

CUTTING TOOL AND CUTTING MATERIALS

- THE TOOL WHICH IS USED FOR THE PURPOSE OF CUTTING THE METALS IN THE DESIRED SHAPE AND SIZE IS CALLED CUTTING TOOL.
- THE MATERIALS WHICH IS USED TO MADE CUTTING TOOL IS KNOWN AS CUTTING TOOL MATERIALS.

CUTTING TOOL

Content

- 1) What is Cutting Tool ?
- 2) Types of Cutting Tool ?
- 3) Types of Cutting Tool Materials ?
- 4) What are Reason of Cutting Tool Failure ?
- 5) Advantages of Cutting Tool ?
- 6) Cutting Tool Parts ?
- 7) Important Angles of Cutting Tool



DEFINATION

What is Cutting Tool ?

A cutting tool is any tool that is used to remove material from the workpiece by means of shear deformation. Cutting may be accomplished by single-point or multipoint tools.

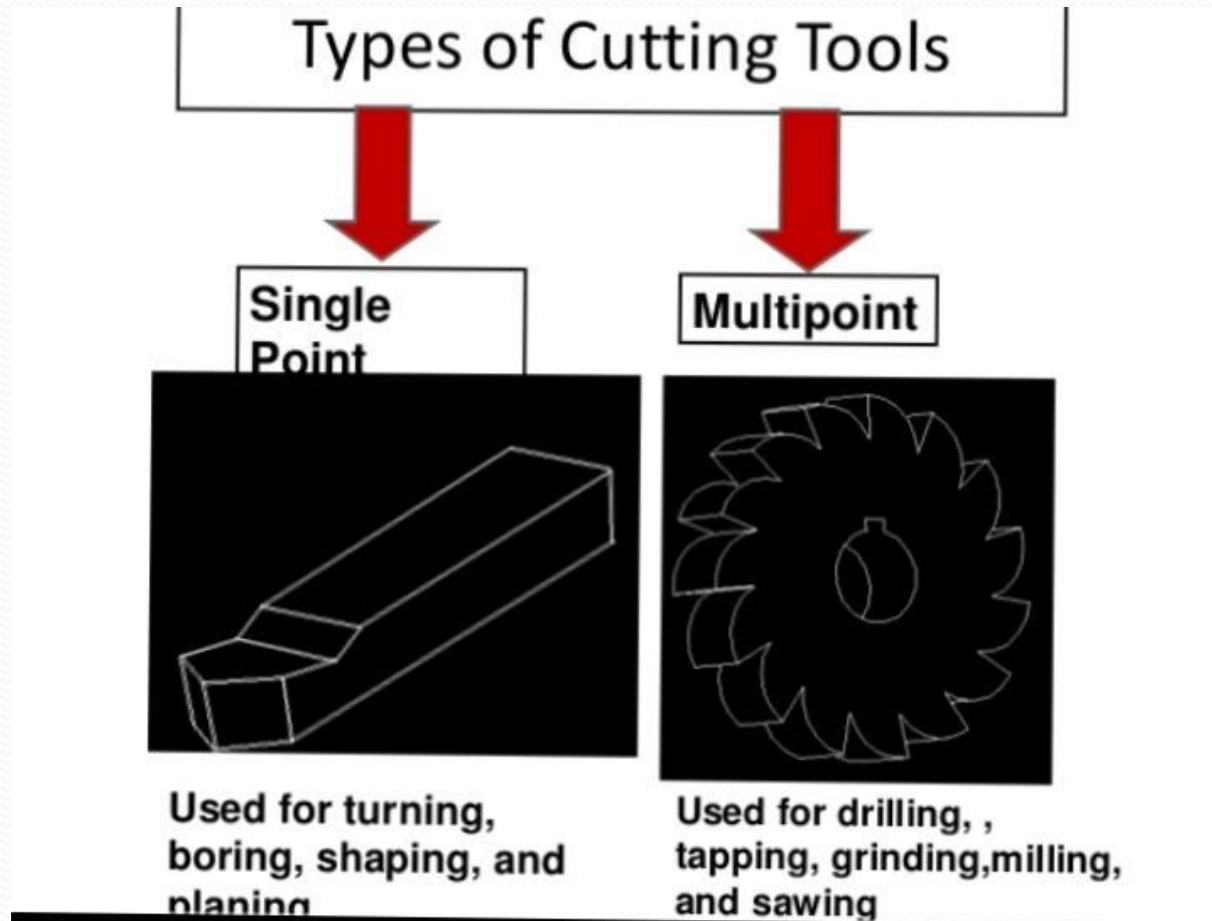


Rotary Broaches



Lathe Tools

TYPES OF CUTTING TOOL



TYPES OF TOOL MATERIALS



Types of Cutting Tool Materials

The selection Of proper tool material depend on surface to which tool will be subjected no material is superior in all respects but rather each has a certain characterstics which limit its field of application

- 1) High-speed steel
- 2) Cast alloys
- 3) Cemented carbides
- 4) Ceramics
- 6) Cubic Boron Nitride
- 7) Polycrystalline



TOOL FAILURE CAUSE

What are Reason of Cutting Tool Failure ?

1) Fracture failure

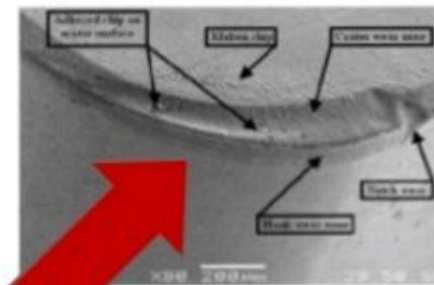
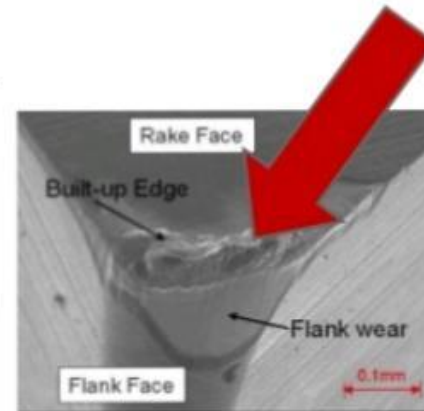
Cutting force becomes excessive and/or dynamic, leading to fracture

2) Temperature failure

Cutting temperature is too high for the tool material

3) Gradual wear

Gradual wearing of the cutting tool



ADVANTAGE

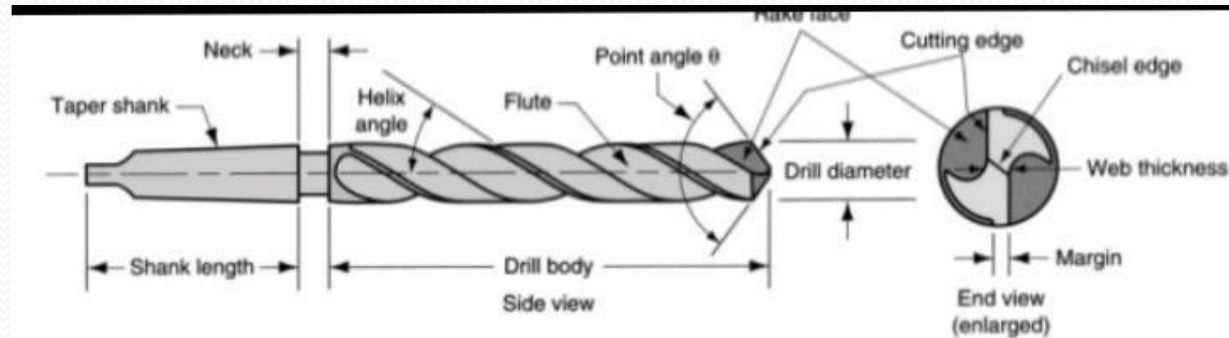


Advantages of Cutting Tool

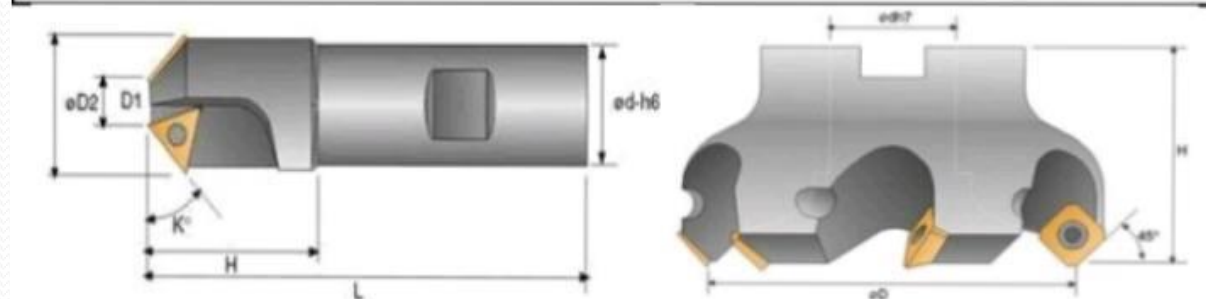
- 1) High hardness
- 2) Resistance to abrasion
- 3) High toughness/impact strength
- 4) High hardness at high temperatures
- 5) High elasticity properties
- 6) Proper geometry and surface finish



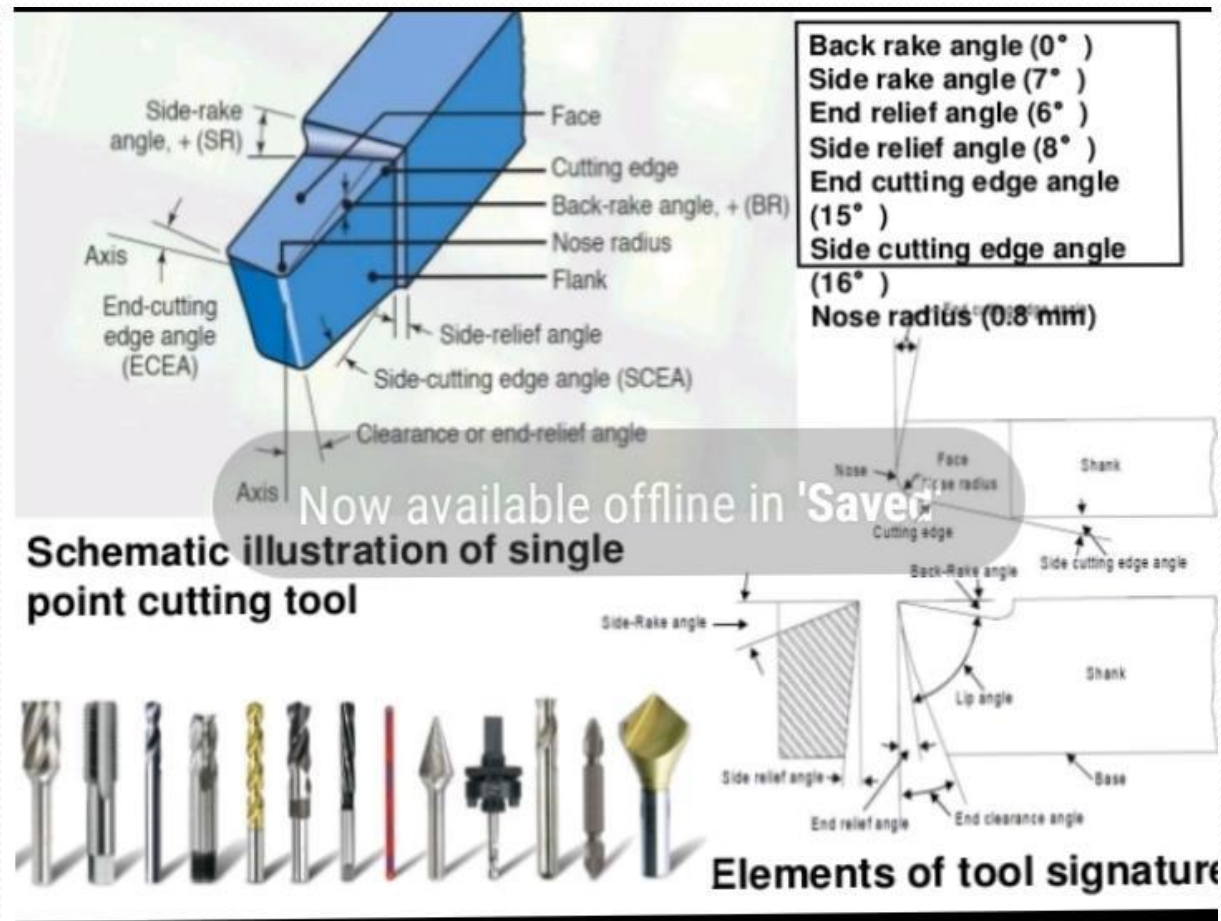
TOOL GEOMETRY



Geometry of Cutting Tools



TOOL SIGNATURE



CUTTING TOOL PARTS

Cutting Tool Parts

Shank: It is main body of tool.

Flank: surface/ surfaces below & adjacent to cutting edge is flank of tool.

Face: Surface on which chip slides is called face of tool.

Nose: It is formed at junction of side & end cutting edges. This junction/ nose has a curve of small radius, know as nose radius.

Cutting Edge: It is the edge on the face of the tool which removes the material from the work piece. The cutting edge consists of the side cutting edge(major cutting edge) and cutting edge(minor cutting edge) and the nose.

ANGLES OF CUTTING TOOL

Important Angles of Cutting Tool

1. Side Cutting Edge Angle:

The angle between side cutting edge and the side of the tool shank is called side cutting edge angle.

2. End Cutting Edge Angle:

The angle between the end cutting edge and a line perpendicular to the shank of the tool shank is called end cutting edge angle.

3. Side Relief Angle:

The angle between the portion of the side flank immediately below the side cutting edge and a line perpendicular to the base of the tool.

4. End Relief Angle:

The angle between the end flank and the line perpendicular to the base of the tool is called end relief angle.

5. Back Rake Angle:

The angle between the face of the tool and line perpendicular to the base of the tool measures on perpendicular plane through the side cutting edge.

6. Side Rake Angle:

The angle between the face of the tool and a line parallel to the base of the tool measured on plane perpendicular to the base and the side edge.

LATHE MACHINE

- **A LATHE MACHINE IS A MACHINE TOOL WHICH IS USED TO REMOVE METAL FROM WORKPIECE AND TO CHANGE IT INTO DESIRED SHAP AND SIZE .IT IS ALSO CALLED MOTHER OF MACHINE.**

LATHE DIAGRAM



PARTS OF LATHE

MAIN PARTS

Lathe Machine is also known as “**Centre Lathe**”, because it has two centres between which the job can be held and rotated.

The main parts of centre lathe are:

- Bed,
- Head stock,
- Tail stock,
- Carriage, etc

TYPES OF CHUCK

TYPES OF CHUCK



**Three jaw
chuck**

- For holding cylindrical stock centered.
- For facing/center drilling, etc.



**Four-Jaw
Chuck**

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

TYPES OF LATHES

TYPES OF LATHES

➤ Engine Lathe or center lathe

- It is most common type of lathe and is widely used in workshop.
- The speed of the spindle can be widely varied as desired which is not possible in a speed lathe.

➤ Bench Lathe

- Small lathe which can mounted on the work bench
- It is used to make small precision and light jobs.

➤ Speed lathe

- It is named because of the very high speed of the head stock spindle.
- Consists head stock, a tail stock and tool post. it has no gear box.
- Applicable in wood turning, metal spinning and operations.

SPEED LATHE



ENGINE LATHE



TOOL ROOM LATHE



TURRET LATHE



LATHE OPERATIONS

LATHE OPERATIONS

- **Turning:** to remove material from the outside diameter of a workpiece to obtain a finished surface.
- **Facing:** to produce a flat surface at the end of the workpiece 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 on the work piece.
- **Reaming:** to finishing the drilled hole.
- **Threading:** to produce external or internal threads on the work piece.
- **Knurling:** to produce a regularly shaped roughness on the workpiece.

CALCULATION

Machining Calculations: Turning

- Spindle Speed - N
• v = cutting speed
• D_o = outer diameter
$$N = \frac{v}{\pi D_o}$$

(rpm)
- Feed Rate - f_r
in/min)
• f = feed per rev
$$f_r = N f$$

(mm/min -or- in/min)
- Depth of Cut - d
in/rev)
• D_o = outer diameter
• D_f = final diameter
$$d = \frac{D_o - D_f}{2}$$

(mm/rev -or- in/rev)
- Machining Time - T_m
• L = length of cut
$$T_m = \frac{L}{f_r}$$

(min)
- Mat'l Removal Rate - MRR
$$MRR = v f_r d$$

(mm³/min -or- in³/min)

DRILLING MACHINE

DRILLING
MACHINE



CONTENT

Content

- Introduction
- Working Principle
- Construction
- Specification For Portable Drilling Machine
- Types Of Drilling Machine
- Operation Of Drilling Machine



DRILLING MACHINE

Drilling Machine...

Drilling is the operation of producing circular hole in the work-piece by using a rotating cutter called DRILL.

The **machine** used for **drilling** is called **drilling machine**.

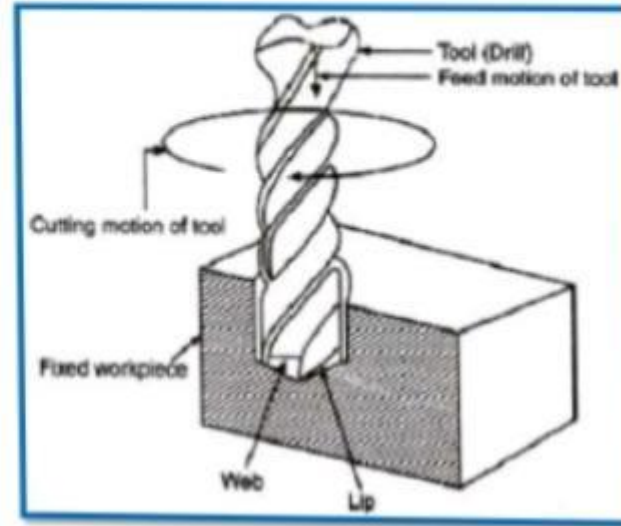
The **drilling** operation can also be accomplished in lathe, in which the drill is held in tailstock and the work is held by the chuck
Drilling Machine

It is the simplest and accurate **machine** used in production shop.

WORKING PRINCIPLE

WORKING PRINCIPLE

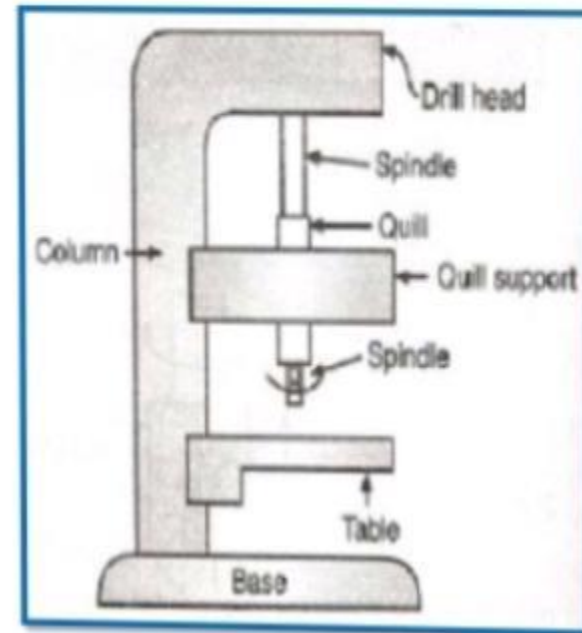
- ▶ The rotating edge of the drill exerts a large force on the work piece and the hole is generated. The removal of metal in a drilling operation is by shearing and extrusion.
- ▶ Use:- Drilling machine is used to drill blind and through holes in work pieces.



CONSTRUCTION

CONSTRUCTION

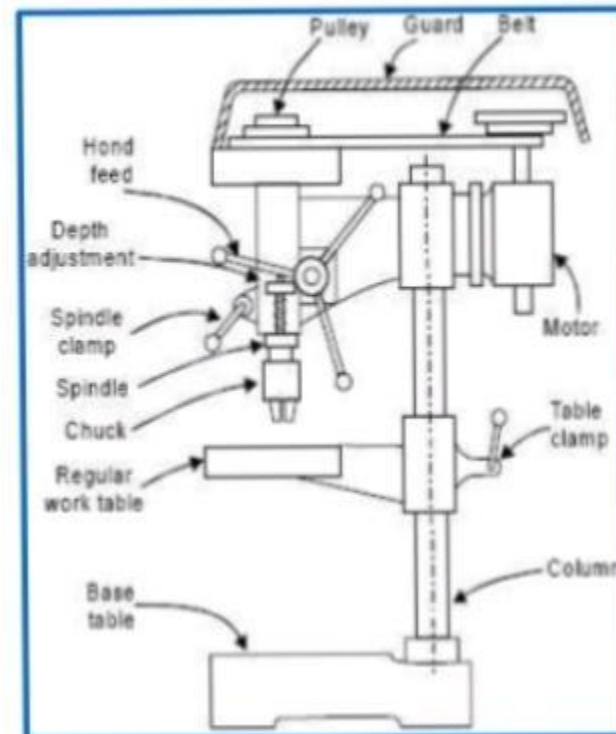
- ▶ The machine has only a hand feed mechanism for feeding the tool into the work piece.
- ▶ This enables the operator to feel how the drill is cutting and accordingly he can control the down feed pressure.
- ▶ Sensitive drill presses are manufactured in bench or floor models, *i.e.*, the base of machine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



TYPES OF DRILL MACHINE

TYPES OF DRILLING MACHINE

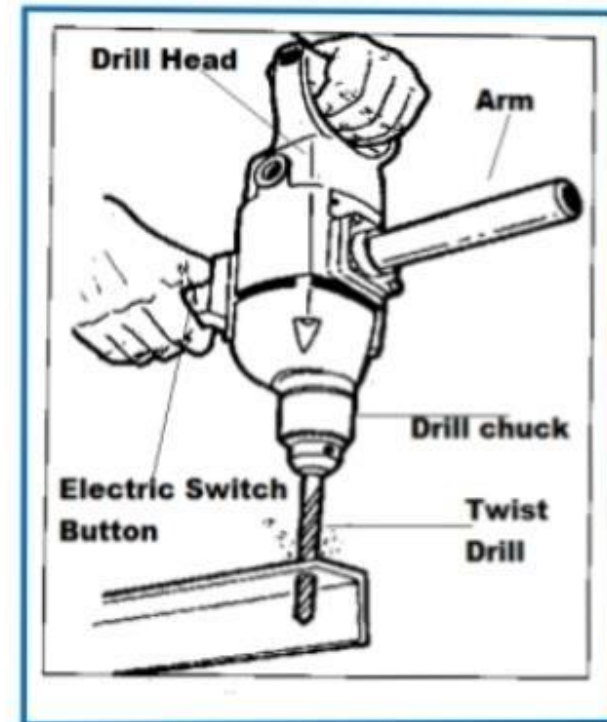
- Portable Drilling Machine
- Sensitive or Bench Drill
- Upright Drilling Machine(Single Spindle)
- Upright Drilling Machine(Turret Type)
- Radial Drilling Machine
- Multiple Spindle Drilling Machine
- Deep Hole Drilling Machine
- Gang Drilling Machine
- Horizontal Drilling Machine
- Automatic Drilling Machine



PORTABLE DRILL

PORTABLE DRILLING MACHINE

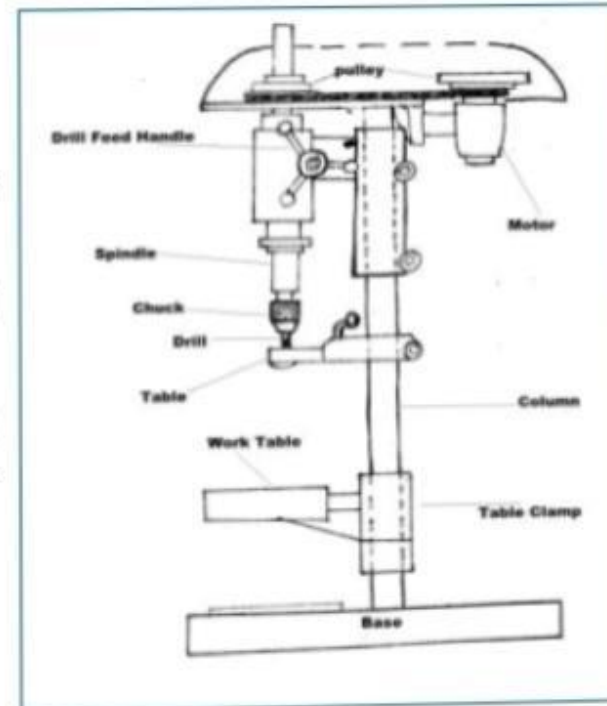
- ▶ It is a very small, compact and self contained unit carrying a small electric motor inside it.
- ▶ It is very commonly used for drilling holes in such components that cannot be transported to the shop due to their size or weight or where lack of space does not permit their transportation to the bigger type of drilling machine.
- ▶ In such cases, the operation is performed on the site by means of the portable electric drill.



BENCH DRILL MACHINE

Sensitive or Bench Drill

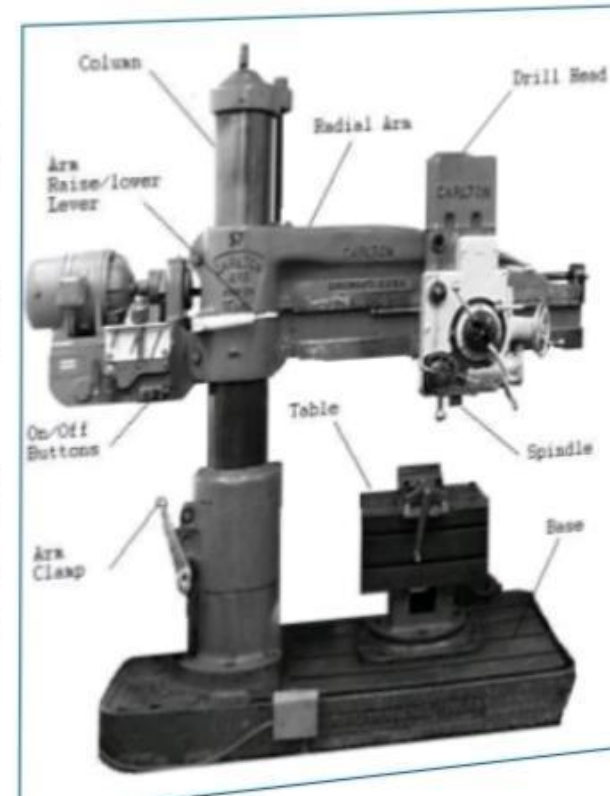
- ▶ This type of drilling machine is used for very light work.
- ▶ Its construction is very simple and so is the operation .
- ▶ It consists of as shown in fig. of a cast iron having a fixed table over it.



RADIAL DRILL MACHINE

Radial Drilling Machine

- ▶ This machine is very useful because of its wider range of action.
- ▶ Its principal use is in drilling holes on such work is difficult to be handled frequently.
- ▶ With the use of this machine, the tool is moved to the desired position instead of moving the work to bring the latter in position for drilling.



GANG DRILL MACHINE

Gang Drilling Machine

- ▶ It is nothing but a type of multiple spindle drilling machine, in which the spindles are arranged in a row.
- ▶ These spindles may be driven either separately or collectively.
- ▶ This machine is very useful when the nature of work is such that a number of operations like drilling, reaming, counter boring and tapping, etc. are to be performed in succession on it.



OPERATIONS

Drilling operations...

Operations that can be performed in a drilling **machine** are

Drilling

Reaming

Boring

Counter boring

Countersinking

Tapping

JIG AND FIXTURE

INTRODUCTION

- Jig and Fixture are production work holding devices used to manufacture duplicate parts accurately.
- They are special purpose tools used for large scale production by semi skilled operator.
- They can also be used for small scale production when interchangeability is important by skilled machinist when the workpiece is difficult to hold without special equipment.

USED

They are used in industry:

- To reduce cost of production
 - To increase productivity
 - To assure accuracy of component
 - For mass production of component on its repeatability basis
 - For fully or partial automation of work
 - To increase the versatility of the machine tool
 - improve quality with greater machining accuracy
-

FIXTURE

FIXTURES

- Used to hold workpiece during machining
 - Fixture is always fixed to the m/c table
 - Classified by the type of machine on which they are used
-

MATERIAL FOR JIG AND FIXTURE

Materials for Jigs and fixtures

Following points for selection:

- Easily available
- Ability to withstand the stress expected in service
- Ability to retain its shape and size
- Corrosion resistance
- Cast iron is generally used as materials for jig and fixture, light materials like brass, bronze, steels, plastic can also be used.
- The choice of the proper material can also be selected when the operating conditions are known.



Thank you