

DRILLING MACHINES

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DRILLING

- Drilling is the operation of producing a hole by rotating edge of a cutting tool called drill.
- Drill is a multi point cutting tool

Types of drilling machines

5.2 TYPES OF DRILLING MACHINE

Drilling machines are made in many different types and sizes, each designed to handle a class of work or specific job to the best advantage. The different types of drilling machines are :

1. Portable drilling machine.
2. Sensitive drilling machine.
 - (a) Bench mounting,
 - (b) Floor mounting
3. Upright drilling machine.
 - (a) Round column section,
 - (b) Box column section
4. Radial drilling machine.
 - (a) Plain
 - (b) Semiuniversal
 - (c) Universal
5. Gang drilling machine.
6. Multiple spindle drilling machine.
7. Automatic drilling machine.
8. Deep hole drilling machine.
 - (a) Vertical
 - (b) Horizontal

Sensitive drilling machine

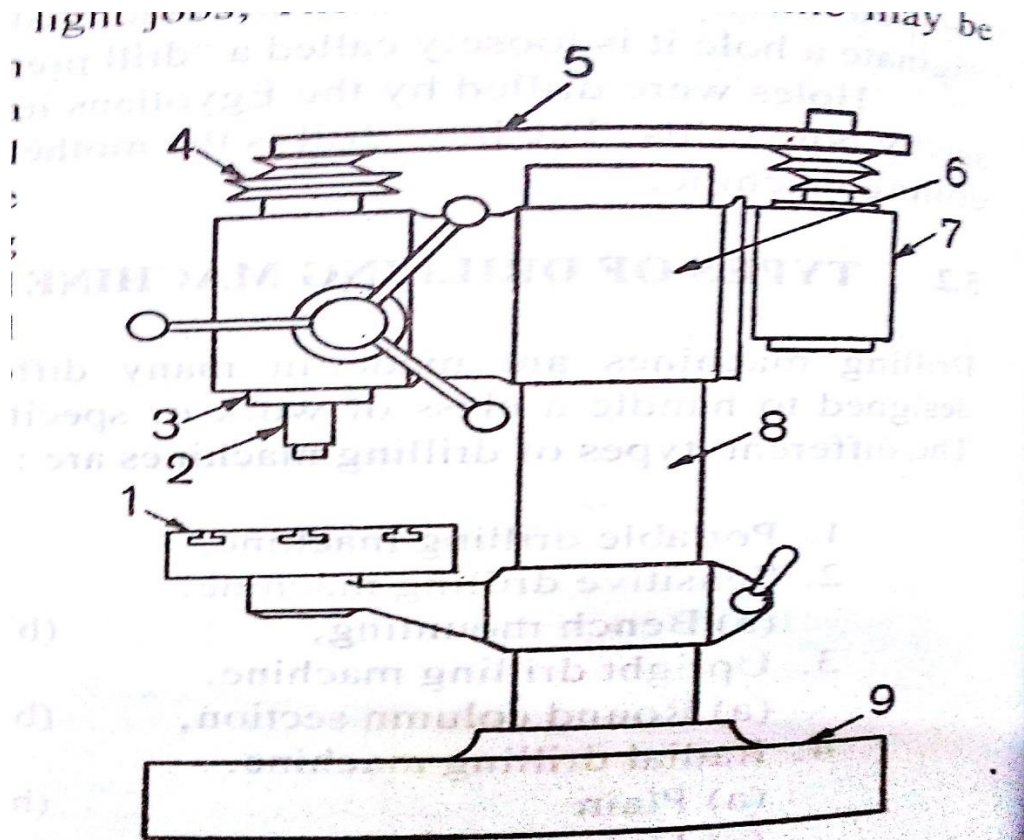


Figure 5.1 Sensitive drilling machine

- 1. Table, 2. Vertical drill spindle, 3. Sleeve, 4. Cone pulley, 5. V-belt, 6. Head, 7. Driving motor, 8. Vertical column, 9. Base.
- e released immediately to prevent it from

Drill Spindle Assembly

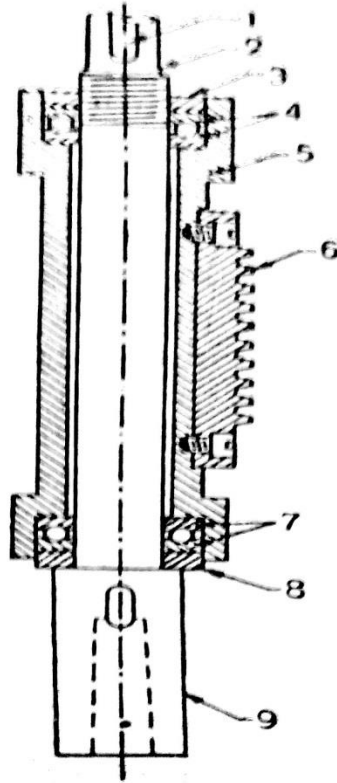


Figure 5.4 Drill spindle assembly

1. Key way on the spindle, 2. Spindle, 3. Nut, 4, 7. Thrust bearing, 5. Quill or sleeve, 6. Rack, 8. Washer, 9. Lower end of the spindle.

Upright pillar drilling machine

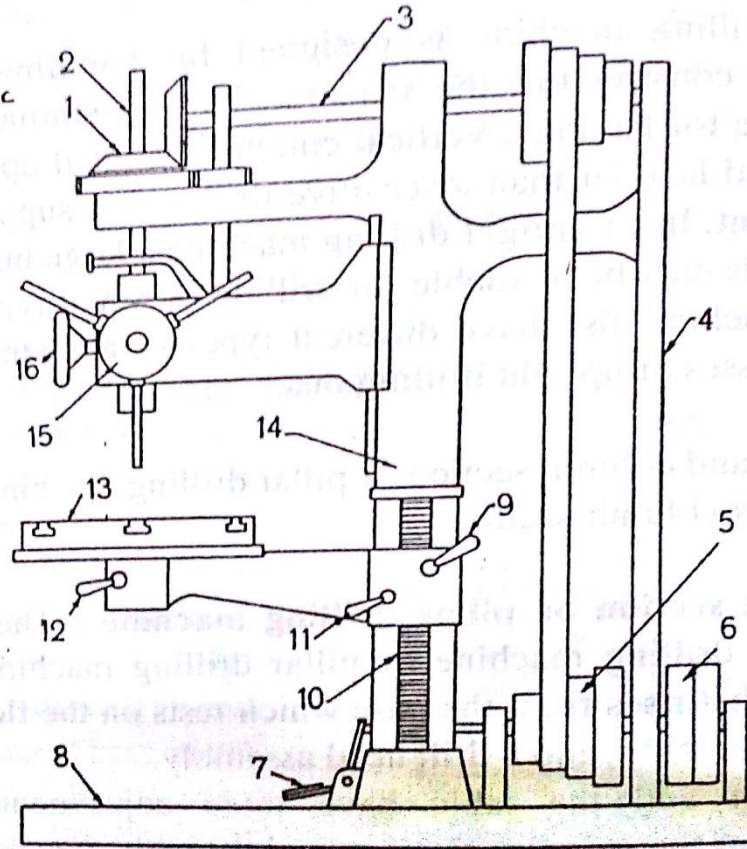


Figure 5.2 Upright pillar drilling machine

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.

Radial Drilling Machine

machine.

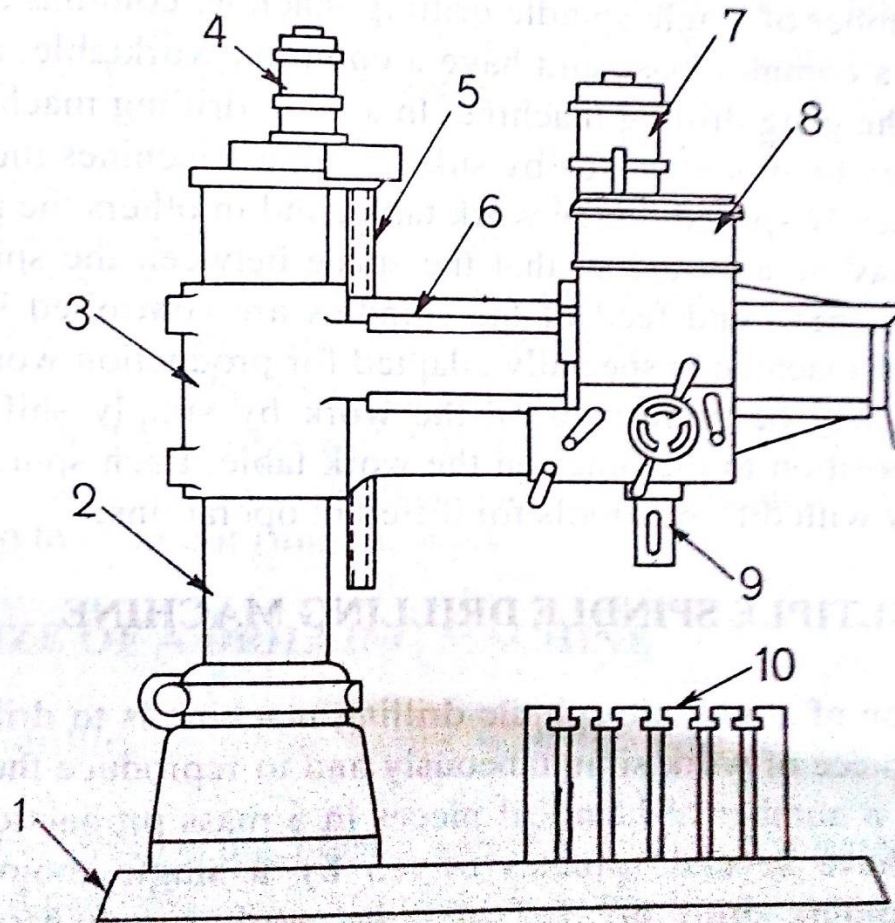


Figure 5.3 Radial drilling machine

1. Base,
2. column,
3. Radial arm,
4. Motor for elevating the arm,
5. Elevating screw,
6. Guide ways,
7. Motor for driving the drill spindle,
8. Drill head,
9. Drill spindle,
10. Table



Drilling Machine Operations

5.16 DRILLING MACHINE OPERATIONS

The different operations that can be performed in a drilling machine are :

1. Drilling.
2. Reaming.
3. Boring.
4. Counterboring.
5. Countersinking.
6. Spot facing.
7. Tapping.
8. Lapping.
9. Grinding.
10. Trepanning.

Drilling Machine Operations

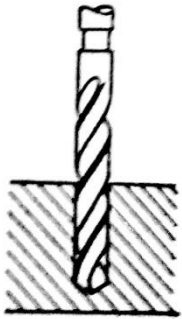


Figure 5.26 Drilling operation

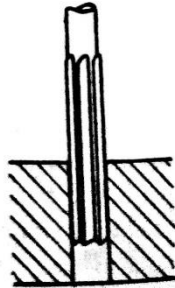


Figure 5.27 Reaming operation

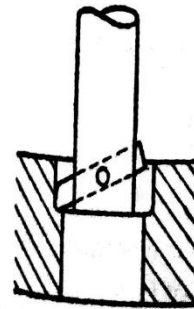


Figure 5.28 Boring operation

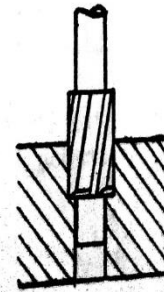


Figure 5.29 Counterboring operation

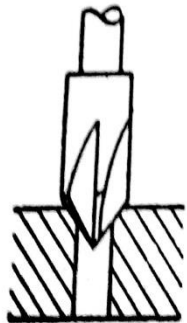


Figure 5.30 Countersinking operation

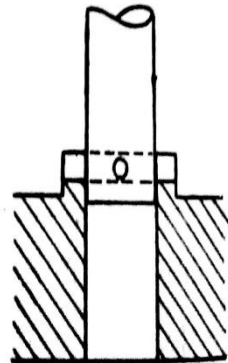


Figure 5.31 Spot facing operation

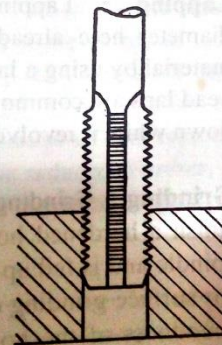


Figure 5.32 Tapping operation

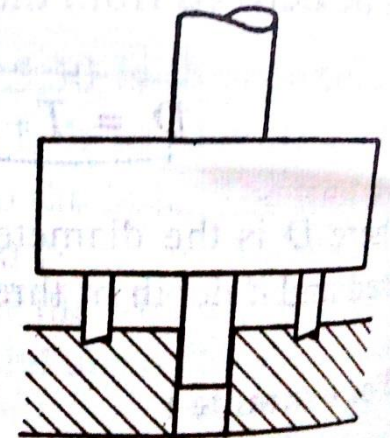


Figure 5.33 Trepanning operation

Drilling Machine Operations

1. To enlarge a hole by means of an adjustable cutting tool with only one cutting edge. This is necessary where suitable sized drill is not available or where hole diameter is so large that it cannot be ordinarily drilled.
2. To finish a hole accurately and to bring it to the required size.
3. To machine the internal surface of a hole already produced in casting.
4. To correct out of roundness of the hole.
5. To correct the location of the hole as the boring tool follows an independent path with respect to the hole.

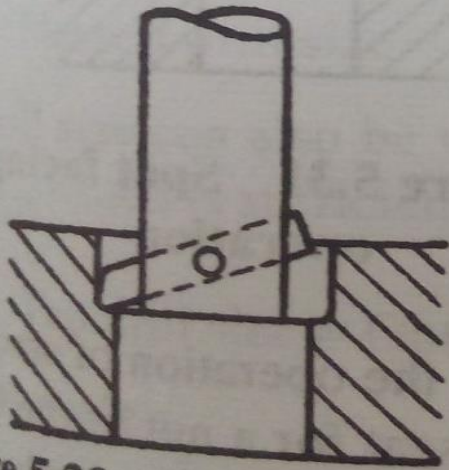


Figure 5.28 Boring operation

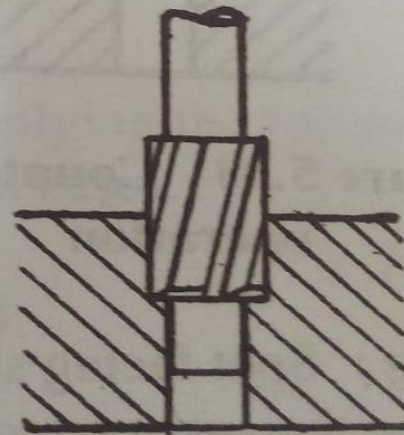


Figure 5.29 Counterboring operation

TYPES OF DRILLS

5.17 DRILLING MACHINE TOOLS

Drill : A drill is a fluted cutting tool used to originate or enlarge a hole in a solid material. Drills are manufactured in a wide variety of types and sizes. The types of the drill commonly used are :

1. Flat or spade drill
2. Straight fluted drill
3. Two-lip twist drill
 - a. Parallel shank (short series or “Jobbers” twist drill)
 - b. Parallel shank (stub series) twist drill
 - c. Parallel shank (long series) twist drill
 - d. Taper shank twist drill
4. Taper shank core drill (Three or four fluted)
5. Oil tube drill
6. Centre drill

TWIST DRILL NOMENCLATURE

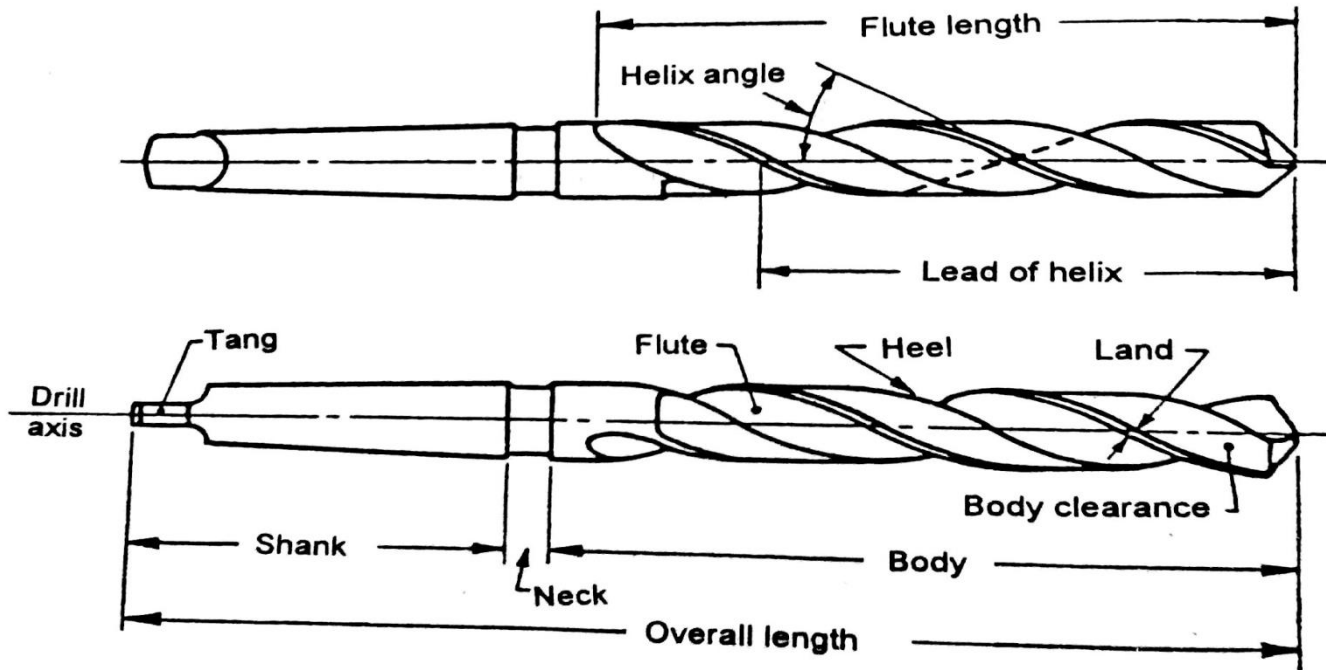


Figure 5.43 Twist drill nomenclature

Twist drill elements : The following are the twist drill elements.

Axis : The longitudinal centre line of the drill.

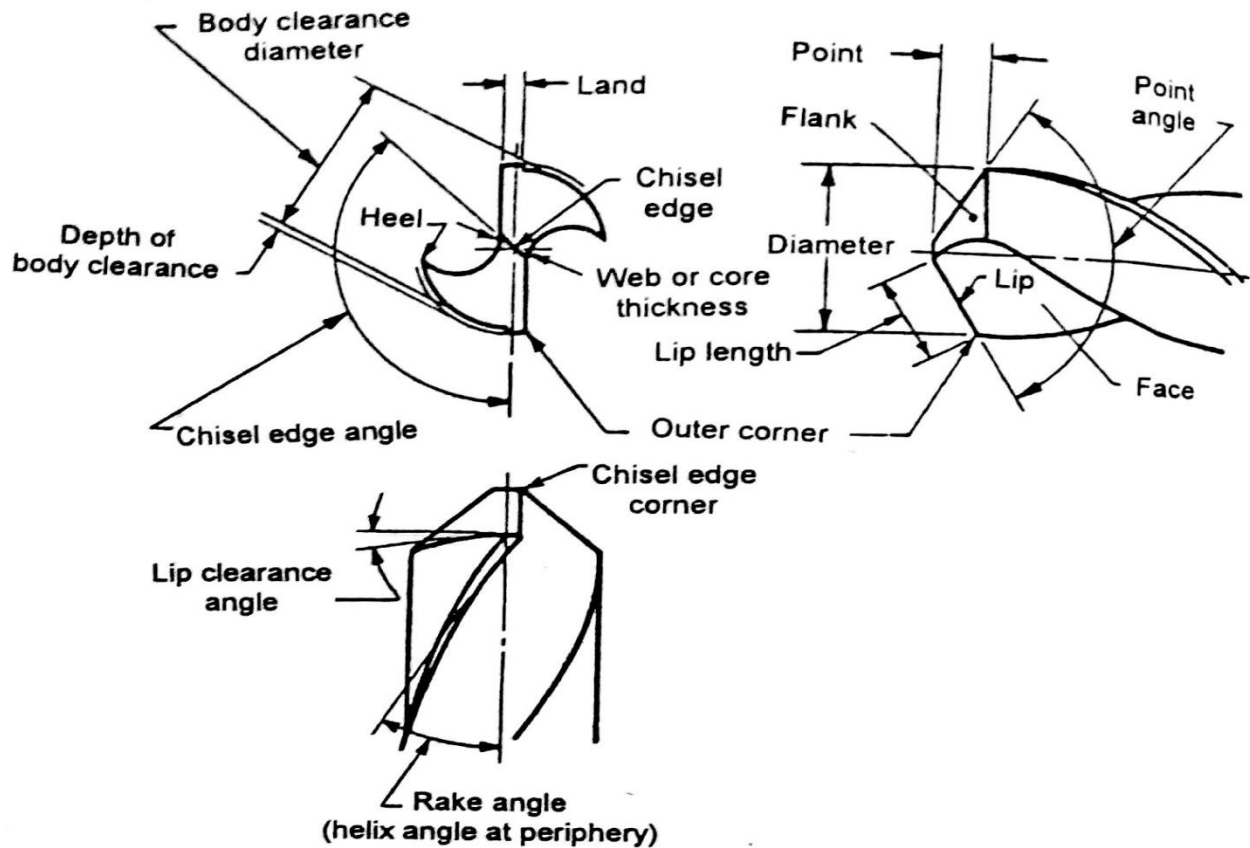
Body : That portion of the drill extending from its extreme point to the commencement of the neck, if present, otherwise extending to the commencement of the shank.

TWIST DRILL NOMENCLATURE

450 ELEMENTS OF MACHINE DESIGN

5.18 TWIST DRILL NOMENCLATURE

The following are the nomenclature, definitions and functions of the different parts of a drill illustrated in Fig.5.43.



Drilling Angles and coolants

TABLE 5.1 DRILLING ANGLES AND COOLANTS USED IN DRILLING

<i>Material</i>	<i>Coolant</i>	<i>Point angle deg.</i>	<i>Lip clearance deg.</i>	<i>Chisel point deg.</i>	<i>Helix angle deg.</i>
Aluminium	$\frac{2}{3}$ lard oil, $\frac{1}{3}$ kerosene	90–140	12–17	125–135	24–48
Brass	$\frac{2}{3}$ lard oil, $\frac{1}{3}$ kerosene	118	12–15	125–135	0–17
Cast iron hard	soluble oil	118	10–12	125–135	24–32
Copper	soluble oil	100–118	12–15	125–135	28–40
Nickel pure	Lard oil	118	12	125–135	24–32
Stainless steel	Sulphur base oil	125–135	10–12	120–130	24–32
Steel	Soluble oil, mineral oil, sulphurised and chlorinated oil	118	12–15	125–135	24–32

DRILL MATERIAL

521 DRILL MATERIAL

The materials for the manufacture of twist drills are as follows :

1. One piece construction : High speed steel or carbon steel.
2. Two piece construction :

Cutting portion– High speed steel.

Shank portion – Carbon steel with a minimum tensile strength of 70 kg per sq mm.

High speed drills are more widely used due to its greater cutting efficiency. Cemented carbide tipped drills are also used in mass production work.