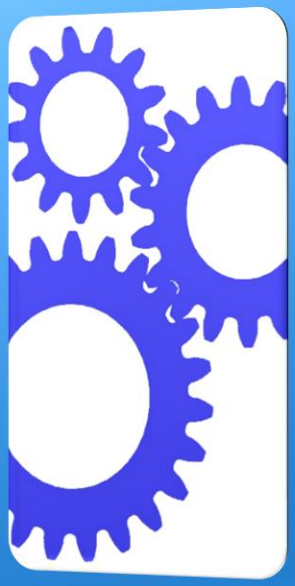

بسم الله الرحمن الرحيم



Presentation on

Machine shop Practice- 2

Sub Code-27032(3rd semester)

Mechanical Technology

Mymensingh Polytechnic Institute

BY .....

Ariful Islam

Junior Instructor (Mechanical)

Chapter-01

Fundamentals of Lathe Machine

Learning Objectives

The students shall be able to understand the following	Define a lathe
	Explain the construction of lathe
	Describe the types of lathe machine
	Explain the operations of lathe machine

Contents

Introduction

i). History

ii). Work principle

iii). Size of lathe

LATHE MACHINE

Presented by Tauqeer ahmad khan

History

i) History

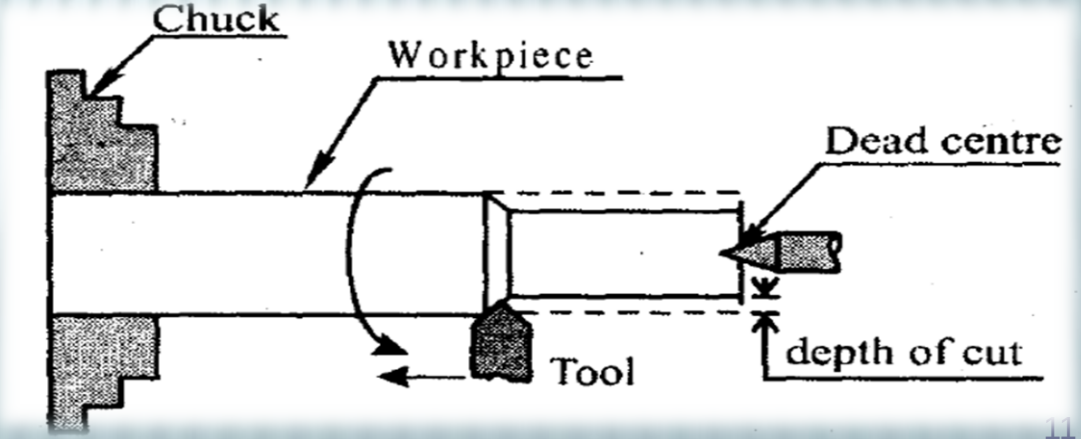
The origin of turning dates to around 1300BC when the Egyptians first developed a two-person lathe. One person would turn the wood work piece with a rope while the other used a sharp tool to cut shapes in the wood

The Romans improved the Egyptian design with the addition of a turning bow. Early bow lathes were also developed and used in Germany, France and Britain.

i. Lathe Introduction

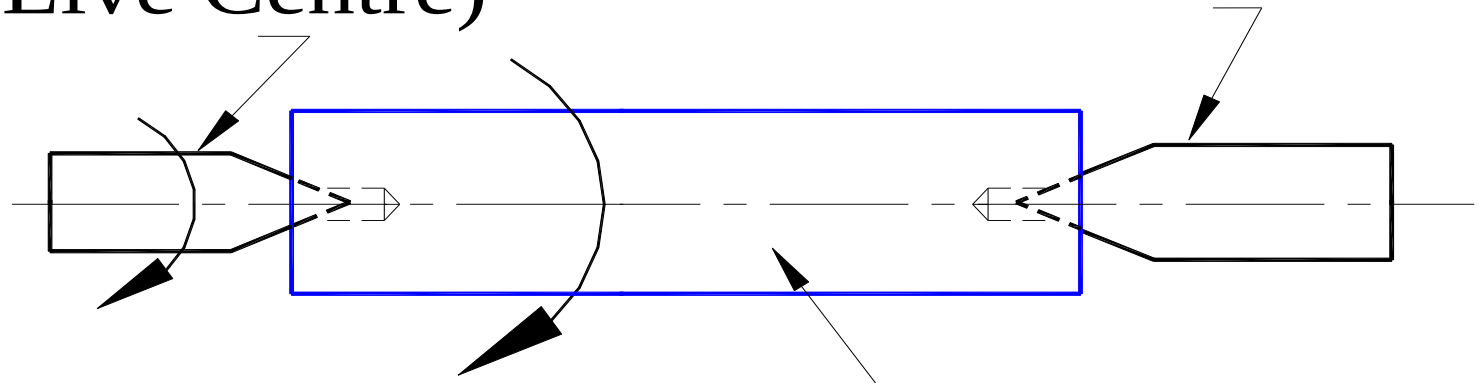
WORKING PRINCIPLE OF LATHE MACHINE

- The lathe is a machine tool which holds the work piece between two rigid & strong supports called centers or in a chuck or in face plate which revolves.
- The cutting tool is held and fed against the revolving work. Cutting tool fed either parallel or at right angles to the axis of w/p. Or may also at an angle .

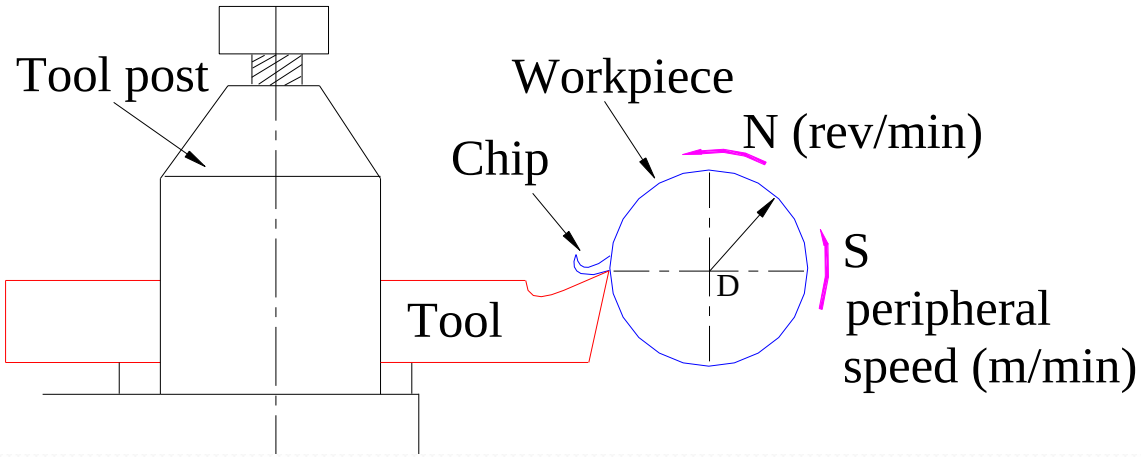


Headstock center
(Live Centre)

Tailstock center
(Dead Centre)



Workpiece



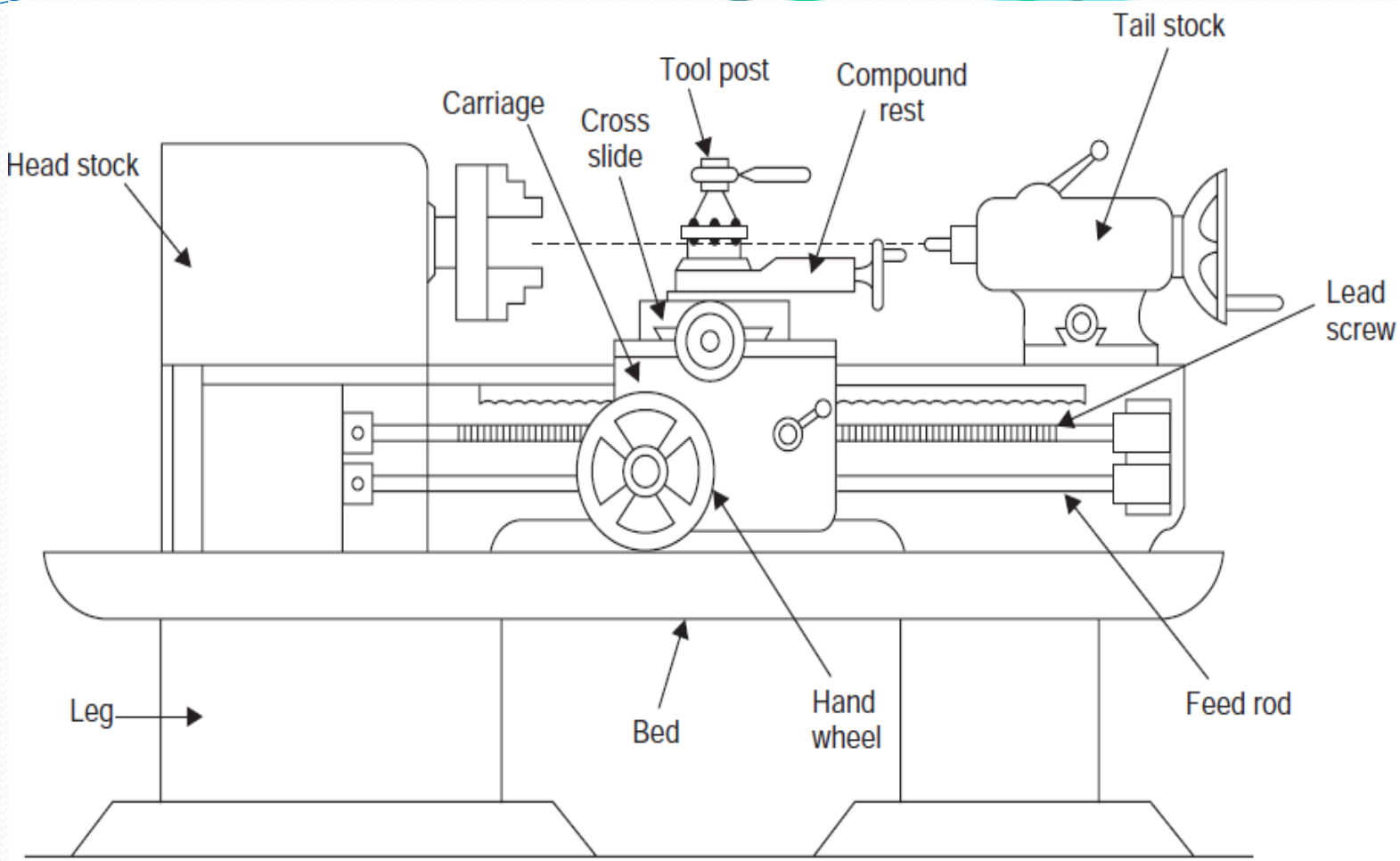
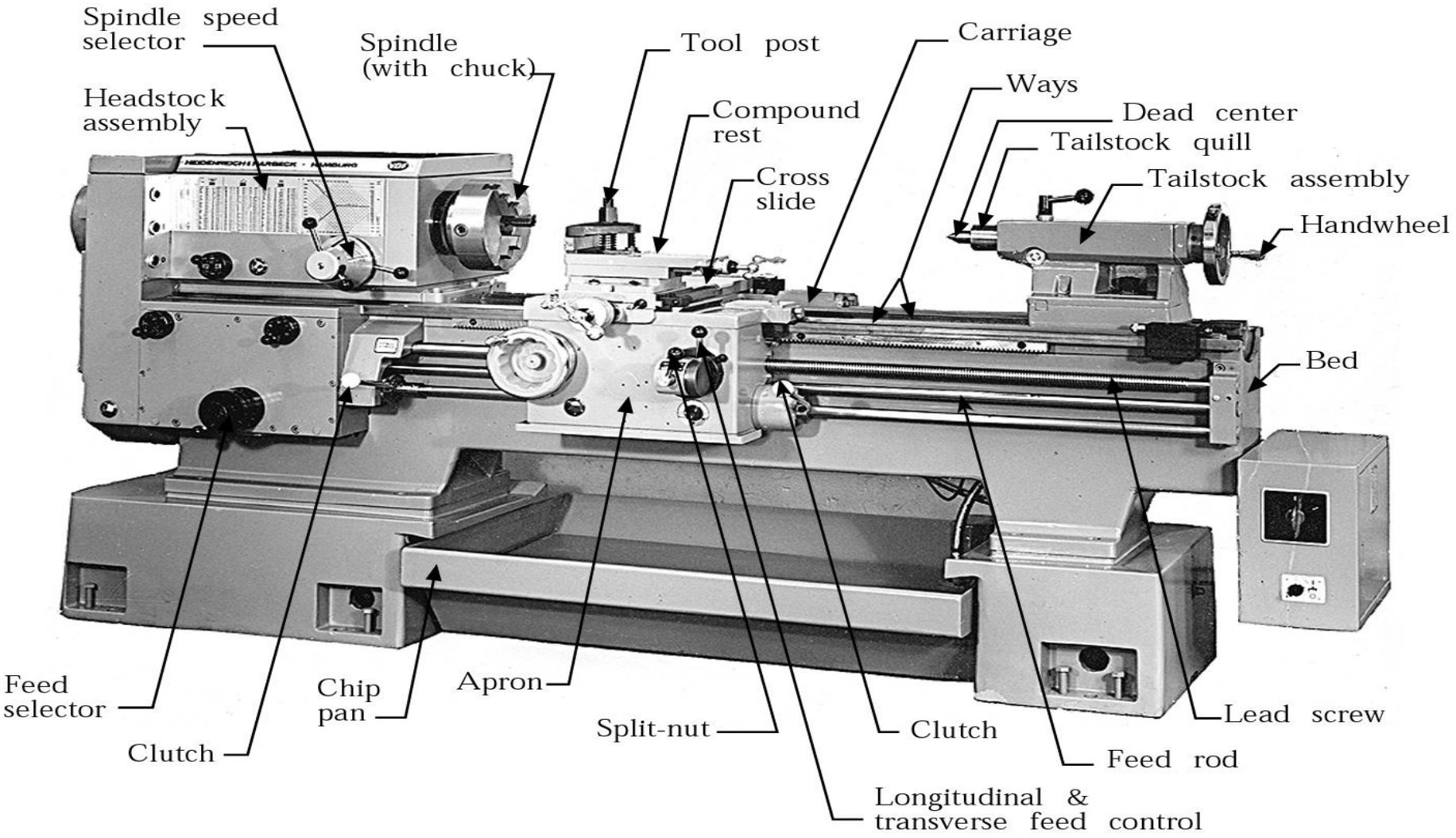
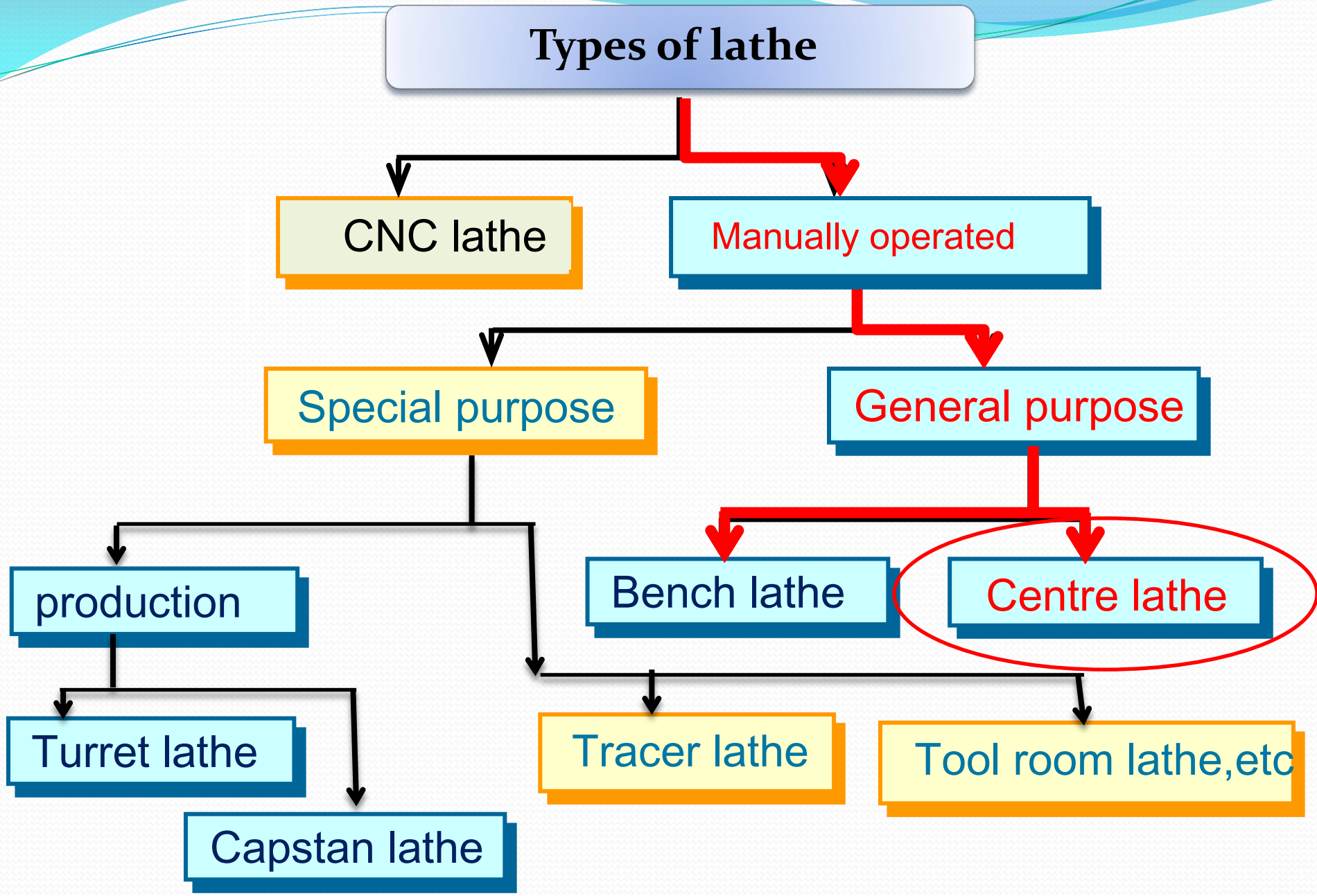


Fig. 1. Lathe Machine.

Component Description



Types


Types of lathe
CNC lathe
Manually operated
Special purpose
General purpose
production
Bench lathe
Centre lathe
Turret lathe
Tracer lathe
Tool room lathe,etc
Capstan lathe

Classification of Lathe

1. Speed Lathe –

   a)wood cutting lathe b)centering lathe
   c)polishing lathe d)spinning lathe

2. Engine Lathe

   a)belt driven lathe b)individual motor drive lathe
   c)gear head drive lathe

3. Bench Lathe

4. Tool room Lathe

5. Capsten & Turret Lathe

6. Automatic Lathe

7. Special purpose Lathe

   a)wheel lathe b)gap-bed lathe
   c)t-lathe d)duplicating lathe

1. Speed lathe

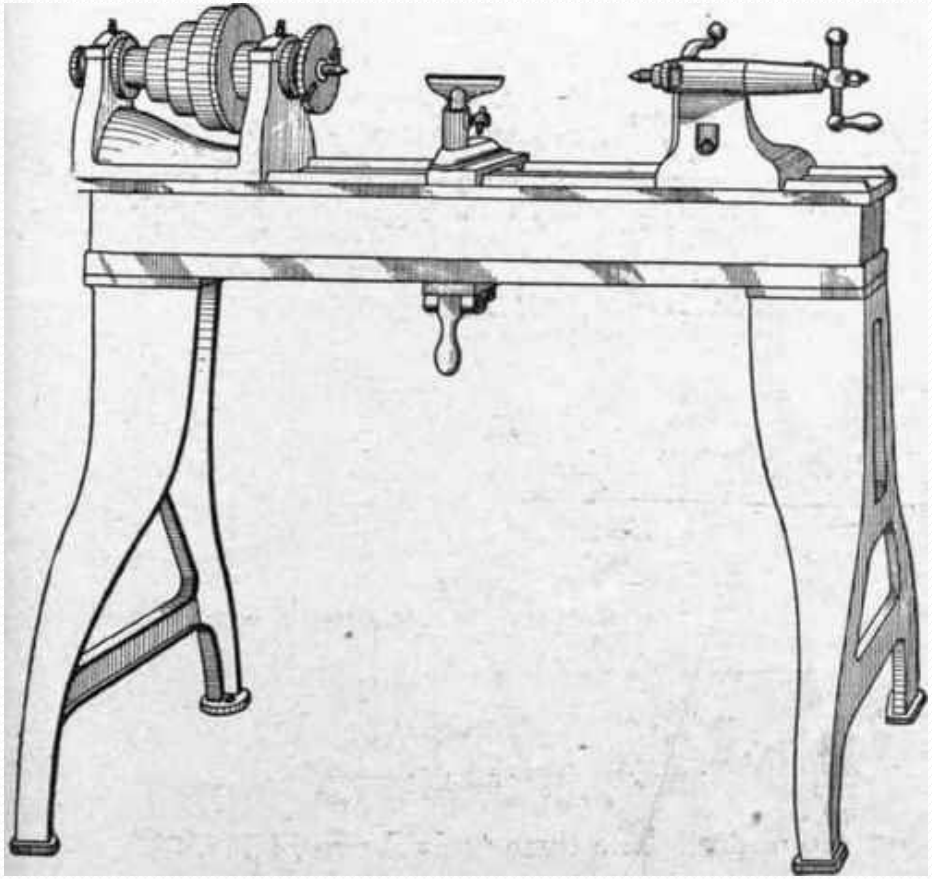
a) It is one of the simplest types of all types all lathes.

b) It is driven by power and consists of a bed, a headstock, a tailstock and an adjustable slide for supporting the tool.

c) Since the tool is fed into the work by hands and cuts are very small, therefore this type of lathe is driven at high speeds usually from 1200 to 3600 r.p.m.

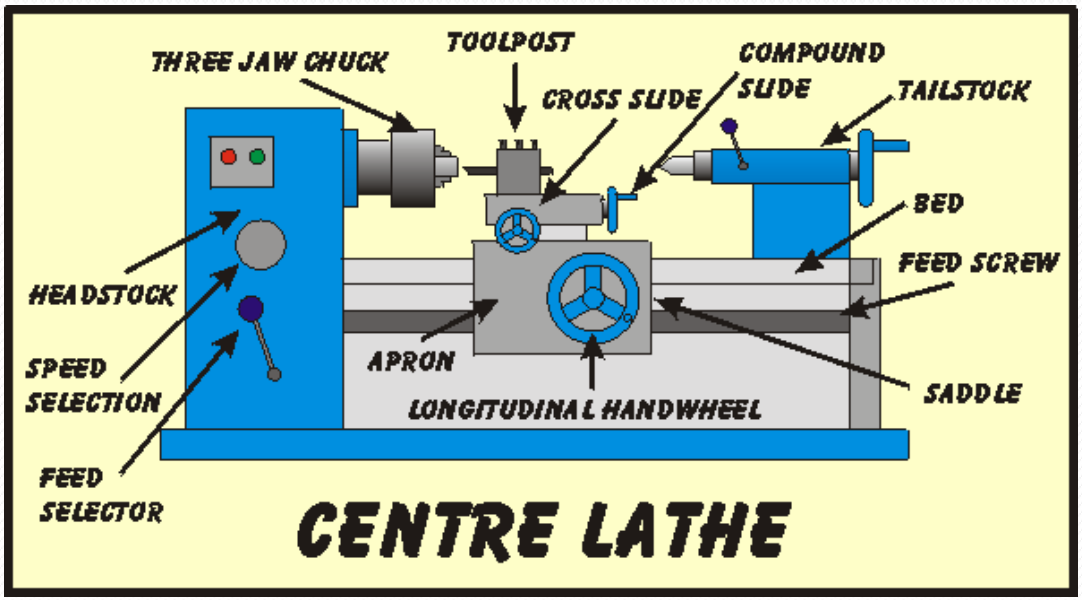
d) The work may be held between centres or attached to a face plate on the headstock.

e) The speed lathe is used mainly for wood working, centering, metal spinning, polishing etc.



2. Engine or centre lathe.

- It is a general purpose lathe and is widely used in workshops.
- Not production lathe, found in school shops, toolrooms, and job shops
- Primarily for single piece or short runs
- Manually operated
- The cutting tool may be led both in cross and longitudinal direction with reference to the lathe axis with the help of a carriage.



Centre lathe

- Most frequently used lathe
- Heavy duty
- power drive for most tool movements
- Size range 12”x24” to 24”x48” - can be larger

3. Bench lathe.

- so small that it can be mounted on a bench.
- All the types of operation can be performed on this lathe that may be done on an ordinary speed or engine lathe.
- used for small work usually requiring considerable accuracy such as in the production of gauges, punches and beds for press tools.

Bench Lathe

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

4. Tool room lathe.

a) The tool room lathe is similar to an engine lathe and is equipped with all accessories needed for accurate tool work.

b) It has an individually driven geared headstock with a wide range of spindle speeds.

c) Since this lathe is used for precision work on tools, gauges, dies, jigs and other small parts, therefore greater skill is needed t operate the lathe.

Tool room lathe

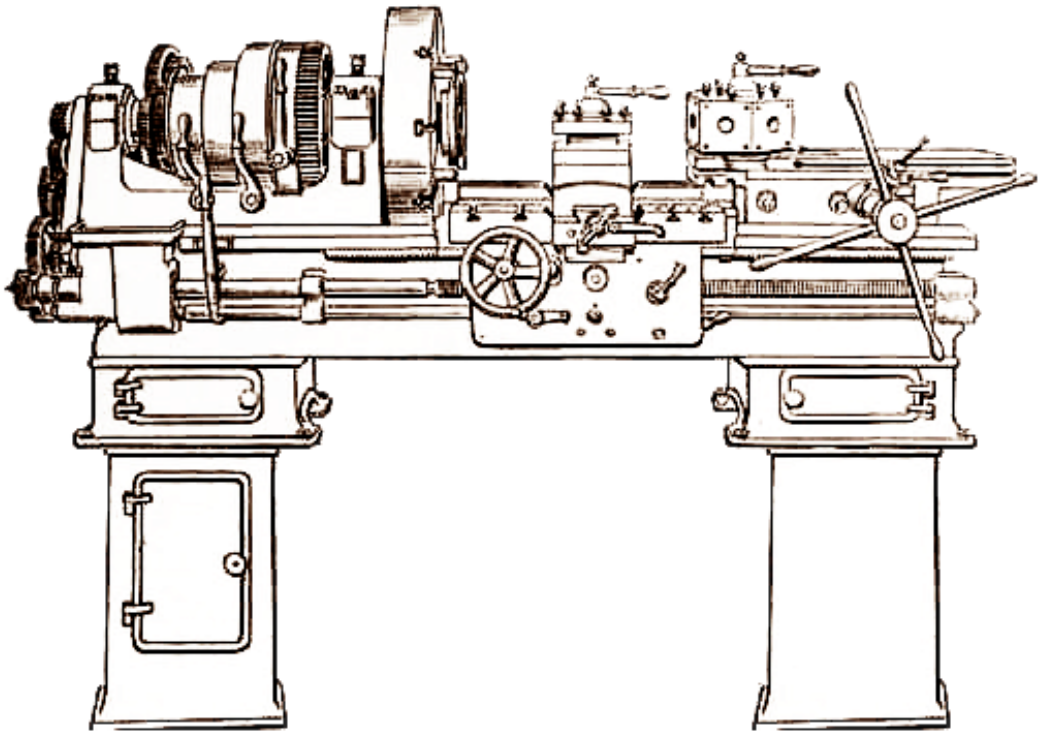
- Look like engine lathe
- Greater accuracy
- More versatility
- Wider range of speeds and feeds

5. Capstan and turret lathe.

a) The capstan and turret lathes are the modification of engine lathes and is particularly used for mass production of identical parts in the minimum time.

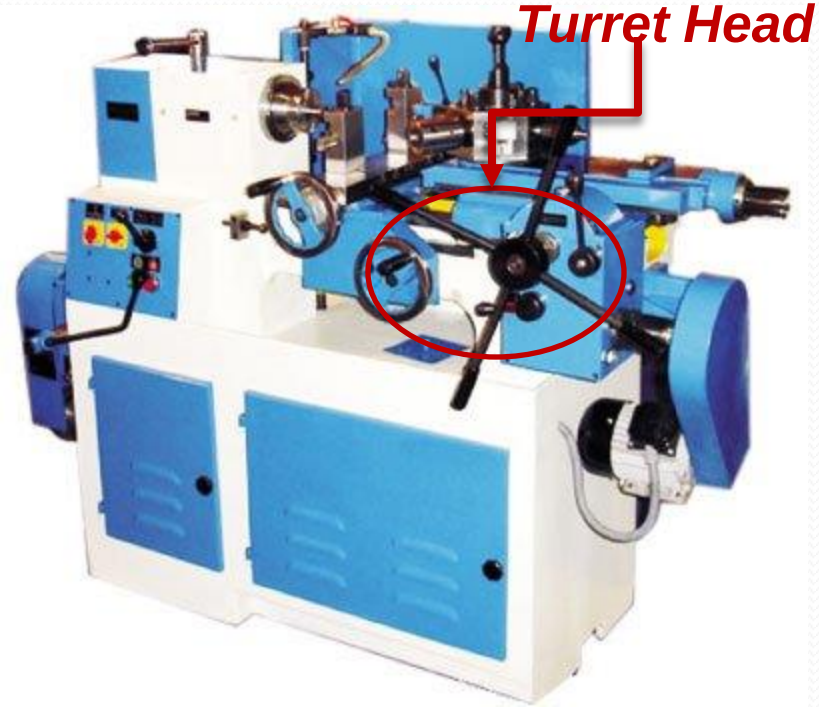
b) These lathes are semi-automatic and are fitted with multi tool holding devices, called capstan and turret heads.

c) The advantage of capstan and turret lathe is that several different types of operations can be performed on a workpiece without resetting of work or tools.



Capstan lathe

- It is production lathe
- Used for light duty work pieces
- Small in size as compared to turret lathe
- It also have turret that replaces tailstock
- Multiple tools set to machine part
- Still may require some operator skill



6. Automatic lathes.

a) The automatic lathe are so designed that the tools are automatically fed to the work and withdrawn after all the operations are complete to finish the work.

b) Since the entire operation is automatic, these lathes require little attention of the operator.

c) These lathes are used for mass production of identical parts.

Automatic lathe

An **automatic lathe** is a lathe (usually a metalworking lathe) whose actions are controlled automatically. Although all electronically controlled (CNC) lathes are automatic, they are usually not called by that name, as explained under "General nomenclature". The first kinds of automatic lathes were mechanically automated ones

7. Special purpose lathes.

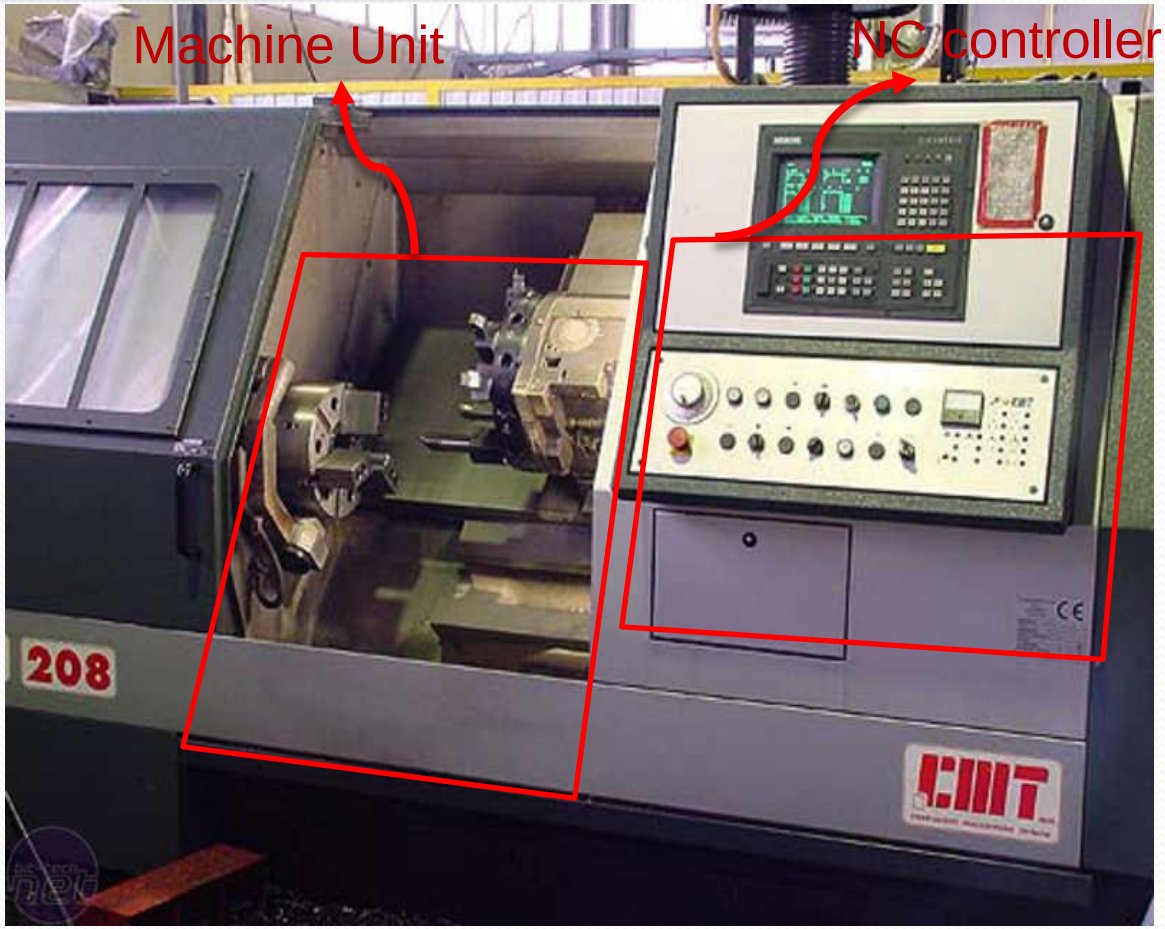
a) The work which cannot be conveniently accommodated or machined on a standard lathe, the special purpose lathes are used.

b) The Gap bed lathe which has a removable section in the bed in front of the headstock to provide a space or gap is used to swing extra large diameter jobs.

c) The Wheel lathe is made for finishing the journals and turning the tread on railroad car and locomotive wheels.

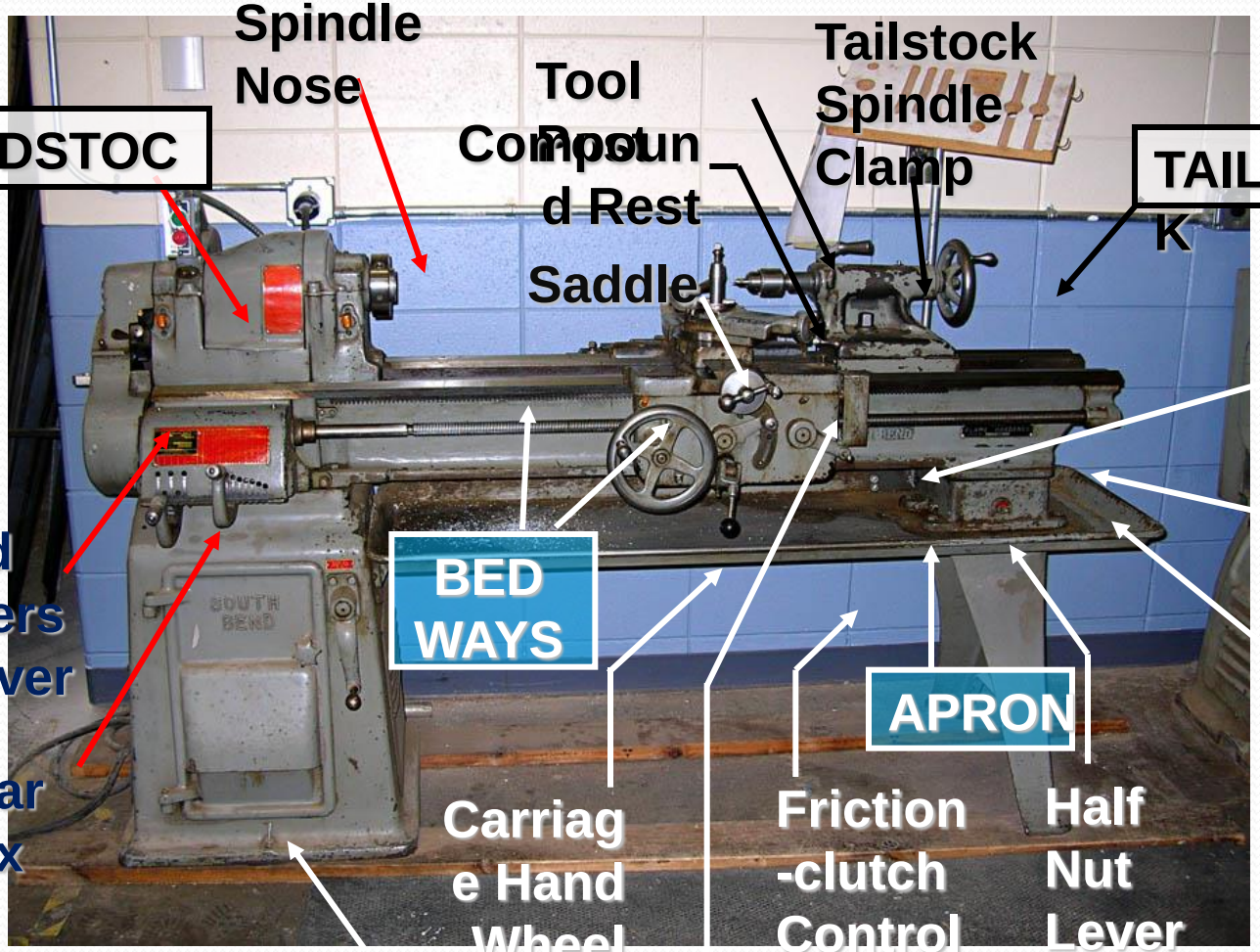
CNC lathe

- Computer controlled
- Wide variety of process capability
- multiple axis
- Indexing and contouring head
- On- line and off- line programming available
- Computer Numerical Controls (CNC)
- Equipped with one or more turrets
- Each turret is equipped with a variety of tools
- Performs several operations on different surfaces of the work piece



Construction of lathe

Lathe Basics



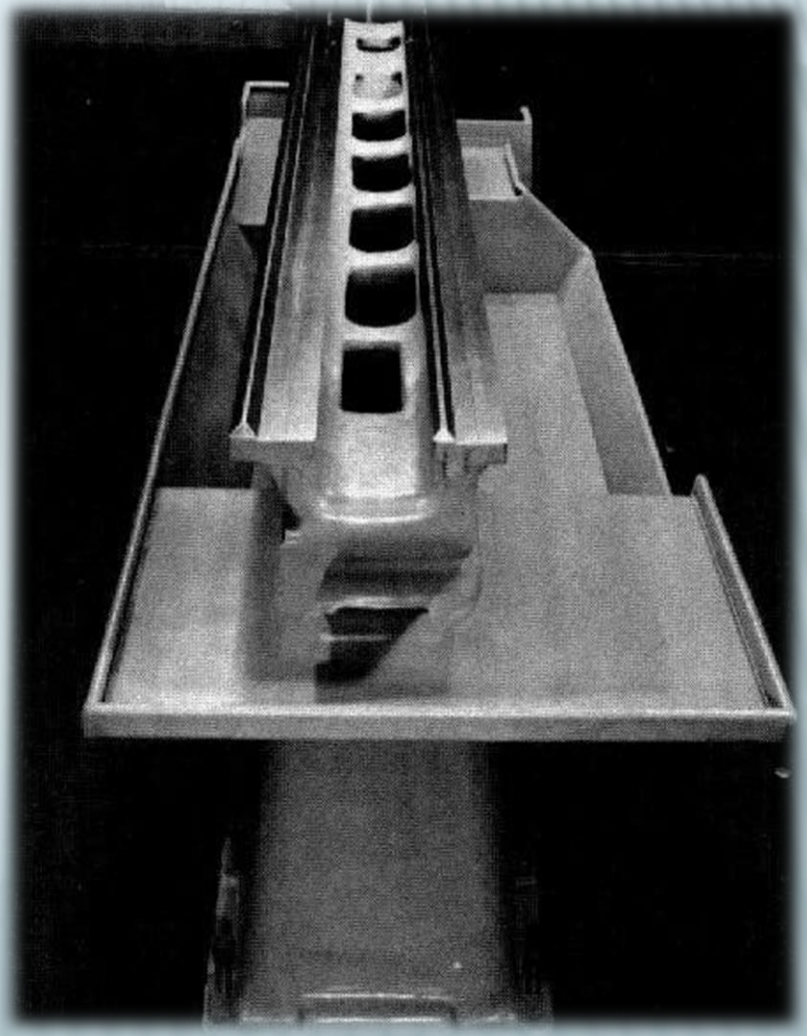
Major parts of centre lathe

- 1.Bed
- 2.Head stock
- 3.Tailstock
- 4.Carriage
- 5.Feed mechanisms
- 6.Screw cutting mechanism

CONSTRUCTION

Bed

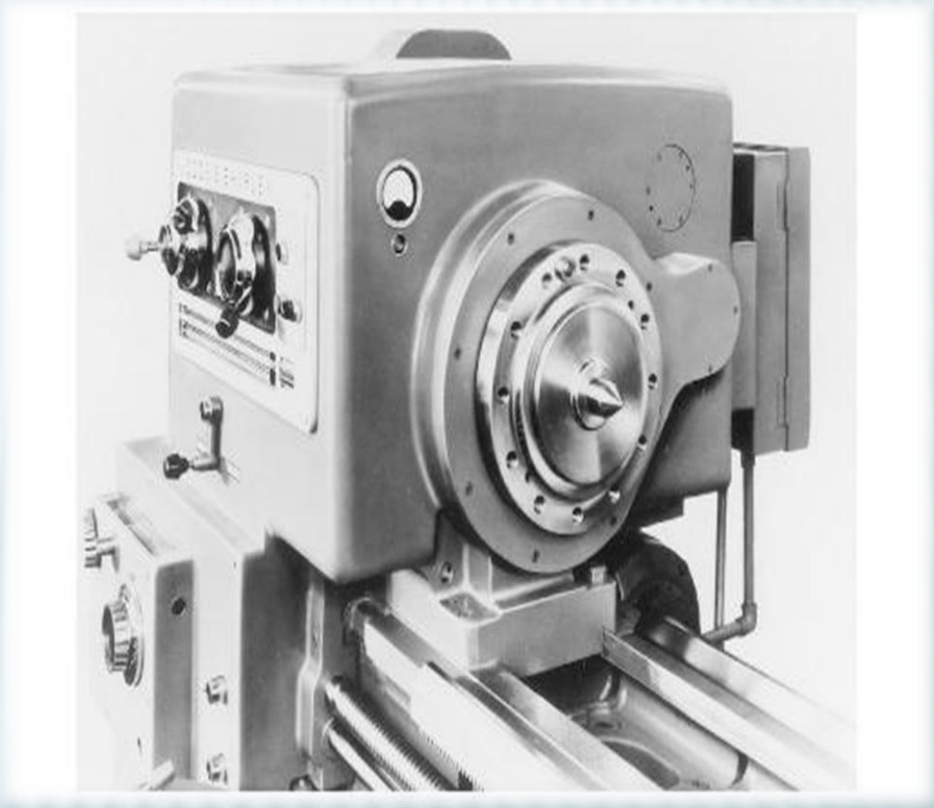
- Made from cast iron or nickel cast iron alloy.
- It supports head stock, Tail stock & carriage.
- On top section are machined ways Guide and align major parts of lathe



CONSTRUCTION

HEAD STOKE

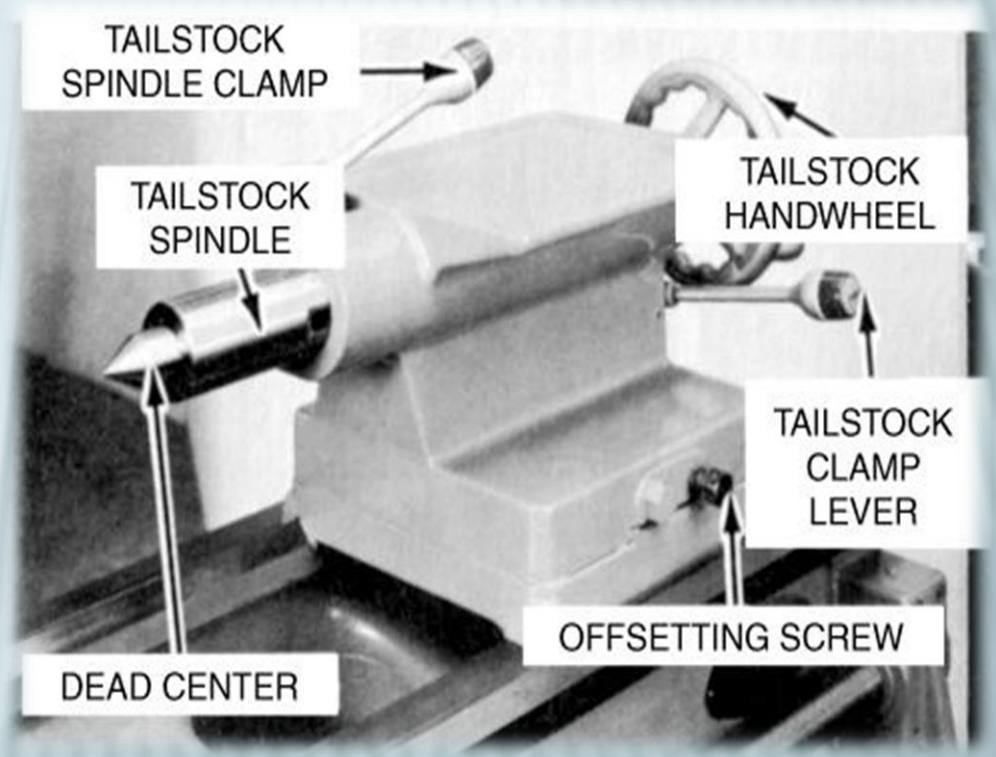
- Clamped on left-hand end of bed
- Headstock spindle
- Hollow cylindrical shaft supported by bearings
- Provides drive through gears to work-holding devices



CONSTRUCTION

TAIL STOKE

- Placed at right side of lathe.
- To support long work piece.
- Operations like drilling, tapping, reaming can done using sleeve of tailstock.



CONSTRUCTION

CARRIAGE

- Used to move cutting tool along lathe bed
- Consists of four main parts
- Saddle
- Cross-slide
- Apron
- Compound rest

CONSTRUCTION

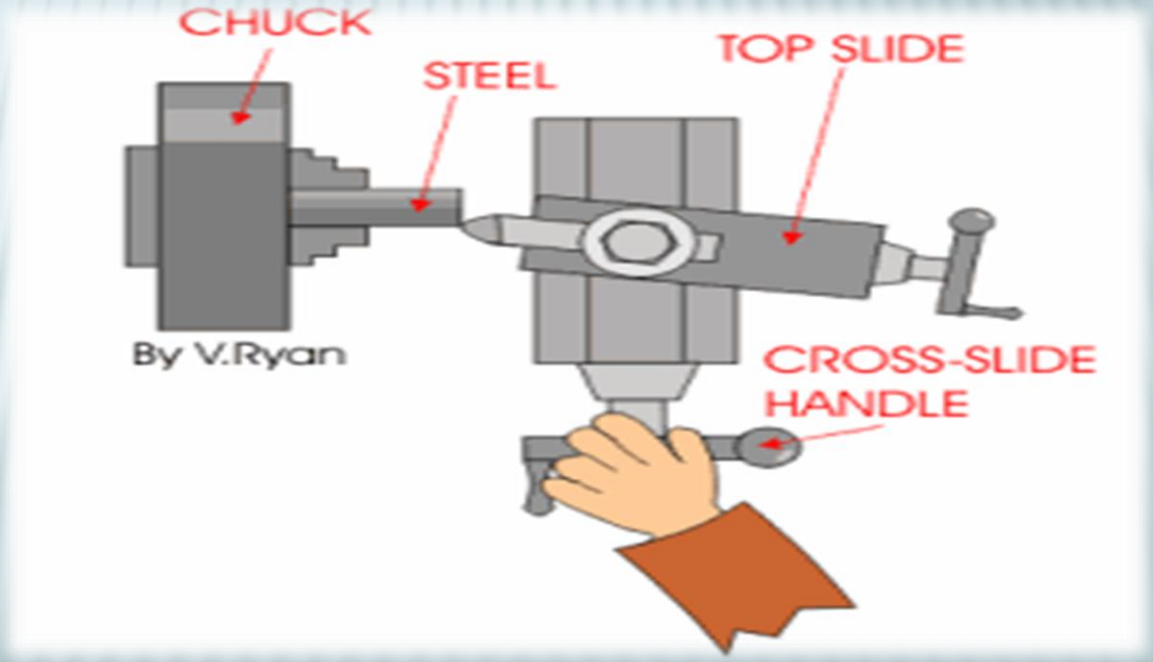
Feed Mechanism

- Three types of feed-
  - Longitudinal
  - Cross
  - Angular

CONSTRUCTION

Cross Slide

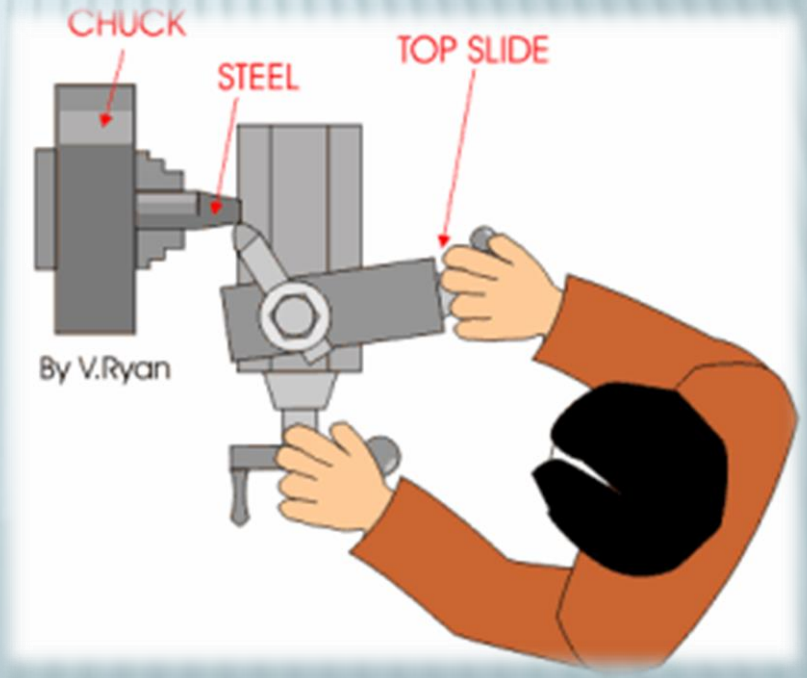
- Fitted on the Saddle
- Moves cutting tool at right angles to lathe bed



CONSTRUCTION

Top Slide

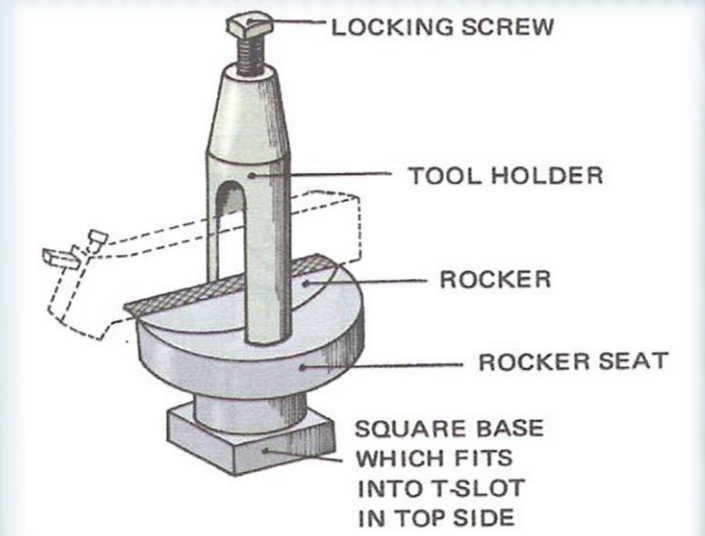
- Fitted to top of Cross slide
- Carries tool post and cutting tool
- Can rotate to any angle
- Is used to turn tapers



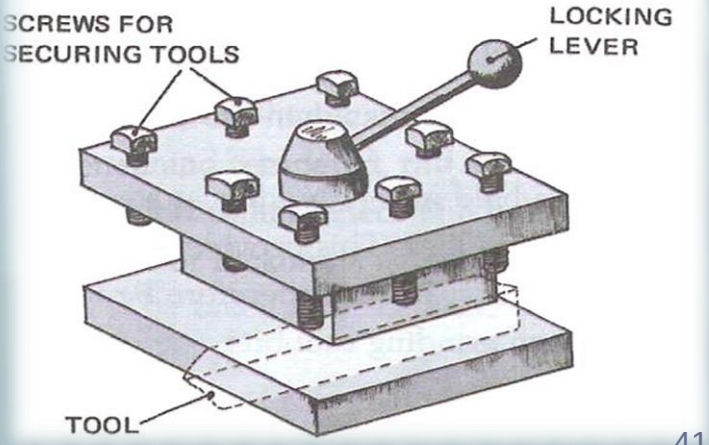
CONSTRUCTION

Tool Post

- Fitted on top slide and carries the cutting tool or the cutting tool holder
- Can adjust the height on some types
- Can carry 4 different tool holders



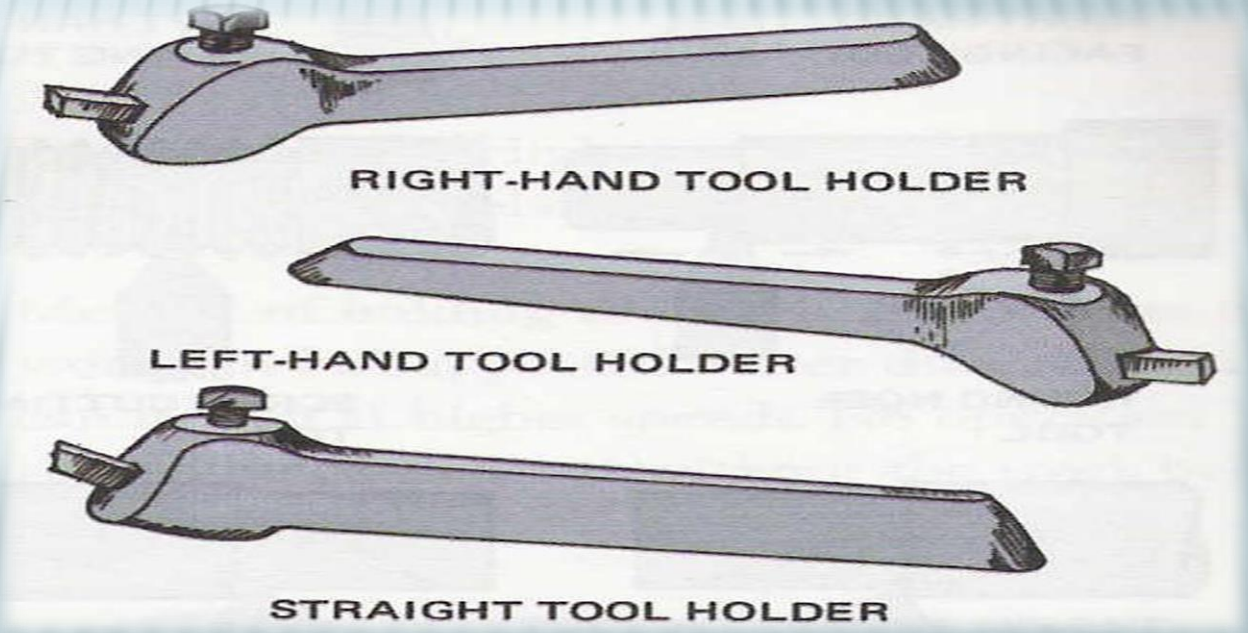
3.5
can type toolpost



CONSTRUCTION

Tool Holder

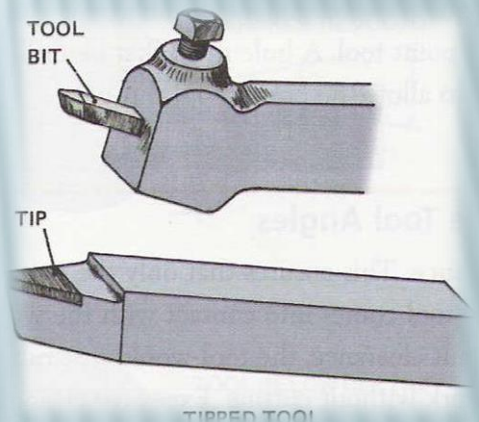
- Used for holding cutting tool bits
- Available in Right hand, left hand and straight

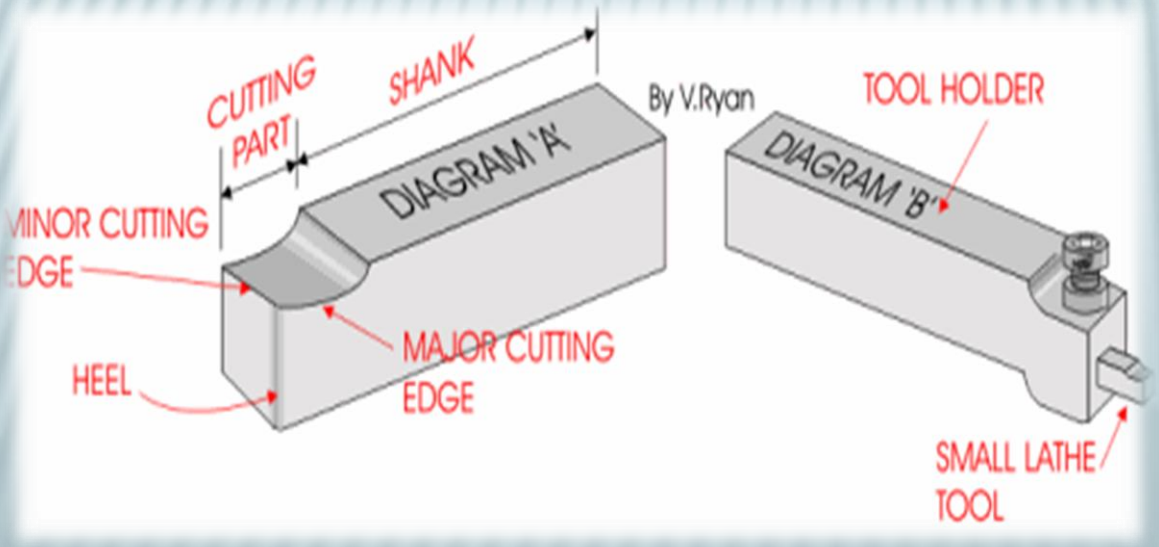


CONSTRUCTION

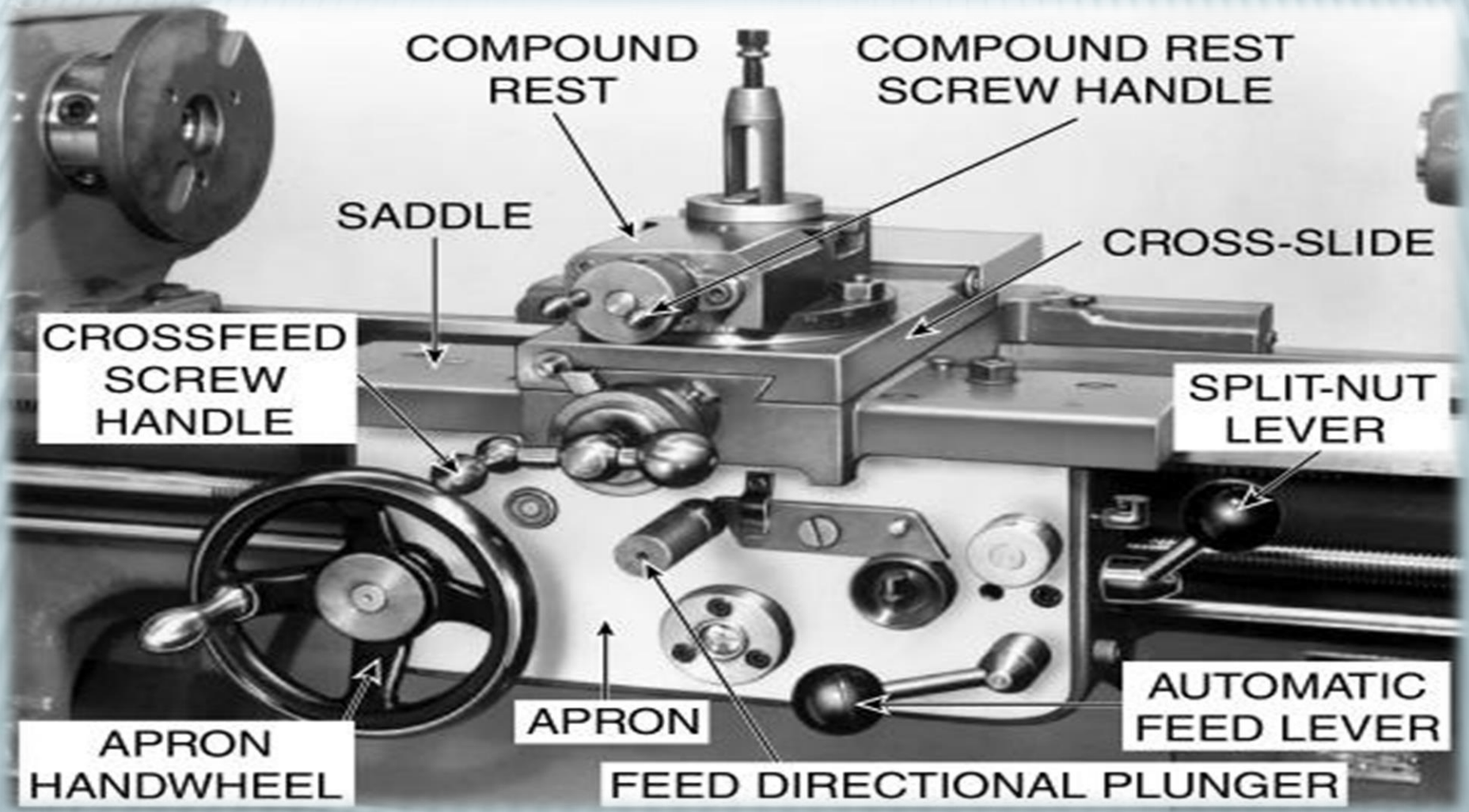
Cutting Tools

- Can be High Speed Steel held in tool holders
- Can be also Ceramic (Tungsten carbide) bits held directly in tool post

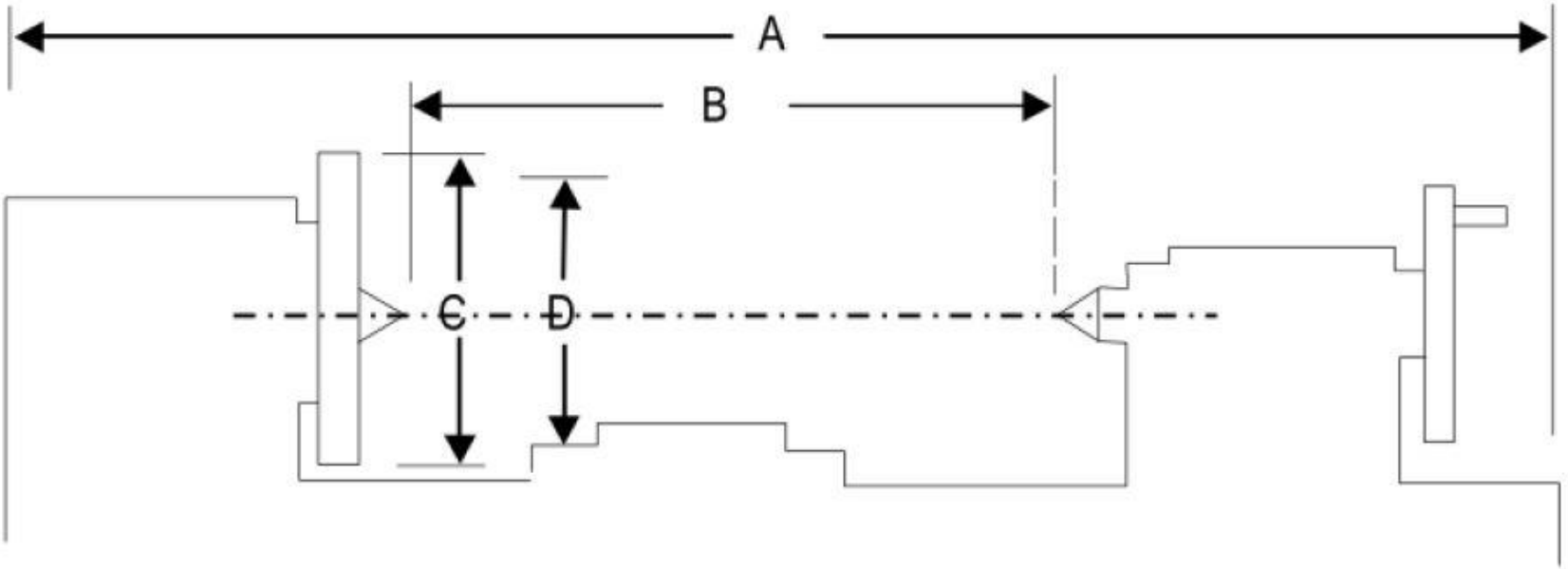




Apron Mechanism



Lathe Specification:



A - Length of bed.
B - Distance between centres.
C - Diameter of the work that can be turned over the ways.
D - Diameter of the work that can be turned over the cross slide.

- The height of the centers measured from the lathe bed.
- The swing diameter over bed. This is the largest diameter of work that will revolve without touching the bed and is twice the height of the centre measured from the bed of the lathe.
- The length between centers. This is the maximum length of work that can be mounted between the lathe centers.
- The swing diameter over carriage. This is the largest diameter of work that over bed.
- The maximum bar diameter. This is the maximum diameter of bar stock that will pass through hole of the headstock spindle.

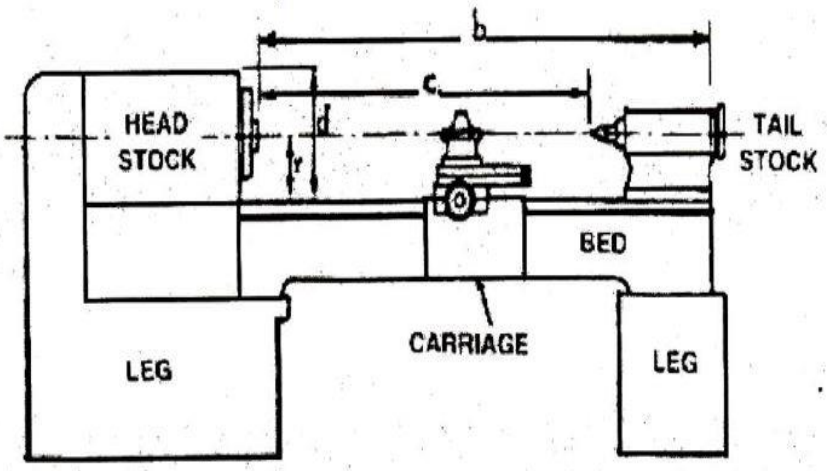


Fig. : SPECIFICATION OF A LATHE

r - Centre height **c** - Length between centres

d - swing diameter over bed **b** - Length of bed.

Lathe Operations

LATHE OPERATIONS

- 1) Facing,
- 2) Plain turning,
- 3) Step turning,
- 4) Taper turning,
- 5) Drilling,
- 6) Reaming,
- 7) Boring,
- 8) Undercutting,
- 9) Threading,
- 10) Knurling.

Lathe Operations

Turning: produce straight, conical, curved, or grooved work pieces

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.

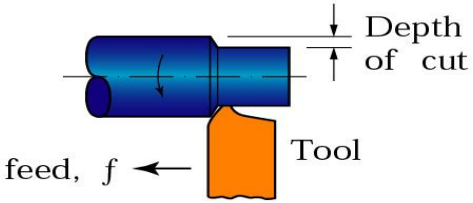
Drilling: to produce a hole by fixing a drill in the tailstock

Threading: to produce external or internal threads

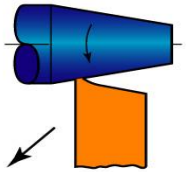
Knurling: to produce a regularly shaped roughness on cylindrical surfaces

Lathe Operations

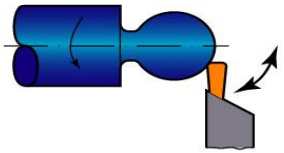
(a) Straight turning



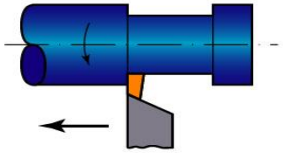
(b) Taper turning



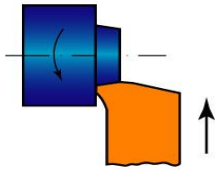
(c) Profiling



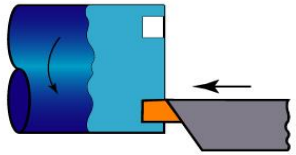
(d) Turning and external grooving



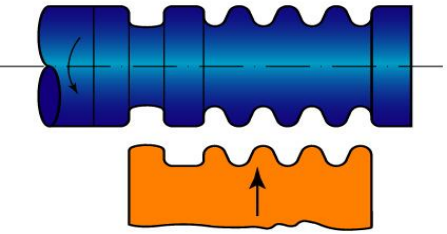
(e) Facing



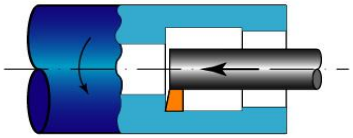
(f) Face grooving



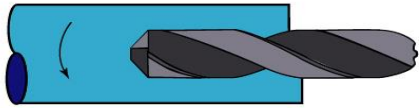
(g) Cutting with a form tool



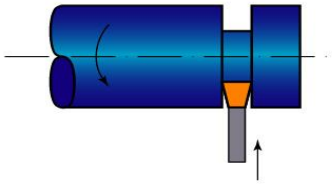
(h) Boring and internal grooving



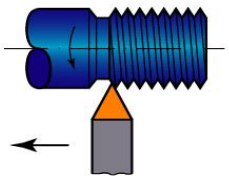
(i) Drilling



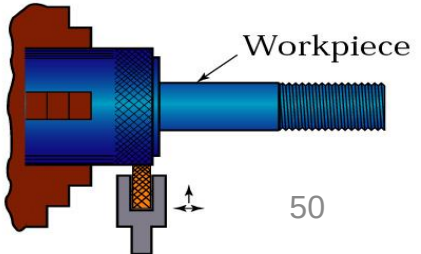
(j) Cutting off



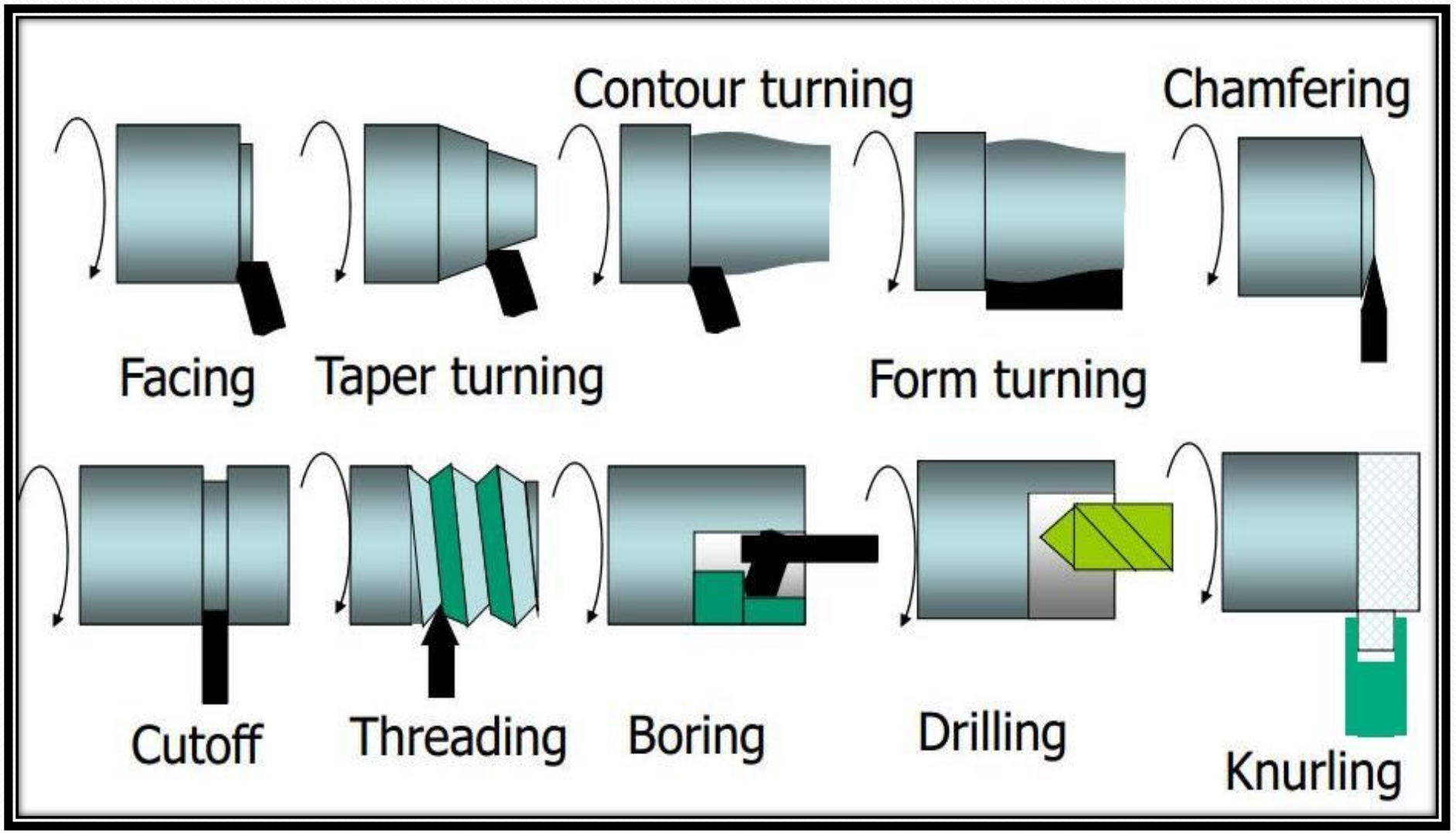
(k) Threading



(l) Knurling



Lathe Operations

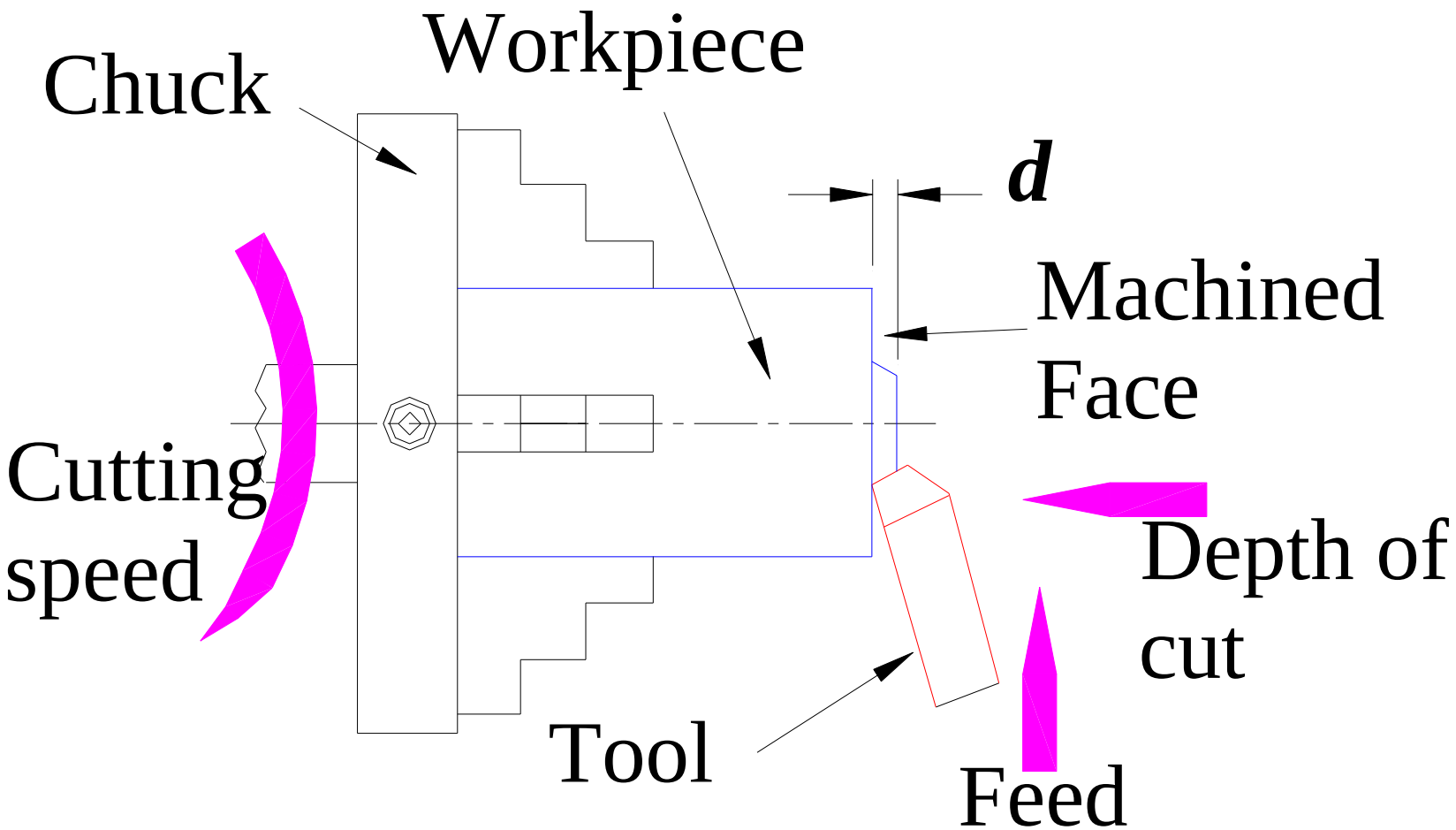


OPERATION

FACING

- To produce a flat surface at the end of the work- piece or for making face grooves.
- To make side surface perpendicular via cutting tool
- Motion of tool is perpendicular to the work piece surface.

Facing **Flat Surface/Reduce length**



Facing operation

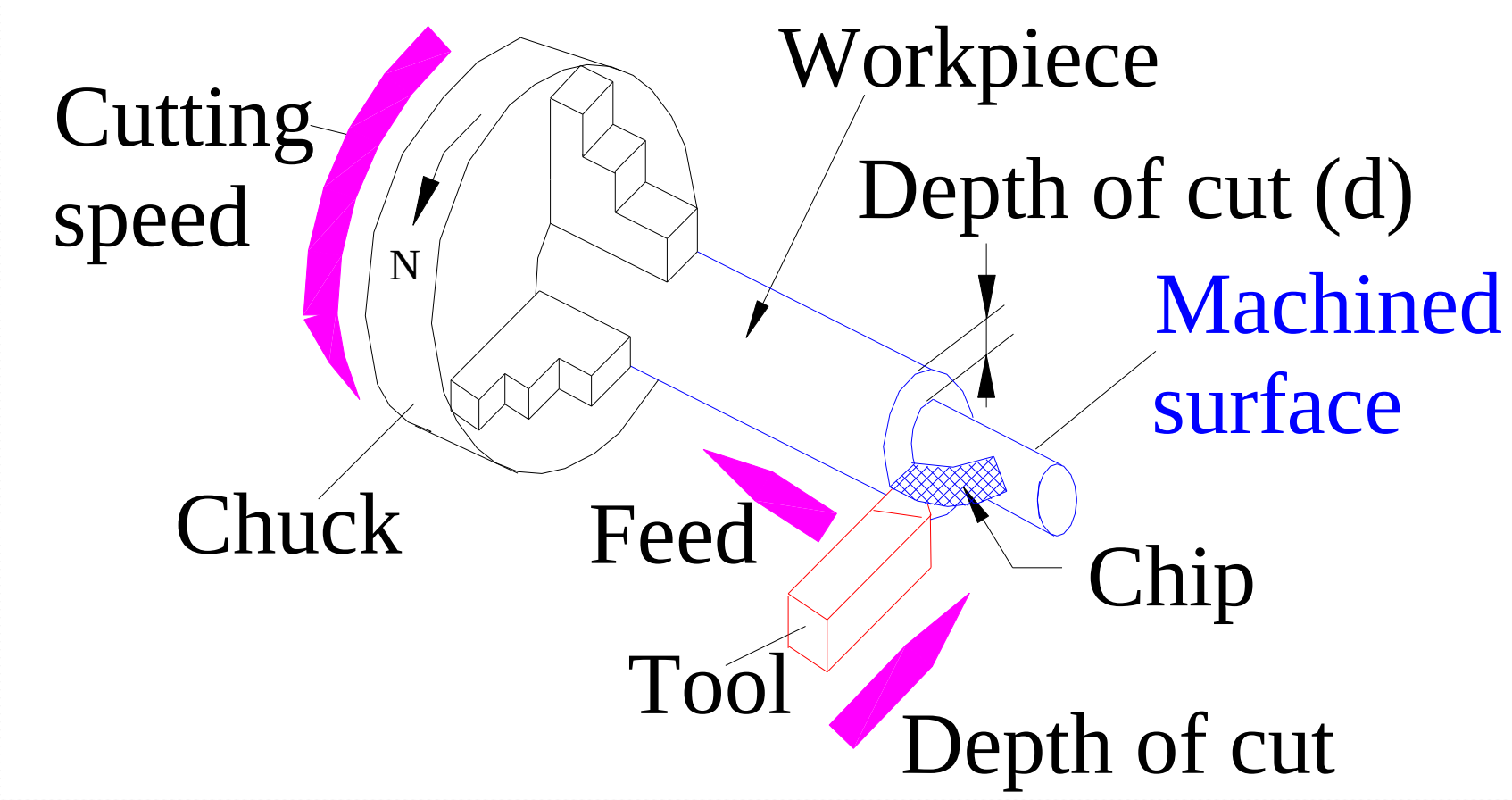
OPERATION

TURNING

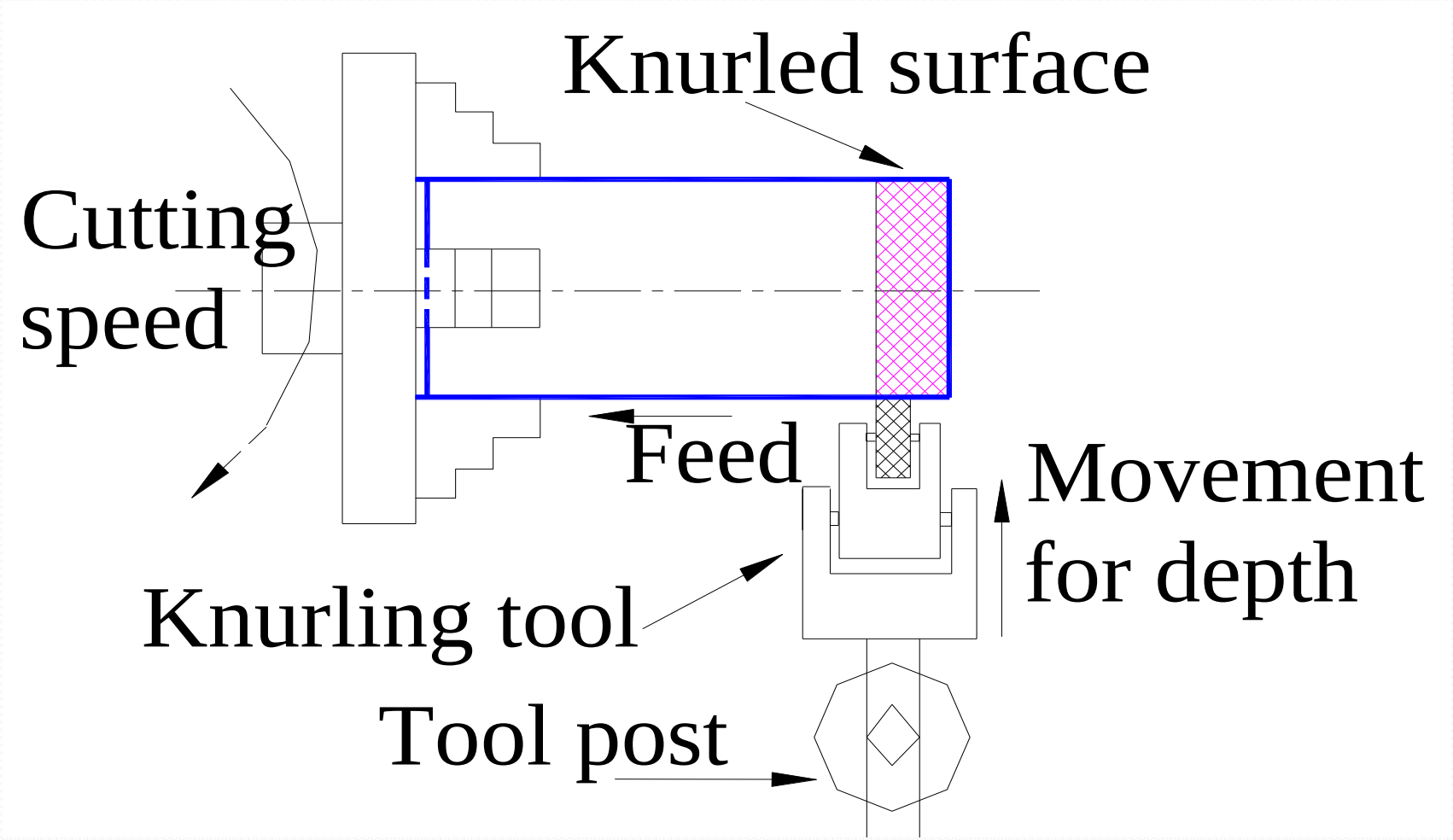
- To remove material from the outside diameter of a work-piece to obtain a finished surface.
- Work piece become cylindrical.
- Motion of tool is parallel to the work piece surface.

Turning ..

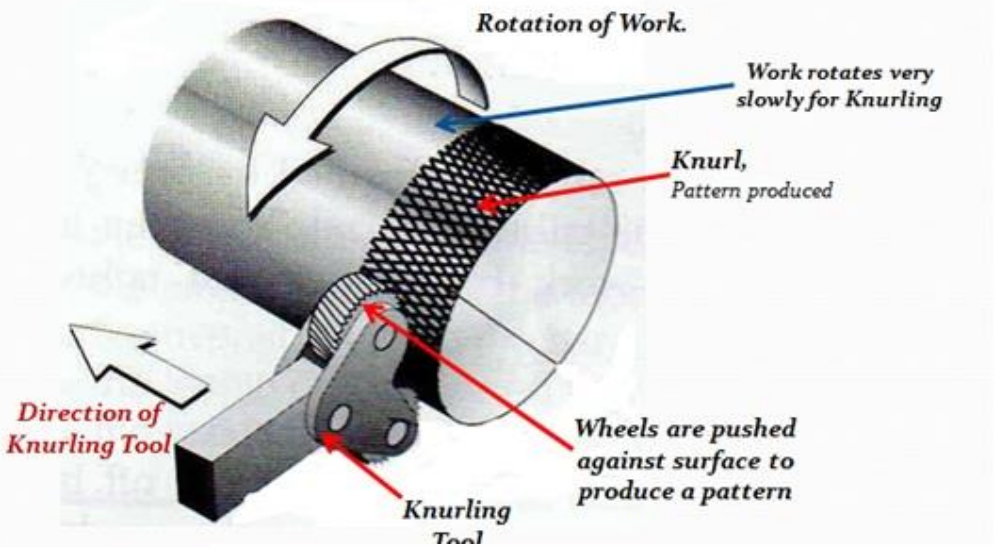
Cylindrical job

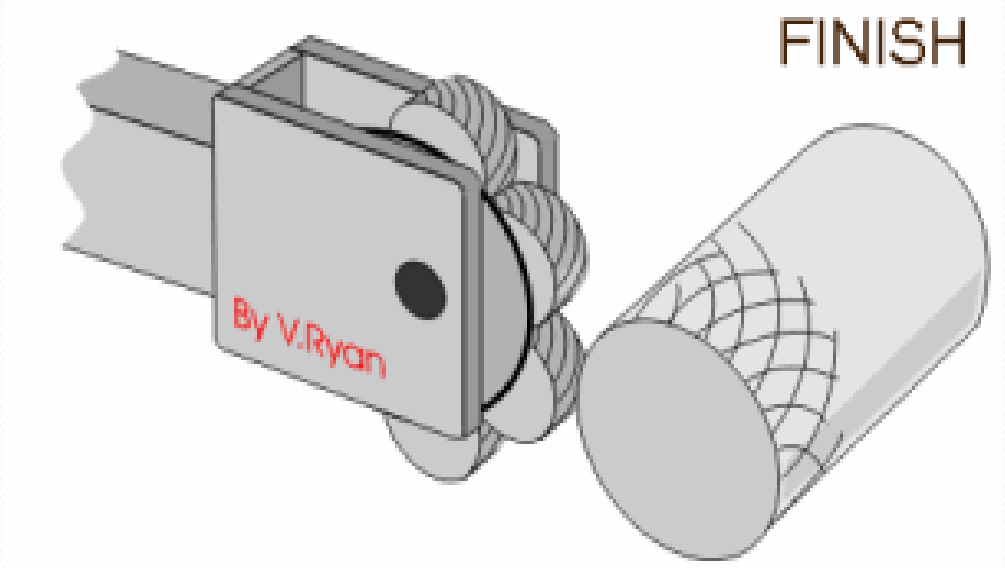


Knurling

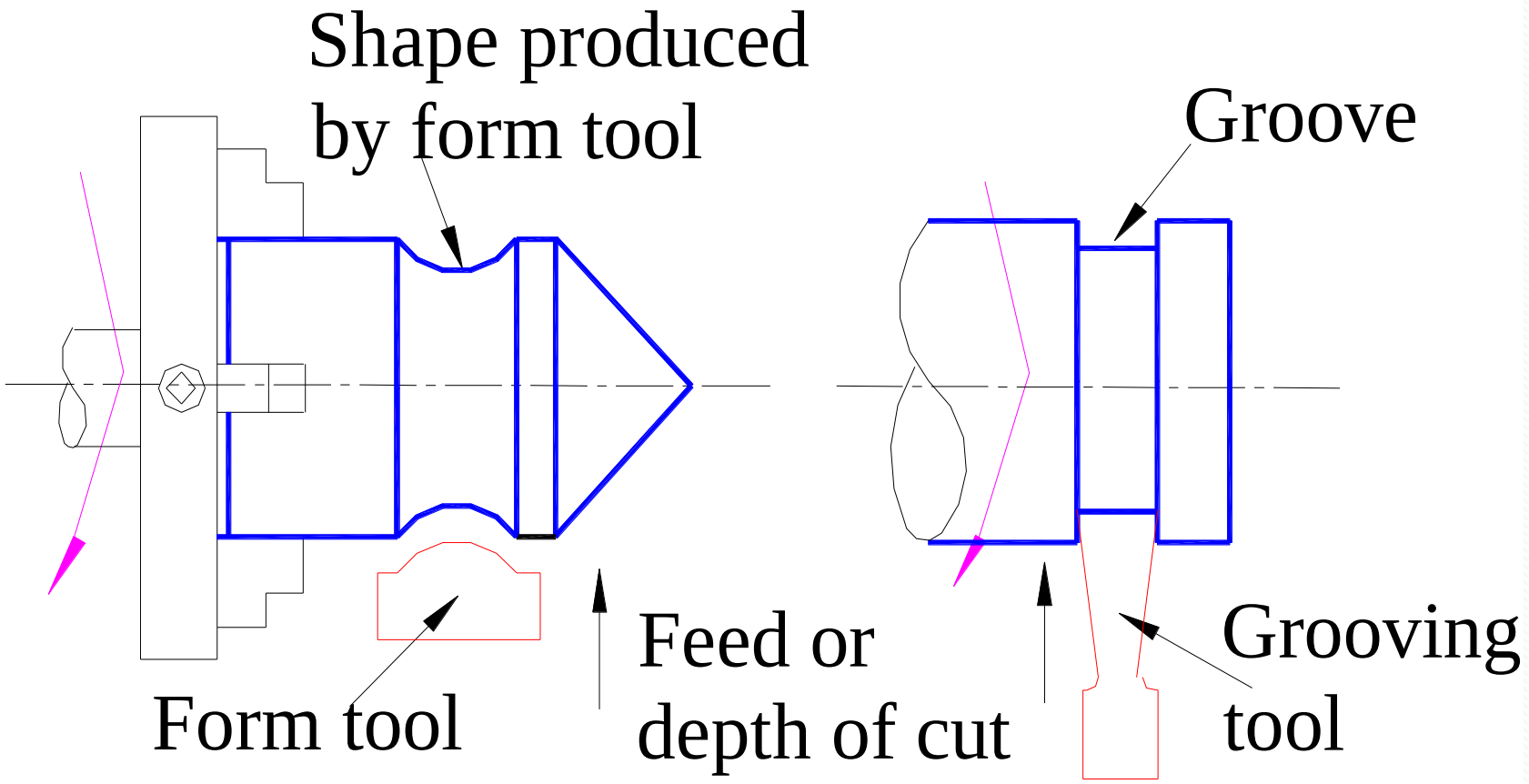

Knurled surface
Cutting speed
Feed
Movement for depth
Knurling tool
Tool post

Knurling

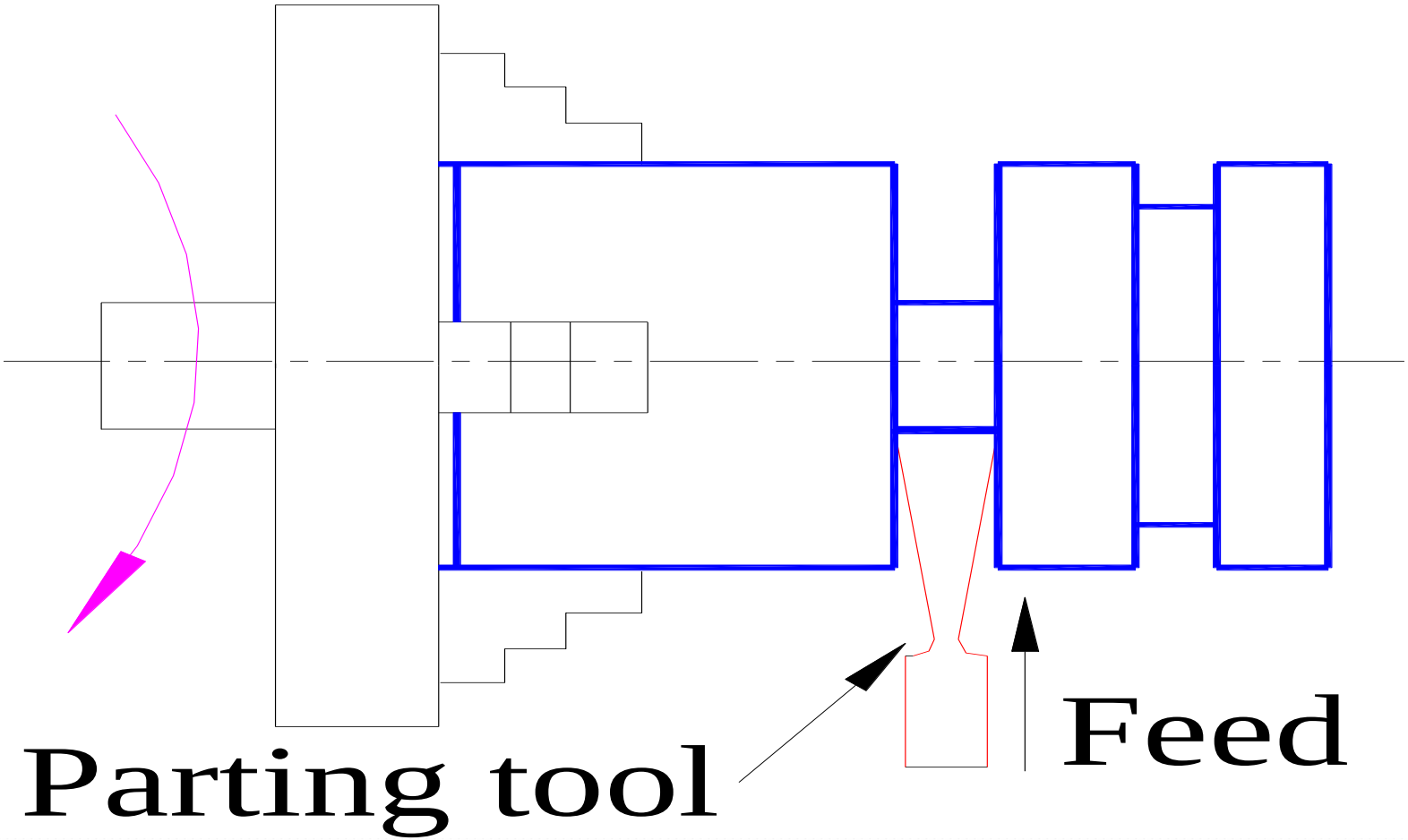

Rotation of Work.
Work rotates very slowly for Knurling
Knurl,
Pattern produced
Direction of Knurling Tool
Wheels are pushed against surface to produce a pattern
Knurling Tool


FINISH
By V.Ryan

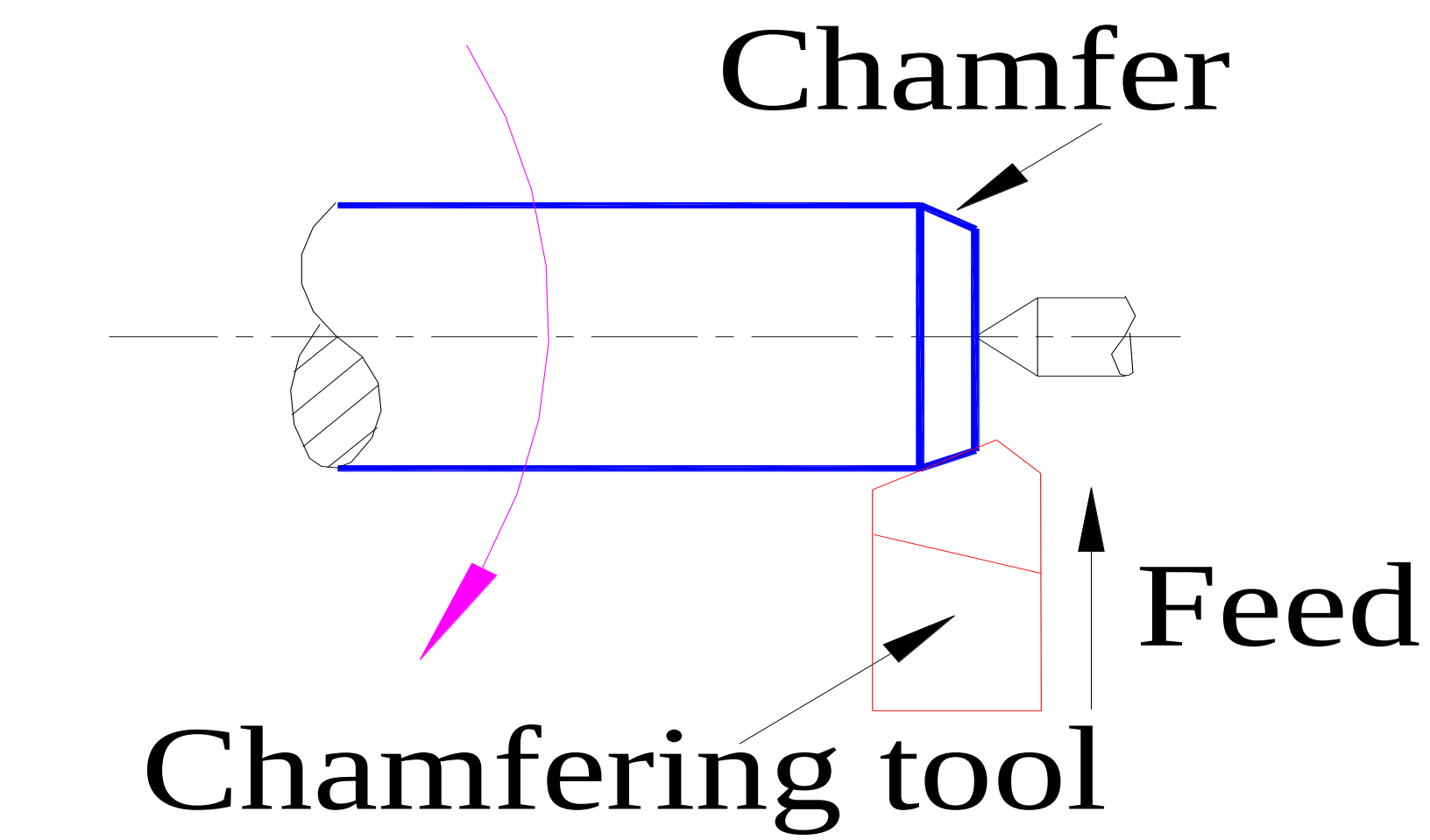
Grooving ..


Shape produced
by form tool
Groove
Form tool
Feed or
depth of cut
Grooving
tool

Parting ..

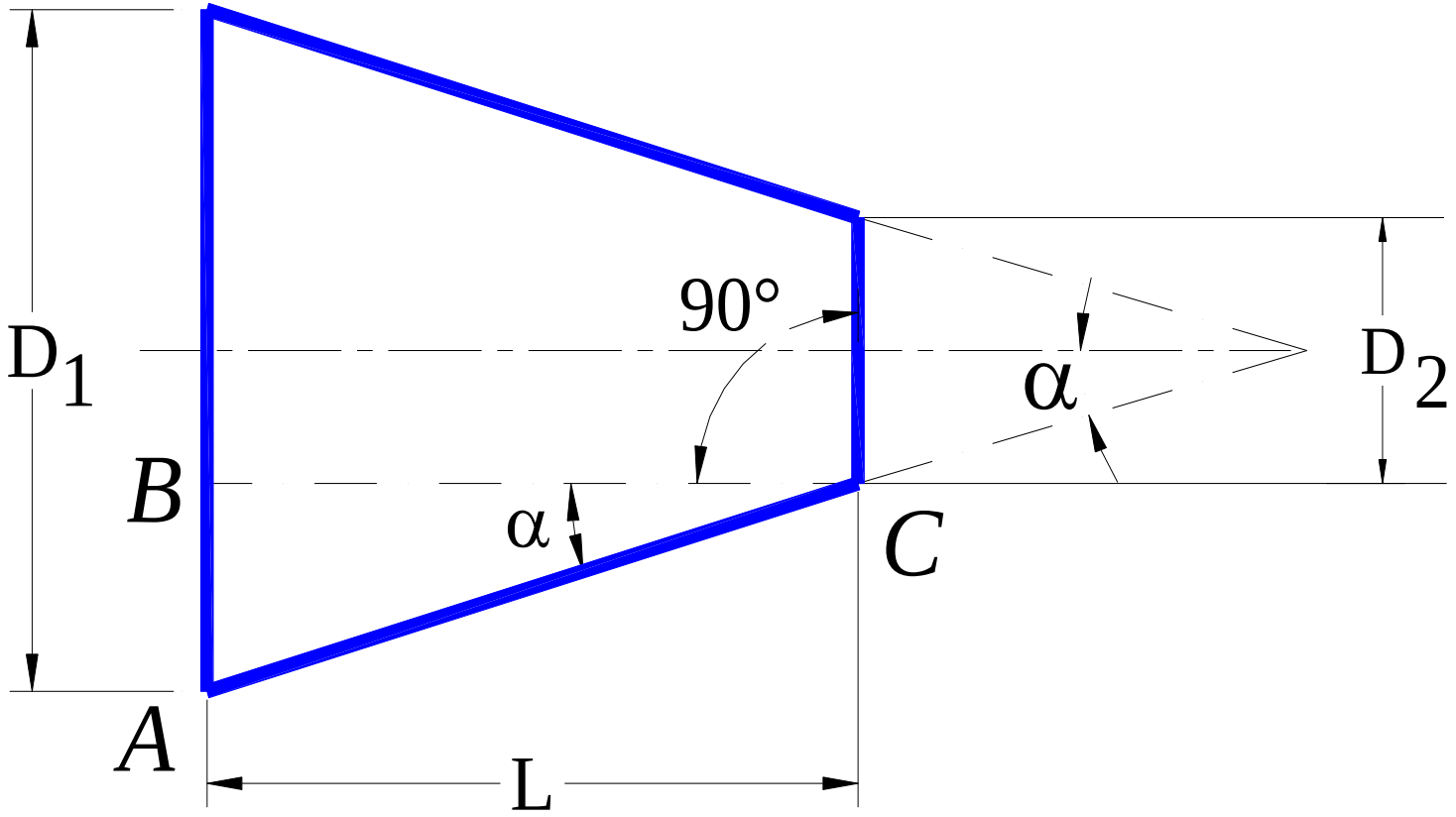


Chamfering



Taper Turning

- Taper: $$\tan\alpha = \frac{D_1 - D_2}{2L}$$



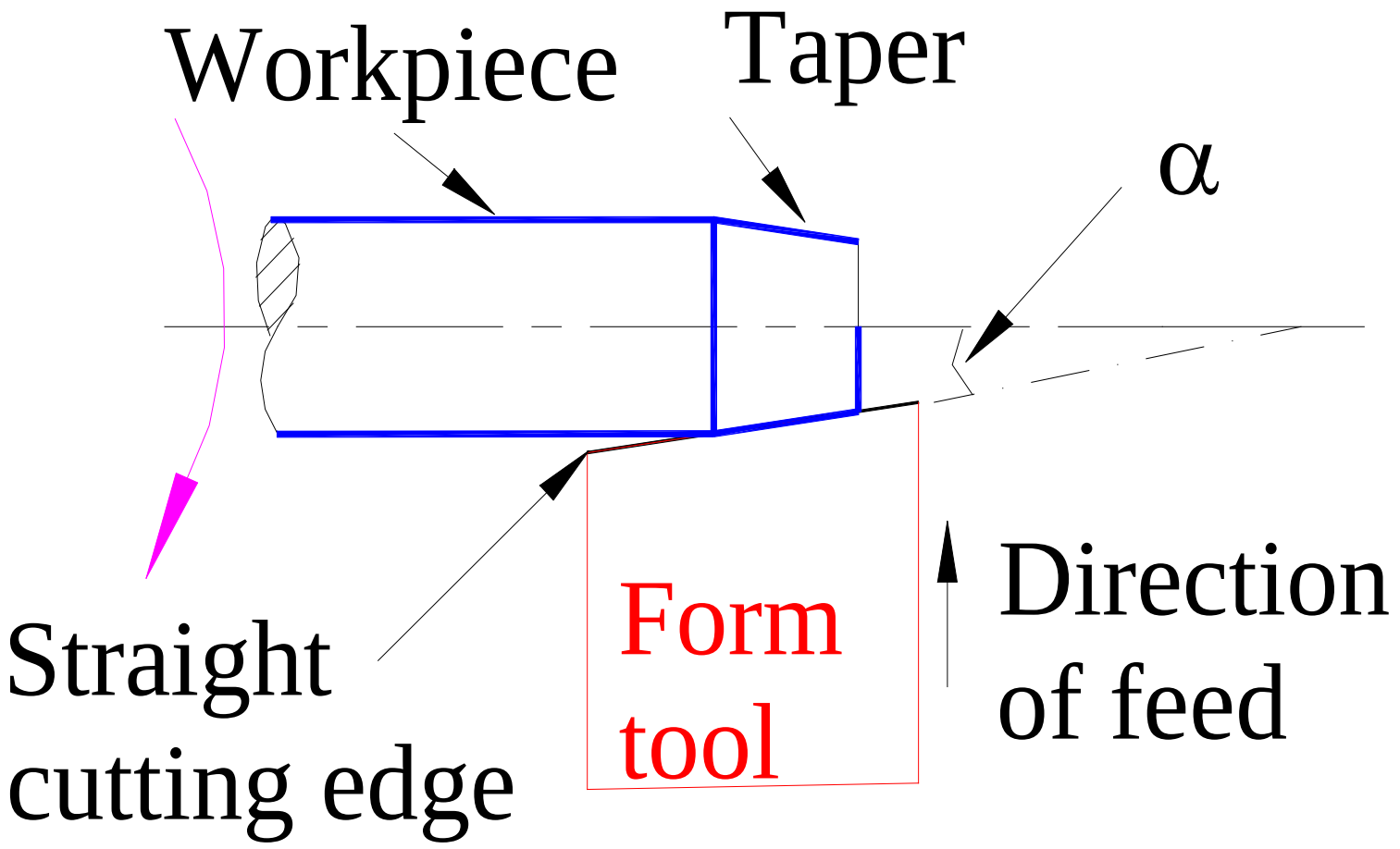
Taper Turning..

Methods . . .

- Form Tool
- Swiveling Compound Rest
- Taper Turning Attachment
- Simultaneous Longitudinal and Cross Feeds

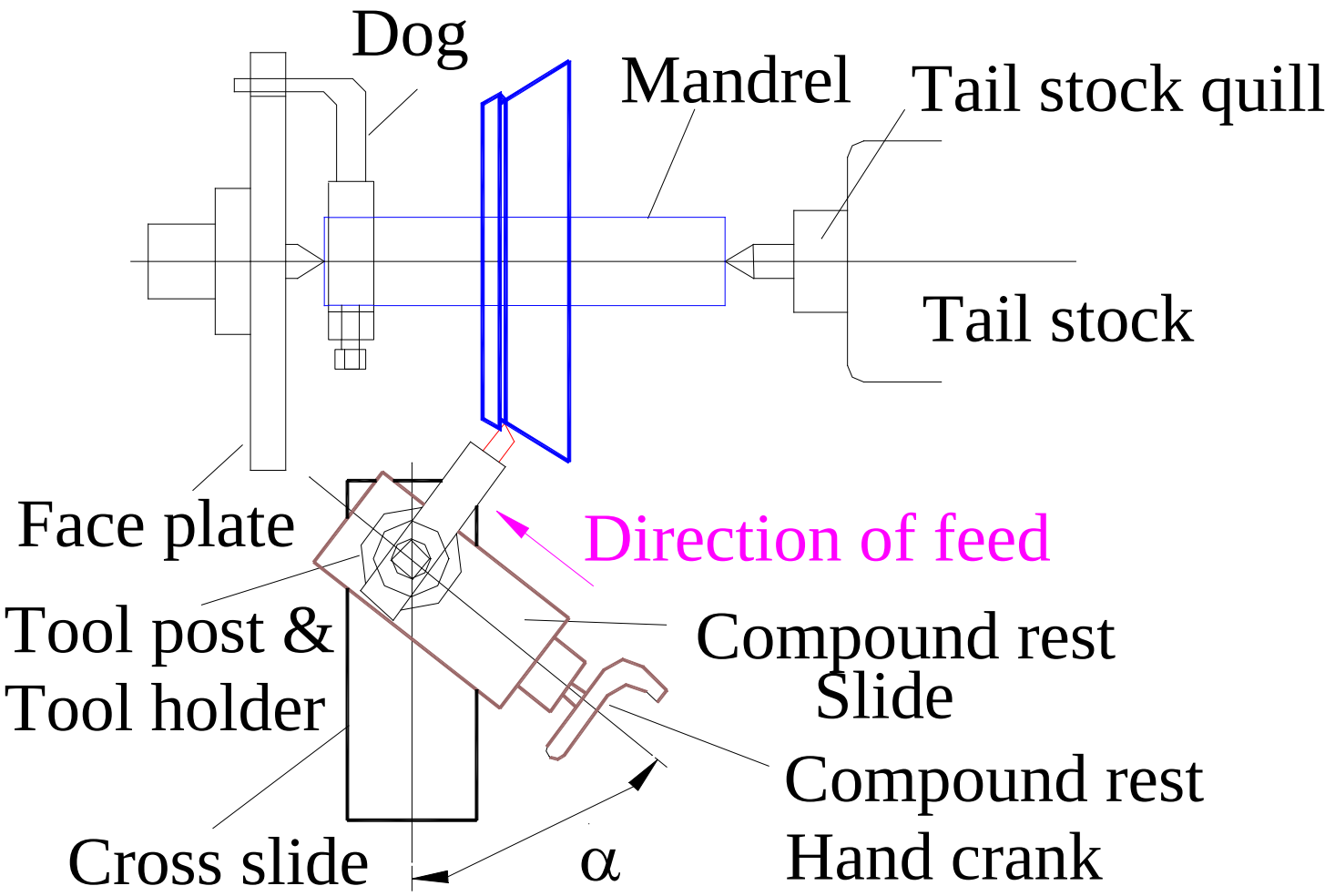
Taper Turning …

by form tool method



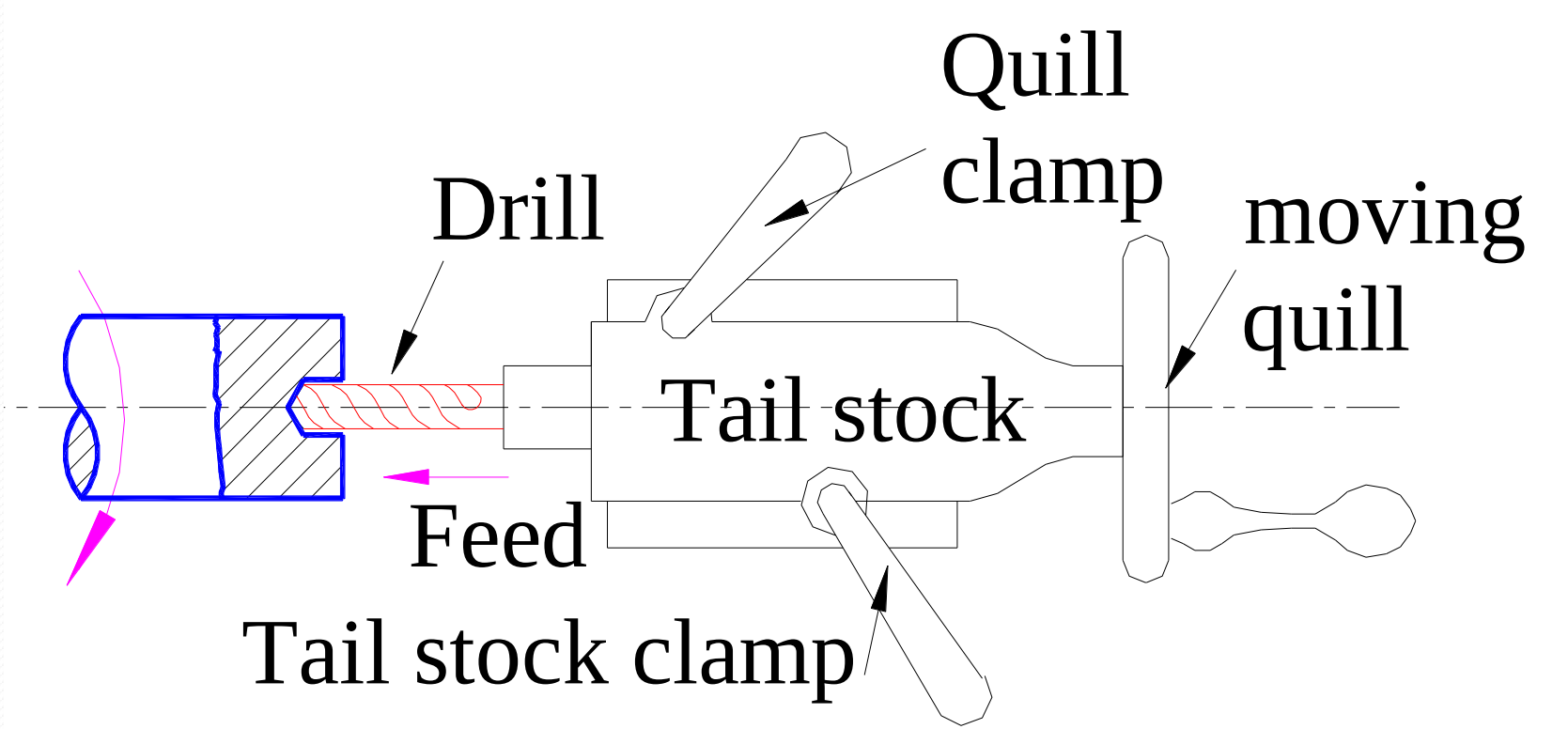
Taper Turning ...

by compound rest method



Drilling

Drill – cutting tool – held in TS – feed from TS



Contour Turning

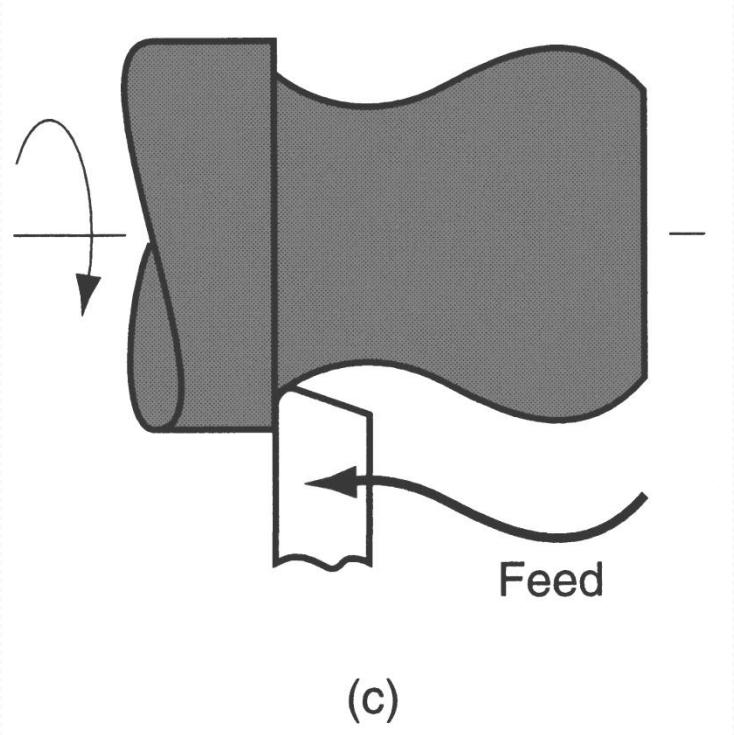
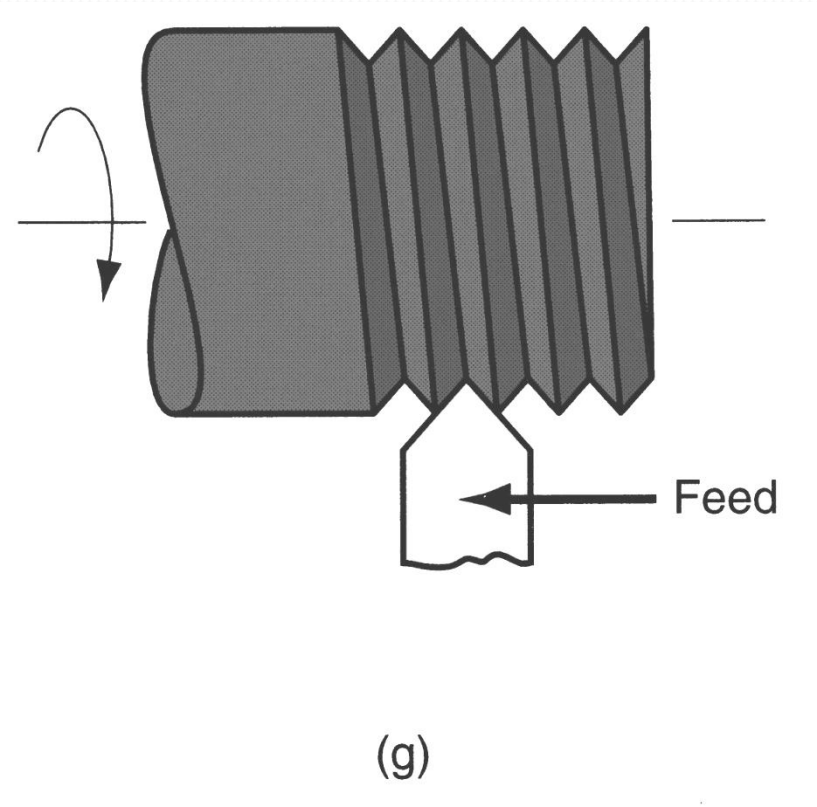


Figure ..contour turning

Instead of feeding the tool parallel to the axis of rotation, tool follows a contour that is not necessarily straight (thus creating a contoured form).

Threading



Figure; threading

Pointed form tool is fed linearly across surface of rotating workpart parallel to axis of rotation at a large feed rate, thus creating threads

Summary.

- Introduction to centre lathe
- Construction of centre lathe
- types of lathe machines
- Operations of lathe

Feed back/Evaluation

1. Lathe is used to turn

i) Square shape ii) cylindrical shape iii) irregular shape

2 Size of lathe depends upon following

i) Size of chuck and length of bed
ii) Distance b/w centres and length of bed
iii) Its weight & length of bed
iv) distance b/w centres & swing diameter of job to be held

3. What are the basic difference b/w turret lathe and capstan lathe

i) Size ii) precision iii) by turret head position iv) i,iii

Lathe Accessories

Lathe Accessories Divided into two categories . . .

1) Work-holding, -supporting, and –driving devices

2) Cutting-tool-holding devices

1) Work-holding, supporting and driving devices used for holding and supporting or holding the workpiece.

1. 1) Lathe Centre
1. 2) Chuck
1. 3) Face plate
1. 4) Angle plate
1. 5) Mandrel
1. 6) Rests
1. 7) Carriers
1. 8) Catch plates
1. 9) Collets

2) Cutting tool holding devices:

2.1) Straight and offset toolholders

2.3) Threading toolholders, boring bars

2.3) Turret-type toolposts

1.1) Lathe Centres:

There are two types of lathe centres,

1. Live centre
2. Dead centre

1) A centre which fits into the headstock spindle and revolves with the work is called live centre.

2) The centre which is used in a tailstock spindle and does not revolve is called dead centre.

1.2) Chucks:

-used for holding and rotating the workpiece

-too short workpiece to be held between centres are clamped in a chuck

-It is attached to the lathe spindle by means of two bolts with the back plate screwed on to the spindle nose

TYPES OF CHUCKS:

i) **Three jaw universal chuck /self-centering chuck /scroll chuck:** is used for holding round and hexagonal work.

ii) **Four jaw independent chuck:**

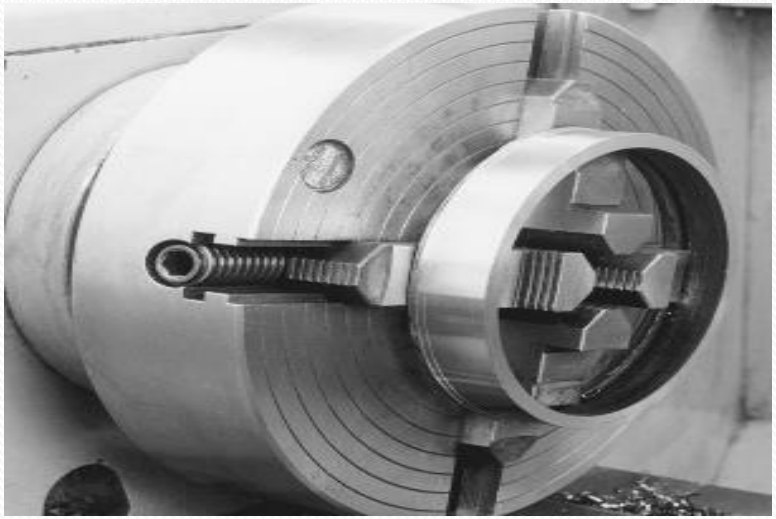
has four reversible jaws, each of which may be independently adjusted to accommodate the work it supports.

It can hold square, round and irregular shape of work ineither a concentric or eccentric position.

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

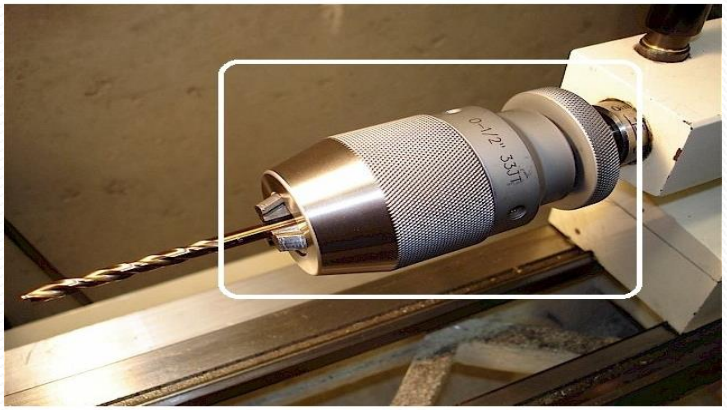
Collet Chuck

Collet chuck is used to hold small workpieces

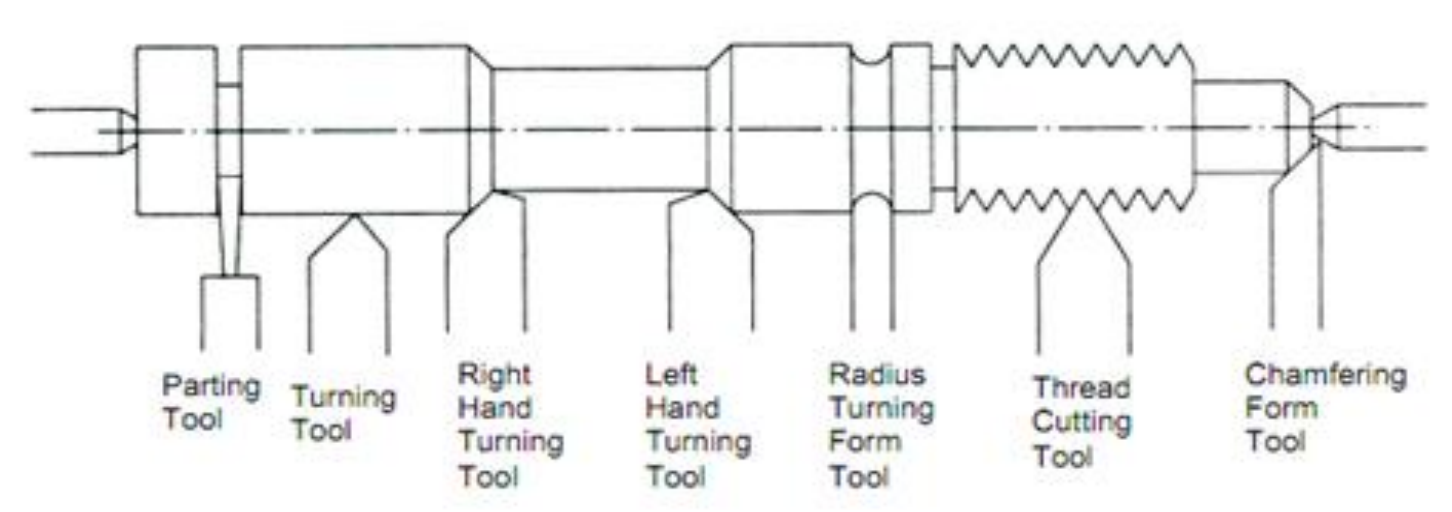
Magnetic Chuck

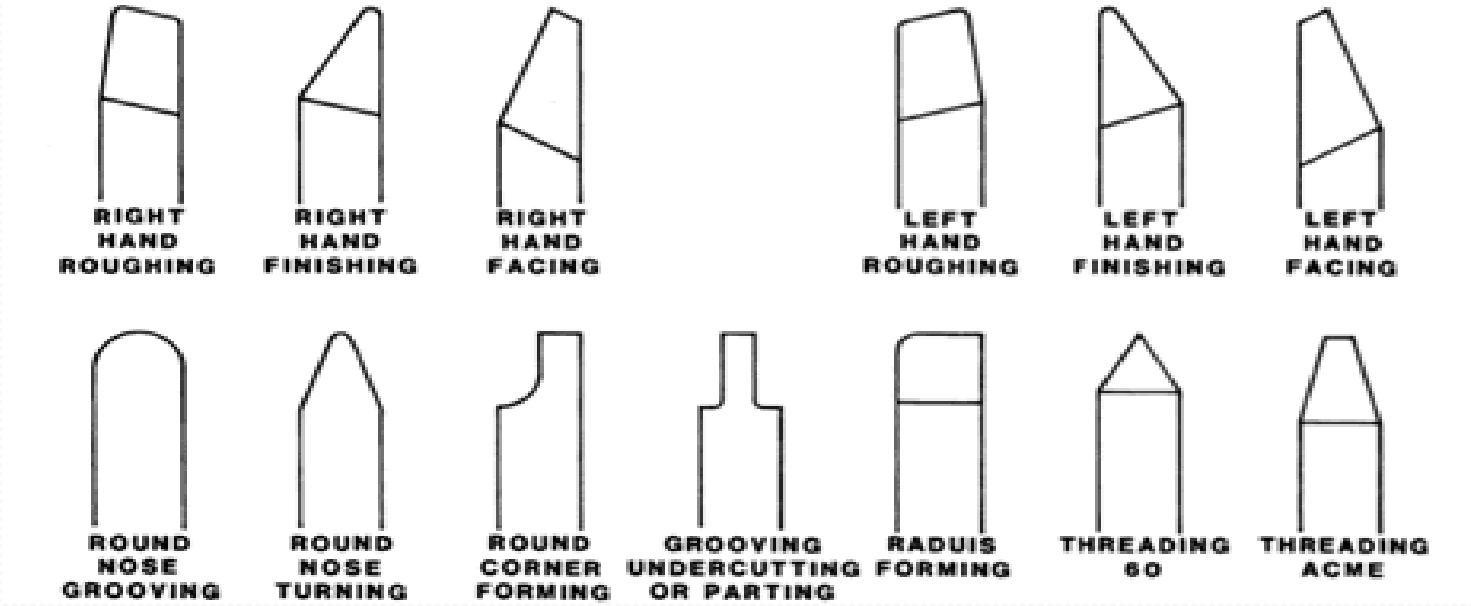
Thin jobs can be held by means of magnetic chucks.

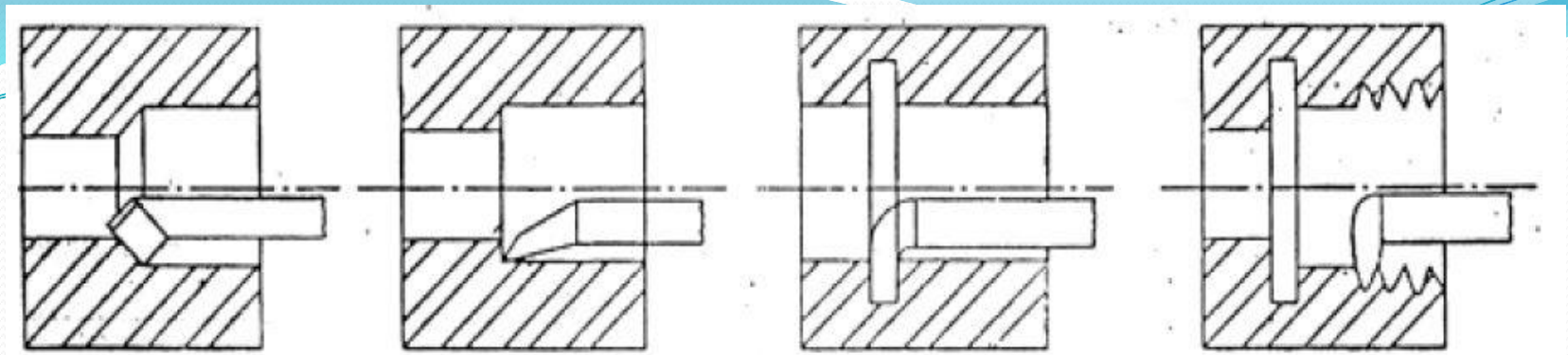
other types- iii) combination chucks, iv) magnetic chuck,
v) collect chuck, vi) drill chuck
vii) air or hydraulic chuck



Different Types of Lathe Tools



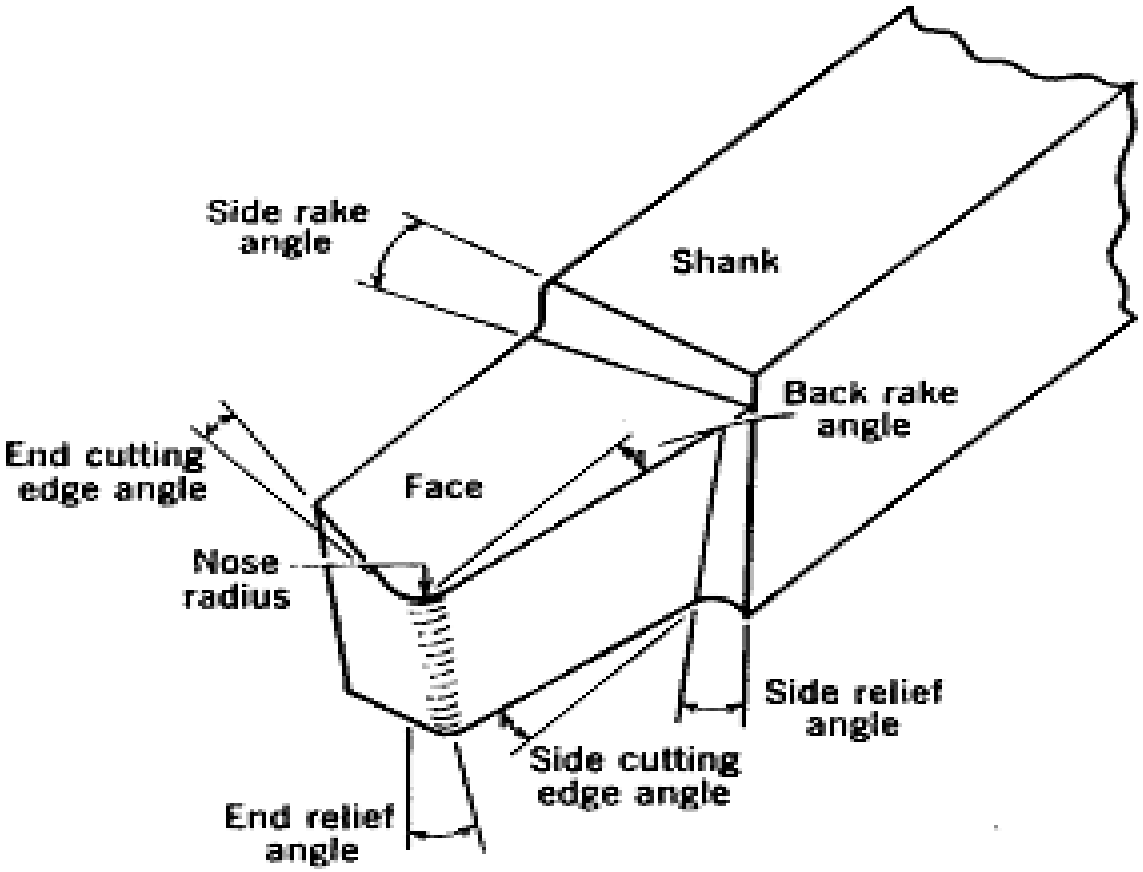




Different kinds of tools used for internal surfaces

Fig Knurling Tools

Single Point Cutting Tools



- YOUR QUESTIONs