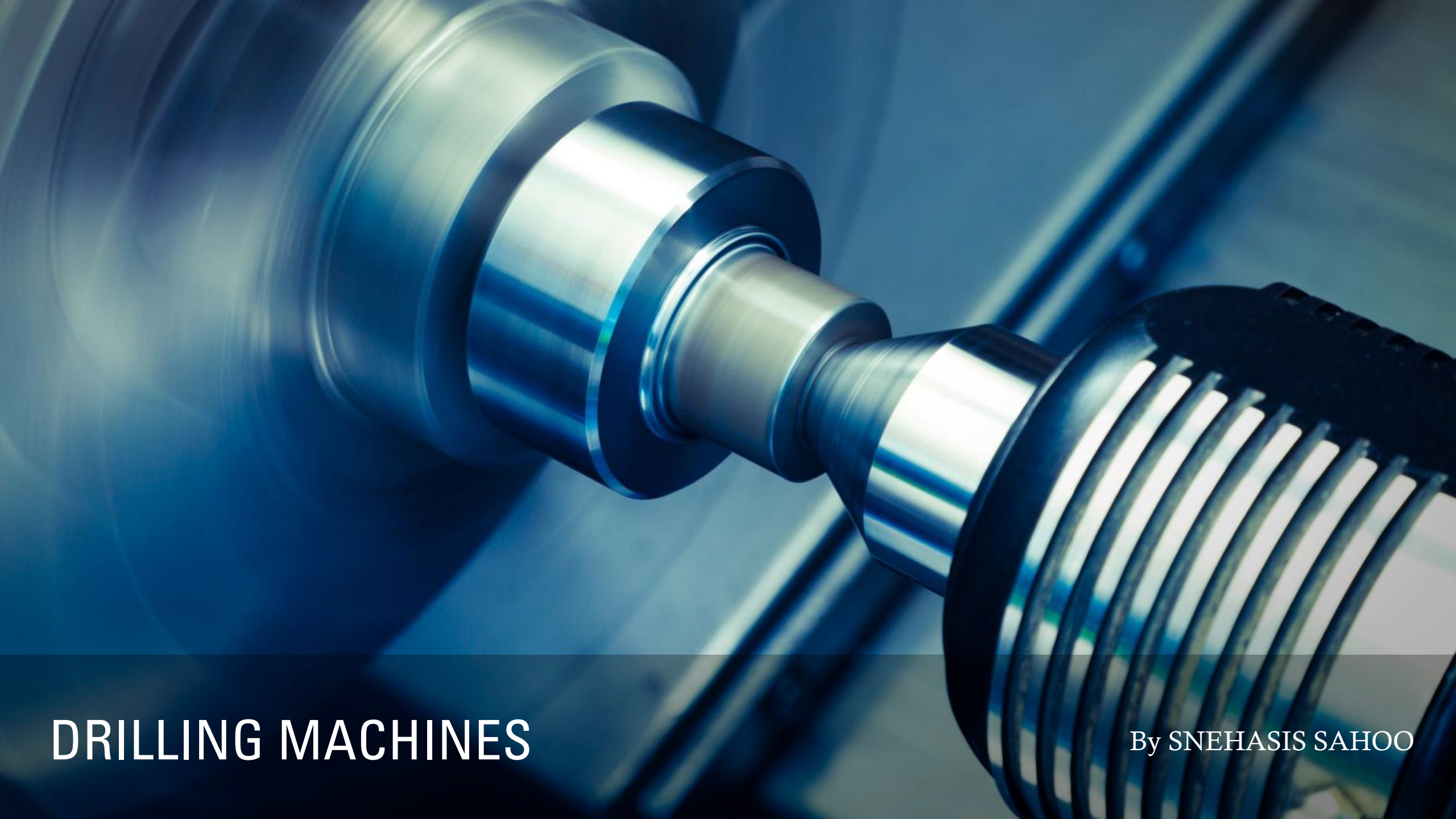


DRILLING MACHINES

By SNEHASIS SAHOO

DRILLING

- Drilling is a process of making hole in an object by forcing a rotating tool called "Drill".
- The drill is generally called as 'twist drill',

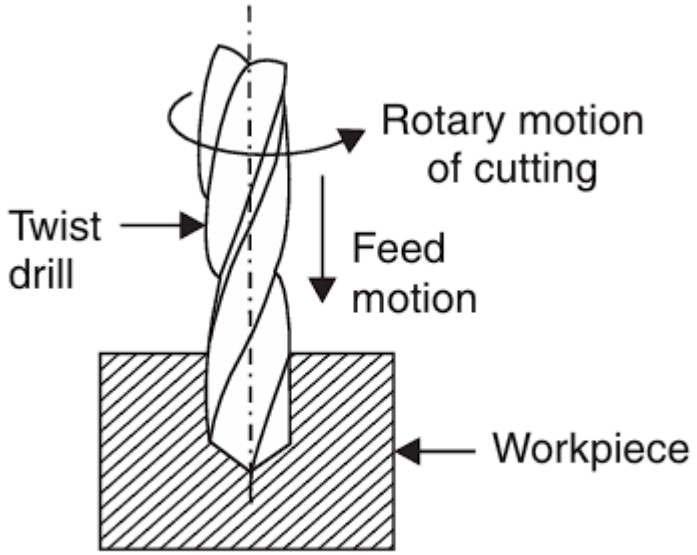


Fig. 9.70. Drilling operation.

DRILLING MACHINE

- A power operated machine tool which holds the drill in its spindle rotating at high speeds and when manually actuated to move linearly simultaneously against the workpiece produces a hole is called drilling machine.
- It consists of a spindle which imparts rotary motion to the drilling tool, or mechanism for feeding the tool into the work, a table on which the work rests and a frame. It is considered as a single purpose machine tool since its chief function is to make holes.

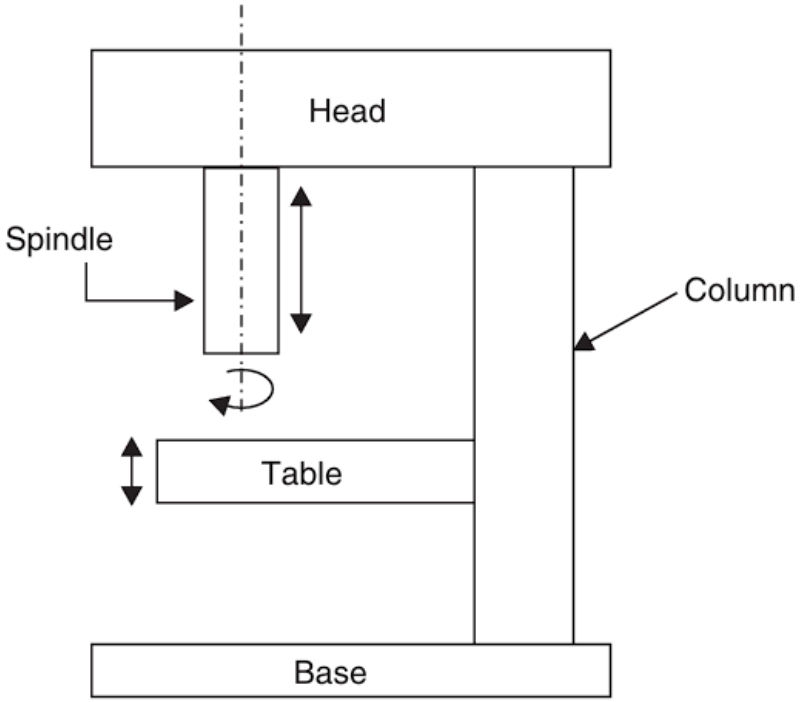


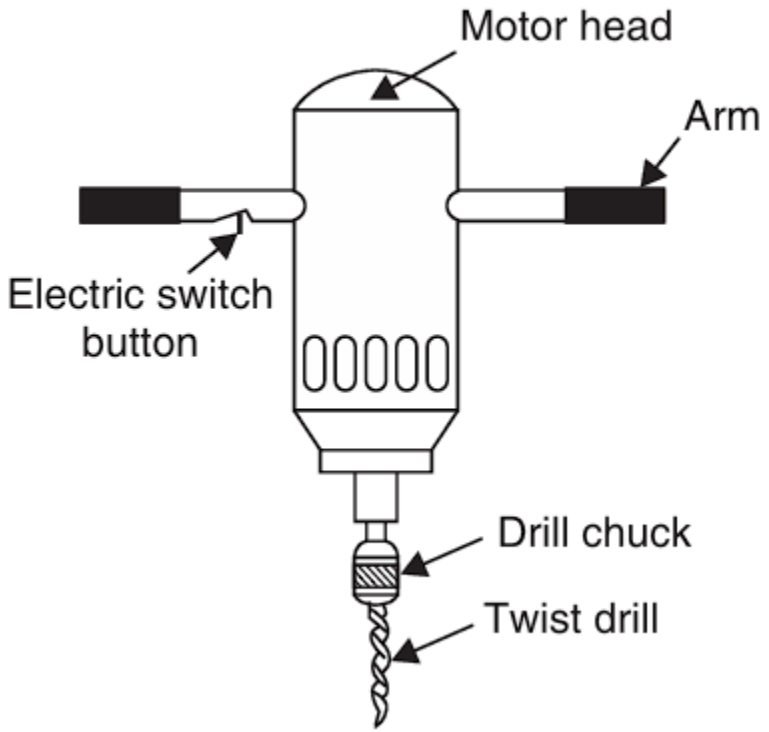
Fig. 9.71. Block diagram of a drill press.

TYPES OF DRILLING MACHINES

- Portable drilling machine.
- Sensitive or bench drilling machine
- Upright drilling machine or pillar drilling machine
- Radial drilling machine

PORTABLE DRILLING MACHINE :

- Portable drilling machine is a very small, compact and self contained unit carrying a small electric motor inside it.
- It is very commonly used to drill holes in the following cases :
  - (i) when the component is bigger in size such that it can not be shifted to the shop floor ;
  - (ii) when the space is restricted so that no other type of drilling machine can be used.
- Usually they are made to hold drills up-to a maximum diameter of 12 mm. However, portable drills of up-to 18 mm dia. capacity are available.



SENSITIVE OR BENCH DRILLING MACHINE

- The sensitive drilling machine is a small machine designed for drilling a small holes at high speed in light jobs.
- The base of the machine may be mounted on a bench or on a floor. It consist of a vertical column , a horizontal table , a head supporting the motor and driving mechanism and a vertical spindle for driving and rotating the twist drill.

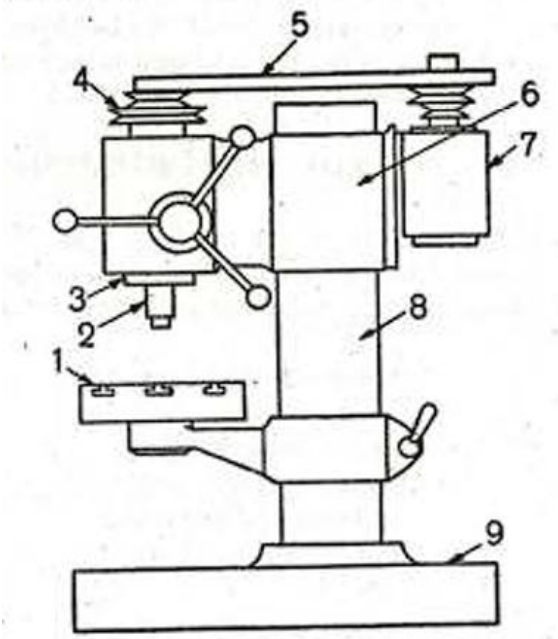


Figure Sensitive drilling machine
1. Table, 2. Vertieal drill spindle, 3. Sleeve, 4. Cone pulley, 5. V-belt, 6. Head, 7. Driving motor, 8. Vertical column, 9. Base.

SENSITIVE OR BENCH DRILLING MACHINE

- There is no arrangement for any automatic feed of the drill spindle.
- The drill is fed into the work purely by hand control.
- **As the operator senses the cutting action, at any instant , it is called sensitive drilling machine.**
- Sensitive drilling machines are capable of rotating drills of diameter from 1.5 to 15.5 mm.

UPRIGHT DRILLING MACHINE

- The upright drilling machine is designed for handling medium sized workpieces.
- In construction the machine is very similar to a sensitive drilling machine having a vertical column mounted upon the base. But this is larger and heavier than a sensitive drill and is supplied with power feed arrangement.
- There are two general type of upright drilling machine:

1. Round Column Section or Pillar drilling machine
2. Box Column section

ROUND COLUMN SECTION OR PILLAR DRILLING MACHINE

- The round column section or pillar drilling machine consists of a round column that rises from the base which rests on the floor, an arm and a round table assembly and a drill head assembly.
- The arm and the table have three adjustments for locating workpieces under the spindle.
    1. The arm and the table may be moved up and down on the column for accommodating workpieces of different heights.

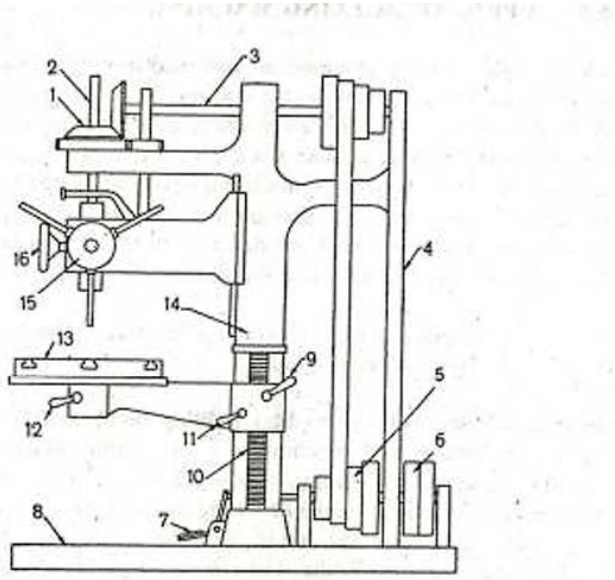


Figure Upright pillar drilling machine

1. Bevel gear drive to spindle, 2. Spindle, 3. Overhead shaft, 4. Back stay, 5. Counter shaft cone pulley, 6. Fast and loose pulley, 7. Table elevating handle, 8. Foot pedal, 9. Base, 10. Rack on column, 11. Table elevating clamp handle, 12. Table clamp, 13. Table, 14. Column, 15. Handwheel for quick hand feed, 16. Handwheel for sensitive hand feed.

ROUND COLUMN SECTION OR PILLAR DRILLING MACHINE

2. The table and the arm may be moved in an arc up-to 180° around the column and clamped at any position.
3. The table may be rotated 360° about its own centre independent of the position of the arm for locating workpieces under the spindle.

- The maximum size of holes that the machine can drill is not more than 50 mm.

RADIAL DRILLING MACHINE

- A radial drilling machine is used to perform the drilling operations on the workpieces which are too heavy and also may be too large to mount them on the worktable of the vertical spindle drilling machine.
- It consists of a heavy base and a vertical column with a long horizontal/radial arm extending from it and can be rapidly raised, lowered and swing in horizontal plane about the main column to any desired location.

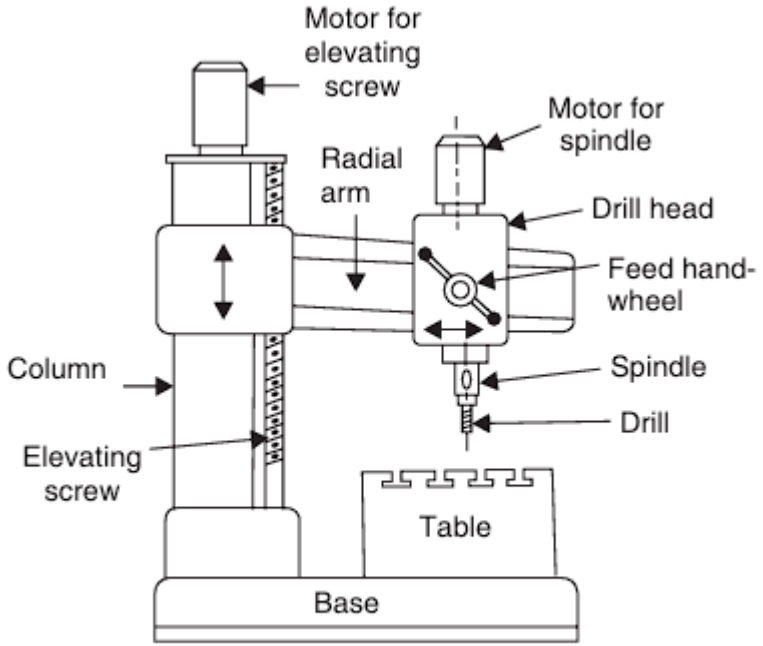


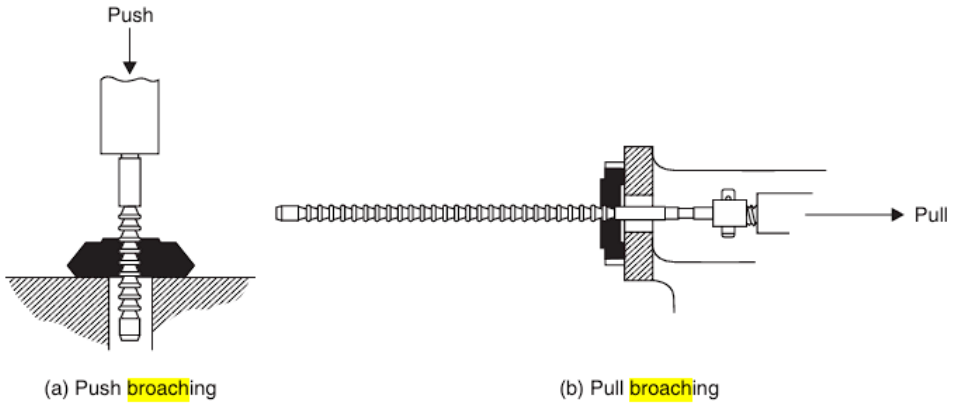
Fig. 9.74. Radial drilling machine.

RADIAL DRILLING MACHINE

- The drilling head can move to and fro along the arm and can be swiveled only in the universal radial drilling machines, to drill holes at an angle.
- The combinations of motions of the radial arm and drilling head offer a great deal of flexibility in moving the drill to any position.
- The main advantage of the radial drilling machine is that the drilling can be carried out Column Elevating screw on heavy workpieces in any position without moving them.
- This type of drilling machine is used in tool rooms and in large scale die manufacturing units.

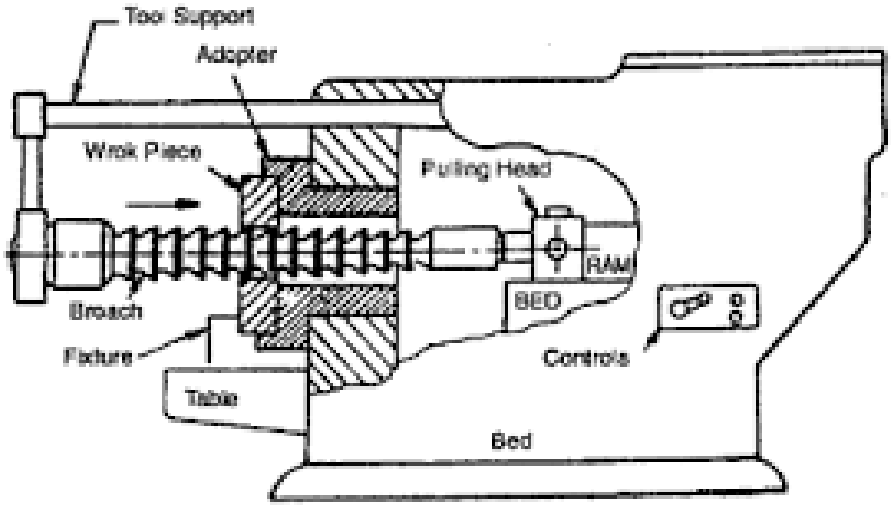
BROACHING MACHINES

- Broaching is a process of machining a surface with a special multipoint tool called a broach, whose teeth remove the material in a single stroke.
- Broaching machines are consist of a work holding fixture , a broaching tool, a drive mechanism and a suitable supporting frame.
- Types of broaching machine ;
    1. Horizontal broaching machine (PULL TYPE)
    2. Vertical broaching machine (PUSH TYPE)



BROACHING MACHINES

- It is a multiple tooth cutting operation with the tool reciprocating as in sawing machine.
- Machining operation completed in a single stroke.
- Teeth are at a gradually increasing height.
- Broach are originally developed for machining internal keyways.
- It is extensively used in mass automobile component manufacture for various other surfaces.



ADVANTAGES OF BROACHING

1. It is the fastest way of finishing an operation with a single stroke. The roughing as well as the finishing cuts are completed with one pass of tool.
2. A broaching machine is a simple machine since only a single reciprocating motion is required for cutting.
3. Internal or external surfaces can be broached.
4. Production rate is high because the actual cutting time is a matter of seconds. Rapid loading and unloading of fixtures minimizes total production time.
5. Since all the machining parameters are built into the broach, very little skill is required from the operator.

ADVANTAGES OF BROACHING

6. Any form that can be reproduced on a broaching can be machined.
7. High accuracy and a high class of surface finish is possible.