

SHAPES THAT MAY BE FORMED ON THE O.T. LATHE

The Ornamental Turning Lathe may be equipped with a wide range of accessories that allow the workpiece to be formed into different shapes and, by using two or more accessories in combination it is possible to superimpose one form upon another to produce compound shapes and complex patterns.

The following notes describe briefly the individual functions of most of the accessories that facilitate the formation of different shapes on the ornamental turning lathe:-

The Headstock allows the workpiece to be mounted horizontally and rotated around its centre.

The Division Plate and Index allows the work to be arrested at any angle so that cuts may be made with a rotating cutter at pre-determined positions on the work.

The Pumping Mandrel allows the work to be moved forward and backward in line with the axis of the lathe under the control of a screw-thread guide or a swash-plate or a rosette, so that a fixed or rotating cutter may cut a thread, a swash or a rose-pattern in relation to the cylinder.

The Rocking Headstock allows the work to be moved from side to side, transverse to the bed of the lathe under the control of a rosette, so that a fixed or rotating cutter may cut a rose pattern in relation to the surface. (see also **Pumping Mandrel** above)

The Segment Apparatus enables the headstock to be arrested at pre-determined points so that an arc may be cut on the work; for example a flute or a section of a key pattern.

The Ornamental Slide-rest allows cuts to be made at any radius from centre, at any angle from surface to cylinder and at any distance from the headstock within its range.

The Vertical Slide enables cuts to be made at quite large distances above or below the centre. Most slide-rests have a raising ring that enables adjustment of centre height but the range of adjustment on these is quite small.

The Curvilinear (or Copying) Apparatus controls the advance of the tool-slide of the Slide-rest by a template so that the path cut may follow the profile of the template

The Spherical Slide-rest allows the workpiece to be cut to a convex or concave form and to be ornamented along a convex or concave path.

The Spiral Spherical Slide-rest may be linked by a drive shaft to the spiral apparatus so that the rotation of the slide may be synchronised with the rotation of the mandrel to form a spiral spherical cut.

The Spiral Apparatus is a train of gears driven by the leadscrew of the Slide-rest to the mandrel of the headstock allowing the headstock rotation to be synchronised with rotation of the Slide-rest leadscrew, so that the cutter follows a helical path along and around a cylinder. **The Dividing Chuck** enables the position of the mandrel to be shifted in relation to the gear train thus allowing a series of helical cuts to be made.

The Face Spiral Apparatus links the Slide-rest leadscrew to the gear train by bevelled or round-edged gears or by universal joints, so that helical cuts may be made on the surface of the work or at any cone angle between surface and cylinder.

The Reciprocator is mounted on the mandrel and geared with the Spiral Apparatus so that, as the gear train is driven by the Slide-rest leadscrew, the eccentric part of the Reciprocator rotates, pushing its moving arm back and forth causing the headstock to make a partial rotation until the Reciprocator reaches maximum eccentricity, after which the rotation of the headstock is reversed until the Reciprocator reaches minimum eccentricity. As this movement is synchronised with the Slide-rest leadscrew, the cutter will follow a zig-zag path along a cylinder or, if used with the Face Spiral Apparatus, across a surface.

The Compound Reciprocator has, instead of a simple eccentric movement, an epicycloidal movement so that the zig-zag path has peaks of varying size and shape.

The Undulator is an alternative form of Reciprocator and operates in the same manner except that instead of a plain eccentric, the movement is governed by a rosette which causes the path of cut to become a complex zig-zag; where the shape of the rosette determines the varying amplitudes of the movement.

The Elliptical or Universal Slide-rest is a spherical slide-rest with the means of converting the spherical movement to an elliptical movement so that elliptical arcs may be cut at various angles in relation to the lathe axis.

The Rocking Slide-rest is pivoted on two bearings which allow it to be rocked forwards and backwards transverse to the bed of the lathe under the control of a rosette mounted on the mandrel, so that the cutter follows a rose-pattern in relation to the surface of the work.

The Geometric (or Sliding) Slide-rest is like an Ornamental Slide-rest with a spring in place of the leadscrew which allows it to slide forwards and backwards transverse to the bed of the lathe under the control of a cam or template geared to the mandrel rotation through the Spiral Apparatus, so that the cutter follows a rose-pattern in relation to the surface of the work.

The Medallion Slide-rest is linked by gears to twin mandrels rotating simultaneously; one mandrel holds a model and the other a blank work-piece. The Slide-rest has a tracer linked by a sprung bar to a cutter so that they are the same distance apart as the twin mandrels and may be set to trace and cut at centre height. This mechanism is moved horizontally by a fine-threaded leadscrew driven through a gear train that is also connected to the mandrels; thus the tracer follows a fine helical path over the model (like the track on a gramophone record, but starting in the centre and moving outwards) and the cutter follows a similar path across the work, cutting deeper or shallower according to the profile of the model, such that the profile of the model is reproduced on the work. Several passes may be necessary to take to full depth the copying of models with fine detail and/or steep changes in their profiles.

The Eccentric Chuck allows the workpiece to be positioned eccentric to its true centre so that cuts may be taken at various positions on the workpiece.

The Rectilinear Chuck is a large Eccentric Chuck in which the eccentric slide can be moved across the centre in both directions. It is not intended to be run at speed but is used primarily for fluting, moulding or grooving lines or cutting facets at all angles.

The Ellipse Chuck allows the work to follow an elliptical path so that it moves alternately towards then away from the cutter twice during every rotation of the mandrel. If the cutter is exactly on the centre line the line of cut will form an ellipse.

The Compensating Index is an eccentric mechanism that compensates for the difference between the equal division of a circle and that of an ellipse such that an ellipse may be divided equally using a circular division plate. This mechanism is used if the path of an ellipse is to be ornamented by equally spaced cuts.

The Dome Chuck allows the work to be mounted vertically and either raised or lowered above or below centre height or, to be rotated horizontally, so that the workpiece may be cut to spherical form, fluted spherically, formed into a polygon and ornamented on each vertical face. Some Dome Chucks are fitted with one or two oblique movements; rolling oblique and pitching oblique; the pitching oblique movement enables facets to be cut and ornamented at any angle (for example: faces of a pyramid) or cut at any tangent of a sphere; the rolling oblique movement enables the work to be swung towards or away from its normal position radial to the mandrel, thus making it possible to cut alternate flutes on a dome based on different centres.

The Oblique Chuck is usually mounted on the Rectilinear Chuck and allows the workpiece to be mounted at an oblique angle to the axis of rotation, in the same way as on the Oblique Dome Chuck.

The Rose Chuck is a substitute for a rocking headstock for rose-turning. It has horizontally opposed slides pushed by springs such that the workpiece may be oscillated from side to side under the control of a rosette and rubber.

The Geometric Chuck Each stage of the Geometric Chuck allows the work to follow an epicycloidal path, so that, as the chuck rotates, a cutter in fixed position will cut a looped pattern on the work. The addition of a second and subsequent stages to the Geometric Chuck causes a second and subsequent epicycloidal movements to be imposed upon the first. It is possible to add a further stage by linking the movement of an Epicycloidal Cutting Frame to a Geometric Chuck through the Spiral Apparatus,

The Vertical Cutting Frame allows a cutter to be rotated vertically, making a vertical concave plunge cut having the same profile as the cutter used, or a continuous swathe or fluting cut having the profile of the radius of the cutter used.

The Horizontal Cutting Frame allows a cutter to be rotated horizontally, making a horizontal concave plunge cut or a continuous swathe around the surface having the profile of the radius of the cutter used or, a fluting cut having the same profile as the cutter used.

The Universal Cutting Frame allows a cutter to be rotated vertically, horizontally or at any angle in between and fulfils all the functions of the Vertical and Horizontal Cutting Frames. Some Universal Cutting Frames are fitted with a height adjustment slide so that cuts may be made above or below centre.

The Internal Cutting Frames allow a cutter to be rotated vertically, axially or horizontally according to type, thus cutting inside a bored hole: a facet, a concave flute or a flute having the profile of the cutter used.

The Internal Vertical Cutting Frame planes a face inside a bored cylinder so that, by indexing the headstock to various angles the cutter may be used to form internal polygons.

The Drilling or Routing Spindle allow a drill or routing cutter to be rotated axially, to drill a hole or a flute having the profile of the drill or router cutter used.

The Eccentric Cutting Frame allows a cutter to be set centrally, for drilling or, eccentrically within its range of adjustment and rotated axially for making circular cuts upon the surface in any positions determined by the Dividing Index and the radius of the Slide-rest or, on the cylinder at any distance from the headstock determined by the Slide-rest when positioned parallel to the lathe bed.

The Ellipse Cutting Frame allows a cutter to be rotated axially but following an elliptical path thus making an elliptical cut upon the surface or upon the cylinder. Some Ellipse Cutting Frames have a pair of change-wheels to enable the cutting of four looped patterns.

The Epicycloidal Cutting Frame allows a cutter to follow an epicycloidal path (a circular path rolling around a base circle) over the surface. The number of rolling circles or loops in the pattern is determined by the ratio of change-wheels selected for the gear-train and the direction of rotation determines whether the loops are formed inward or outward of the base circle.

The Rose Cutting Frame has a mobile head that oscillates from side to side as it rotates under the control of a rosette and rubber, causing the cutter to follow a rose-pattern over the surface.

The Segment Cutting Frame enables an arc to be cut anywhere on a work-piece and not necessarily concentric or axial with the mandrel.

The Compound Segment Cutting Frame enables two sizes of arc to be cut at a single setting.