WORK HOLDING DEVICES USED IN LATHE MACHINE

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The work holding devices are used to hold and rotate the workpieces along with the spindle. Different work holding devices are used according to the shape, length, diameter and weight of the workpiece and the location of turning on the work. They are:

- Chucks
- Face plate
- Driving plate
- Catchplate
- Carriers
- Mandrels
- Centres
- Rests

### Chucks

Workpieces of short length, large diameter and irregular shapes, which can not be mounted between centres, are held quickly and rigidly in chuck. There are different types of chucks namely, Three jaw universal chuck, Four jaw independent chuck, Magnetic chuck, Collet chuck and Combination chuck.

### Three Jaw self-centering chuck

The three jaws fitted in the three slots may be made to slide at the same time by an equal amount by rotating any one of the three pinions by a chuck key. This type of chuck is suitable for holding and rotating regular shaped workpieces like round or hexagonal rods about the axis of the lathe. Workpieces of irregular shapes cannot be held by this chuck.
The work is held quickly and easily as the three jaws move at the same time.

**Four Jaw Independent Chuck**

There are four jaws in this chuck. Each jaw is moved independently by rotating a screw with the help of a chuck key. A particular jaw may be moved according to the shape of the work. Hence this type of chuck can hold works of irregular shapes. But it requires more time to set the work aligned with the lathe axis. Experienced turners can set the work about the axis quickly. Concentric circles are inscribed on the face of the chuck to enable quick centering of the workpiece.

![Four Jaw Chuck Diagram](image)

**Magnetic Chuck**

The holding power of this chuck is obtained by the magnetic flux radiating from the electromagnet placed inside the chuck. Magnets are adjusted inside the chuck to hold or release the work. Workpieces made of magnetic material only are held in this chuck. Very small, thin and light works which cannot be held in a ordinary chuck are held in this chuck.
**Collet Chuck**

Collet chuck has a cylindrical bushing known as collet. It is made of spring steel and has slots cut lengthwise on its circumference. So, it holds the work with more grip. Collet chucks are used in capstan lathes and automatic lathes for holding bar stock in production work.
Faceplate

Faceplate is used to hold large, heavy and irregular shaped workpieces which can not be conveniently held between centres. It is a circular disc bored out and threaded to fit to the nose of the lathe spindle. It is provided with radial plain and ‘T’ - slots for holding the work by bolts and clamps.

Face Plate

Driving Plate

The driving plate is used to drive a workpiece when it is held between centres. It is a circular disc screwed to the nose of the lathe spindle. It is provided with small bolts or pins on its face. Workpieces fitted inside straight tail carriers are held and rotated by driving plates.
Driving Plate

Catch Plate

When a workpiece is held between centres, the catch plate is used to drive it. It is a circular disc bored and threaded at the centre. Catch plates are designed with ‘U’ – slots or elliptical slots to receive the bent tail of the carrier. Positive drive between the lathe spindle and the workpiece is effected when the workpiece fitted with the carrier fits into the slot of the catch plate.
When a workpiece is held and machined between centres, carriers are useful in transmitting the driving force of the spindle to the work by means of driving plates and catch plates. The work is held inside the eye of the carrier and tightened by a screw. Carriers are of two types and they are:

1. Straight tail carrier
2. Bent tail carrier

Straight tail carrier is used to drive the work by means of the pin provided in the driving plate. The tail of the bent tail carrier fits into the slot of the catch plate to drive the work.
A previously drilled or bored workpiece is held on a mandrel to be driven in a lathe and machined. There are centre holes provided on both faces of the mandrel. The live centre and the dead centre fit into the centre holes. A carrier is attached at the left side of the mandrel. The mandrel gets the drive either through a catch plate or a driving plate. The workpiece rotates along with the mandrel. There are several types of mandrels and they are:

1. Plain mandrel
2. Collar mandrel
3. Step mandrel
4. Cone mandrel
5. Gang mandrel
6. Expansion mandrel

**Plain mandrel**

The body of the plain mandrel is slightly tapered to provide proper gripping of the workpiece. The taper will be around 1 to 2mm for a length of 100mm. It is also known as solid mandrel. It is the type
mostly commonly used and has wide application.

**Plain Mandrel**

**Gang Mandrel**

It has a fixed collar at one end and a movable collar at the threaded end. This mandrel is used to hold a set of hollow workpieces between the two collars by tightening the nut.

**Screwed Mandrel**

It is threaded at one end and a collar is attached to it. Workpieces having internal threads are screwed on to it against the collar for machining.
Cone Mandrel

It consists of a solid cone attached to one end of the body and a sliding cone, which can be adjusted by turning a nut at the threaded end. This type is suitable for driving workpieces having different hole diameters.
Centres

Centres are useful in holding the work in a lathe between centres. The shank of a centre has Morse taper on it and the face is conical in shape. There are two types of centres namely

- Live centre
- Dead centre

The live centre is fitted on the headstock spindle and rotates with the work. The centre fitted on the tailstock spindle is called dead centre. It is useful in supporting the other end of the work. Centres are made of high carbon steel and hardened and then tempered. So the tip of the centres are wear resistant. Different types of centres are available according to the shape of the work and the operation to be performed. They are

1. Ordinary centre
2. Half centre
3. Tipped centre
4. Pipe centre
5. Revolving centre
6. Inserted type centre
7. Ball centre
Holding a work between centres

**Rests**

A rest is a mechanical device to support a long slender workpiece when it is turned between centres or by a chuck. It is placed at some intermediate point to prevent the workpiece from bending due to its own weight and vibrations setup due to the cutting force. There are two different types of rests

- Follower rest
- Steady rest

**Steady rest**

Steady rest is made of cast iron. It may be made to slide on the lathe bedways and clamped at any desired position where the workpiece needs support. It has three jaws. These jaws can be adjusted according to the diameter of the work. Machining is done upon the distance starting from the headstock to the point of support of the rest. One or more steady rests may be used to support the free end of a long work.
Follower rest

It consists of a ‘C’ like casting having two adjustable jaws to support the workpiece. The rest is bolted to the back end of the carriage. During machining, it supports the work and moves with the carriage.
So, it follows the tool to give continuous support to the work to be able to machine along the entire length of the work.

In order to reduce friction between the work and the jaws, proper lubricant should be used.
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