Presentation on

MECHANICAL WORKSHOP

By: Hafiz Muhammad Rizwan

PPE

Suitable Personal Protective Equipment must be used before using a tool, Machines , check its safety instruction

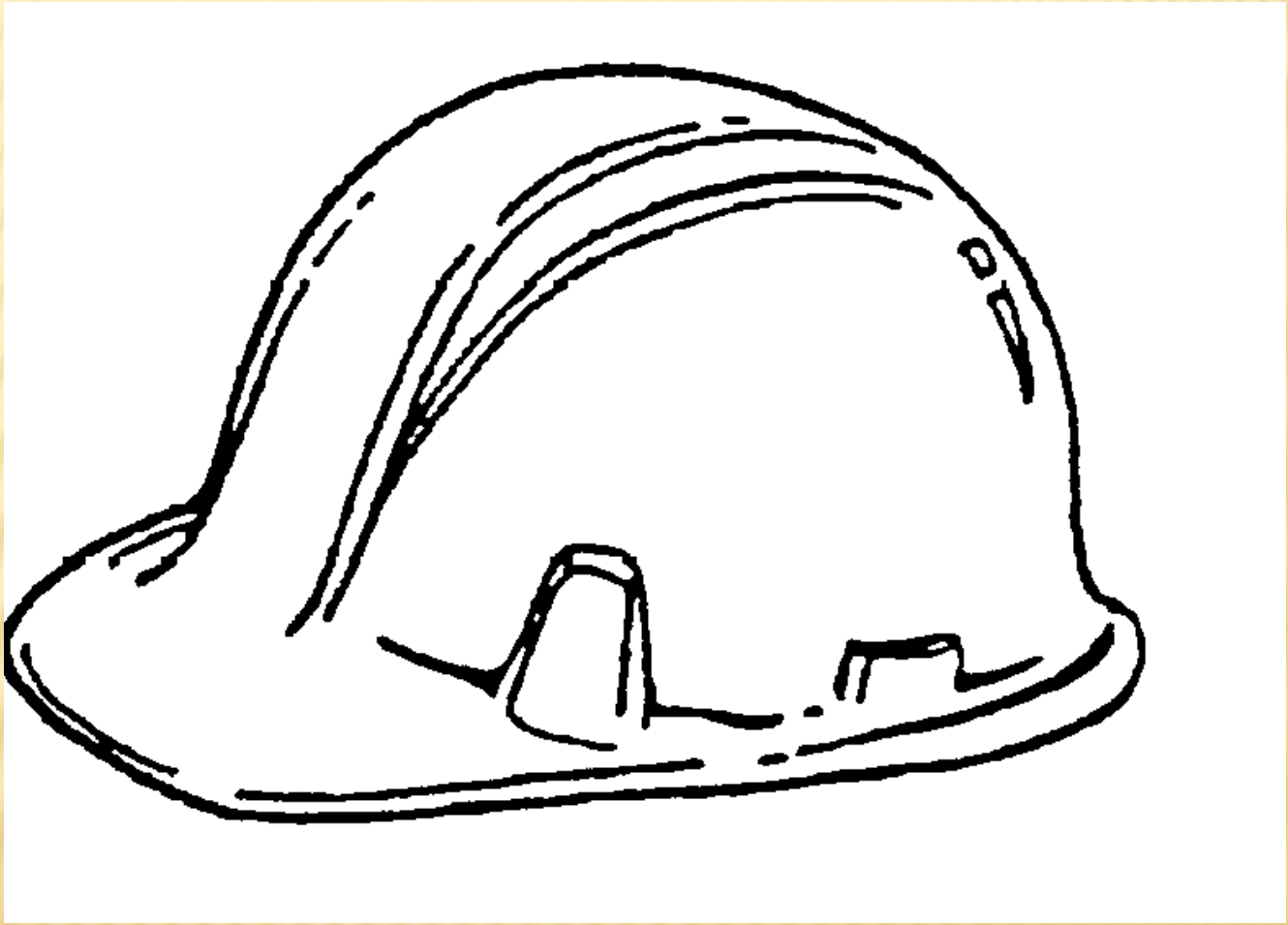




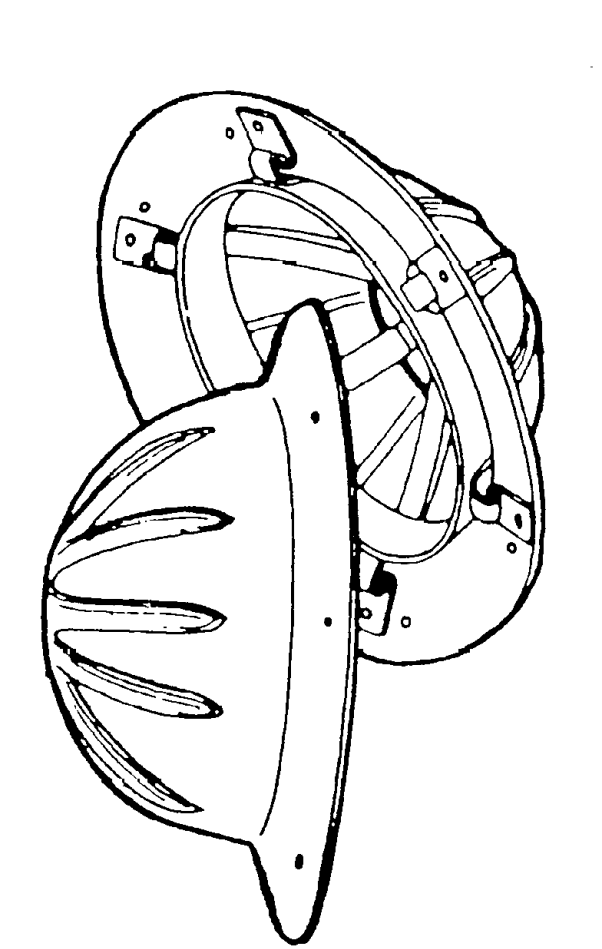
PPE

- Head protection
- Eye and Face protection
- Hearing protection
- Arm and Hand protection
- Foot and Leg protection
- Protective clothing

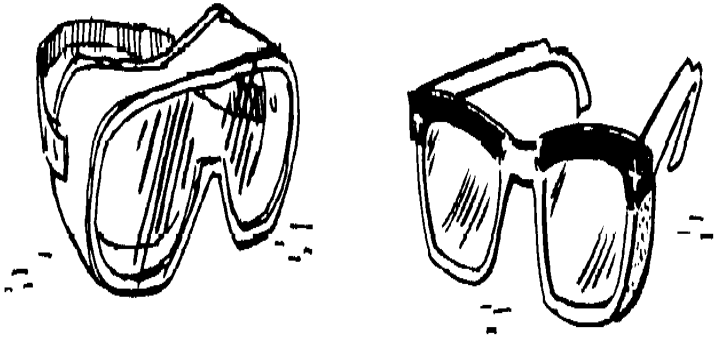
HEAD PROTECTION



HARD HATS WORK BY DISSIPATING FORCE



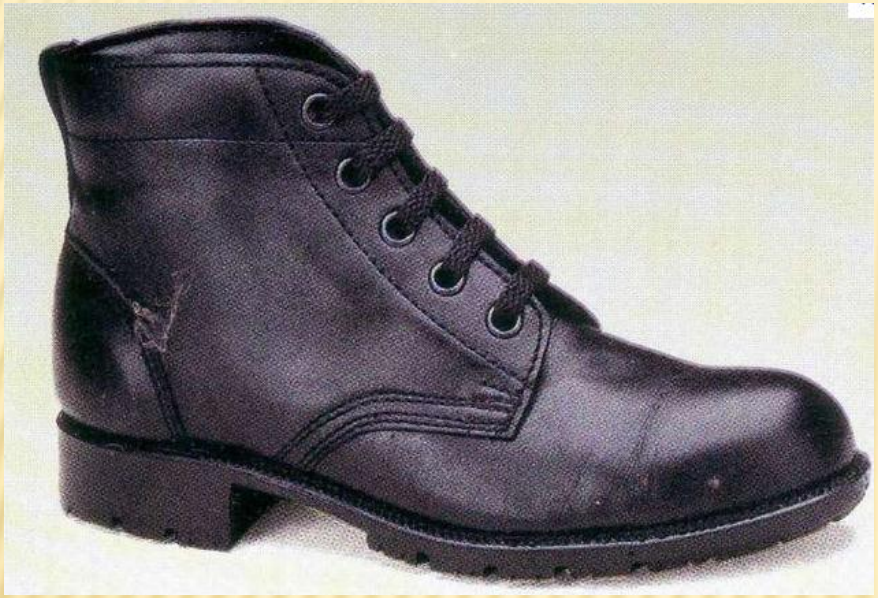
EYE PROTECTION



HEARING PROTECTION

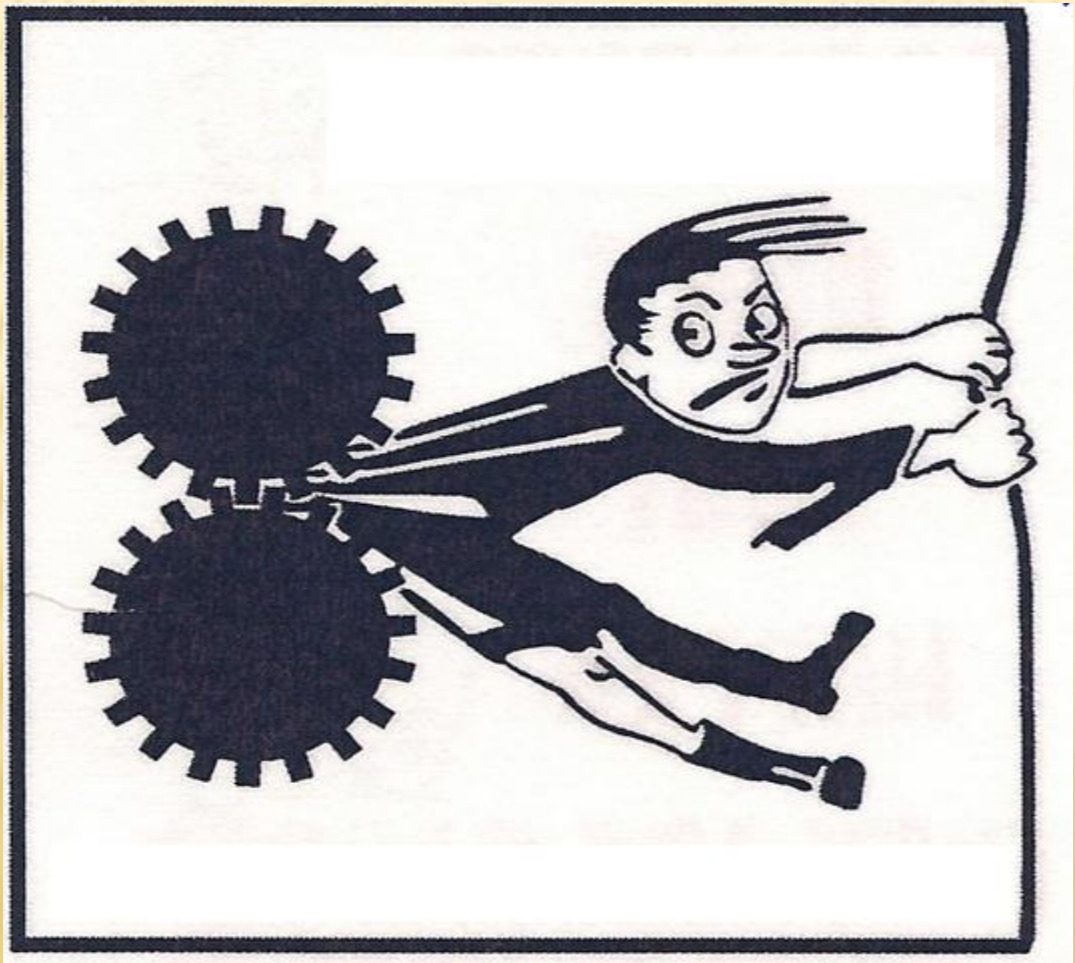
ARM AND HAND PROTECTION

FOOT AND LEG PROTECTION



PROTECTIVE CLOTHING

LOOSE CLOTHING HAZARD



THE LATHE

INTRODUCTION

- Lathe machine is also known as " the mother/father of the entire tool family".
- Lathe is one of the most impotent machine tool in the metalworking industry.
- A lathe operates on the principle of rotating workpiece and a fixed cutting tool .
- The cutting tool is feed into workpiece which rotates about its own axis, causing workpiece to be formed to the desired shape.

HISTORY

- The lathe machine is one of the oldest and most impotent machine tools.
- As early as 1569, wood lathes were in use in France. The lathe machine was adapted to metal cutting in England during the Industrial Revolution
- Lathe machine also called “Engine Lathe” because the first type of lathe was driven by a steam engine.

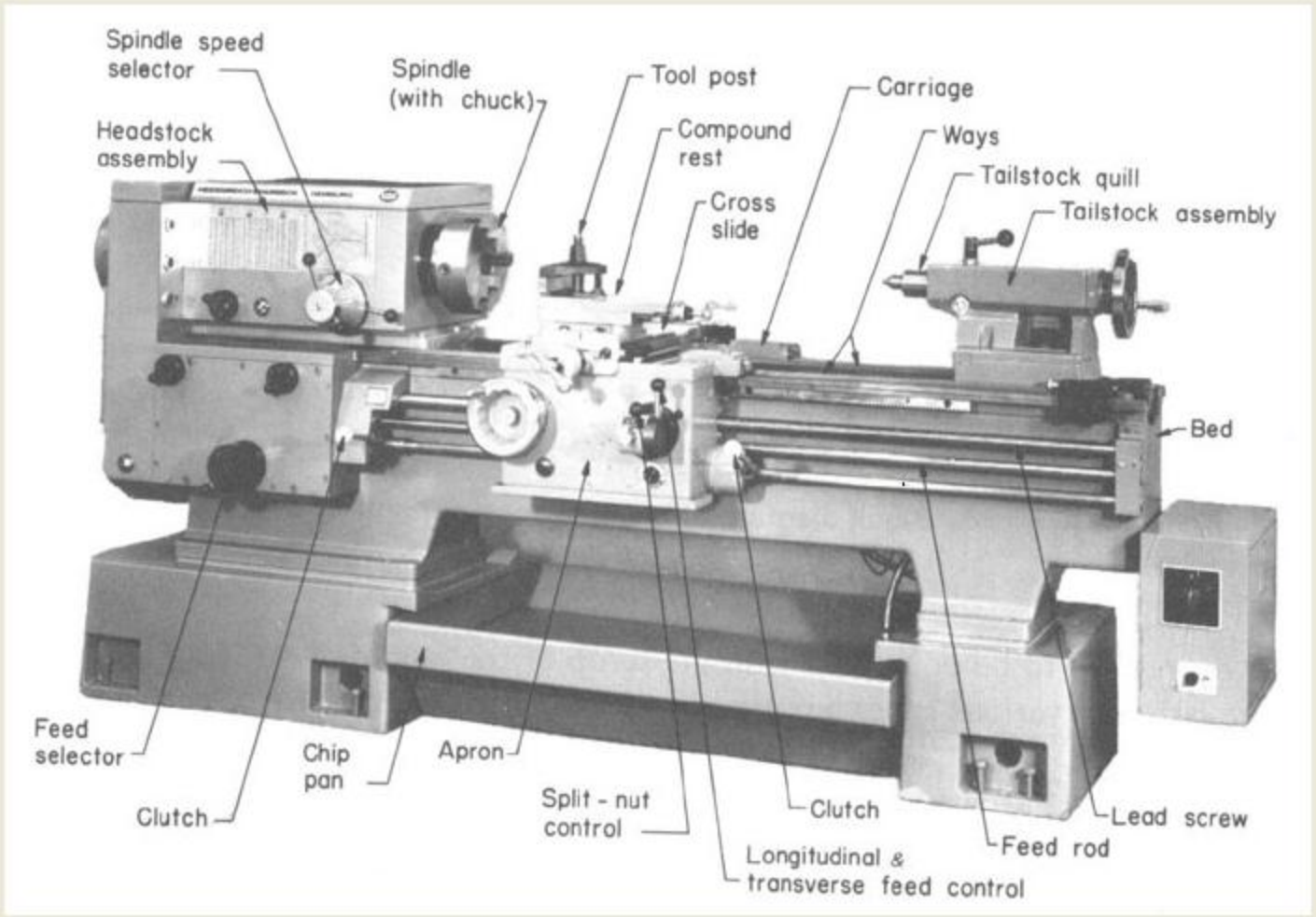
TYPES OF LATHE MACHINE

- Engine Lathe
- Bench Lathe
- Copy Lathe
- Automatic lathe
- Turret Lathe
- Computer controlled lathe

LATHE MACHINE OPERATION

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

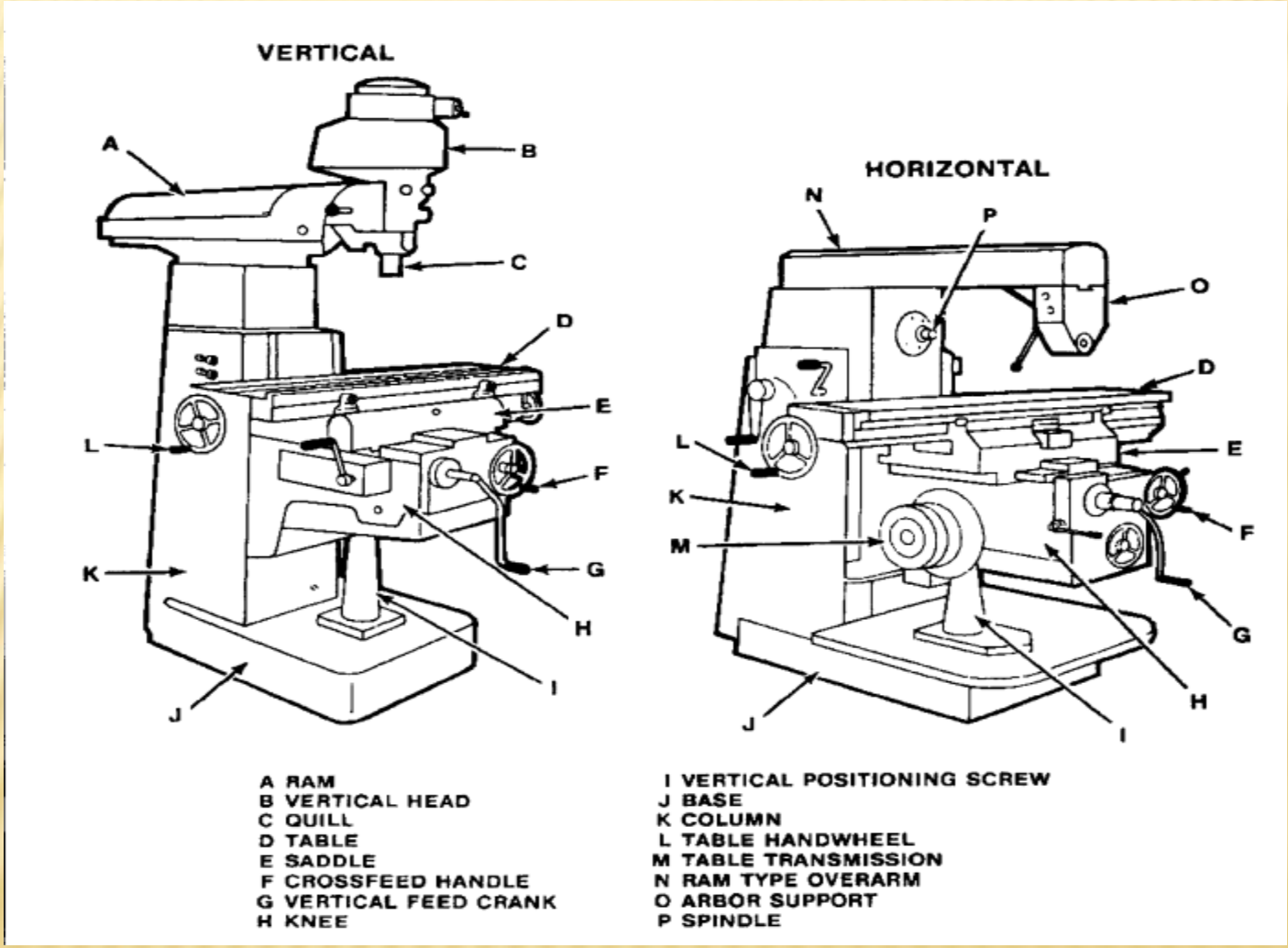
LATHE MACHINE AND ITS PARTS



THE MILLING MACHINE

- Developed in 1860's.
- Can be used for milling, drilling, boring, and reaming.
- Can machine in one , two, or three planes, X,Y,Z
- Used to produce one or more machined surfaces accurately on workpiece,One or more rotary milling cutters.
- workpiece held on work table or holding device and brought into contact with cutter
- Vertical milling machine most common
- Horizontal milling machine handles operation normally performed by other tools

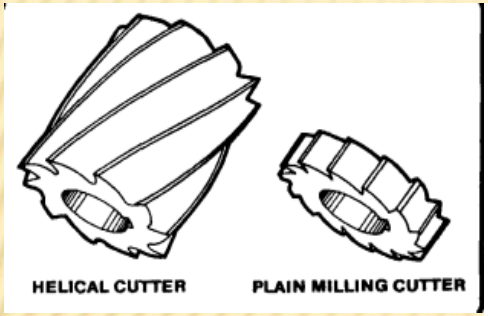
TYPES OF MILLING AND ITS PARTS

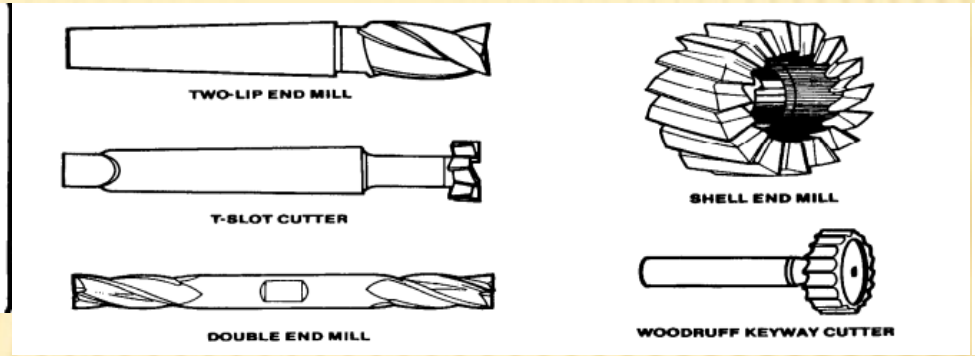


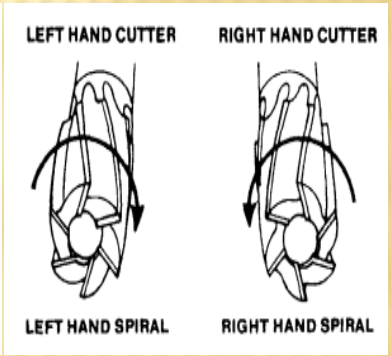
VERITY OF OPERATION

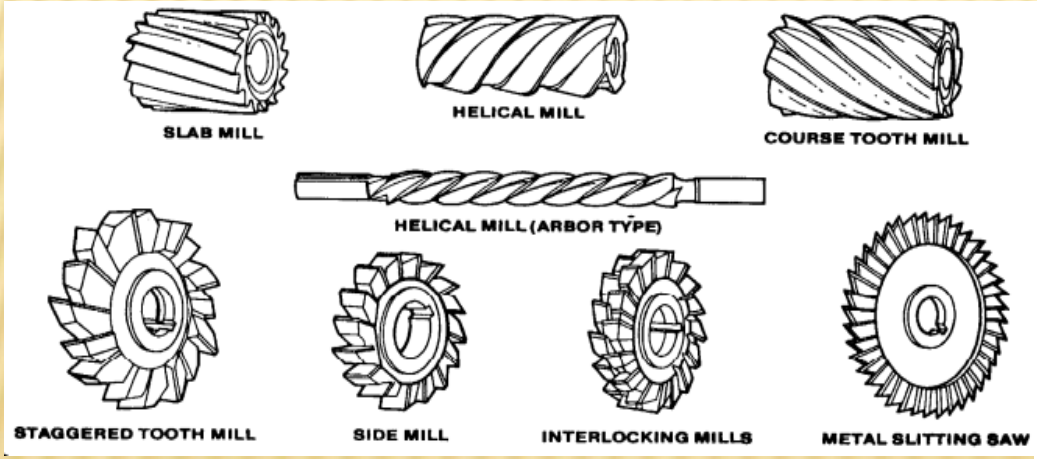
- Face milling.
- End milling.
- keyway cutting .
- Dovetail cutting.
- T-slot and circular slot cutting.
- Many facing operation done with fly tool.
- Gear cutting.
- Drilling.
- Boring.

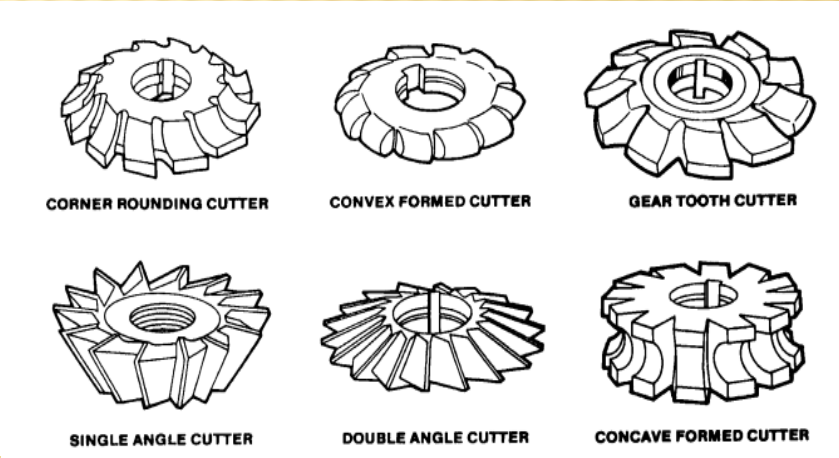
VERITY OF MILLING CUTTERS











CNC MACHINES

- **What is a CNC Machine?**

- CNC : Computer Numerical Control

- Conventionally, an operator decides and adjusts various machines parameters like feed , depth of cut etc depending on type of job , and controls the slide movements by hand. In a CNC Machine functions and slide movements are controlled by motors using computer programs.

TYPES OF CNC MACHINES

There are many different types of CNC Machines used in industry, Such as:

- Mills and Machining Centers
- Lathes and Turning Centers
- Drilling Machines
- EDM Sinker and wire cut Machines
- Flame and Laser-Cutting Machines
- Water Jet Profilers

HOW OPERATE CNC

Different ways of data input are :

- MDI : Manual Data Input.
- Program operation with CAD CAM.
- Program data transfer from PC to CNC Machine Control Unit.
- Program data transfer from PC to DNC by RS232 data cable.

HOW CNC LATHE AND MILLING MACHINES WORK

- Controlled by G and M codes.
- These are number values and co-ordinates.
- Each number or code is assigned to a particular operation.
- Typed in manually to CAD/CAM by machine operators.
- G & M codes are automatically generated by the CAD/CAM software.

CNC LATHE AND MILLING

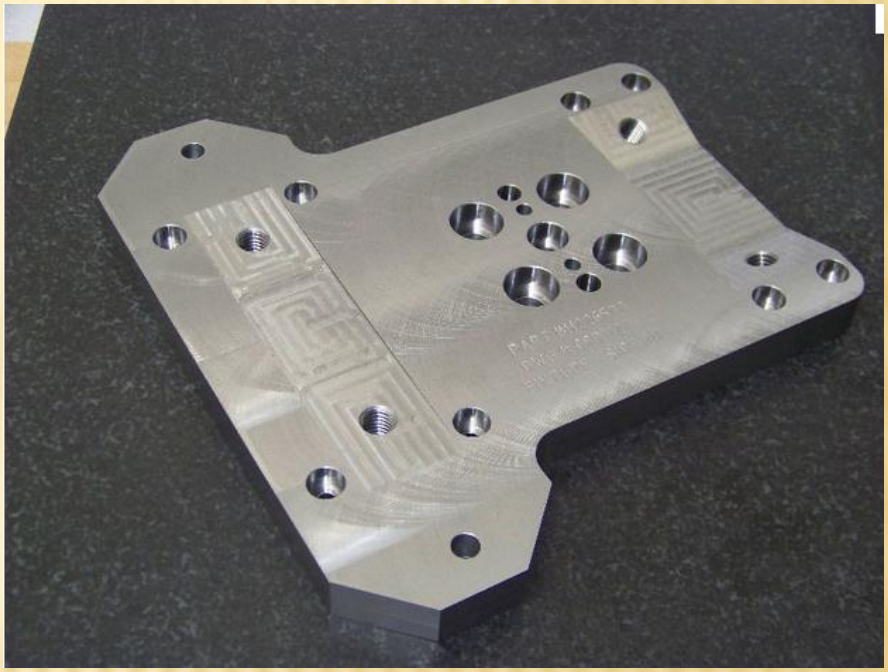
CNC PROGRAMMING KEY LETTERS

- O - Program number (Used for program identification)
- N - Sequence number (Used for line identification)
- G - Preparatory function
- X - X axis designation
- Y - Y axis designation
- Z - Z axis designation
- R - Radius designation
- F – Feed rate designation
- S - Spindle speed designation
- H - Tool length offset designation
- D - Tool radius offset designation
- T - Tool Designation
- M - Miscellaneous function

CNC LATHE AND MILLING PART

Lathe operation

Milling operation



IMPORTANT G AND M CODES

- G00 Rapid Transverse
- G01 Linear Interpolation
- G02 Circular Interpolation, CW
- G03 Circular Interpolation, CCW
- G17 XY Plane,G18 XZ Plane,G19 YZ Plane
- G20/G70 Inch units
- G21/G71 Metric Units
- G40 Cutter compensation cancel
- G41 Cutter compensation left
- G42 Cutter compensation right
- G43 Tool length compensation (plus)

- M00 Program stop
- M01 Optional program stop
- M02 Program end
- M03 Spindle on clockwise
- M04 Spindle on counterclockwise
- M05 Spindle stop
- M06 Tool change
- M08 Coolant on
- M09 Coolant off
- M10 Clamps on
- M11 Clamps off
- M30 Program stop, reset to start

PROGRAMMING EXAMPLE

```
O0077
N0005  G28 U0.0 W0.0;
N0010  T0202;
N0020  G97 S1500 M03;
N0030  G00 X50.0 Z1.0 ;
N0040  G71 U1.0 R2.0;
N0050  G71 P0060 Q00 U0.5 W0.2 F0.2;
N0060  G01 X13.0;
N0070  X15.0 Z-1.0;
N0080  Z-30.0
N0090  X23.0
N0100  X25.0 Z-50.0;
N0110  X50.0;
N0120  G70 P0060 Q0110 S2500 F0.1;
N0130  G28 U0.0 W0.0,
N0140   M30
```

CNC MACHINE ADVANTAGES/DISADVANTAGES

Advantages:

- High Repeatability and Precision e.g. Aircraft parts
- Volume of production is very high
- Complex contours/surfaces need to be machined. etc
- Flexibility in job change, automatic tool settings, less scrap
- More safe, higher productivity, better quality
- paper work, faster prototype production, reduction in lead times

Disadvantages:

- Costly setup, skilled operators.
- Computer programming knowledge required.
- Maintenance is costly and difficult.

Thank You