# Drilling Machine…

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# Drilling

- 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.
- The most common drill used is the twist drill.

# Drilling Machine

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

The work piece is held stationary ie. Clamped in position and the drill rotates to make a hole.

Types :-

a) Based on construction:

Portable, Sensitive,Radial, up-right, Gang, Multi-spindle

b)Based on Feed:

Hand and Power driven

# Sensitive Drilling Machine

- Drill holes from 1.5 to 15mm

- Operator senses the cutting action so sensitive drilling machine

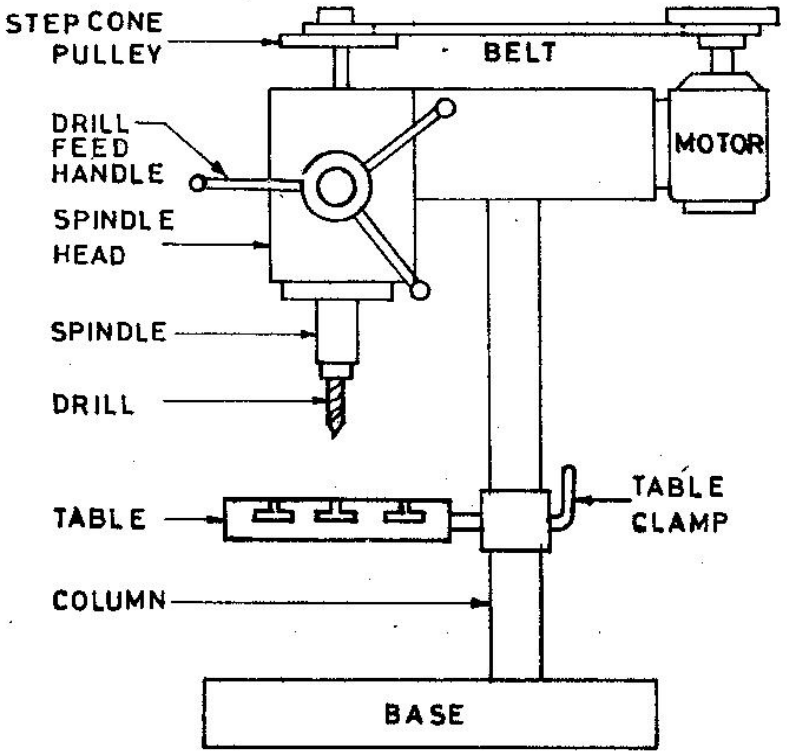
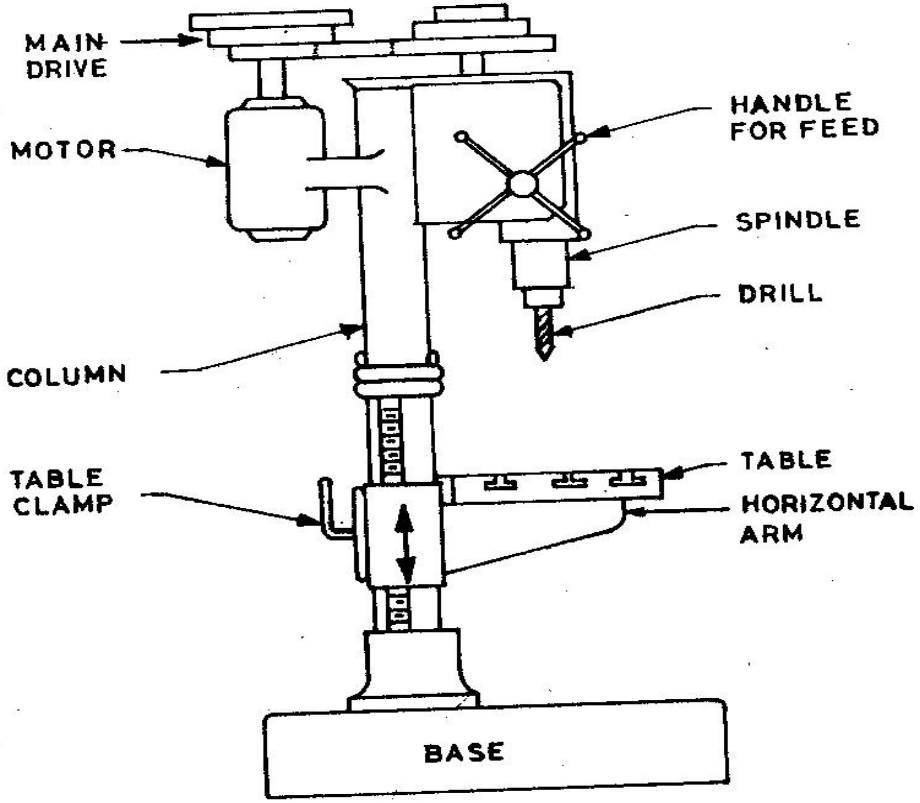



*Fig.*

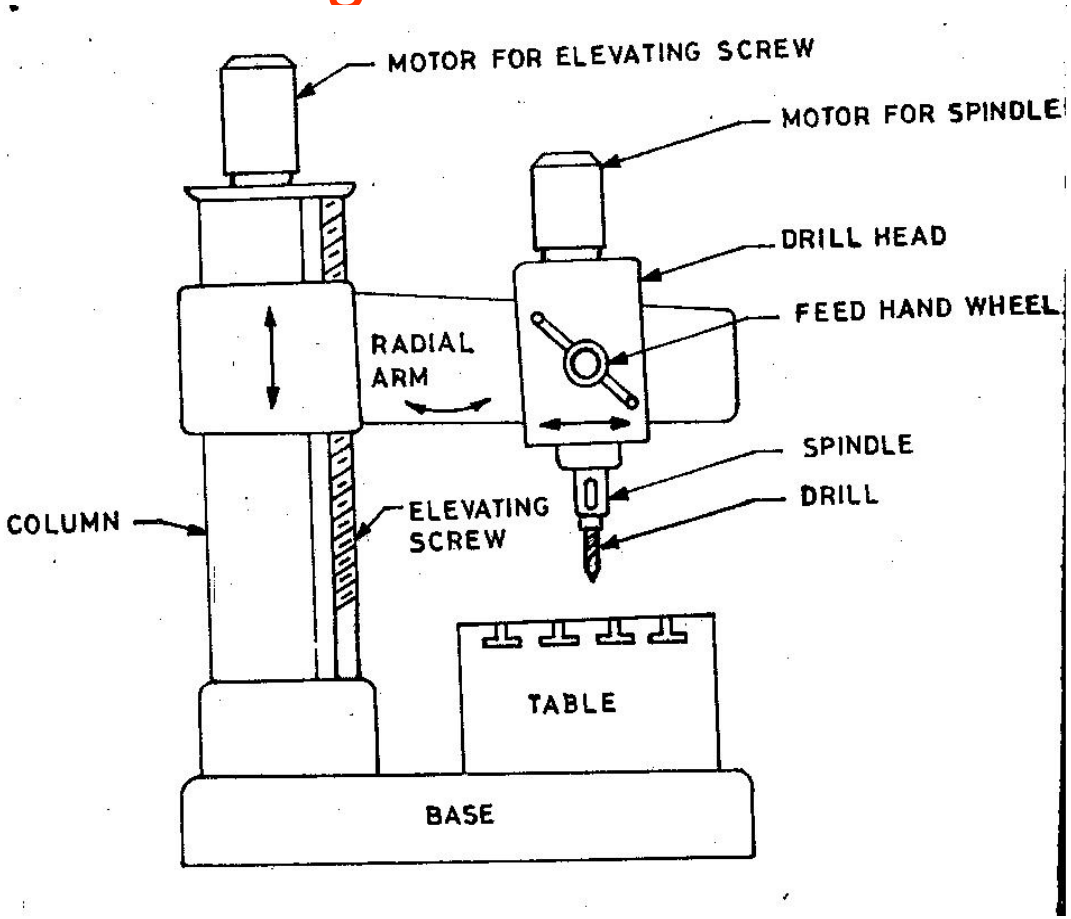
# Up-Right Drilling Machine

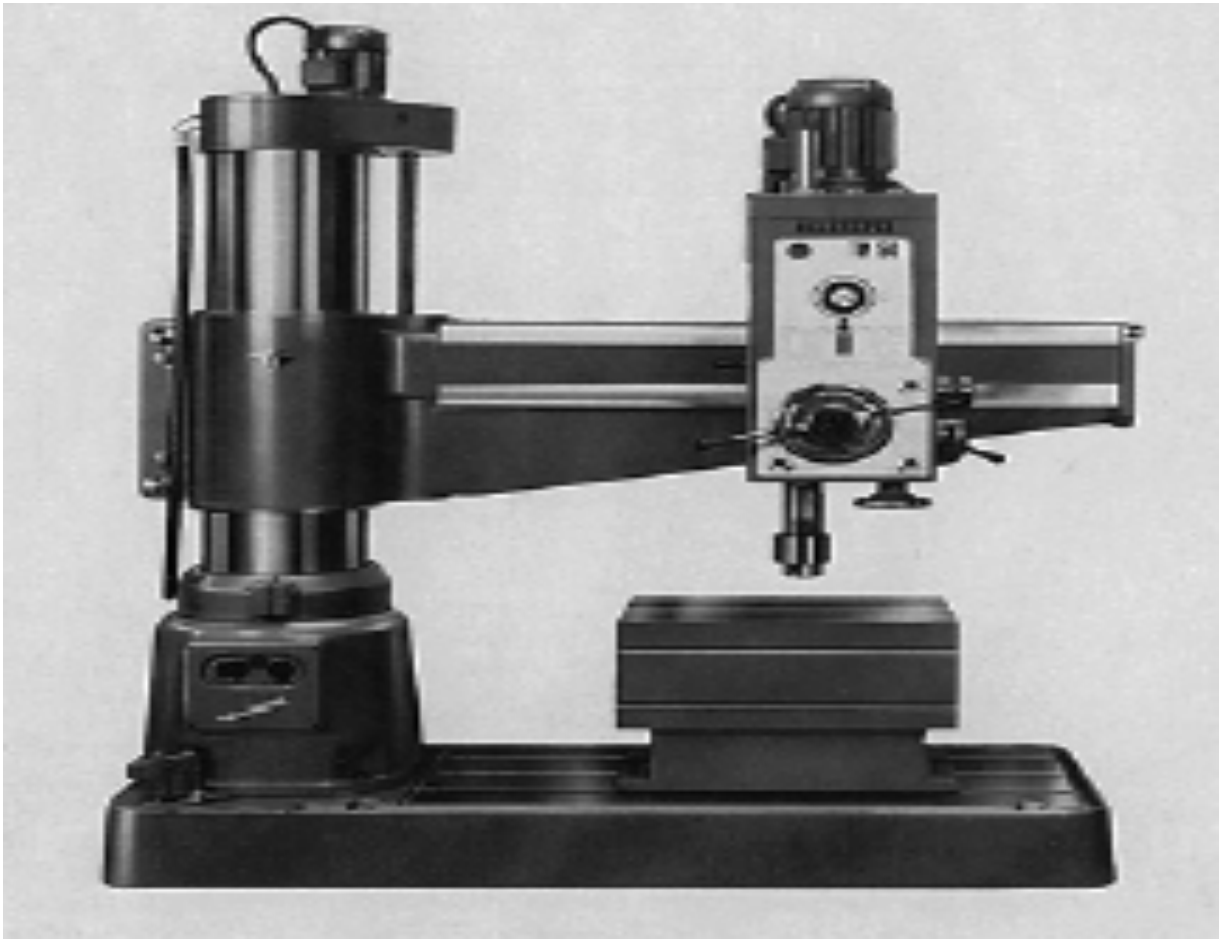



- Drill holes upto 50mm
- Table can move vertically and radially

# Radial Drilling Machine

- It the largest and most versatile used fro drilling medium to large and heavy work pieces.





# Drill Materials

The two most common types are

1. HSS drill
   - Low cost
2. Carbide- tipped drills
   - high production and in CNC machines

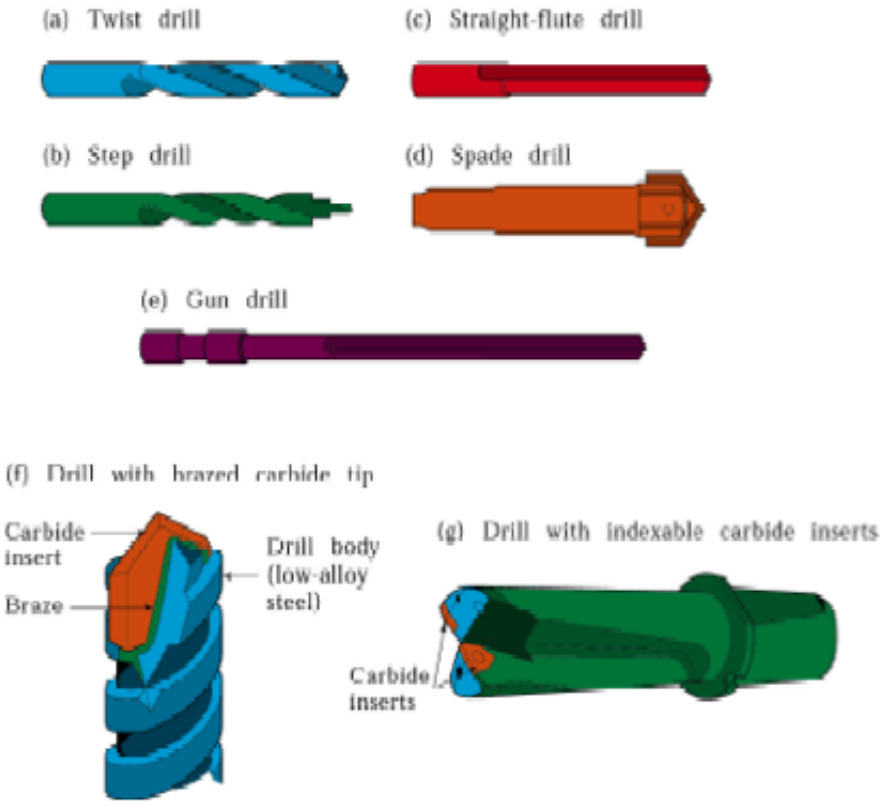
Other types are

Solid Carbide drill, TiN coated drills, carbide coated masonry drills, parabolic drills, split point drill

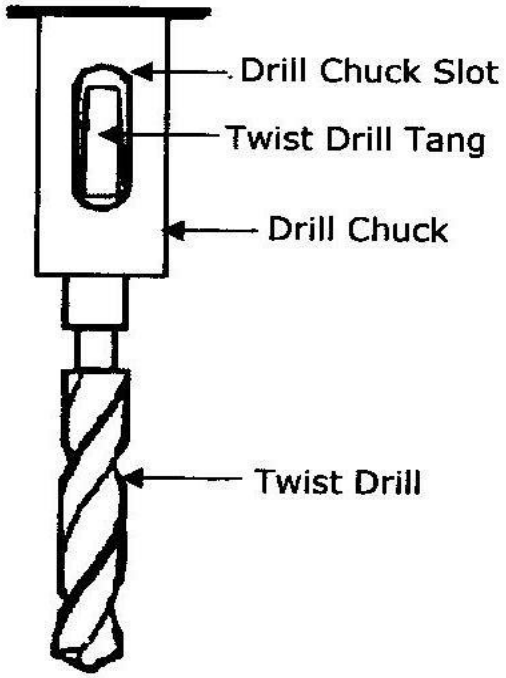
# Drilling And Drills

Types of drills

- Twist drill: most common drill
- Step drill: produces holes of two or more different diameters
- Core drill: used to make an existing hole bigger



# Drill fixed to the spindle



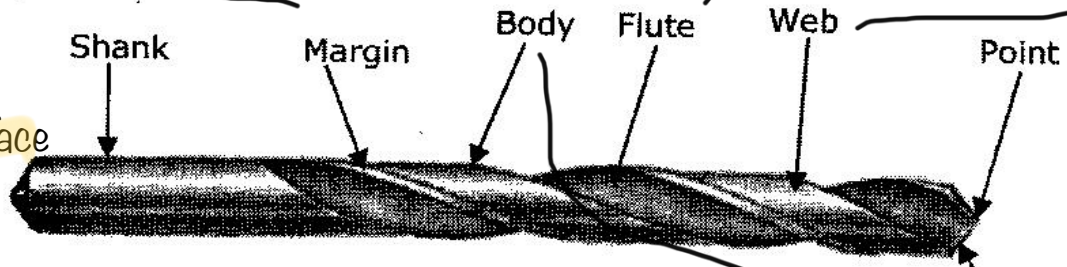

## Drilling operations

- Drilling Centre Hole
- Drilling Deep Holes
- Drilling Thin Material
- Drilling Pilot Hole

# Tool Nomenclature

It does the final cutting actions

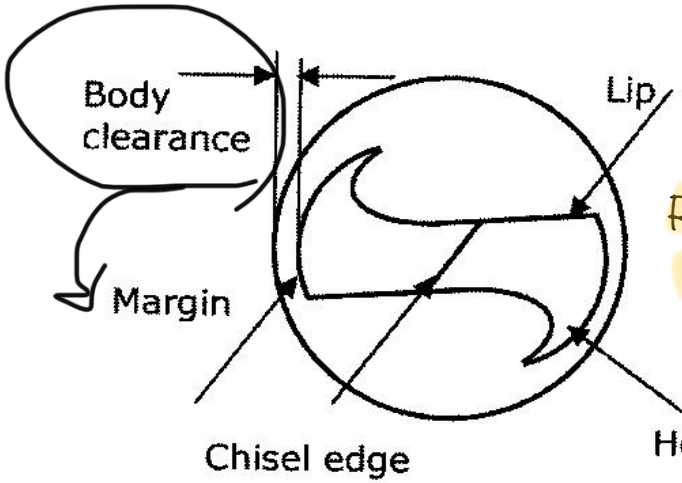
Passage of the chip and removed material




Determine the surface finish

Support

Dimensional accuracy




Cutting Edge

Rigid material to keep tool from deformation

Major cutting action

It doesn't cut

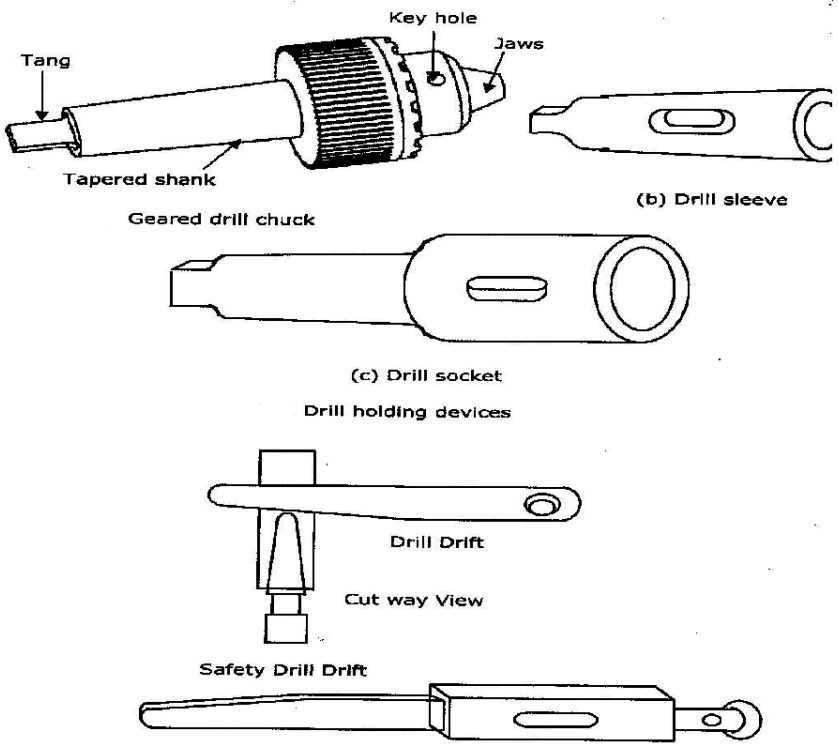
Does plastic deformation

Support cutting edges

# Tool Holding devices

- The different methods used for holding drill in a drill spindle are
    - By directly fitting in the spindle hole.
    - By using drill sleeve
    - By using drill socket
    - By using drill chuck

# Work Holding Devices

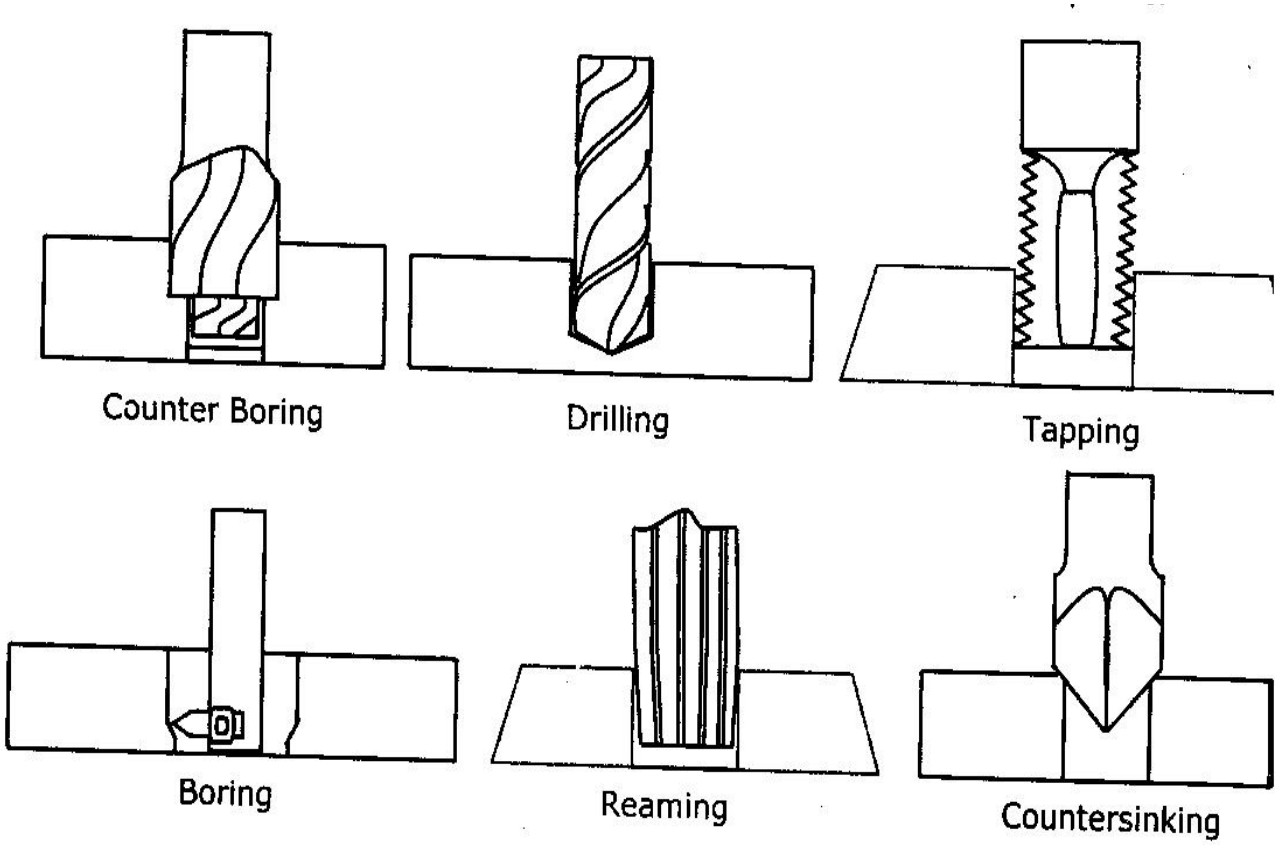


# Drilling operations…

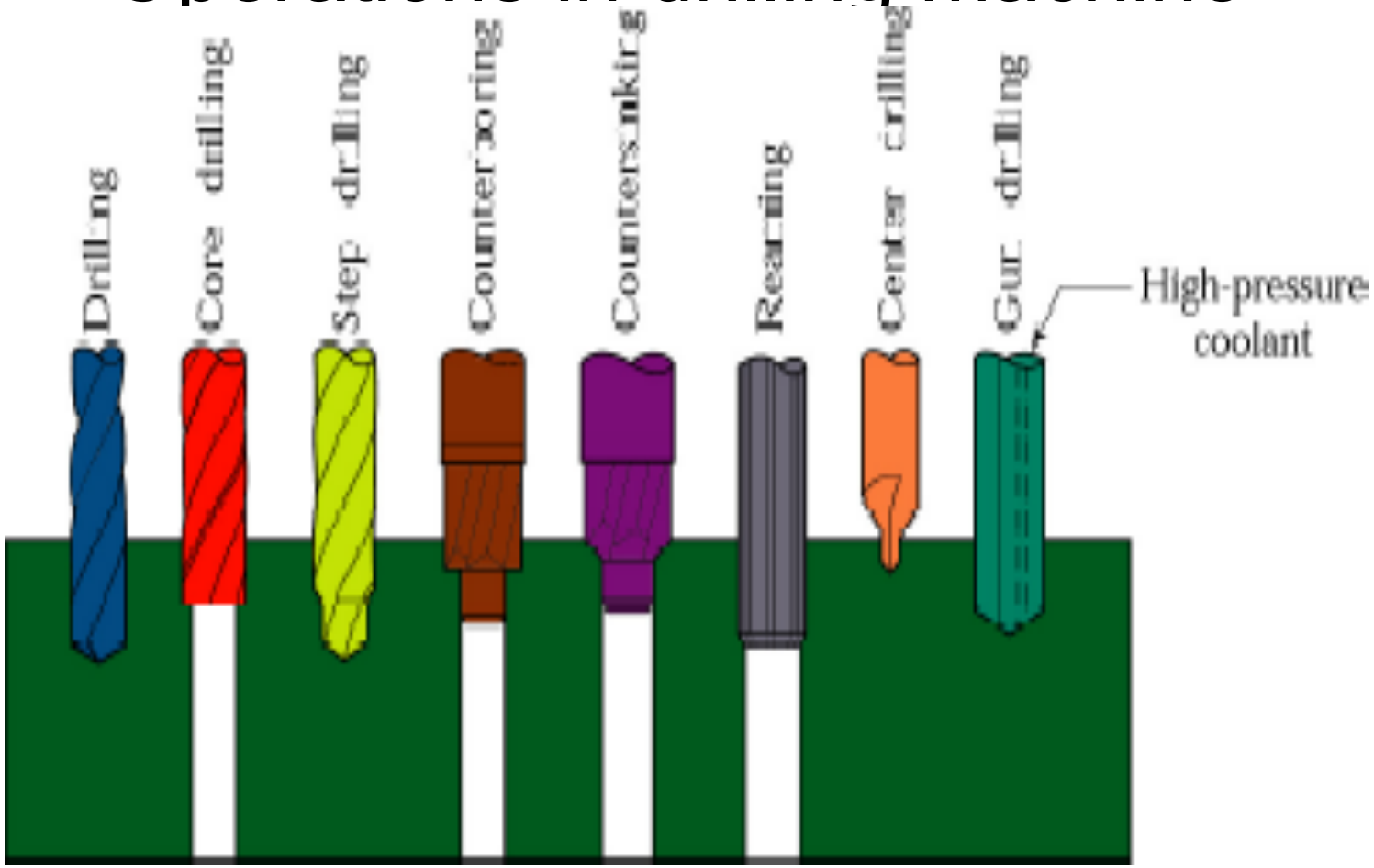
- Operations that can be performed in a drillin g machine are

  - Drilling
  - Reaming
  - Boring
  - Counter boring
  - Countersinking
  - Tapping

# Operations in drilling machine



# Operations in drilling machine



# Types of cutters

## Reamers :-

- Multi tooth cutting tool
- Accurate way of sizing and finishing the pre-existing hole.
- Accuracy of □0.005mm can be achieved

## Boring Tool:-

- Single point cutting tool.
- Boring tool is held in the boring bar which has the shank.
- Accuracy of □0.005mm can be achieved.

# Types of cutters

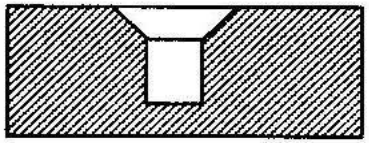
## Countersinks :-

- Special angled cone shaped enlargement at the end of the hole
- Cutting edges at the end of conical surface.
- Cone angles of 60°, 82°, 90°, 100°, 110°, 120°

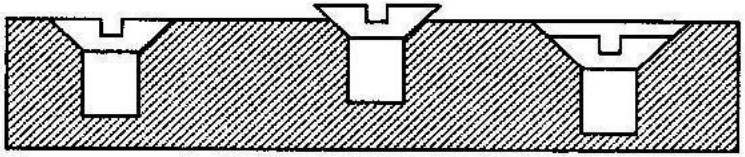
## Counter Bore Tool:-

- Special cutters uses a pilot to guide the cutting action .
- Accommodates the heads of bolts.

# Counter bore and spot facing



a

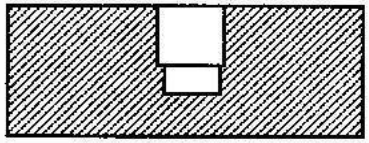


b

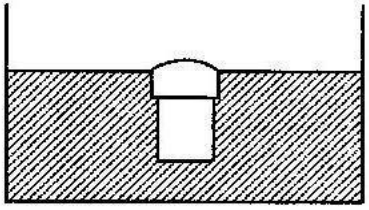
Countersunk hole

Not good because it rip clothes

Not good, collect dust



Counterbored hole



Spot faced hole

# Types of cutters

## Combined Countersinks and central drill :-

Special drilling tool to start the hole accurately.

At the end it makes countersinks in the work piece.

## Gun drill :-

Machining of lengthy holes with less feed rates.

To overcome the heating and short life of the normal drill tool

# Types of cutters

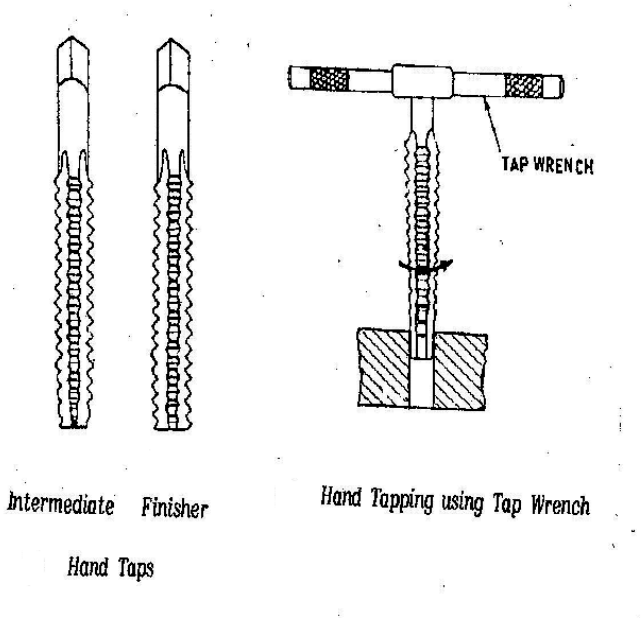
Tapping:-

For cutting internal thread

Multi cutting edge tool.

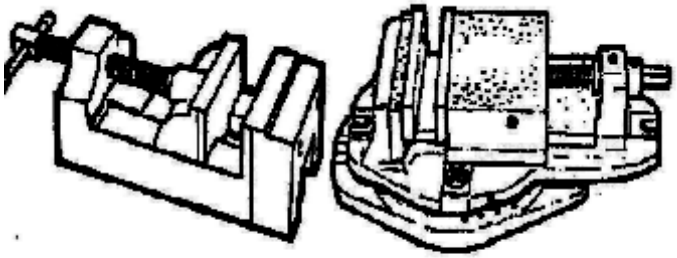
Tapping is performed either by hand or by machine.

Minor dia of the thread is drilled and then tapping is done.



# Work Holding Devices

- 1. Machine Table Vice

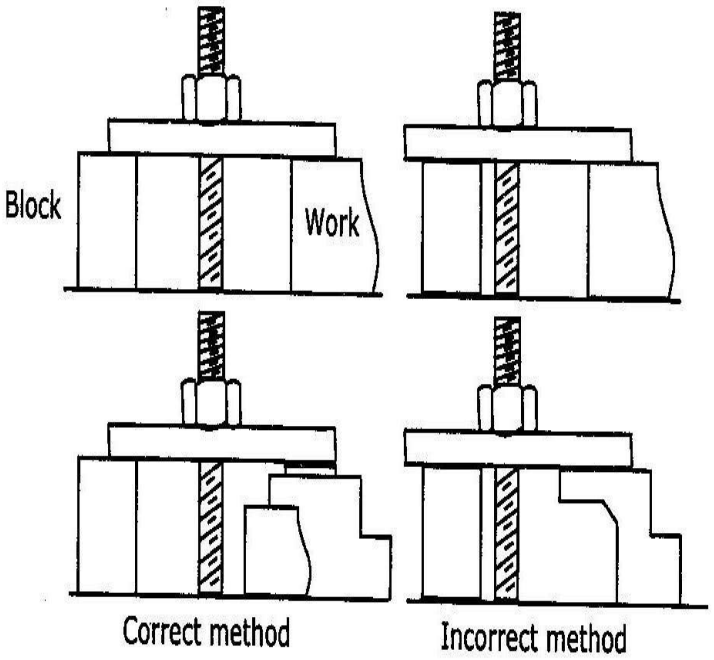


Standard machine table vice

Swivel vice

# Work Holding Devices

- Step Blocks
- Clamps
- V-Blocks
- Angles
- Jigs
- T- Slots Bolt



# Definitions

- Cutting Speed (v):-

  It's the peripheral speed of the drill

  v = □*D*N  where

  D =  dia of the drill in m

  N = Speed of rotation in rpm

  Feed Rate (f):-

  It's the movement of drill along the axis (rpm)

  Depth of Cut (d):-

  The distance from the machined surface to the drill axis

  d = D / 2

## Material Removal Rate:-

It’s the volume of material removed by the drill per unit time

MRR = (□ D2 / 4) * f * N  mm3 / min

## Machining Time (T) :-

It depends upon the length (l) of the hole to be drilled , to the Speed (N) and feed (f) of the drill

t = L / f N min

# Precautions for Drilling machine

- Lubrication is important to remove heat and friction.
- Machines should be cleaned after use
- Chips should be removed using brush.
- T-slots, grooves, spindles sleeves, belts, pulley should be cleaned.
- Machines should be lightly oiled to prevent from rusting

# Safety Precautions

- Do not support the work piece by hand – use work holding device.
- Use brush to clean the chip
- No adjustments while the machine is operating
- Ensure for the cutting tools running straight before starting the operation.
- Never place tools on the drilling table
- Avoid loose clothing and protect the eyes.
- Ease the feed if drill breaks inside the work piece.