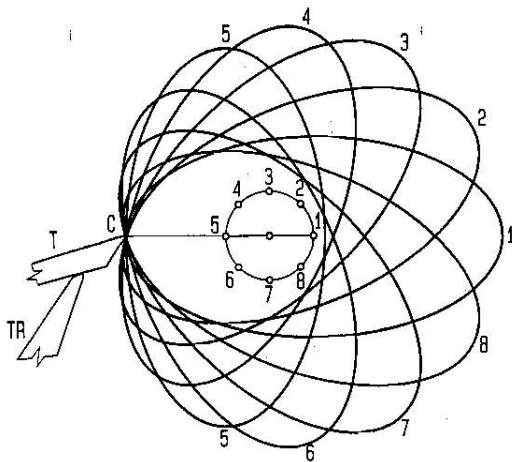


Figure 1101 ellipse motion

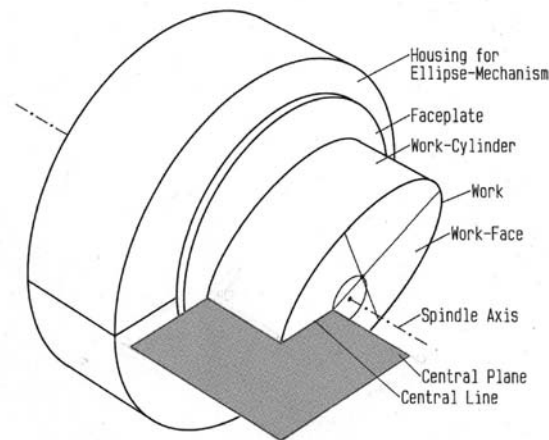


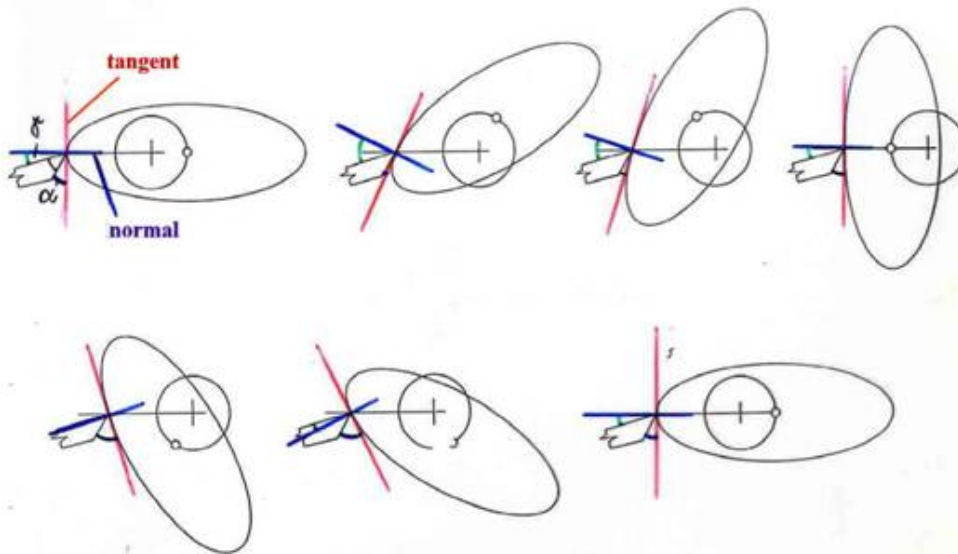
Figure 1102 Central plane

the diameter of which equals the difference of the ellipse's half-axes. For half a revolution of the ellipse its midpoint runs around the entire circle. For the explanation of other important terms look at figure 1102 in which an oval cylinder is fixed onto the faceplate of the ovalturning lathe. In this drawing the central plane is marked.

This is an imaginary horizontal plane exactly at centre height. The central plane marks the central Line on the work piece. This line is of essential importance as the cutting part of the tool edge should always be guided exactly on this line.

Considering the cutting process: There are differences between the shaving removal on the work-cylinder and on the work-face. When circular turning, the surface of a cylindrical work piece will form constant angles with a fixed tool edge. On an elliptical work-cylinder the angles alter periodically during the revolution. Thus, the cutting forces acting at the tool edge are also changing. The ovalturner has to take this alteration into account when guiding the tool for optimum cutting conditions to yield clean, shearing cutting and smooth surfaces. This is especially important when ovalturning wood. The materials preferred by the court turners were ivory and ebony for a "scraping" cut can produce a smooth surface because of the isomorphic structure of those materials.

## What Is Oval Turning (Continued)



When circular turning the work-face it does not matter along which cutting line the tool edge is guided to the centre because concentric circles are always generated. When ovalturning the cutting line is important. In figure 1104a the edge is guided along the central line. Cutting line and central line are identical. The results are concentric coaxial ellipses or "parallel" ellipses. If the cut is not made along the central line, as shown in figure 1104b, concentric ellipses are produced but they are twisted to each other. All these ellipses have the same axes difference (sway). This is the parameter for adjusting the

Figure 1103: Alteration of the rake angle  $\gamma$  and the clearance angle  $\alpha$  oval chuck. With circular turning the work-face has in the centre a point, with ovalturning you obtain a line.

The art of ovalturning resides in the skill to guide the cutting area of the tool edge exactly, and unwaveringly, along the central line. Minimal deviations have noticeable consequences on the surface. One recognizes this on the surface of facing grooves. Figure 1105 illustrates this. The tool edge, when above the central line, will cut an ellipse that penetrates the centrally cut ellipse in two opposing places.

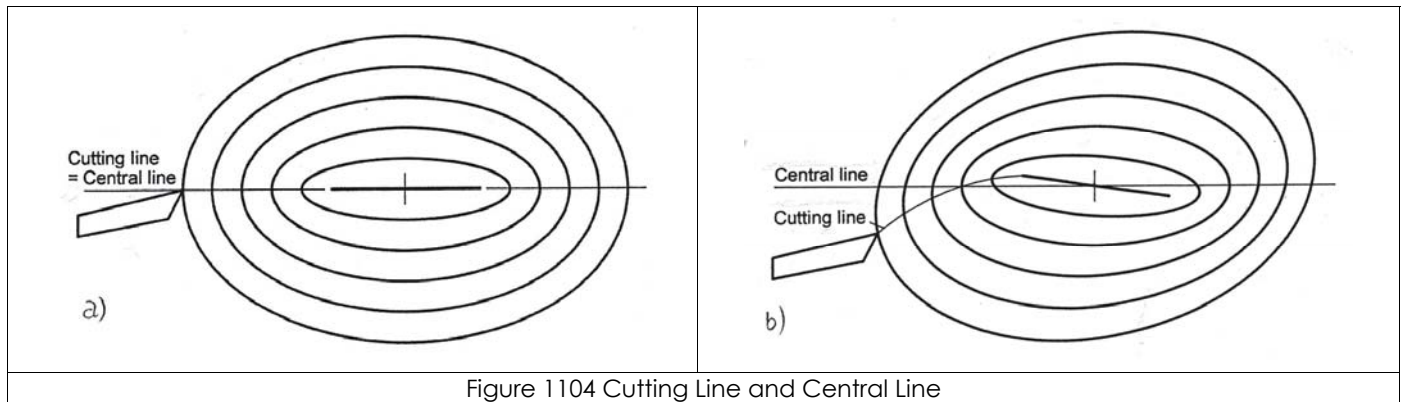


Figure 1104 Cutting Line and Central Line

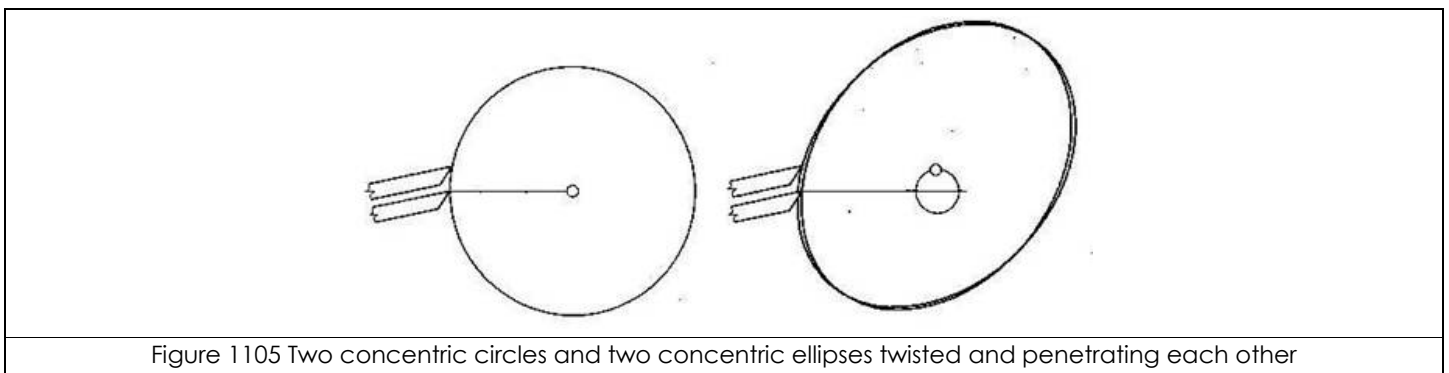


Figure 1105 Two concentric circles and two concentric ellipses twisted and penetrating each other