Subject Name & Code:

MANUFACTURING PROCESSES-BE04000191

ASSIGNMENT-4: Boring Machine (CO-2,3,4)

Q1. Explain the various operations carried out on a vertical boring machine.

Vertical Boring Machine (Vertical Turret Lathe):

- Large rotating table holds workpiece; tools mounted on vertical rams/side heads.
- Suitable for large, heavy, awkward-shaped workpieces (flywheels, turbine casings).

Operations Performed:

1. **Facing:** Machining top surface of workpiece using side head or turret tool.
2. **Turning (External):** Machining cylindrical outer surface using side head.
3. **Boring (Internal):** Enlarging/truing central bore using vertical ram tool.
4. **Taper Turning:** Using swivelling tool head or taper attachment.
5. **Grooving (Internal/External):** Cutting grooves/recesses on bore or OD.
6. **Contour/Profile Turning:** Using template or CNC control.
7. **Drilling/Reaming/Tapping:** With vertical ram holding drill chuck or tap holder.
8. **Parting:** Cutting off ring-shaped components.

Advantages: Workpiece stationary (table rotates), better stability for large parts; multiple tools can operate simultaneously (side head + vertical ram).

Q2. Explain jig boring machine.

Jig Boring Machine:

- **Definition:** High-precision vertical boring machine designed for accurately locating and boring holes in jigs, fixtures, dies, and precision parts.
- **Purpose:** Achieve hole location accuracy within **±0.0025 mm**.

Key Features:

- **Extremely rigid construction** to minimize deflection and vibration.
- **Precision spindle** with minimal runout (0.001 mm TIR).

- **Accurate positioning system:** Precision lead screws, vernier scales, optical measuring devices, or digital readout.
- **Temperature controlled environment** to maintain accuracy.
- **High spindle speeds** for small diameter precision boring.

Types:

1. **Vertical Jig Borer:** Most common; spindle vertical, table moves in X-Y plane.
2. **Horizontal Jig Borer:** Spindle horizontal; for long workpieces.

Applications:

- Boring holes in jigs and fixtures.
- Precision dies and moulds.
- Master gauges and templates.
- Aerospace and instrumentation components.

Diagram:

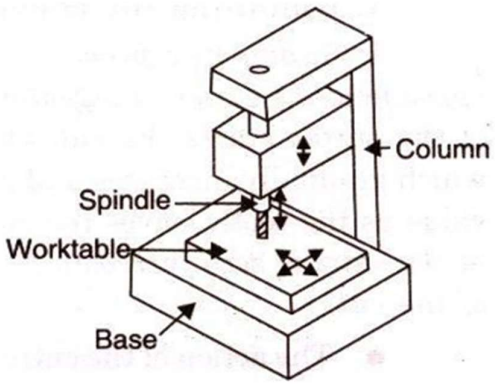

Fig.4.3 Jig Boring or precesion boring machine

Q3. Explain vertical boring machine.

Vertical Boring Machine (Vertical Turret Lathe):

Construction:

- **Base/Bed:** Heavy cast iron base supporting rotating table.
- **Table:** Large circular table with T-slots; rotates on precision bearings.
- **Columns:** Two vertical columns (one for vertical ram, one for side head).
- **Cross Rail:** Horizontal beam connecting columns; can be raised/lowered.
- **Vertical Ram/Turret:** Mounted on cross rail; holds turning/boring tools; moves vertically and horizontally.

- **Side Head:** Mounted on right column; for facing and external turning.

Working Principle:

- Workpiece clamped on rotating table.
- Table rotation provides **cutting motion**.
- Tools mounted on rams provide **feed motion**.
- Multiple tools can operate simultaneously for roughing and finishing.

Types:

1. **Single Column (Open Side):** For large diameter but limited height.
2. **Double Column:** For heavy and tall workpieces.

Applications:

- Large gear blanks, flywheels, turbine casings, large rings.
- Parts too large/heavy for horizontal lathe.

Advantages:

- Better work holding for large parts (gravity assists).
- Multiple tool stations increase productivity.
- Can machine both ID and OD in one setup.

Diagram:

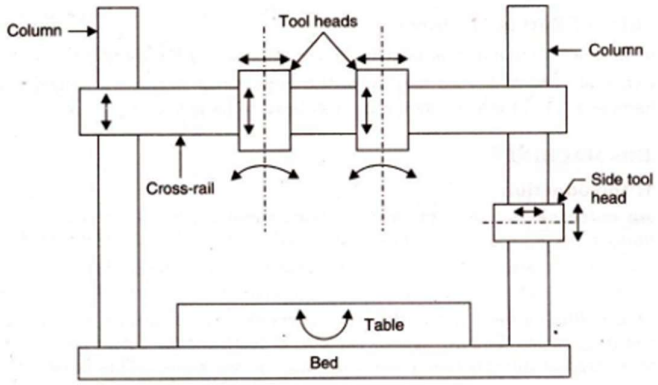

Fig.4.2 Vertical Boring Machine