

# MACHINE TOOLS

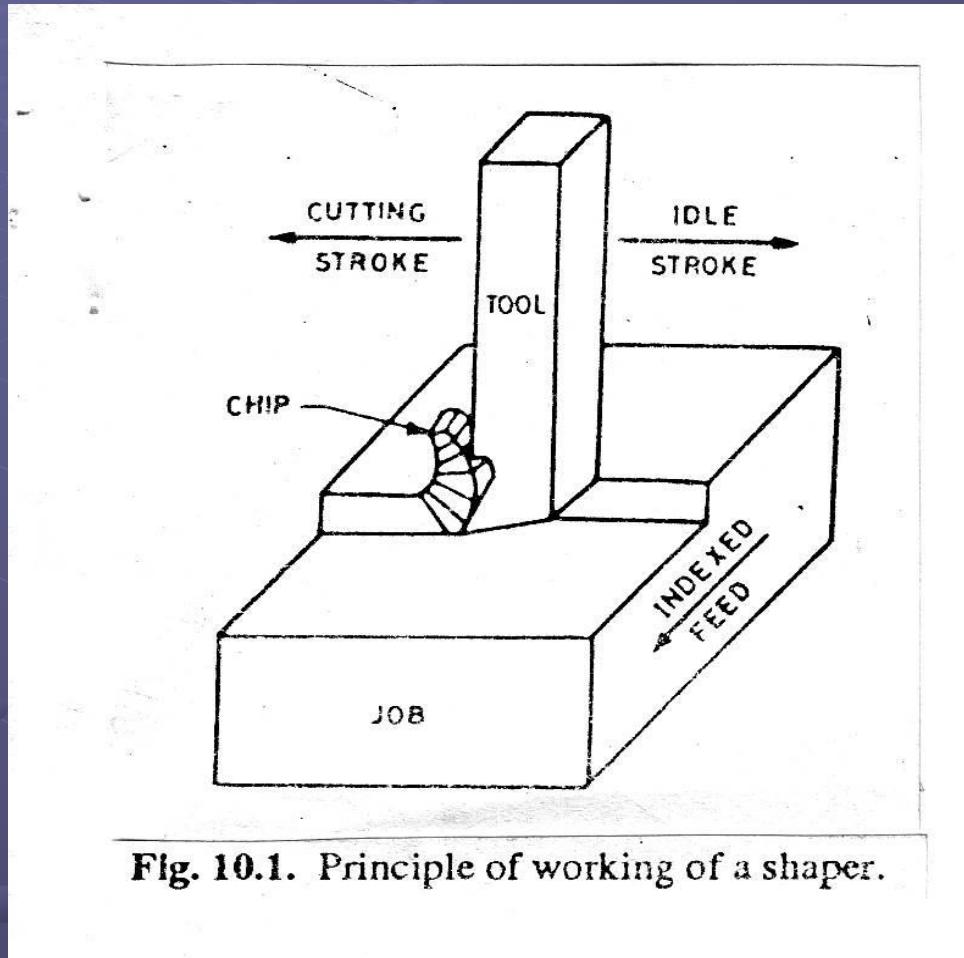
## Shaper Machines

# SHAPER MACHINES

## ● Introduction

- The **shaper machine** is a reciprocating type of **machine** basically used for producing the horizontal, vertical or flat surfaces.
- In shaper single point cutting tool moves in a straight line motion in relation to workpiece to generate flat surfaces.
- Shaper is a relatively slow machine with a low material removal capability.
- It is rarely used for production operations.
- It is a low cost machine which is basically used for initial rough machining operations.
- Nowadays shaper is being replaced by more versatile milling machine.

# SHAPER MACHINES



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## Working Principle of a Shaper

- Vice or Clamped on M/C table – Tool held in the tool post mounted on the ram – To and fro motion – No cutting during return stroke – Draw Cut shaper

■ Base

■ Column

■ Cross – rail

■ Table

■ Ram

■ Tool head

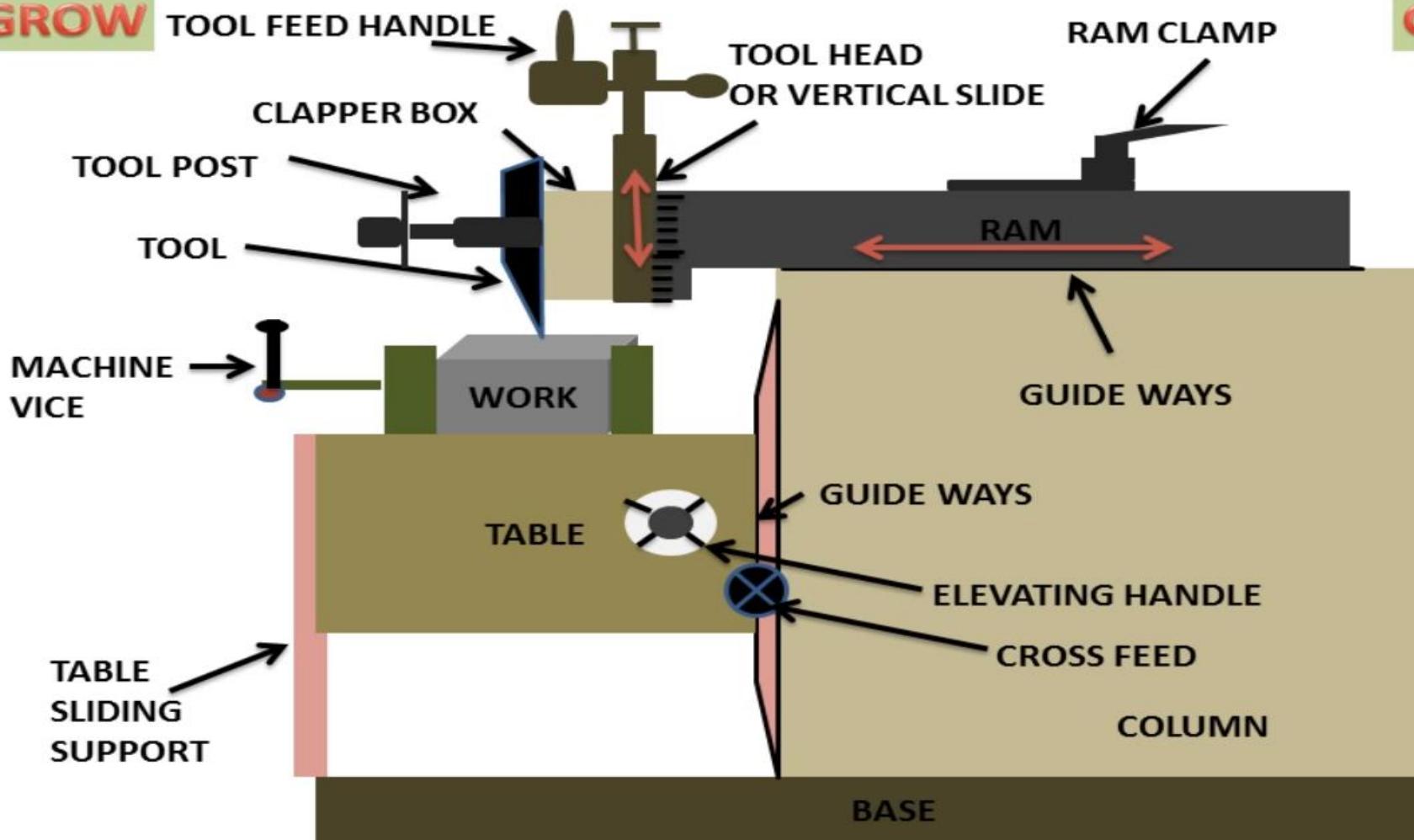
■ Vice

# SHAPER MACHINES

LEARN  
AND  
GROW

## CONSTRUCTION DETAILS OF SHAPER MACHINE

LEARN  
AND  
GROW



# Working Principle

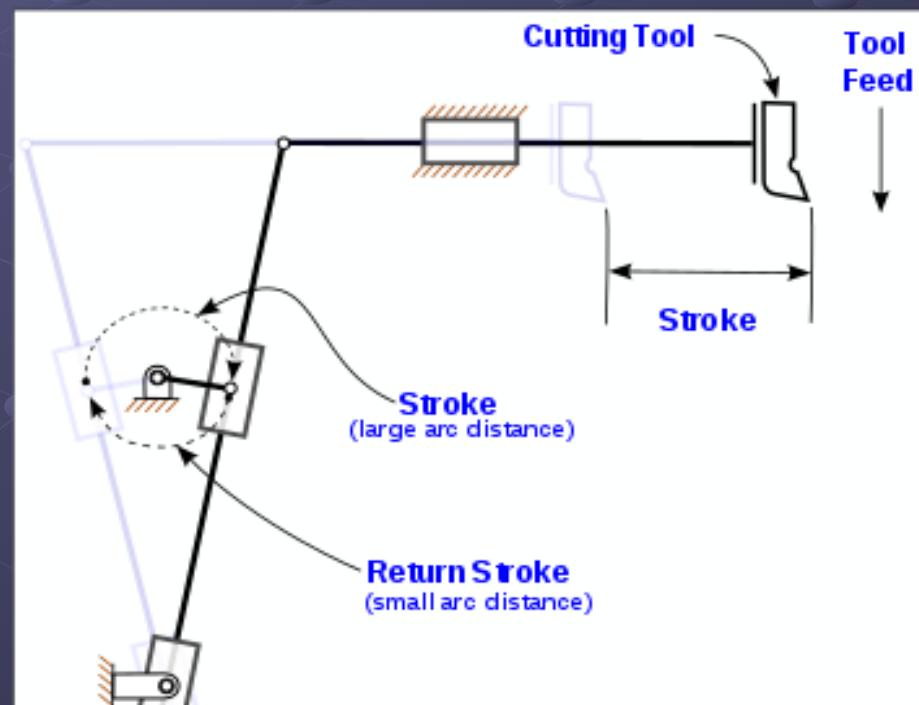
- Cutting tool is clamped to a tool post mounted on clapper box which in turn is mounted on reciprocating ram.
- Tool post at the ram can be easily rotated through an angle.
- It enables to feed the tool into work table at an angle.
- The ram reciprocates horizontally and its motion is guided by guide vane.
- During forward stroke (Cutting Stroke) work table is remains stationary and tool reciprocates.
- During backward (idle stroke) there is no material removed.
- After every idle stroke workpiece is fed at right angle to the motion of cutting tool in order to provide a layer of uncut material to the tool.

# SHAPER MACHINES

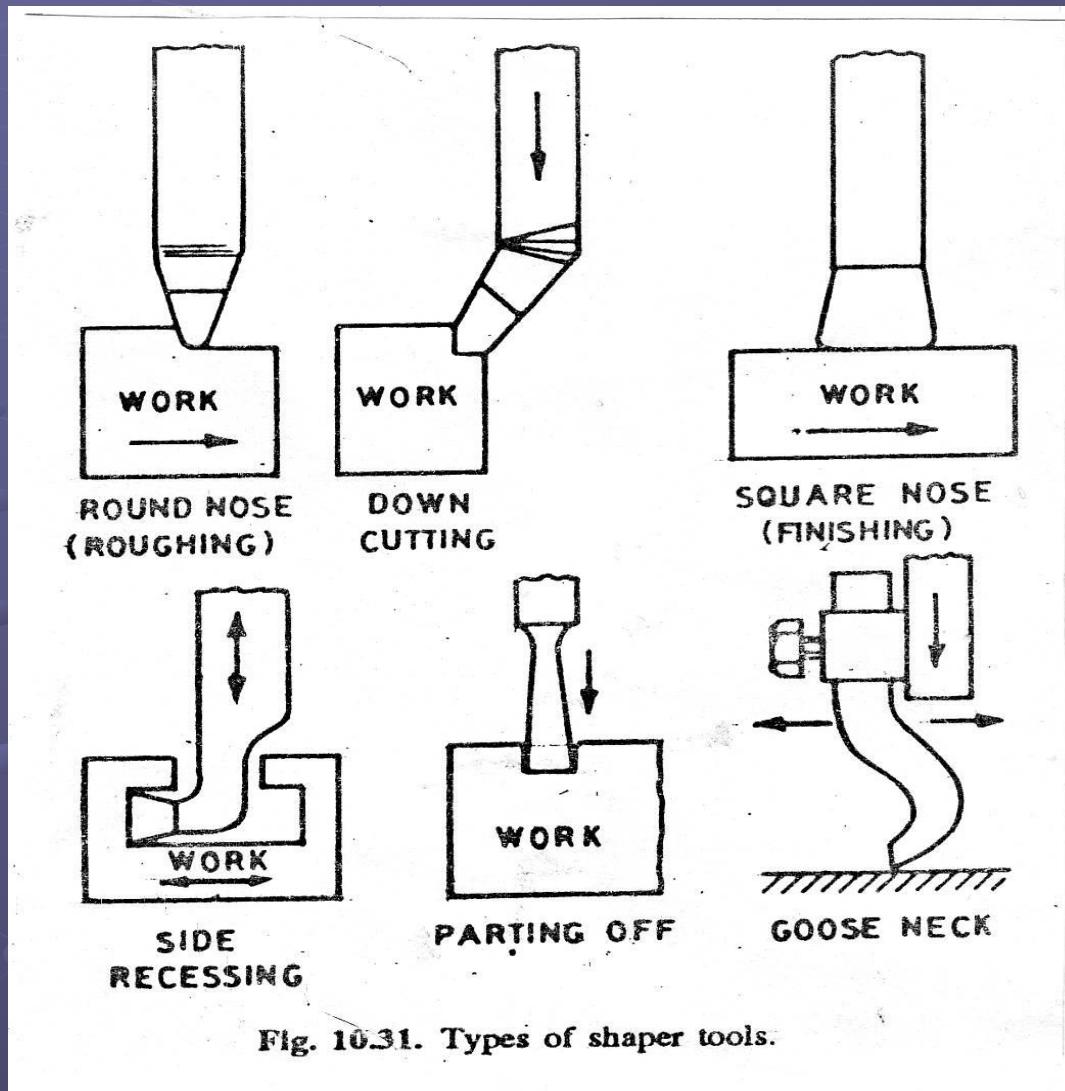
- **Quick return Mechanism**

A quick return mechanism is an apparatus to produce a reciprocating motion in which the time taken for travel in return stroke is less than in the forward stroke. It is driven by a circular motion source (typically a motor of some sort) and uses a system of links with three turning pairs and a sliding pair.

- Quick return is a common feature of tools in which the action is performed in only one direction of the stroke, such as shapers and powered saws, because it allows less time to be spent on returning the tool to its initial position.



# SHAPER MACHINES



# SHAPER MACHINES

## ● Shaper Operations

- Machining horizontal surface: i.e. facing the horizontal surfaces
- Vertical shaping i.e. shaping the vertical surfaces of the job
- Shaping the grooves, T slots, steps and angles

# SHAPER MACHINES

- Cutting Speed, feed and depth of Cut
- Cutting Speed: The rate at which the metal is removed by the cutting tool

Length of the cutting stroke

Cutting Speed = -----

Time required by the cutting stroke

- Feed: Relative movement of the tool or work in a direction perpendicular to the axis of reciprocation of the ram per double stroke – mm
- Depth of Cut: Thickness of metal that is removed in one cut -  $\perp$  distance measured between machined surface and non - machined surface



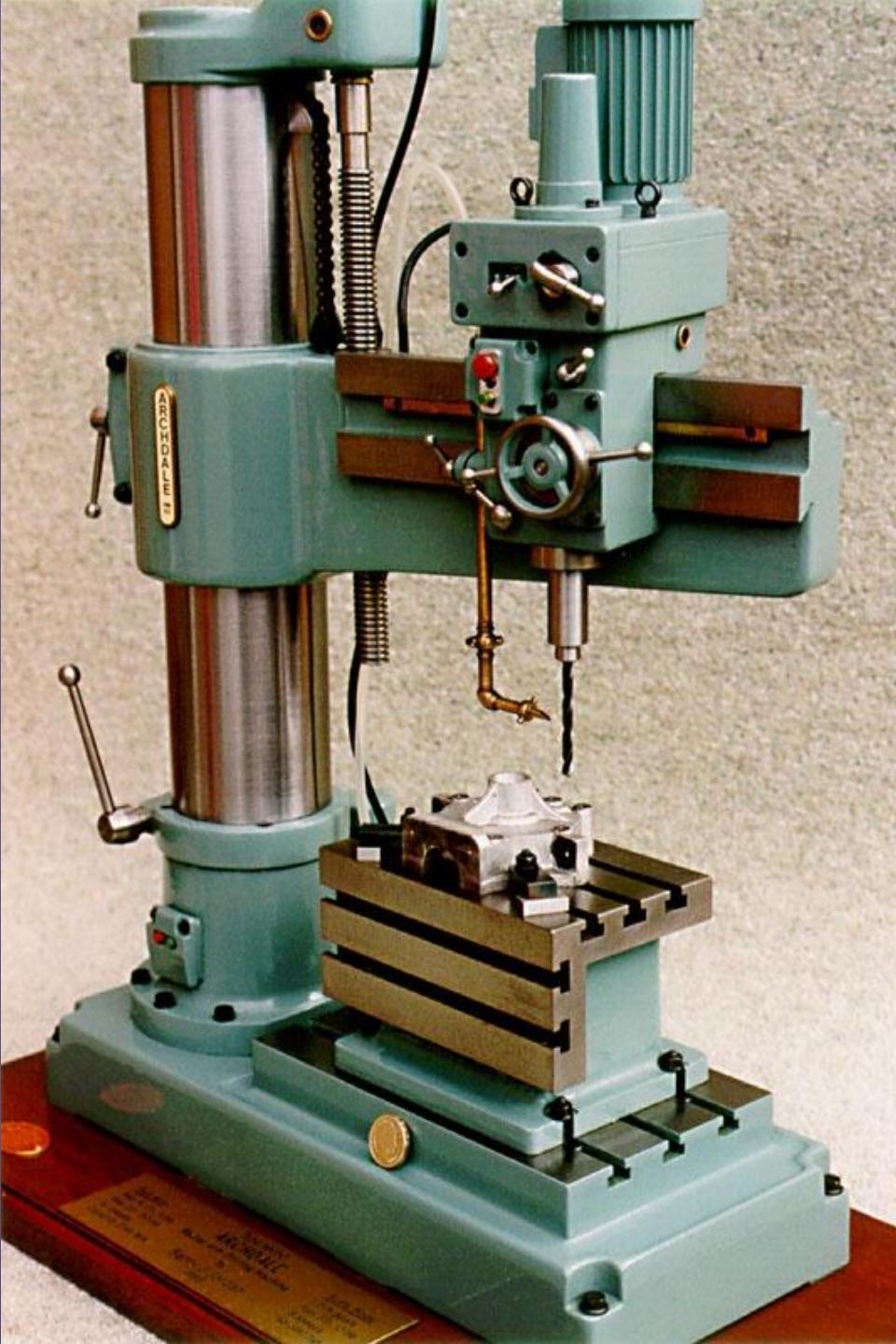
# DRILLS AND DRILLING PROCESSES

# Introduction

- Drilling Machine is a machine tool designed for making holes in metallic and nonmetallic materials.
- The cutting tool is multi point cutting tool known as drill or drill bit.

## Classification:

- Portable
- Upright Drills
- Radial Drilling Machine
- Gang Drilling Machines
- Turret Machines
- Deep hole Drilling Machines



# Radial Drilling Machine

# Gang Drilling Machine

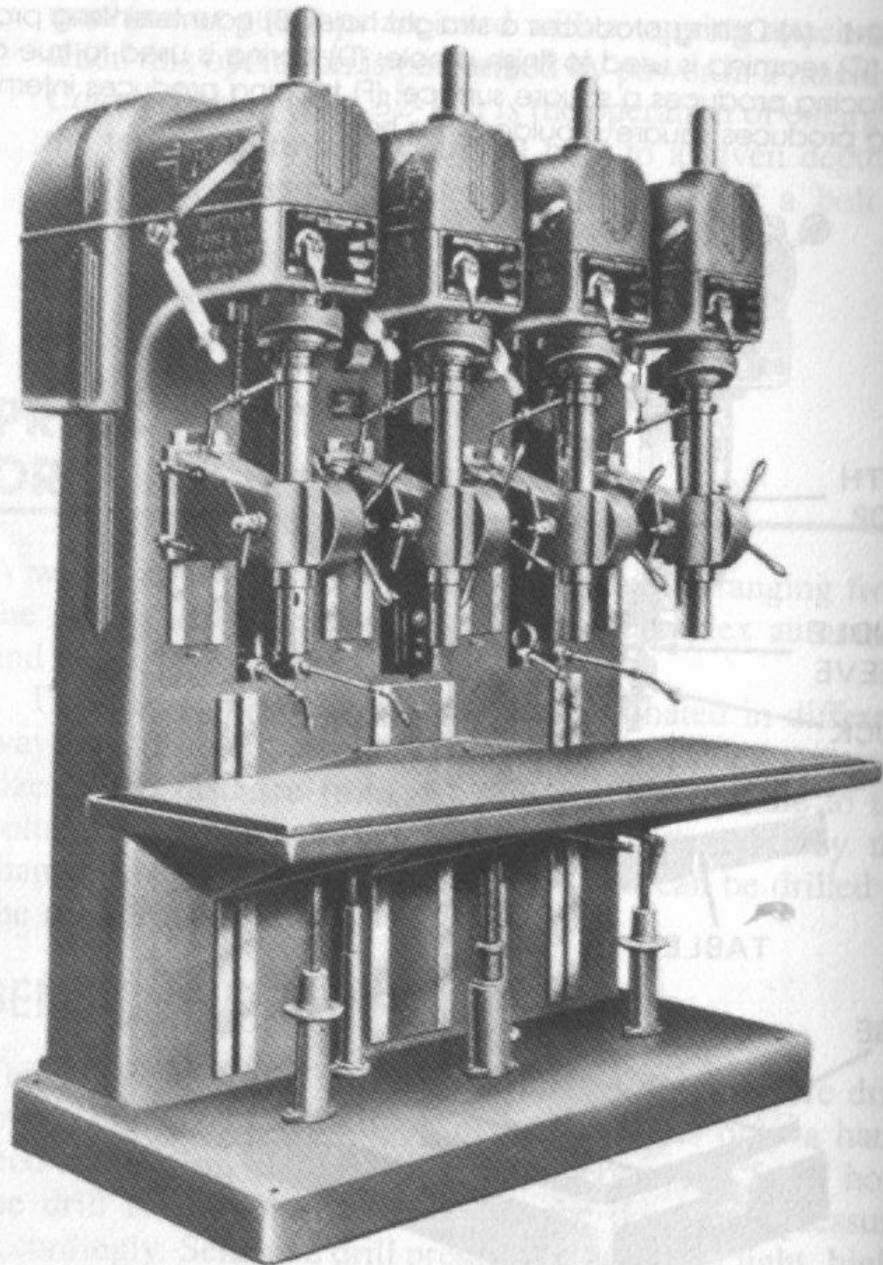
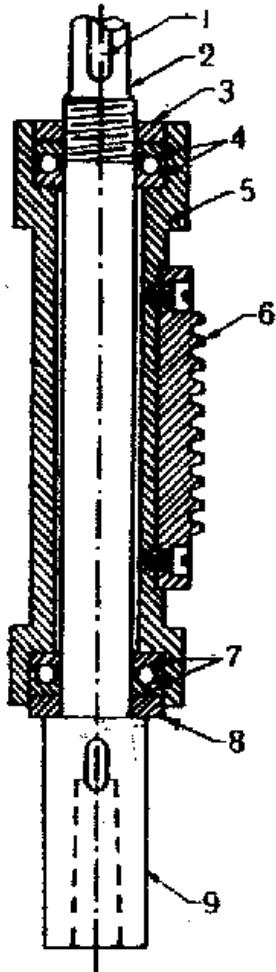


Fig. 32-4 A gang drilling machine. (Courtesy Buffalo Forge Co.)

# Holding Devices

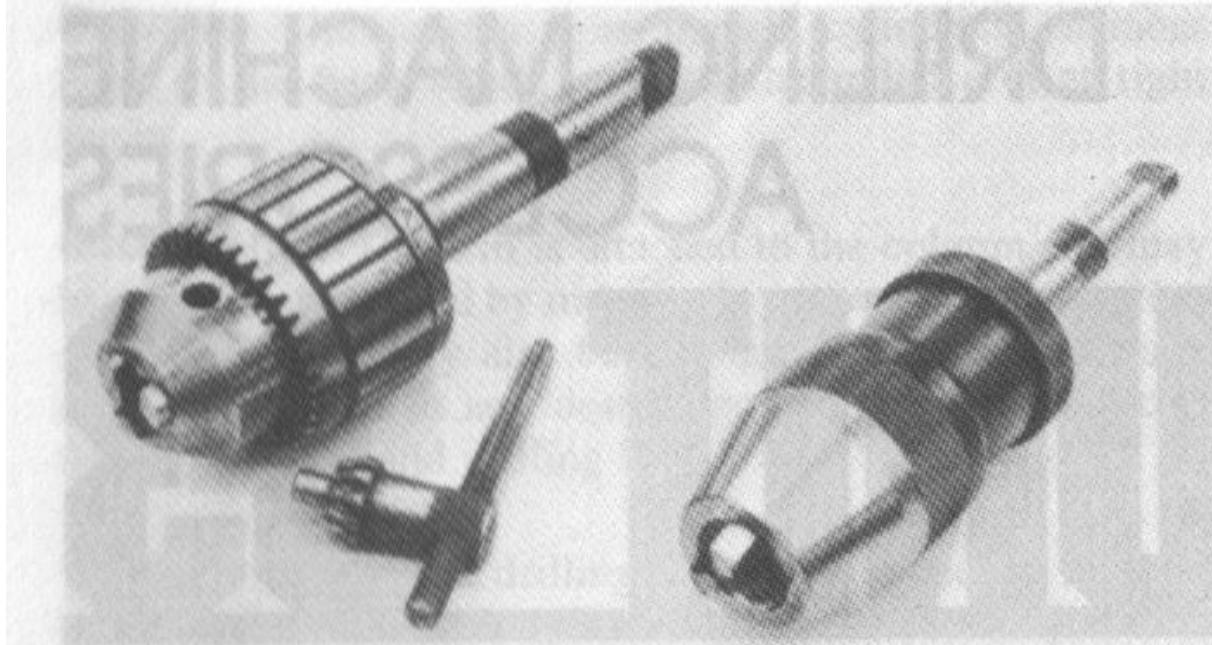
- Job is usually clamped on the vice mounted upon the table, which can be elevated at the convenient height.
- Tool can be directly fitted to the spindle or by:
  - Chuck
  - Sleeve
  - Socket
  - Or Special attachments
- Tool fitting device is selected as per the shape and size of tool.

# Tool Holding Devices



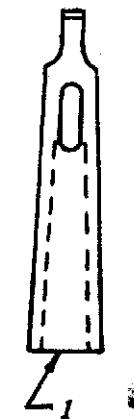
**Fig. 5.4 Drill spindle assembly**

1. Keyway on the spindle.  
2. Spindle.  
3. Nut.  
4, 7. Thrust bearing.  
5. Quill or sleeve.  
6. Rack.  
8. Washer.  
9. Lower end of the spindle.



**Fig. 33-2 A key-type drill chuck.**

**Fig. 33-3 A keyless drill chuck.**



**Fig. 5.19 Drill sleeve**  
1. Inside taper.



**Fig. 5.20 Drill socket**  
1. Socket body.

# Drill Tools

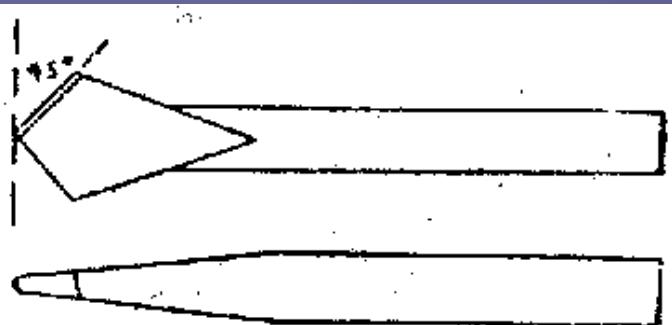


Fig. 5.34 Flat drill

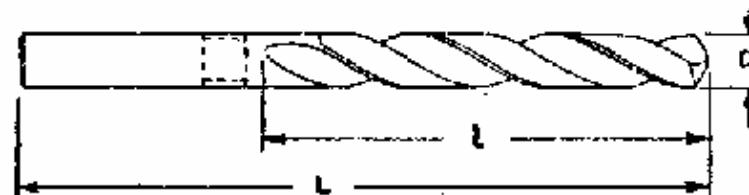


Fig. 5.38 Parallel shank (long series) twist drill

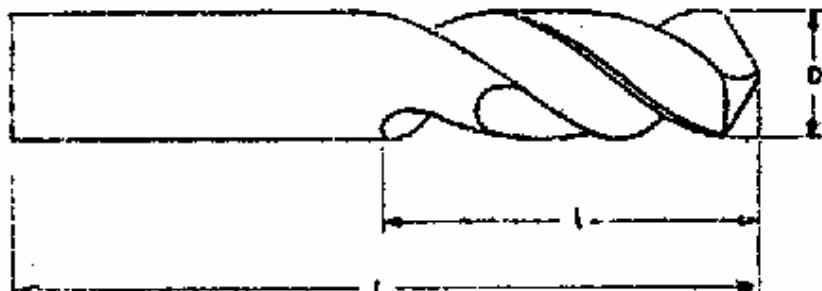


Fig. 5.37 Parallel shank (stub series)



Fig. 5.35 Straight fluted drill

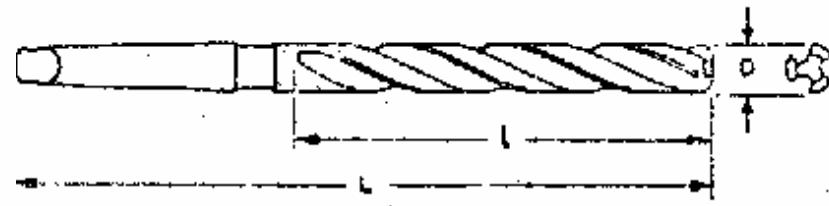


Fig. 5.40 Taper shank core drill  
(Three fluted)

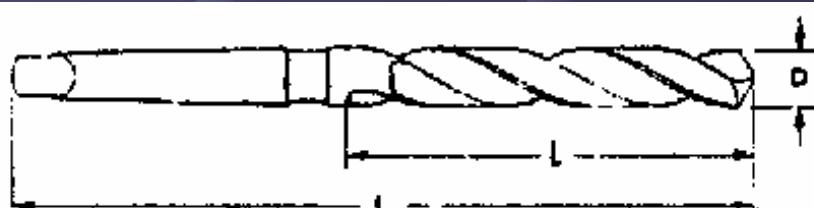


Fig. 5.39 Taper shank twist drill  
*l. Flute length, L. Overall length,  
D. Diameter.*

# Drill Tool

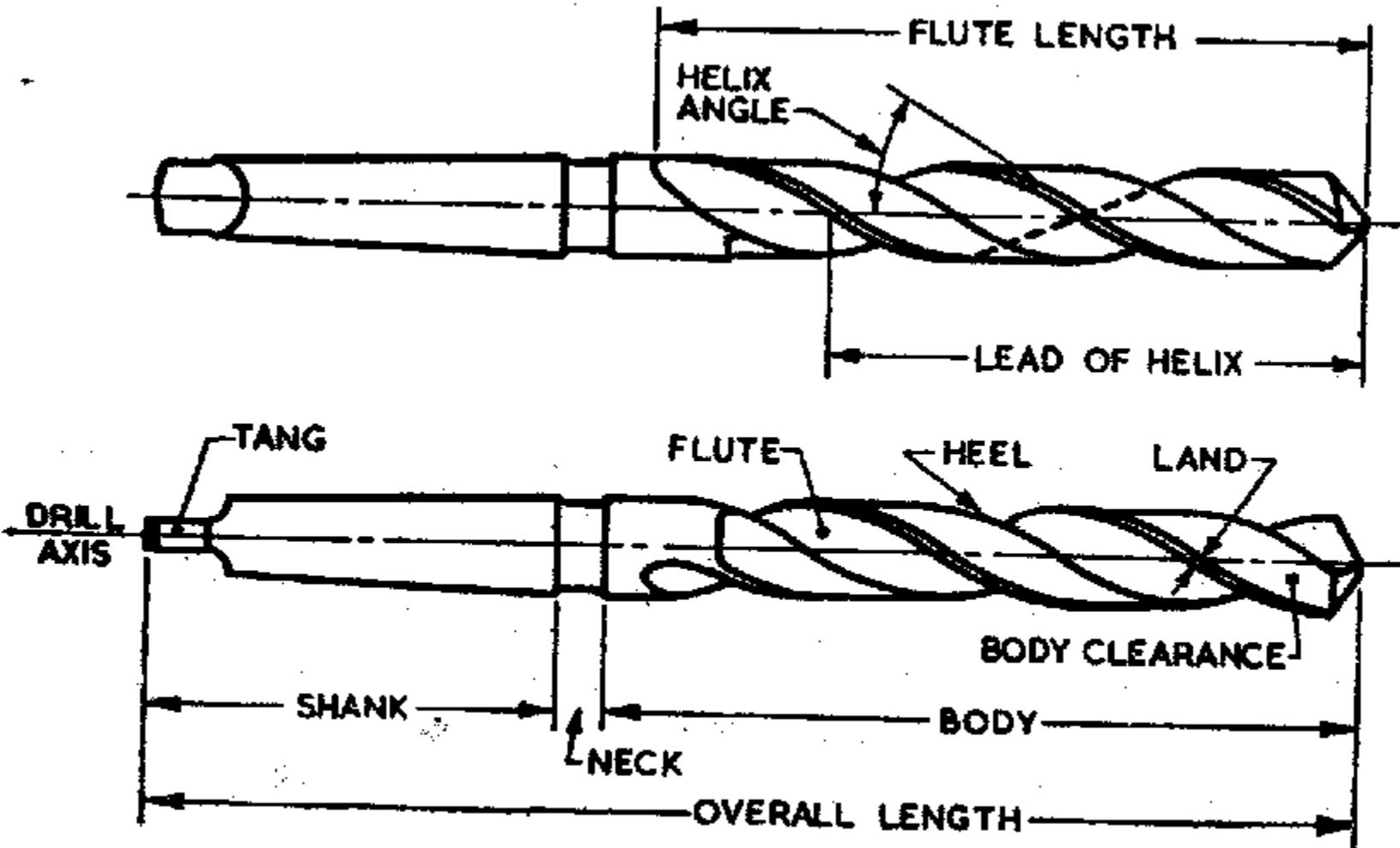


Fig. 5.43 Twist drill nomenclature

# Drill Tools



Taper shank oil drill hole



Drill for molded plastics



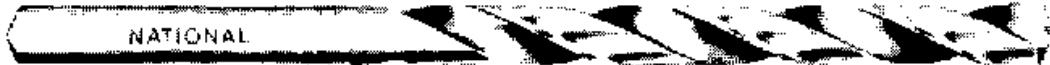
Four-fluted drill



Three-fluted drill



High helix drill for aluminum

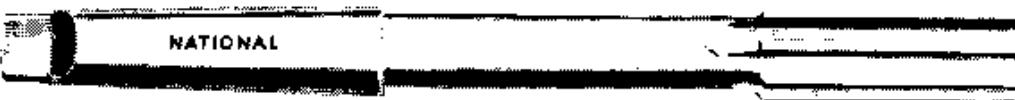


Straight shank twist drill for mild steel

# Reaming Tools



Arbor for shell reamer



Fluted chucking reamer



Carbide-tipped shell expansion reamer



Taper pin reamer



Hand reamer

# Drilling Operations

1. Drilling
2. Reaming ( finished already drilled hole)
3. Boring (Enlarge the already drilled hole)
4. Counter boring (Enlarge a little part of already drilled Hole)
5. Countersinking (Enlarge a little part of already drilled hole in conical shape)
6. Spot Facing (surface finishing of the spot)
7. Tapping (cutting internal thread)

# Drilling Operations

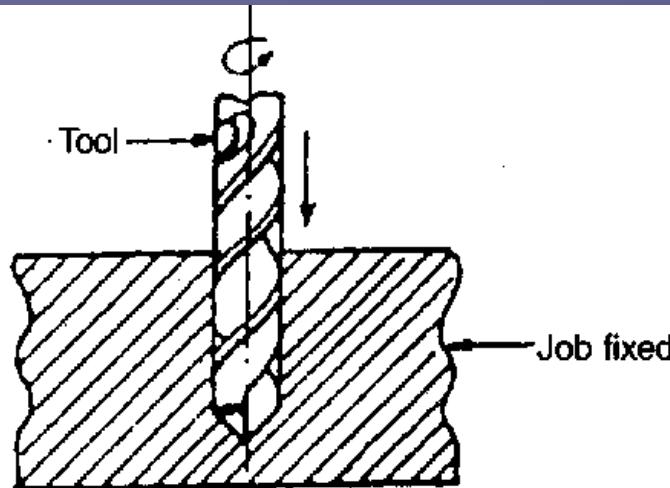


Fig. 29.34. Drilling.

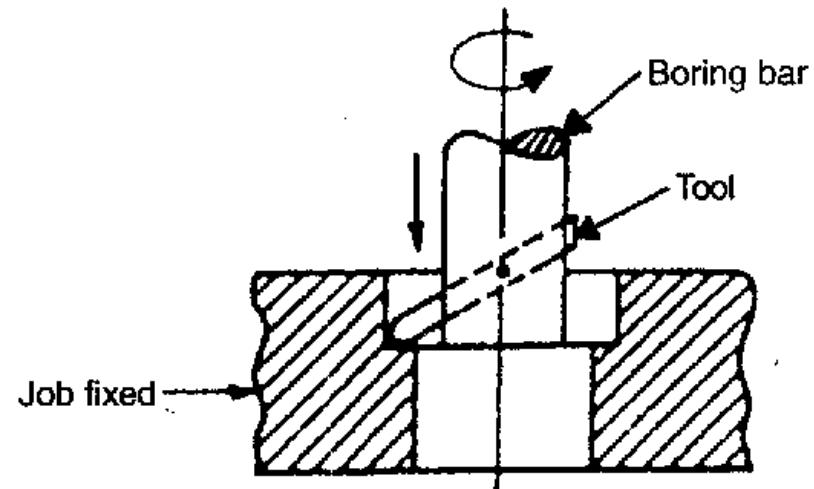


Fig. 29.35. Boring.

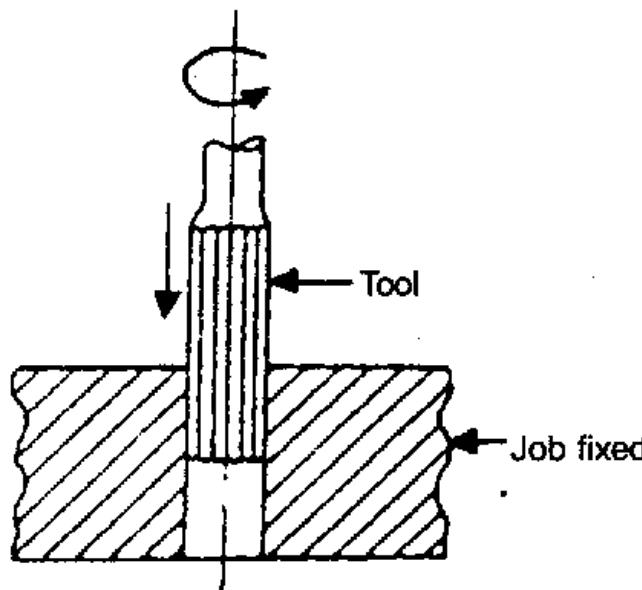


Fig. 29.36. Reaming.

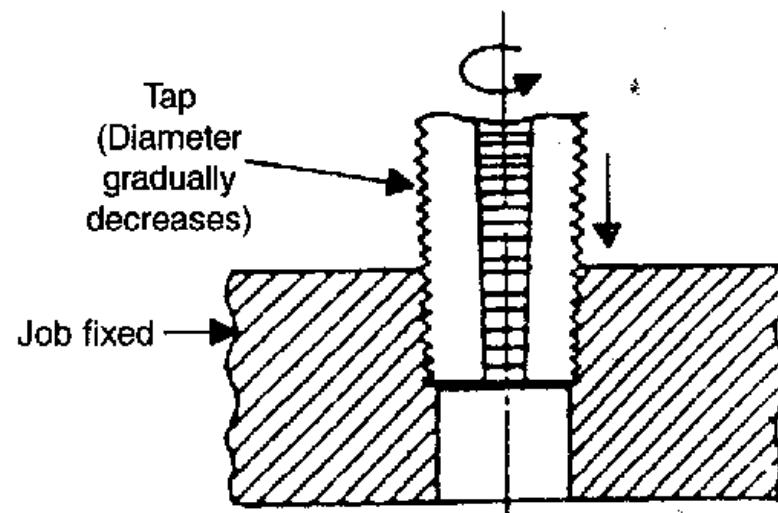
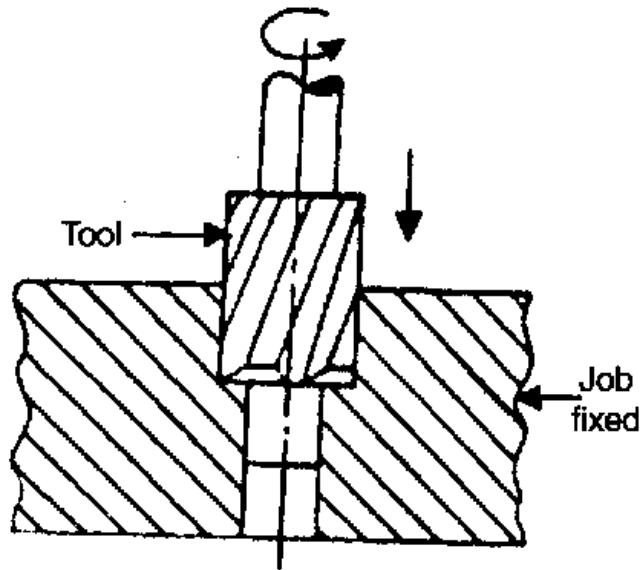
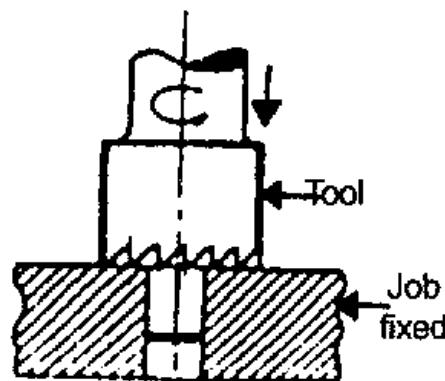


Fig. 29.37. Tapping.

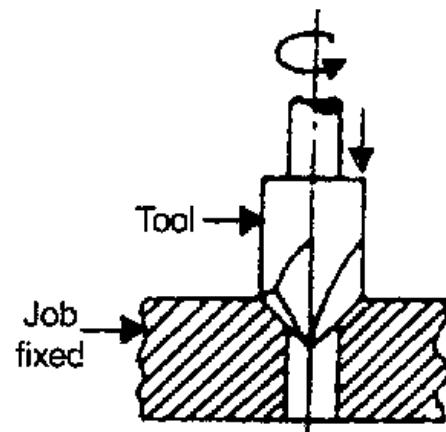
# Drilling Operations



**Fig. 29.38. Counter Boring.**



**Fig. 29.39. Spot Facing.**



**Fig. 29.40. Counter Sinking.**

# DRILLS AND DRILLING PROCESSES

- Portable Drilling Machine



# DRILLS AND DRILLING PROCESSES

## ■ Sensitive Drilling Machine

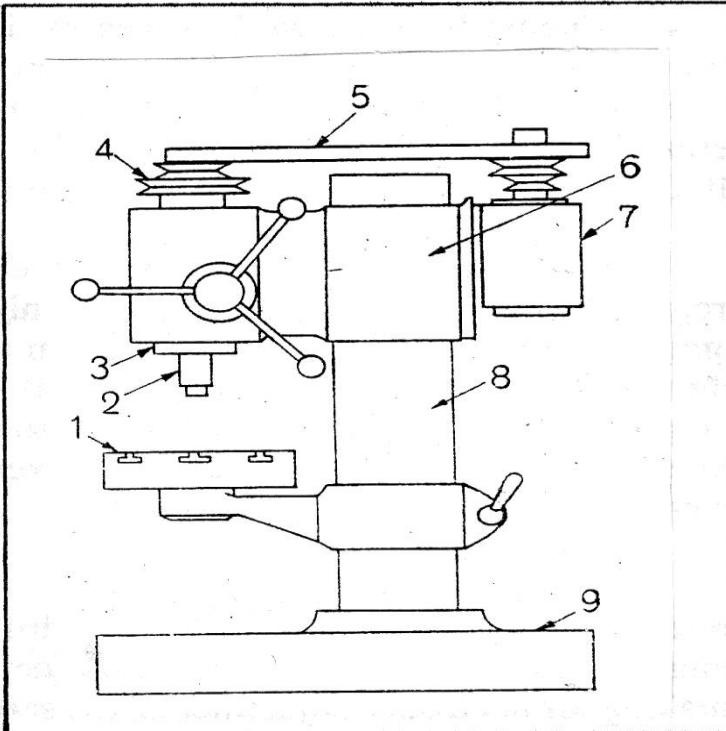
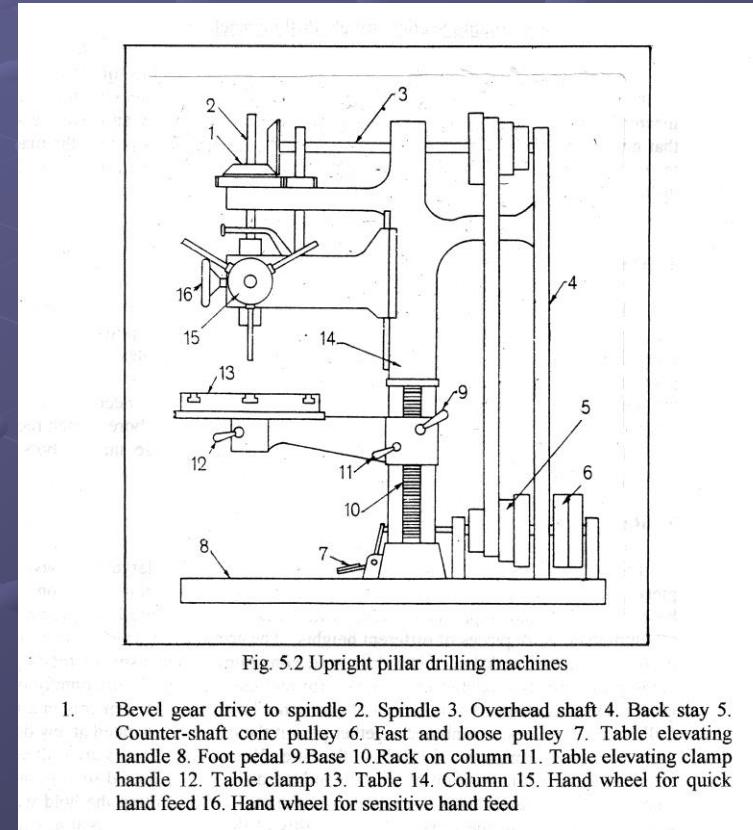


Fig.5.1. Sensitive drilling machines

1. Table
2. Vertical drill spindle
3. Sleeve
4. Cone pulley
5. V-belt
6. Head
7. Driving
8. Vertical column
9. Base.

# DRILLS AND DRILLING PROCESSES

- Upright Drilling Machine – Round column section or pillar and Box column section



# DRILLS AND DRILLING PROCESSES

- Heavy duty Drilling Machine



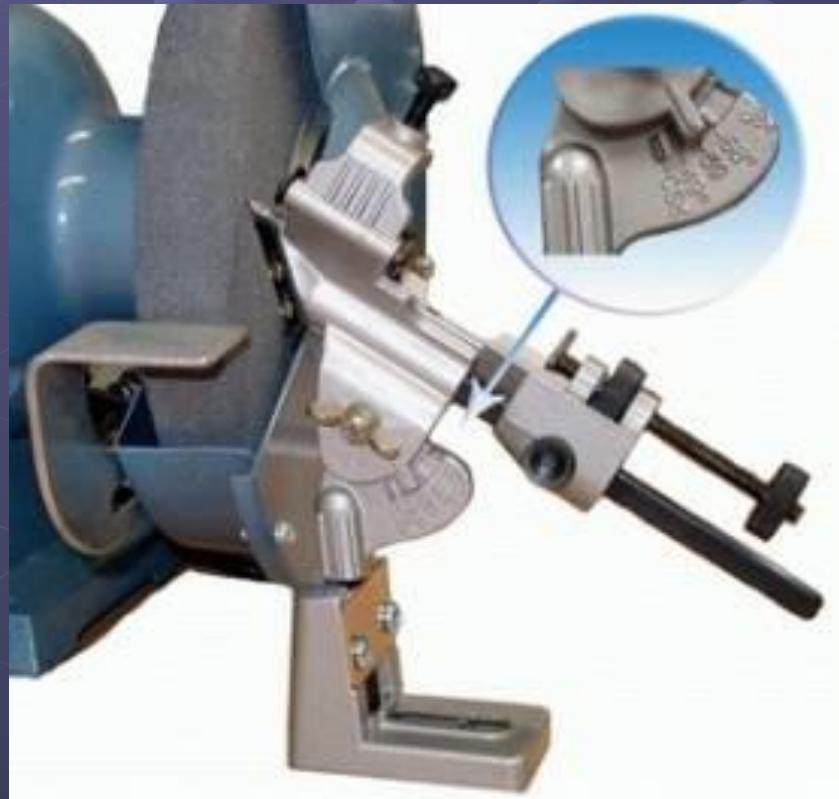
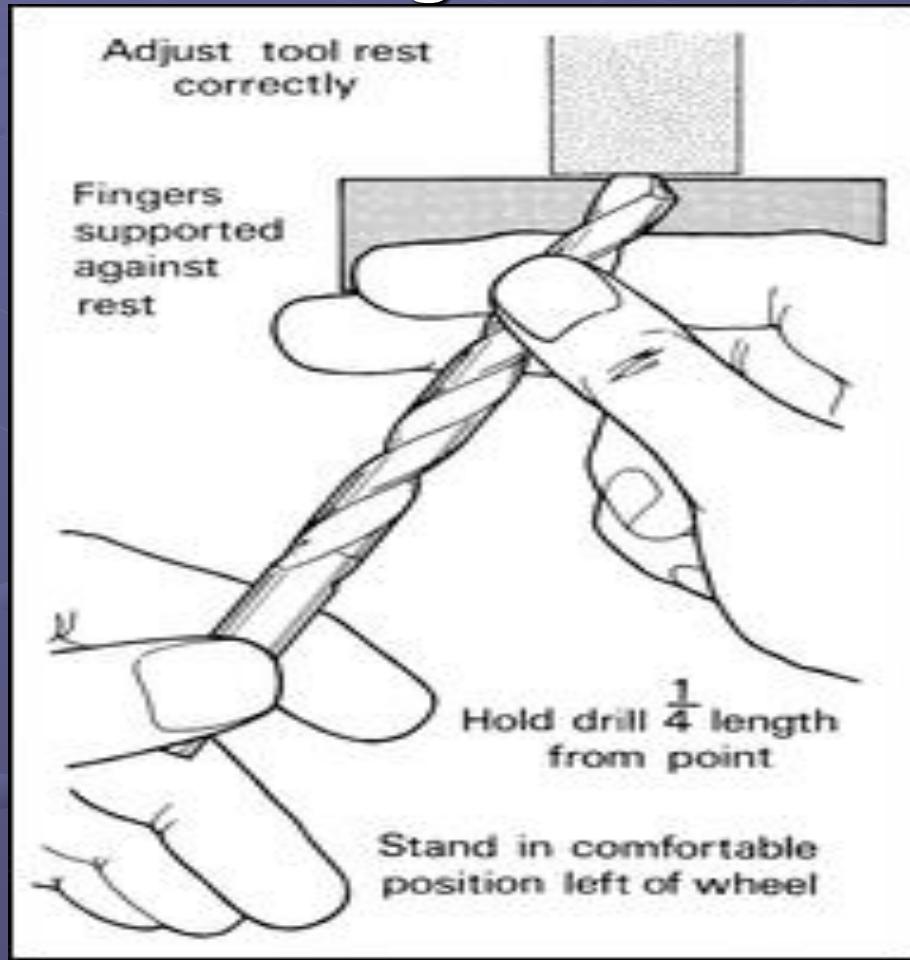
# DRILLS AND DRILLING PROCESSES

## ● Cutting Tool

- Flat or Spade drill
- Straight fluted drill
- Twist drill
  - Parallel shank – short series
  - Parallel shank – stub series
  - Parallel shank – long series
  - Taper shank
- Taper shank core drill
- Oil tube drill

# DRILLS AND DRILLING PROCESSES

## Grinding of drill bits



# DRILLS AND DRILLING PROCESSES

- Cutting Speed
- $v = (\pi D N) / 1,000$  rpm
- D – diameter of drill in mm
- N – rpm of the drill spindle

# DRILLS AND DRILLING PROCESSES

## • Safety

- Work should not be held by hand
- Hair cut short, wear a cap, short sleeves, no neck ties, no rings or a wrist watch
- Dull drill can cause an accident

# DRILLS AND DRILLING PROCESSES

- Use correct tool to release a taper shank drill from drilling m/c – drill drift
- Stop the m/c before measuring or adjusting
- Stop m/c before removing chips and excess coolant





**THANK YOU!**