Experiment No. 1

UNIVERSITY OF ENGINEERING & MANAGEMENT

WORKSHOP PRACTICE -111

MACHINE SHOP

MACHINE SHOP

A machine tool is a powered mechanical device, typically used to fabricate metal components of machines by machining, which is the selective removal of metal. The term machine tool is usually reserved for tools that used a power source other than human movement, but they can be powered by people if appropriately set up.

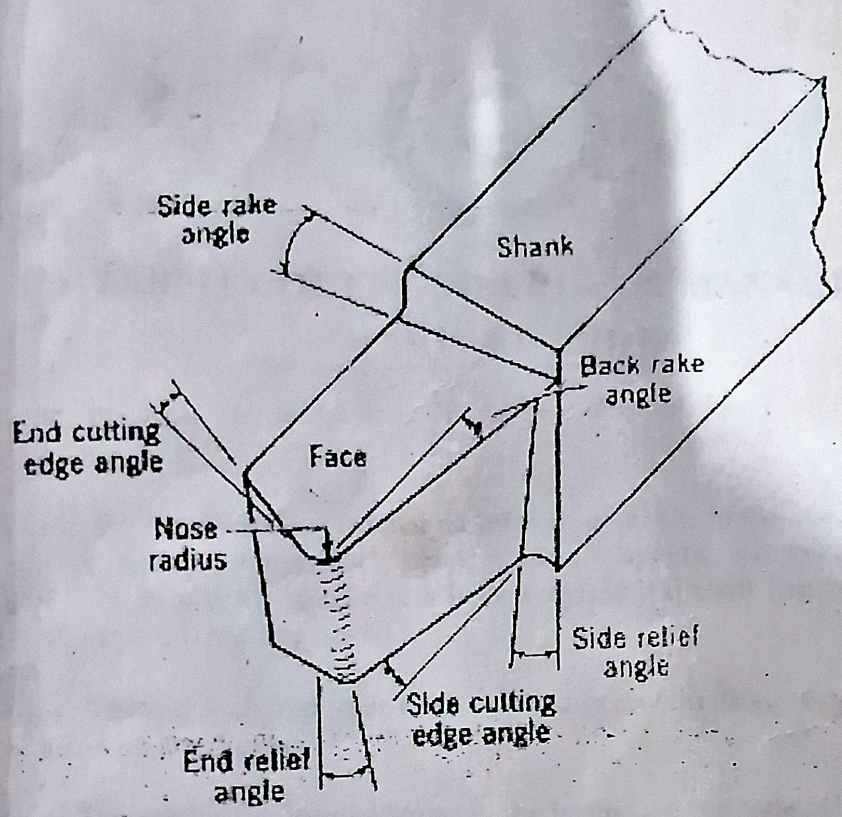
Conventional machining, one of the most important material removal methods, is a collection of material-working processes in which power-driven machine tools, such as lathes, milling machines, and drill presses, are used with a sharp cutting tool to mechanically cut the material to achieve the desired geometry. Machining is a part of the manufacture of almost all metal products, and it is common for other materials, such as wood and plastic, to be machined. A person who specializes in machining is called a machinist. A room, building, or company where machining is done is called a machine shop.

MACHINE - A device which is used to transform the shape of any material as per requirement by some leverage mechanism but can not do so without any tool.

TOOL - A device which is also used to transform the shape of any material but it can do so without any machine like hammer, Screw driver, and file and saw etc. Tool can work without Machine but machine can not work without tool.

A tool is a device that makes work easier, IE: Hammer, screwdriver, pry bar, etc. A machine has two or more moving parts. IE: Nail Gun, Kitchen Blender, Automobile A machine is still a tool, but all tools are not machines.

A machine tool is a common name for machine equipment such as lathes and milling machines.



Single point cutting tool

LATHE MACHINE

Working Principle: The lathe is a machine tool which holds the workpiece between two rigid and strong supports called centers or in a chuck or face plate which revolves. The cutting tool is rigidly held and supported in a tool post which is fed against the revolving work. The normal cutting operations are performed with the cutting tool fed either parallel or at right angles to the axis of the work.

The cutting tool may also be fed at an angle relative to the axis of work for machining tapers and angles.

2. **Legs**: The legs carry the entire load of machine and are firmly secured to floor by foundation bolts.

3. **Headstock**: The headstock is clamped on the left hand side of the bed and it serves as housing for the driving pulleys, back gears, headstock spindle, live centre and the feed reverse gear. The headstock spindle is a hollow cylindrical shaft that provides a drive from the motor to work holding devices.

4. **Gear Box**: The quick-change gear-box is placed below the headstock and contains a number of different sized gears.

5. **Carriage**: The carriage is located between the headstock and tailstock and serves the purpose of supporting, guiding and feeding the tool against the job during operation. The main parts of carriage are:

a). **The saddle** is an H-shaped casting mounted on the top of lathe ways. It provides support to cross-slide. compound rest and tool post.

b). **the cross slide** is mounted on the top of saddle, and it provides a mounted or automatic cross movement for the cutting tool.

c). **The compound rest** is fitted on the top of cross slide and is used to support the tool post and the cutting tool.

d). **The tool post** is mounted on the compound rest, and it rigidly clamps the cutting tool or tool holder at the proper height relative to the work centre line.

e). **The apron** is fastened to the saddle and it houses the gears, clutches and levers required to move the carriage or cross slide. The engagement of split nut lever and the automatic feed lever at the same time is prevented she carriage along the lathe bed.

6. **Tailstock**: The tailstock is a movable casting located opposite the headstock on the ways of the bed. The tailstock can slide along the bed to accommodate different lengths of workpiece between the centers. A tailstock clamp is provided to lock the tailstock at any desired position. The tailstock spindle has an internal taper to hold the dead centre and the tapered shank tools such as reamers and drills.

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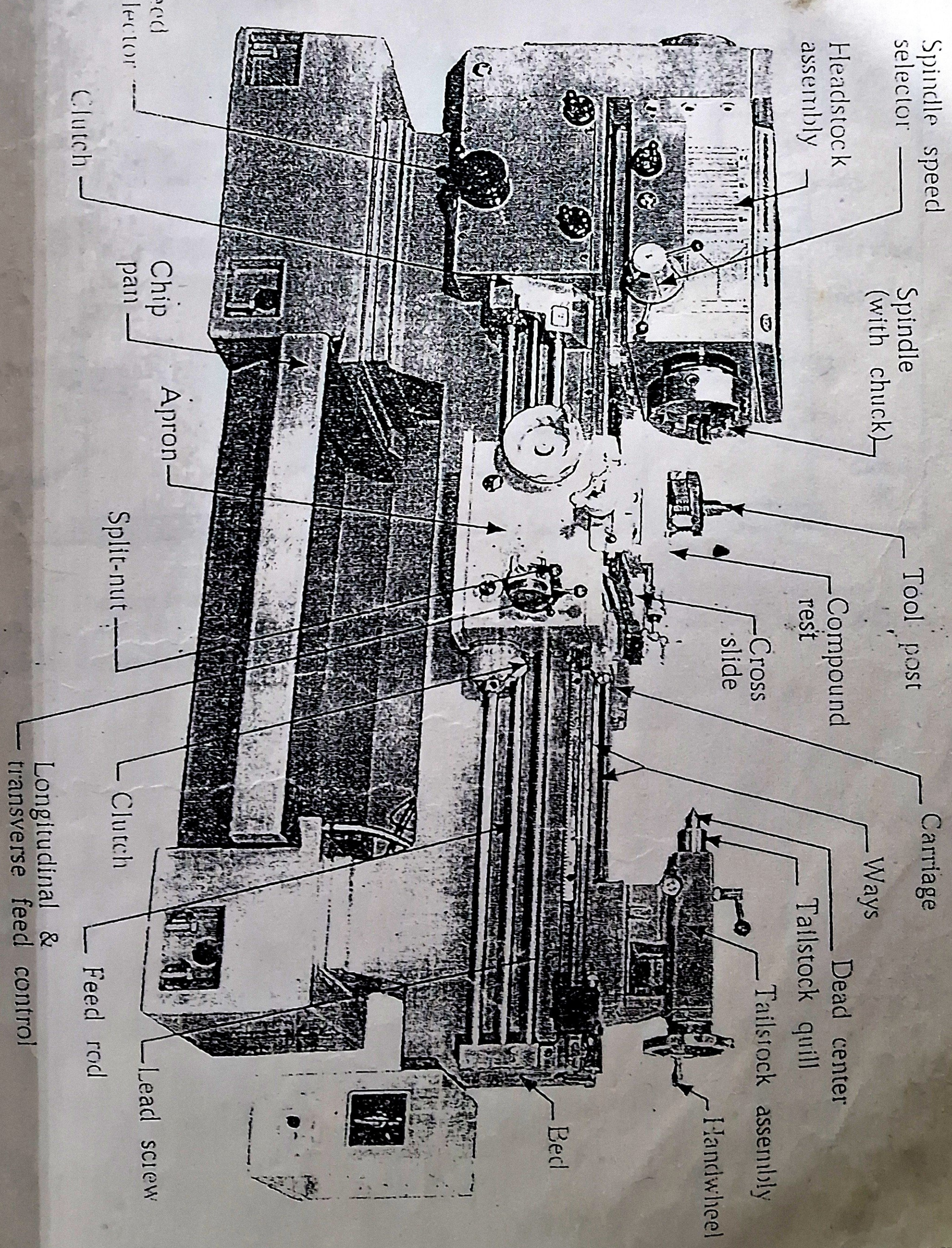
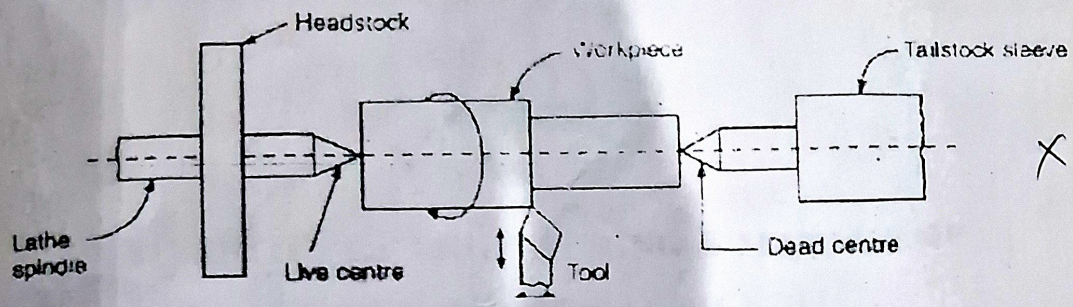
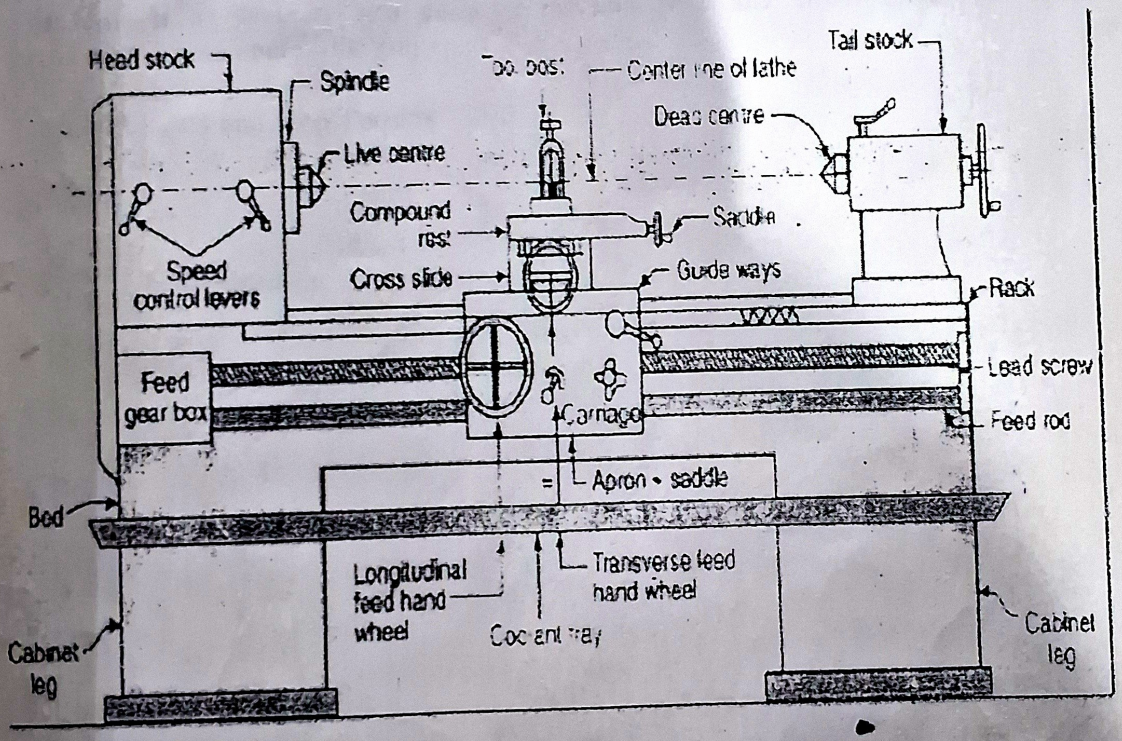




Construction: The main parts of the lathe are the bed, headstock, quick changing gear box, carriage and tailstock.



1. **Bed:** The bed is a heavy, rugged casting in which are mounted the working parts of the lathe. It carries the headstock and tail stock for supporting the workpiece and provides a base for the movement of carriage assembly which carries the tool.

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WORKSHOP PRACTICE - III
MACHINE SHOP

LATHE OPERATIONS

The lathe is an accurate and versatile machine on which many operations can be performed. These operations are:

1. Plain Turning and Step Turning
2. Facing
3. Parting
4. Drilling
5. Reaming
6. Boring
7. Knurling
8. Grooving
9. Threading
10. Forming

Some important operations are explain below

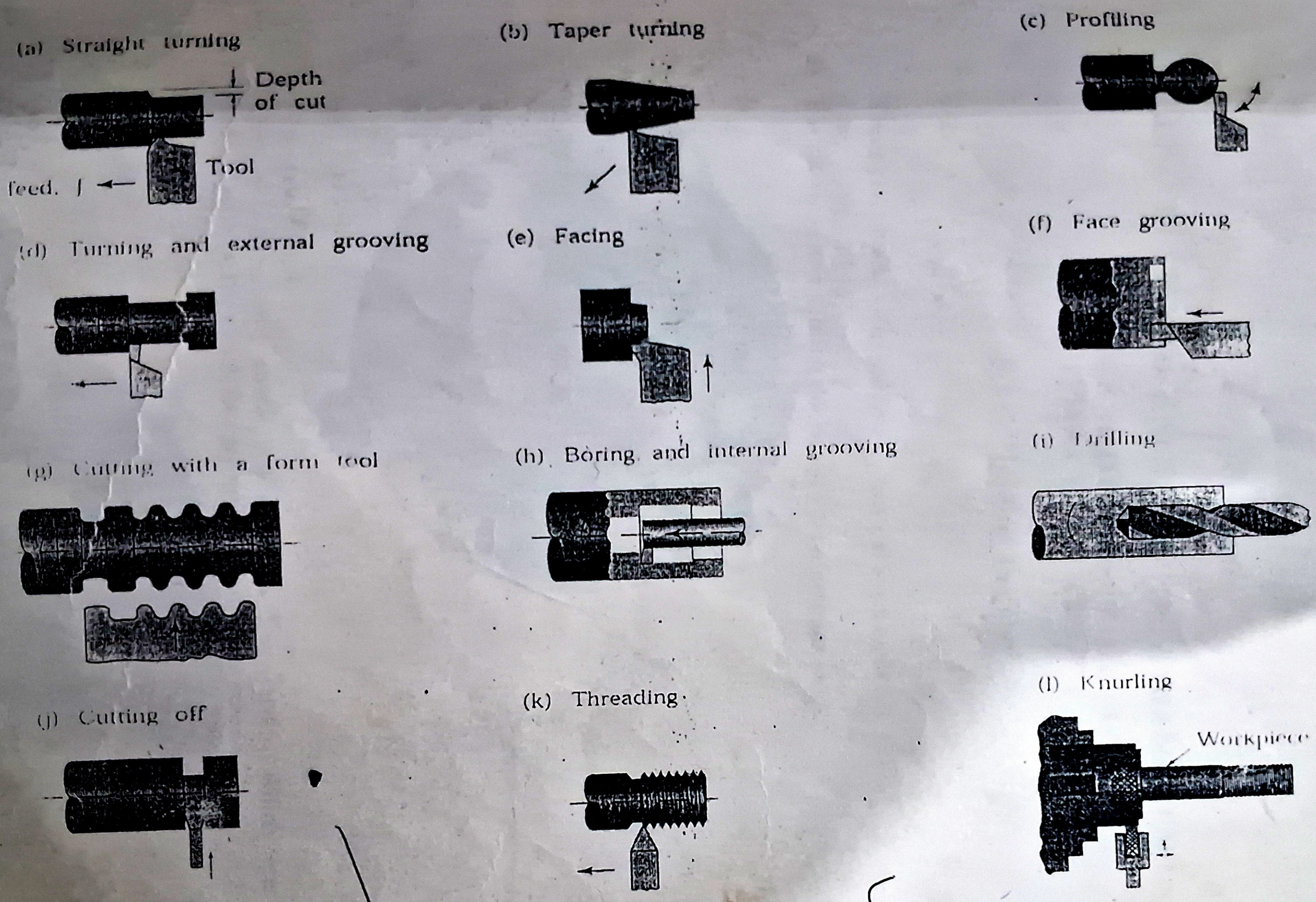
Turning: produce straight, conical, curved, or grooved workpiece

Facing: to produce a flat surface at the end of the part or for making face grooves.

Boring: to enlarge a hole or cylindrical cavity made by a previous process or to produce circular internal grooves.

Drilling: to produce a hole by fixing a drill in the tailstock

Threading: to produce external or internal threads



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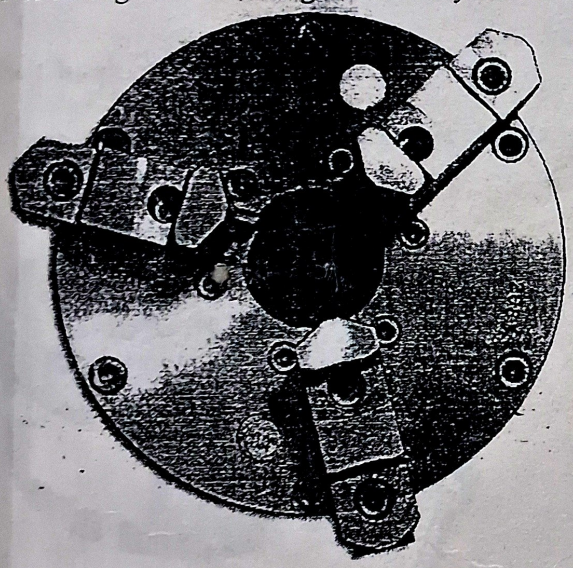
MACHINE SHOP

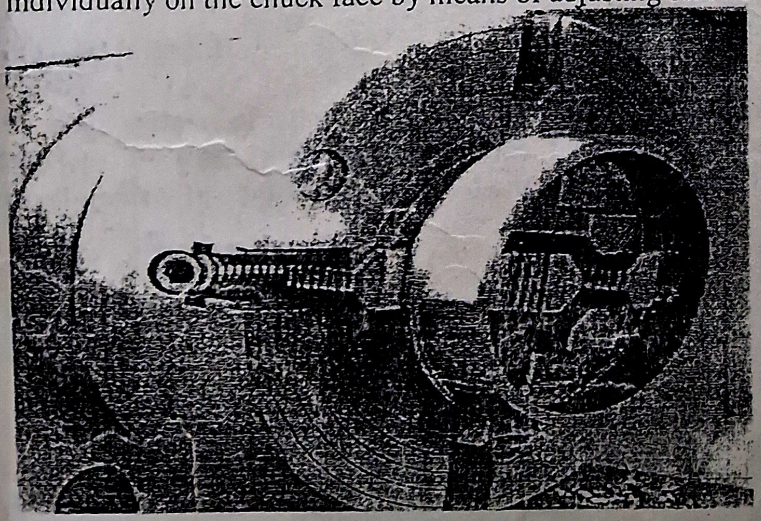
Work Holding Devices

Three jaw chuck: - For holding cylindrical stock centered.

- For facing/center drilling the end of your aluminum stock



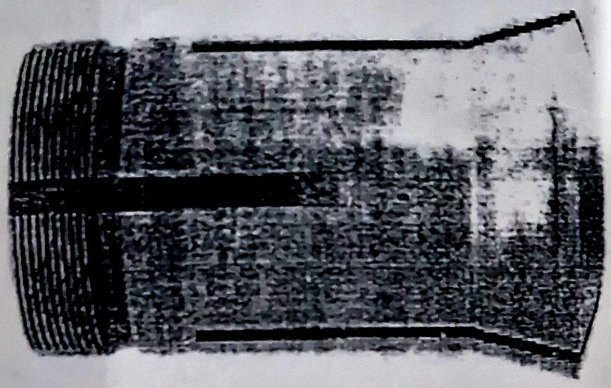
- Four-Jaw Chuck
- This is independent chuck generally has four jaws , which are adjusted individually on the chuck face by means of adjusting screws



MACHINE SHOP

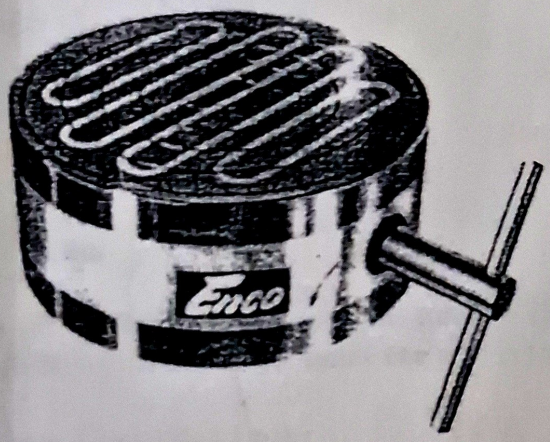
Collet Chuck

Collet chuck is used to hold small workpiece



Magnetic Chuck

Thin jobs can be held by means of magnetic chucks.



Types of metal lathes

There are many variants of lathes within the metalworking field. Some variations are not all that obvious, and others are more a niche area. For example, a centering lathe is a dual head machine where the work remains fixed and the heads move towards the workpiece

and machine a center drill hole into each end. The resulting workpiece may then be used "between centers" in another operation. The usage of the term metal lathe may also be considered somewhat outdated these days, plastics and other composite materials are in wide use and with appropriate modifications, the same principles and techniques may be applied to their machining as that used for metal.

Engine Lathe

The most common form of lathe, motor driven and comes in large variety of sizes and shapes.

Bench Lathe

A bench top model usually of low power used to make precision machine small work pieces.

Tracer Lathe

A lathe that has the ability to follow a template to copy a shape or contour

Automatic Lathe

A lathe in which the work piece is automatically fed and removed without use of an operator. Cutting operations are automatically controlled by a

Sequencer of some form

Turret Lathe

Lathes which have multiple tools mounted on turret either attached to the tailstock or the cross-slide, which allows for quick changes in tooling and cutting operations.

Computer Controlled Lathe

A highly automated lathe, where both cutting, loading, tool changing, and part unloading are automatically controlled by computer coding.

MACHINE SHOP

2. Sensitive drill machine/press: This is a light weight, high speed machine designed for drilling small holes in light jobs. Generally the machine has the capacity to rotate drills of 1.5 to 15.5 mm at high speed of 20,000 rev/min.

Construction: The machine has only a hand feed mechanism for feeding the tool into the workpiece. This enables the operator to feel how the drill is cutting and accordingly he can control the down feed pressure. Sensitive drill presses are manufactured in bench or floor models, *i.e.*, the base of machine may be mounted on a bench or floor.

The main operating parts of a sensitive machine/drill press are Base, Column, Table, and Drill Head.

1. **Base**: The base is a heavy casting that supports the machine structure; it provides rigid mounting for the column and stability for the machine. The base is usually provided with holes and slots which help to Bolt the base to a table or bench and allow the work-holding device or the workpiece to be fastened to the base.

2. **Column**: The column is a vertical post that Column holds the worktable and the head containing the driving mechanism. The column may be of round or box section.

3. **Table**: The table, either rectangular or round. Drill machine/press in shape supports the workpiece and is carried by the vertical column. The surface of the table is 90-degree to the column and it can be raised, lowered and swiveled around it. The table can be clamp/hold the required the workpiece. Slots are provided in most tables to allow the jigs, fixtures or large workpiece to be securely fixed directly to the table.

4. **Drilling Head**: The drilling head, mounted close to the top of the column, houses the driving arrangement and variable speed pulleys. These units transmit rotary motion at different speeds to the drill spindle. The hand feed lever is used to control the vertical movement of the spindle sleeve and the cutting tool.

The system is called the sensitive drilling machine/press as the operator is able to sense the progress of drill with hand-faced.

Book:

- work shop Technology by Hajra choudry
- Advances in Manufacturing Technology C.J Thomas

Base. The base is a heavy cast iron casting which is fixed to the shop floor. It supports the body frame and the entire load of the machine. The base absorbs and withstands vibrations and other forces which are likely to be induced during the shaping operations.

Body (Pillar, Frame, and Column): It is mounted on the base and houses the drive mechanism compressing the main drives, the gear box and the quick return mechanism for the ram movement. The top of the body provides guide ways for the ram and its front provides the guide ways for the cross rail.

Cross rail: The cross rail is mounted on the front of the body frame and can be moved up and down. The vertical movement of the cross rail permits jobs of different heights to be accommodated below the tool. Sliding along the cross rail is a saddle which carries the work table.

Ram and tool head: The ram is driven back and forth in its slides by the slotted link mechanism. The back and forth movement of ram is called stroke and it can be adjusted according to the length of the workpiece to be-machined.