@h- Cutting tool material

Characteristics :-

① high hot hardness

1. The material must remain harder than the work material at elevated operating temperature

② Wear Resistance

The material must withstand excessive wear even through the relative hardness of the tool work materials changes.

3. Toughness

The toughness actually implies a combination of strength and ductility the material must have sufficient toughness, cost and

cost and easeness in fabrication.

- The cost and easeness of fabrication should have with reasonable limits

Composition

Types of tool material.

* Carbon tools steels.

* : 0.08%

* carbon steel contens carbon in amounts ~~resting~~ from 0.08 to 1.5% ranging

• It is used in manufacture of tools of low cutting speed about 12 m/mints.

* High speed steel

• High speeds steel opperate at to cutting speed 2 to 3 time more then the carbon steels.

• To improve the hot hardness cobalt is used.

• Tungsten in High speed steel provides hot hardness molybdenum is used ~~sharpness~~ the keenness of the cutting edge.

- Cobalt Improves the hot hardness and wear resistance.

Stellites

- It is the trademark of non-ferrous cast iron alloy composed of cobalt, cromium and tunston
- Diamond is the hardest, most wear resistance material in the world. It is suetable for cutting material glass, plastic and seramics.

Types of

*. Question

Write the different types of tool material and explain high speed steel. tool material and its uses.

Cutting fluids:-

Cutting fluids sometimes referred to as lubricants, and coolants are liquid and gases applied to the tool and workpices to assist in cutting opperation,

* Purpose of cutting fluids

1. To cool the work pices material
2. To lubricate and reduces friction.
3. To improve surface finish
4. To protect finish surface from corosion.
5. To cause chipes breakup into small parts
6. To wash the chipes away from the tool.

* Properties of cutting fluids

1. High heat absorbtion and readily absorbing heat develop.
2. Good lubricate qualities. to produces low coefficient of friction

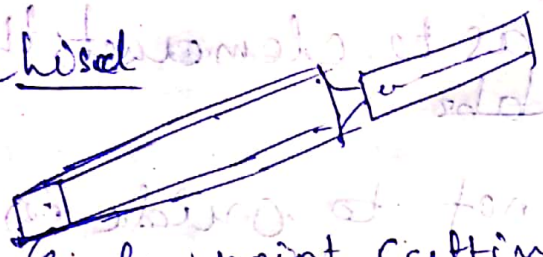
③ High flash point so as to elements the hazard of fire show

④ Stability show as not to oxide in the air.

⑤ Neutral show as not to react chemically

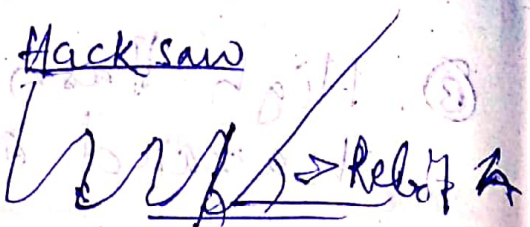
⑥ Odorless show as not to produces any bad small even when heated

Chisel



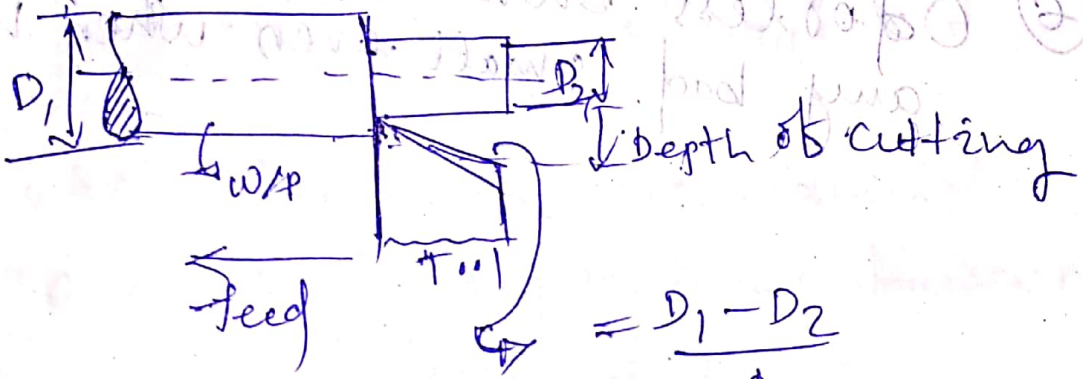
(Single point cutting tool)

Hack saw



(Multi point cutting tool)

Machining process parameter



$$= \frac{D_1 - D_2}{2}$$

Cutting speed

The cutting speed of the tool is the speed at which metal is remove by the tool from the work pieces (W/P) in a length lathe it is the parabary of the speed of the W/P. Cutting speed unit is meter per minits

$$\text{Cutting speed} = \frac{\pi d n}{1000} \text{ m/min}$$

d = diameter of W/P

n = rpm.

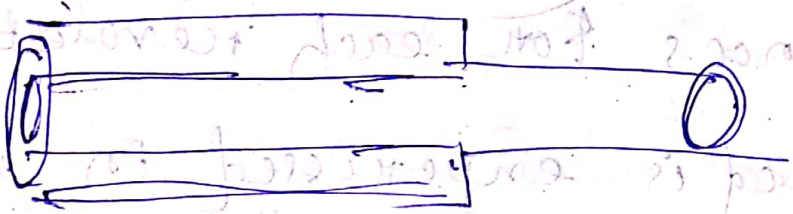
Feed

- The feed of a cutting tool in a length work is the distance the tool advances for each revolution of work.
- Feed is expressed in 'mm' per revolution.
- Increased feed reduces the cutting time
- Increased feed reduces the tool life.
- The feed affects such factors as size, shape, strength, depth of cut, power absorbed etc.
- Coarse Feeds are used for roughing and final feeds for finishing cut.

Depth of cut :-

- The depth of cut is the perpendicular distance measured from the machined surface to uncut surface of the workpiece.

Depth of cut = $\frac{D_1 - D_2}{2}$



- Where D_1 = diameter of the work shaft phase before maching into D_2 = diameter of the machine surface.

- Depth :

Machining time :-

Machining time on the length work can be calculated for a particular operation if the speed of, feed length of the jump is known.

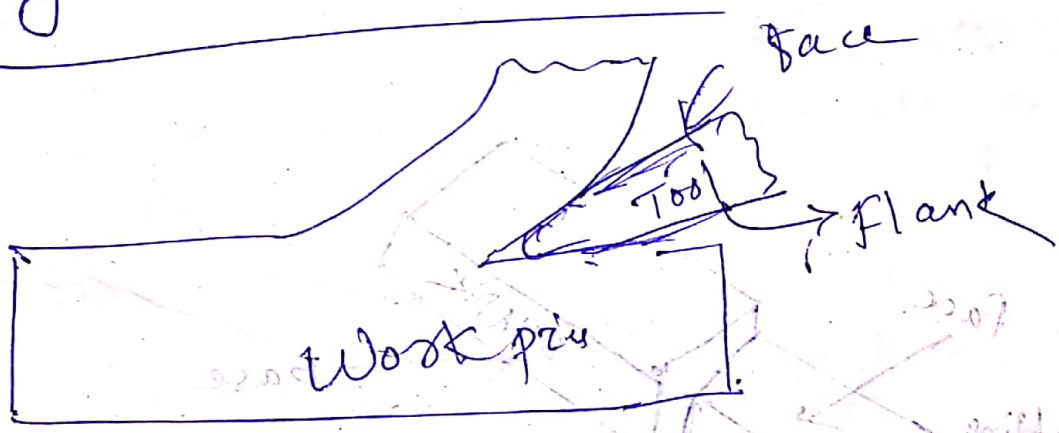
The time taken for a complete cut

$= \frac{l}{fxn} =$

Where l = length of the job.

f = the feed of job per revolution, end is

Cutting tool nomel Geometry:-



Face

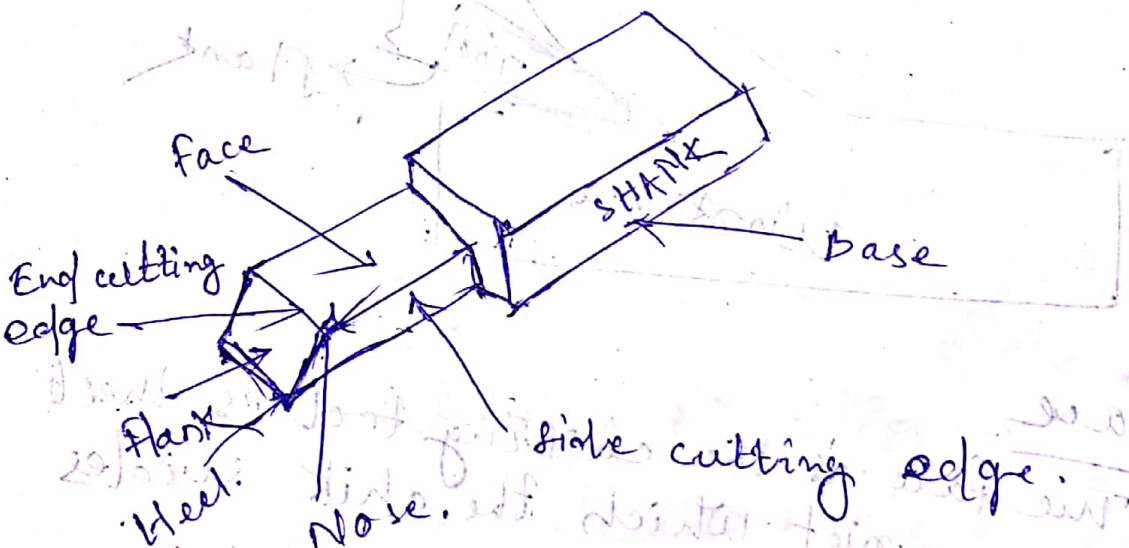
The face is the cutting tool is that surface against which the chip slides upward.

Flank :-

The flank of cutting tool is that surface which faces the work piece. i.e. or the combination of the side and cutting adjacent edges.

- The nose radius increases the tool life and surfaces finish.

Single point Cutting tool.



SHANK :-

It that persion of the tool which is not ground to from the cutting edges at it is rectangular in cross-section.

HEEL:-

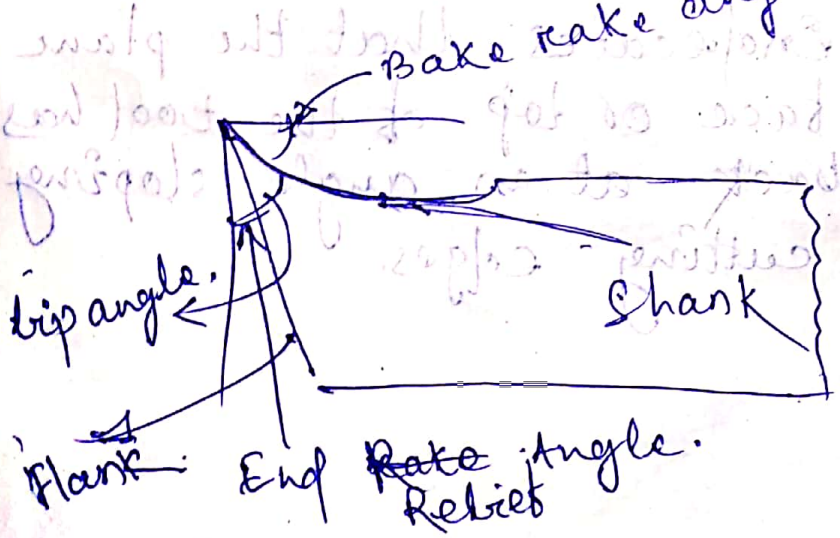
The heel of a single point cutting tool is the lowest portion of side cutting edge.

BASE:-

It is the under side of portion of the shank.

Cutting tool nomenclature:-

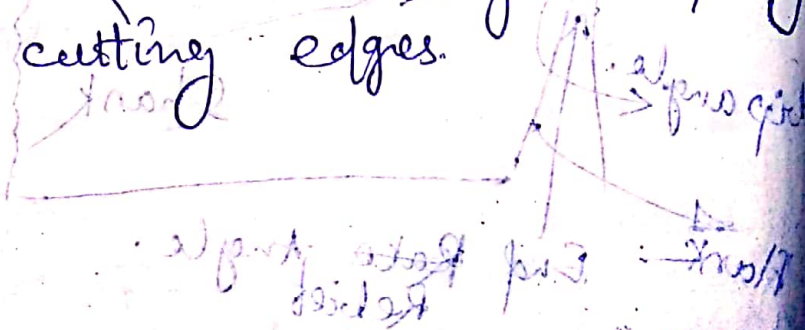
- Cutting tool nomenclature means systematic naming of various parts, and angle of a cutting tool.
- The various part of cutting tool those are shank, face, flank, heel, nose, base of back rake, side rake, side clearance angle, end cutting edge and lip angle shown in the figure.



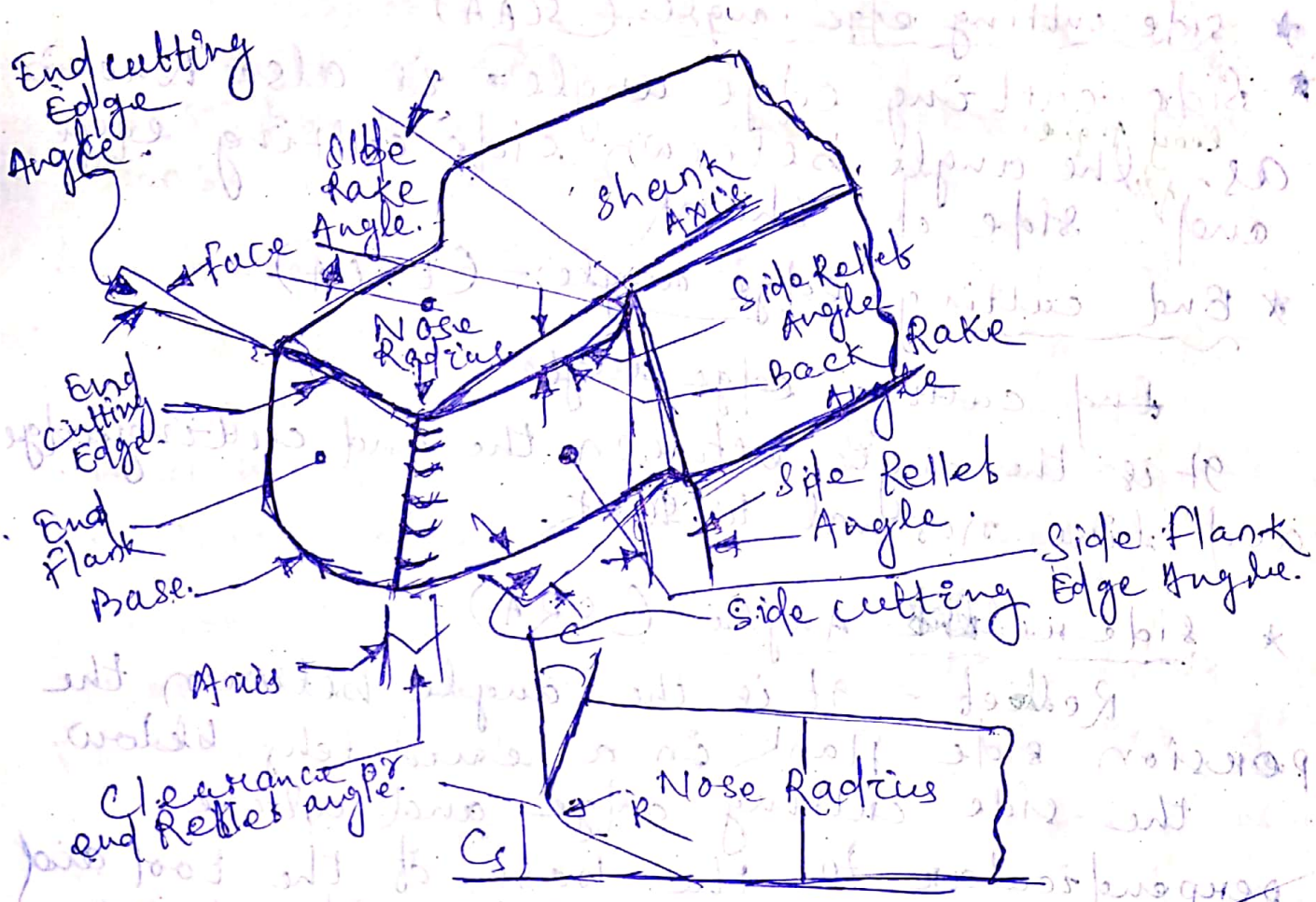
Rake Angle:-

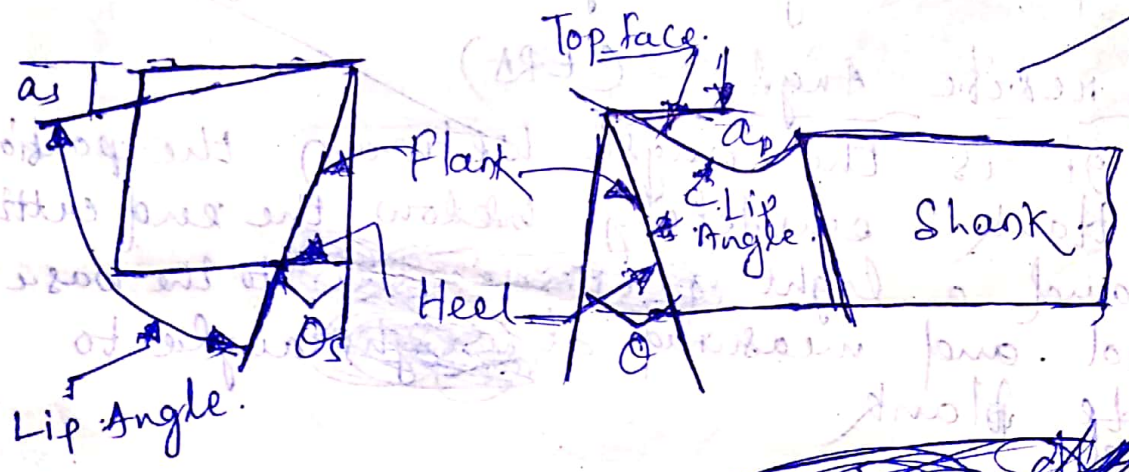
The rake is the slope of the top away from the cutting edge. The larger of the rake angle larger will be the shear angle and subsequently the power & cutting force reduces.

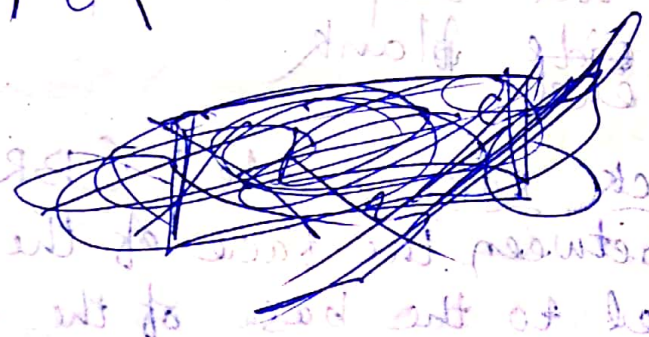
- A larger rake angle is good for surface finish.
- If tool has a side and back rake angle.
- Back rake indicates that the plane which forms the face or top of a tool has been ground back at an angle sloping from the nose
- Side rake indicates that the plane that forms the face or top of the tool has been ground back at an angle sloping from the side cutting edges.



Geometry of turning tool







The three views of single point cutting tool and cutting angles are shown ~~and explained~~ above and explained below.

* Side cutting edge angle:- (SCEA)

* Side cutting edge angle is also known as lead angle. It is the angle between side cutting edge and side of shank

* End cutting edge angle:- (ECEA)

End cutting edge angle

It is the angle between the end cutting edge and line normal to shank.

* Side relief Angle (SRA)

Relief - It is the angle between the portion side flank immediately below the side cutting edge and a line perpendicular to the base of the tool and measured at right angle to side flank.

* End relief Angle:- (ERA)

It is the angle between the portion of end flank immediately below the end cutting edge and a right [illegible] to the base of the tool and measured at [illegible] angle to the end flank.

* Back Rake Angle: (BRA), or. It is the angle between the face of the tool and a line parallel to the base of the tool and measured in a plane (perpendicular) through the side cutting edge.

this angle is positive, if the side cutting edge slope ~~of the side~~ downwards from the point towards the shank and is negative if the slope of the side cutting edge is reverse. So this angle gives the slope of the face of the tool from the nose towards the shank.

Side Rake angle :- (SR) α_s.

It is the angle between the face of the tool and a line parallel to the base of the tool and measured in a plane perpendicular to the base and the side cutting edge. This angle gives the slope of the face of the tool from the cutting edge. The side rake is negative if the slope is towards the cutting edge and is positive if the slope is away from the cutting edge.

Barcode

Lathe operations:-

The operations which are performed in a lathe either by holding the workpices between the centers or by chucks are called as turning

(2) Tapper turning.
(3) Chamfering
(4) Theared cutting
(5) facing
(6) Knurling
(7) Spinning
(8) Groving

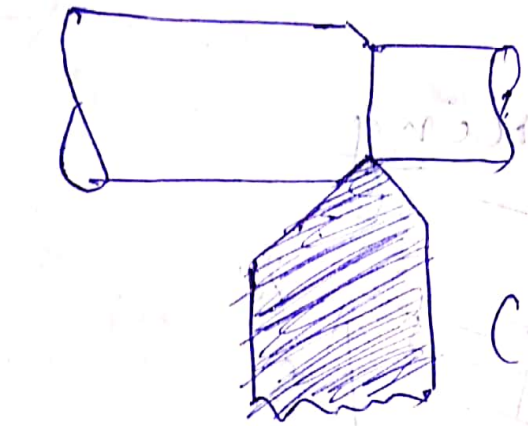
Operation which are performed by holding the work by a chuck or a face plate -

(1) Drilling
(2) Reaming.
(3) Boring
(4) Counter Boring
(5) Tapping
(6) patting

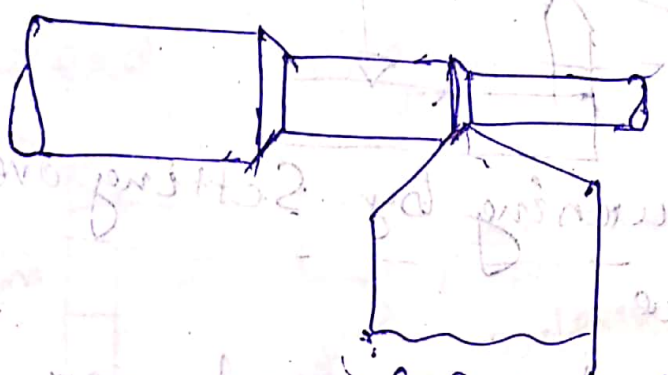
Operation which are performed by using special attachment

① Greading
② Milling

Turning operation:-



(Rough turning)



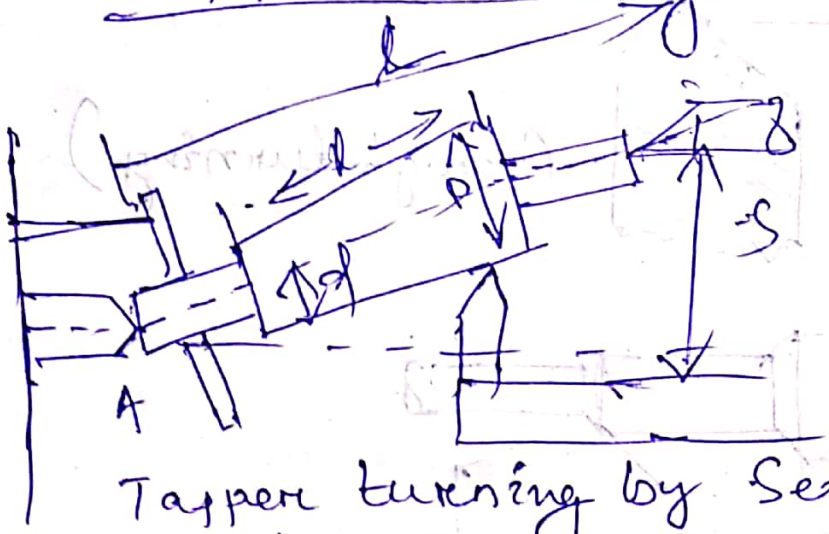
(finish turning)

Ⓐ

Turning in a lathe is to remove excess material from the work pieces to produces a cillinder surface.

In straie turning the work is turned straie when it's made to rotated about the lathe axis and tool is ~~head~~ fed parallel to the lathe axis. The straie turning produces a cylindrical by removing extra metal from the workpiece.

Tapper turning



Tapper turning by setting over the tailstoke.

The principial of turning tapper by this method is to ~~shift~~ the axes of rotation of workpiece at an angle to the lathe axis and feeding the tool parallel to the lathe axis. The ~~axis~~ angle at which

the axis of rotation to which is shifted to equal to half the angle of the tapper. This is done when body of tail stock is made to slide on the base from the operater by a set over distance.

$$\sin\alpha = \frac{S}{L} \quad (S = \text{set over distance})$$

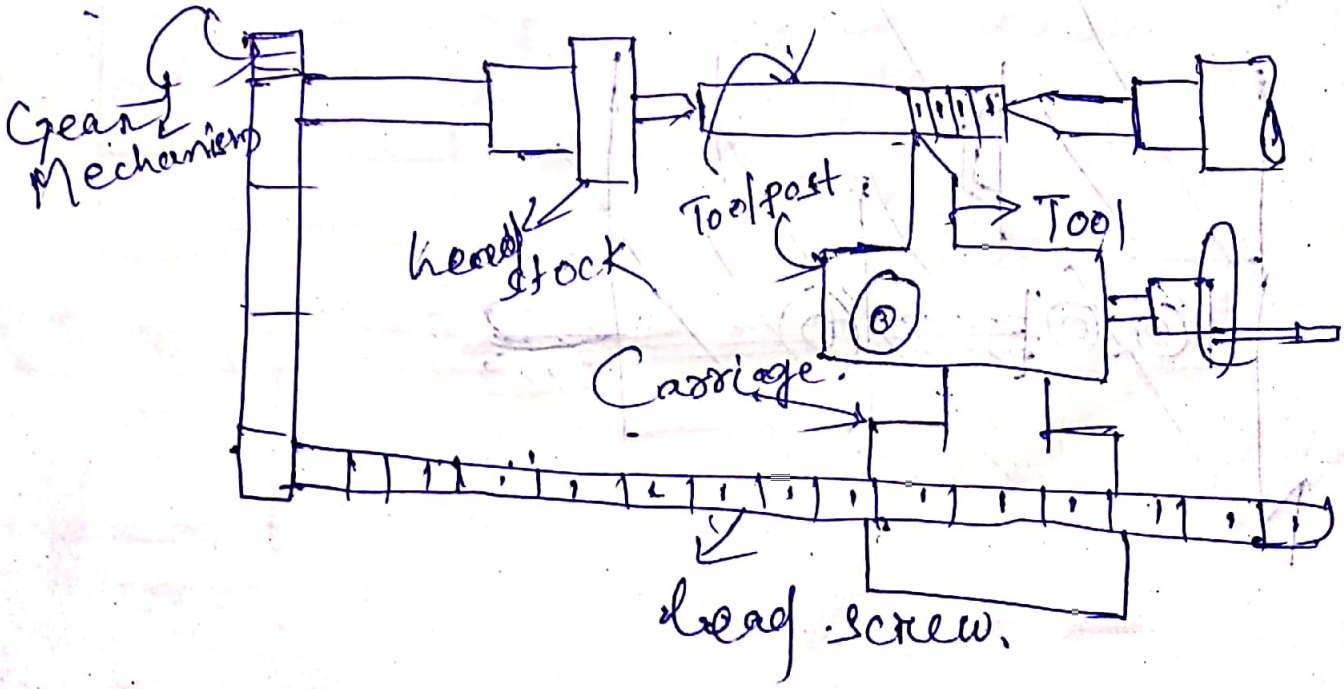
$$\Rightarrow S = L\sin\alpha$$

for small angle $\sin\alpha = \tan\alpha$

$$S = L\tan\alpha$$

$$\text{Setover} = L \times \frac{D-d}{2L}$$

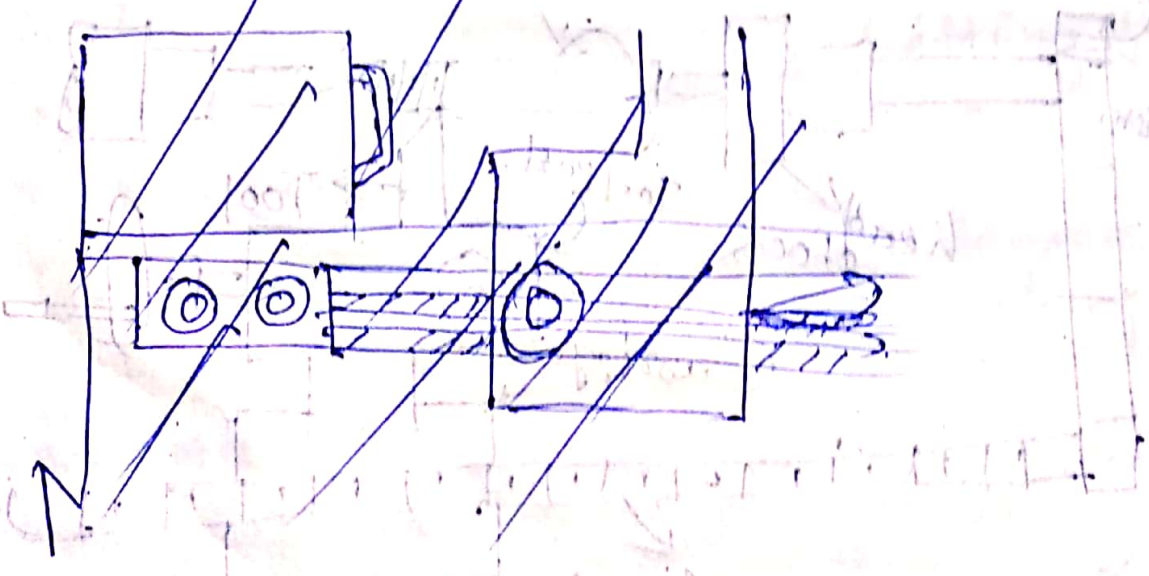
Thread cutting :-



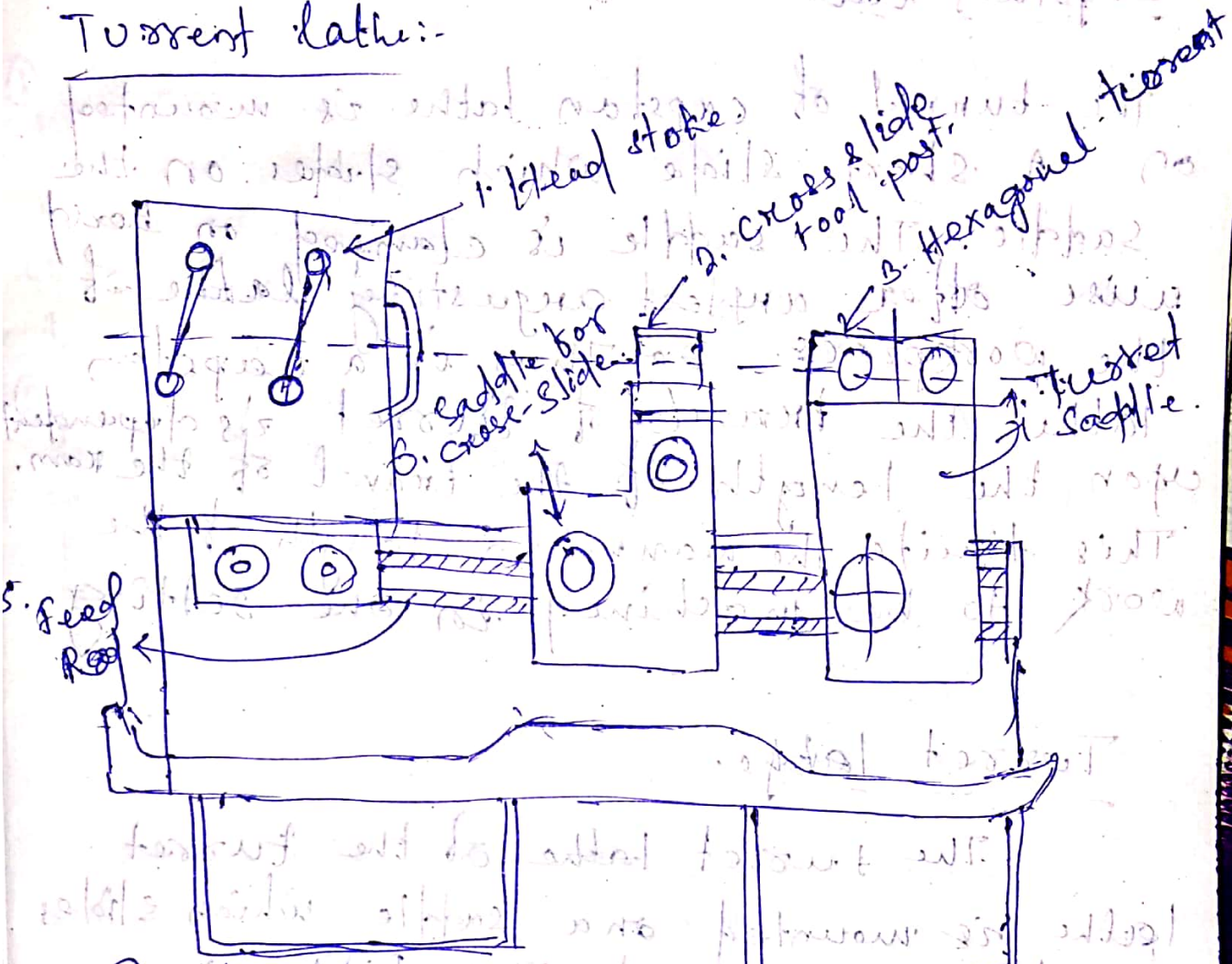
The principle of thread cutting is to produces a helical groove on a cylindrical surface by feeding the tool longitudinal when the job is revolved between the centers or by chucks.

The longitudinal feed should be equal to the pitch of thread to be cut per revolution of workpiece. The lead screw of the lathe through which the saddle receives the transformation has a definate pitch.

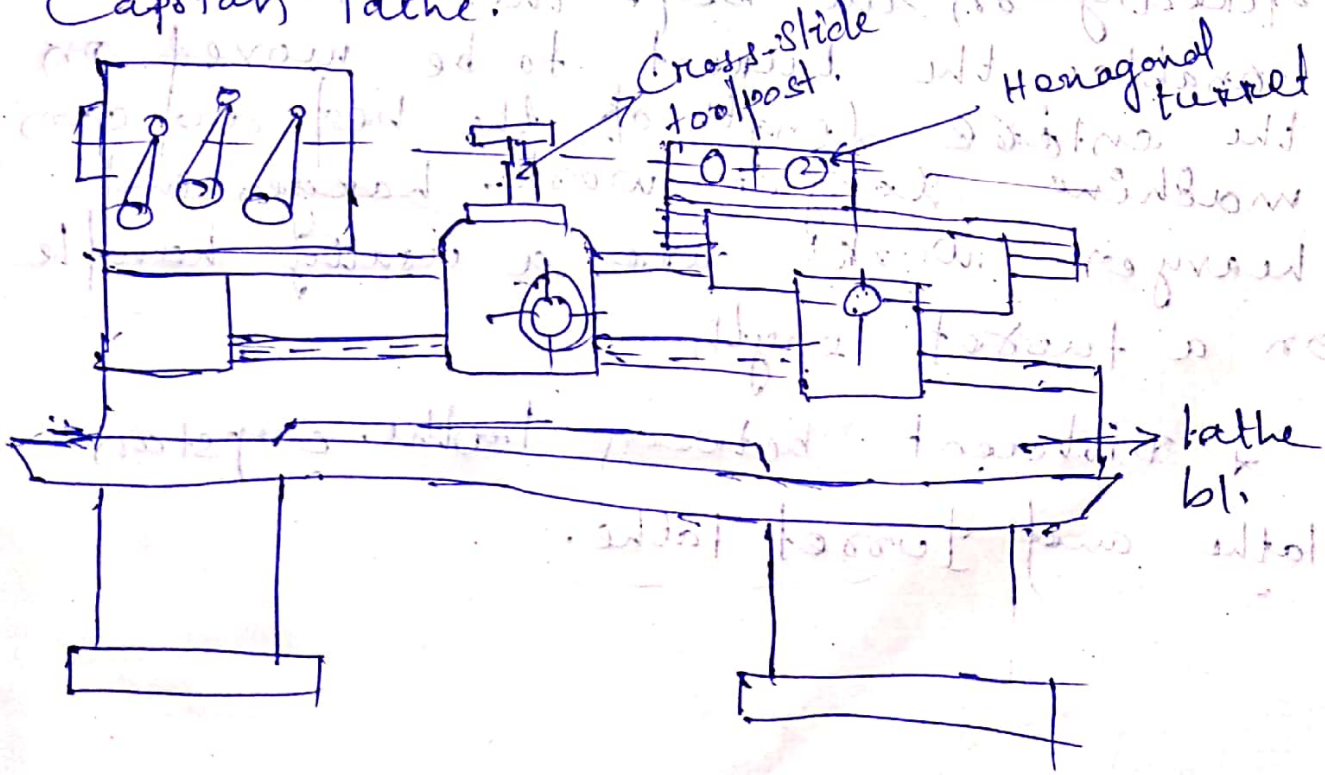
Turret Lathe.



Turret lathe:-



Capstan lathe:



Capstan lathe.

The turret of capstan lathe is mounted on A short slide which slides on the saddle. The saddle is clamped on bed wise after accurate adjusting the of the workpiece. Due this in a capstan lathe the travel of turret is dependent upon the length of the travel of the ram. This limits the maximum length of the work to be machined in one setting.

Turret lathe.

The turret lathe of the turret lathe is mounted on a saddle which slides directly on the Bed. This fixture enables the turret to be moved on the entire length of the bed and can machine longer work. Larger and heavier works are usually handle on a turret length.

Different between lathe. capstan lathe and turret lathe.

Capstan	turret
① It's turret (head) is mounted on an auxiliary slide which moves on the guide-ways provided on the saddle.	① It's turret (head) is mounted directly on the saddle.
② In this case the saddle is fixed at a convenient distance from work and the tools are feed by moving the slide.	② For feeding tools to the work the entire saddle unit is moved.

Scanned with CamScanner