UNIT – III

BORING, REAMING, AND TAPING

REAMING

Reaming is an operation of finishing a hole previously drilled to give a good surface finish and an accurate dimension. A reamer is a multi tooth cutter which rotates and moves axially into the hole. The reamer removes relatively small amount of material. Generally the reamer follows the already existing hole and therefore will not be able to correct the hole misalignment. *Fig. 3.1 illustrates the elements of a reamer. Fig. 3.2 shows the different types of reamers of standard sizes.*

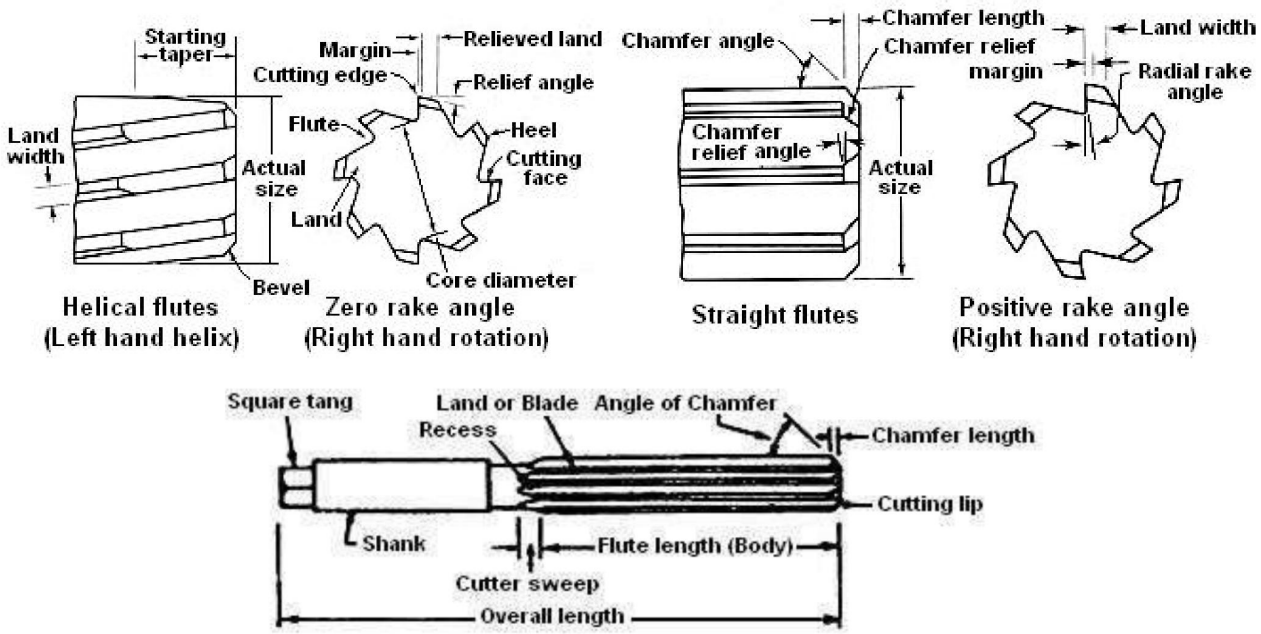

Fig. 3.1 Elements of a reamer

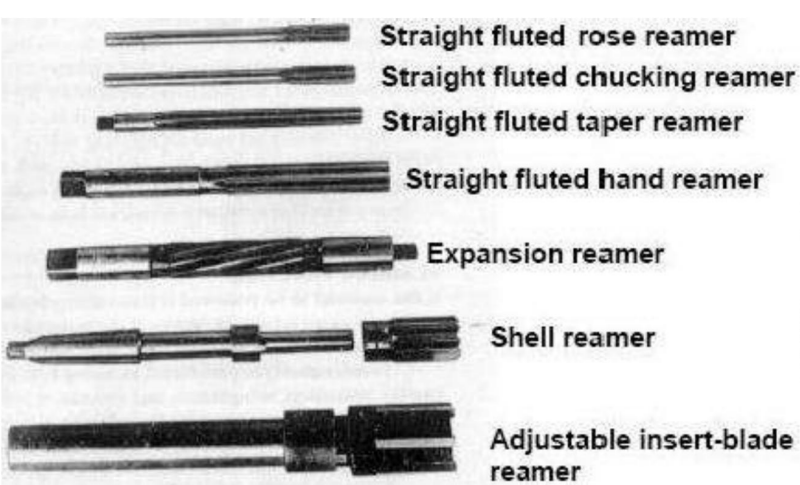

Fig. 3.2 Different types of reamers

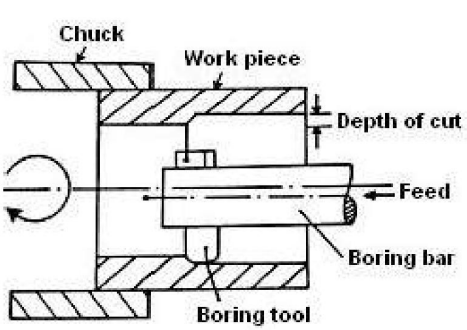

Fig. 3.3 Principle of boring operation

BORING

Boring is an operation of enlarging and locating previously drilled holes with a single point

cutting tool. The machine used for this purpose is called boring machine. The boring machine is one of the most versatile machine tools used to bore holes in large and heavy parts such as engine frames, steam engine cylinders, machine housings etc. Drilling, milling and facing operations also can be performed in this machine. Screw cutting. Turning, planetary grinding and gear cutting operations also can be done by fitting simple attachments. *The principle of boring operation is illustrated in Fig. 3.3.*

Horizontal boring machines

In horizontal boring machine, the tool revolves and the work is stationary. A horizontal boring machine can perform boring, reaming, turning, threading, facing, milling, grooving, recessing and many other operations with suitable tools. Work pieces which are heavy, irregular, unsymmetrical or bulky can be conveniently held and machined. This machine has two vertical columns. A headstock slides up and down in one column. It may be adjusted to any desired height and clamped. The headstock holds the cutting tool. The cutting tool revolves in the headstock in horizontal axis. A sliding type bearing block is provided in the other vertical column. It is used to support the boring bar. The work piece is mounted on the table and is clamped with ordinary strap clamps, T-slot bolts and nuts, or it is held in a special fixture if so required. Various types of rotary and universal swiveling attachments can be installed on the horizontal boring machines table to bore holes at various angles in horizontal and vertical planes. *Fig. 3.4 schematically shows the basic configuration of a horizontal boring machine.*

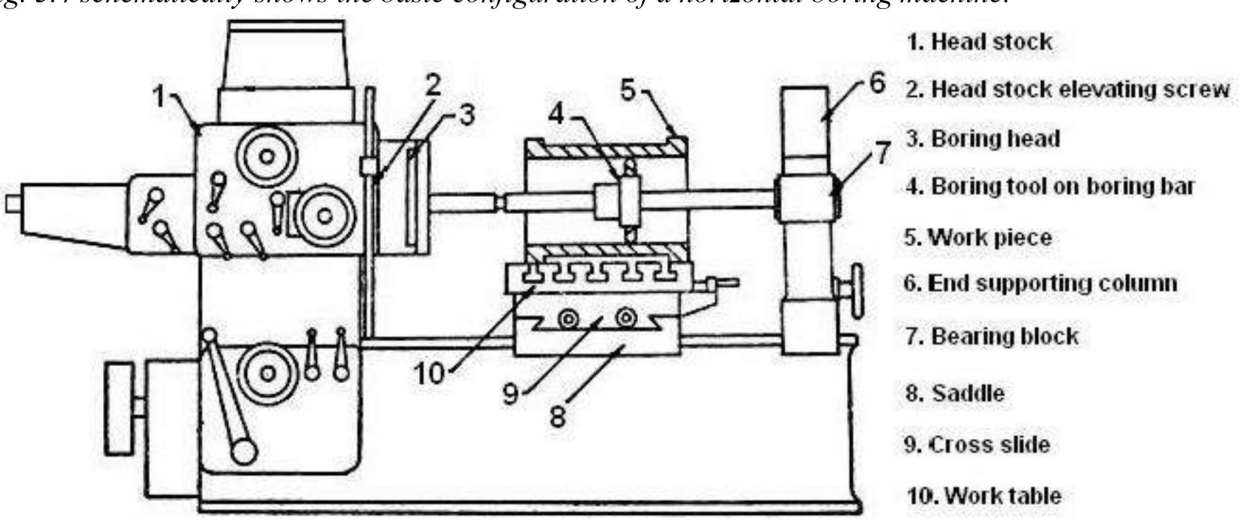

Fig. 3.4 Basic configuration of a horizontal boring machine.

Types of horizontal boring machine

Different types of horizontal boring machines have been designed to suit different purposes. They are:

Table type horizontal boring machine

The work is held stationary on a coordinate work table having in and out as well as back and forth movements that is perpendicular and parallel to the spindle axis. The spindle carrying the tool can be fed axially. Alternatively, the table travels parallel to the spindle axis (longitudinal feed). This method of boring with longitudinal feed of the table is employed when holes are of considerable length and being bending of the boring bar is possible. *Fig. 3.5 shows the table type horizontal boring machine.*

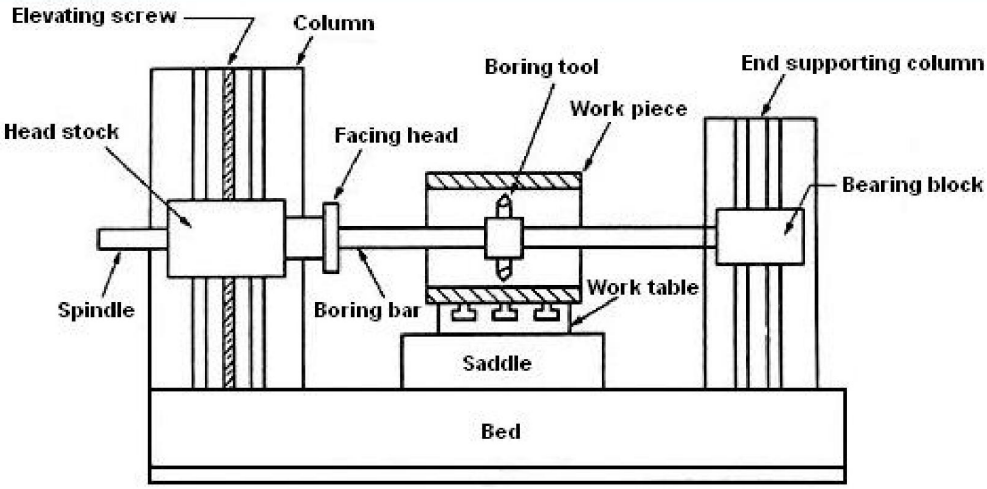

Fig. 3.5 Table type horizontal boring machine

Planer type horizontal boring machine

This machine is similar to the table type horizontal boring machine except that the work table has only in and out movements that is perpendicular to the spindle axis. Other features and applications of this machine are similar to the table type horizontal boring machine. This type of machine is suitable for supporting a long work. *Fig. 3.6 shows the planer type horizontal boring machine.*

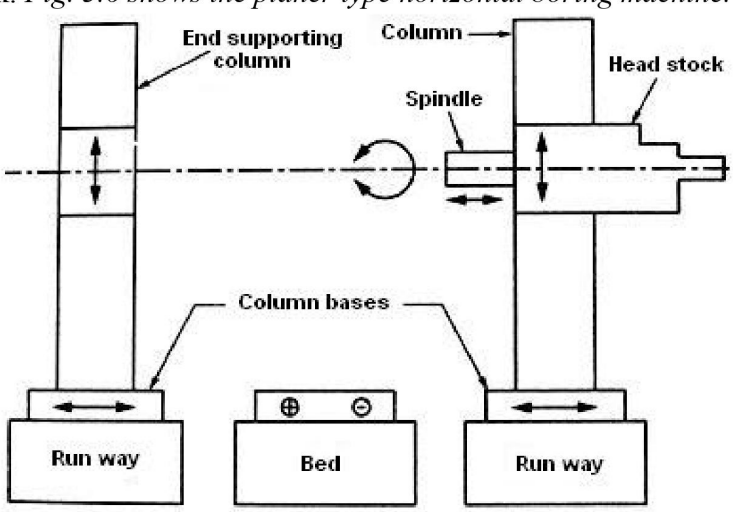

Fig. 3.6 Planer type horizontal boring machine

Floor type horizontal boring machine

Here, there is no work table and the job is mounted on a stationary T-slotted floor plate. This design is used when large and heavy jobs can not be mounted and adjusted on the work table. Horizontal movement perpendicular to the spindle axis is obtained by traversing the column carrying the head stock, on guide ways. *Fig. 3.7 shows the floor type horizontal boring machine.*

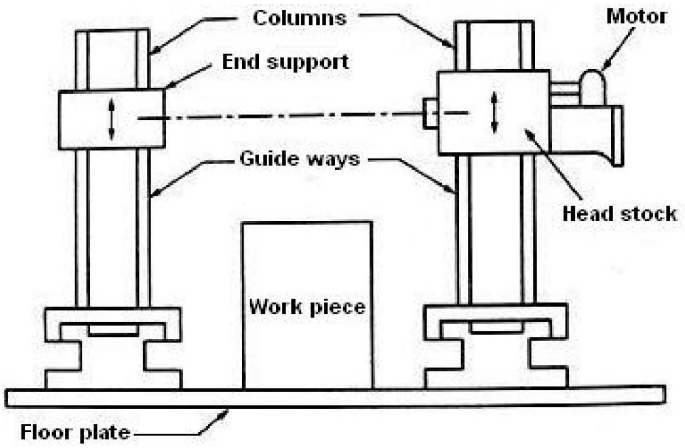

Fig. 3.7 Floor type horizontal boring machine

Multiple head type horizontal boring machine

The machine resembles a double housing planer or a Plano-miller and is used for boring holes of large diameter is mass production. The machine may have two, three or four headstocks. This type of machine may be used both as a horizontal and vertical machine. *Fig. 3.8 shows the multiple head type horizontal boring machine.*

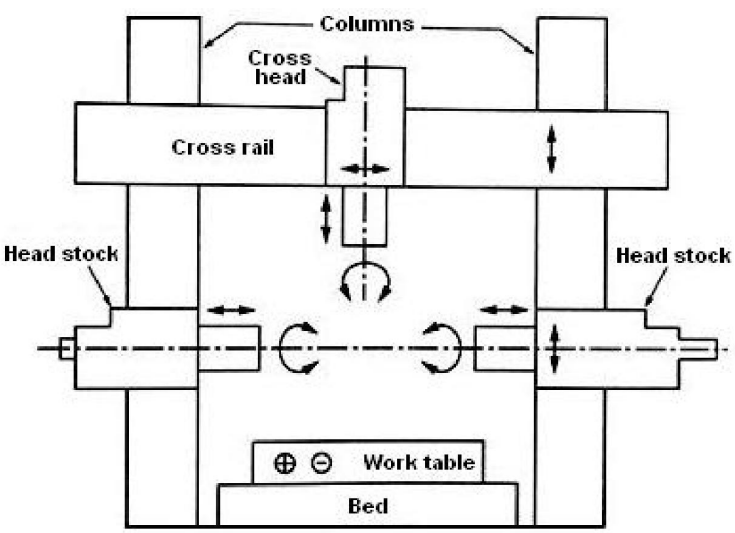

Fig. 3.8 Multiple head type horizontal boring machine

Vertical boring machines

For convenience, parts whose length or height is less than the diameter are machined on vertical boring machines. The typical works are: Large gear blanks, locomotive and rolling stock tires, fly wheels, large flanges, steam and water turbine castings etc. On a vertical boring machine, the work is fastened on a horizontal revolving table, and the cutting tool(s) which are stationary, advance vertically into it are as the table revolves.

There are two types of vertical boring machine: Single column vertical boring machine and double column vertical boring machine. The single column vertical boring machine looks like a drilling machine or a knee type vertical milling machine. Guide ways are employed on the column to support the spindle head in the vertical direction. *A double column vertical boring machine is shown in Fig. 3.9.* The work is accommodated on the horizontal revolving table at the front of the machine. The circular work can be clamped on to the table with the help of jaw chucks whereas the T-slots can be used with bolts and clamps for setting up and holding irregular work. A horizontal cross rail is carried on vertical slideways and carries the tool holder slide(s). On machines designed for working on large batches of identical parts, a single slide with turret may be employed. *Fig. 3.10 shows the turret boring machine.*

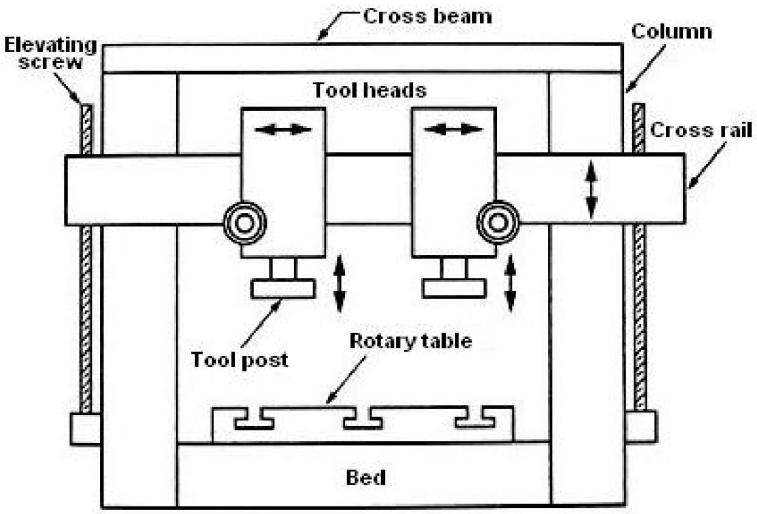

Fig. 3.9 Double column vertical boring machine

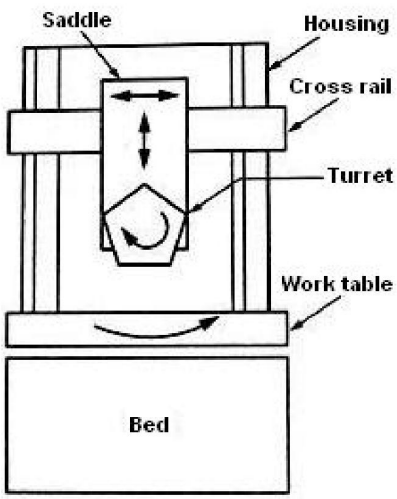

Fig. 3.10 Turret boring machine

Jig borers or jig boring machines

It is very precise vertical type boring machine. The spindle and spindle bearings are constructed with very high precision. The table can be moved precisely in two mutually perpendicular directions in a plane normal to the spindle axis. The coordinate method for locating holes is employed. Holes can be located to within tolerances of 0.0025 mm. Jig boring machines are relatively costlier. Hence, they are found only in the large machine shops, where a sufficient amount of accurate hole locating is done. Jig boring machines are basically designed for use in the making jigs, fixtures and other special tooling. *Fig. 3.11 shows the block diagram of a jig boring machine.*

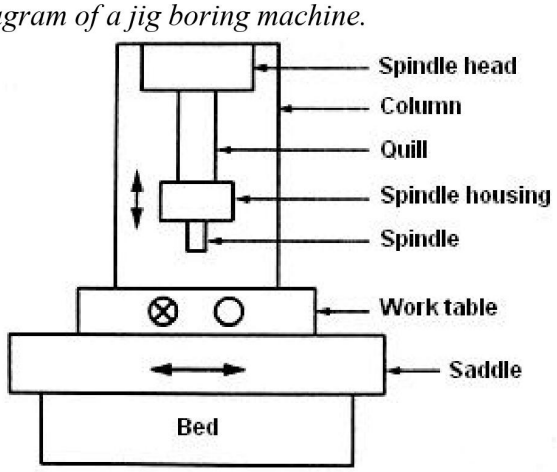

Fig. 3.11 Block diagram of a jig boring machine

Boring tools

A boring tool consists of a single point cutting tool (boring bit) held in a tool holder known as boring bar. The boring bit is held in a cross hole at the end of the boring bar. The boring bit is adjusted and held in position with the help of set screws. The material of the boring bit can be: Solid HSS, solid carbide, brazed carbide, disposable carbide tips or diamond tips. Boring tools are of two types: fixed type and rotating type. Fixed type boring tools are used on working rotating machines such as lathes, whereas rotating type boring tools are used on tool rotating machines such as drilling machines, milling machines and boring machines. *Fig. 3.12 shows the different types of boring tools (bars).*

TAPPING

Tapping is the faster way of producing internal threads. A tap is a multi fluted cutting tool with cutting edges on each blade resembling the shape of threads to be cut. A tap is used after carrying out the pre drilling operation corresponding to the required size. *Fig. 3.13 shows the hand (solid) taps.Fig. 3.14 shows the elements of a solid tap.*

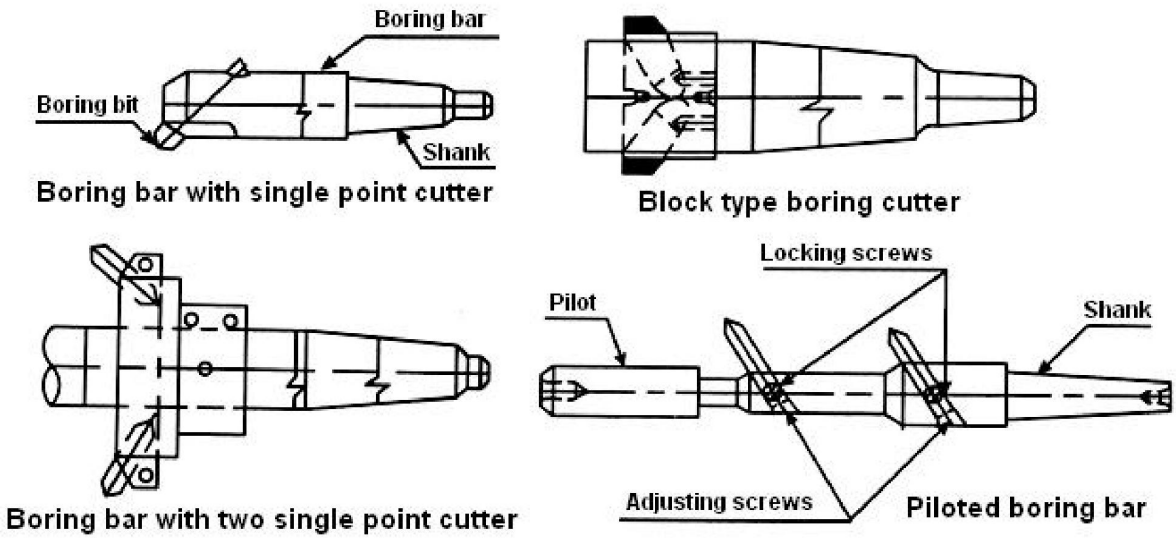

Fig. 3.12 Different types of boring tools (bars)

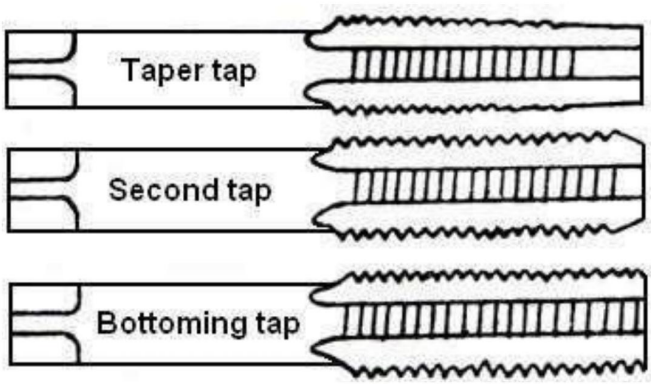

Fig. 3.13 Hand (solid) taps

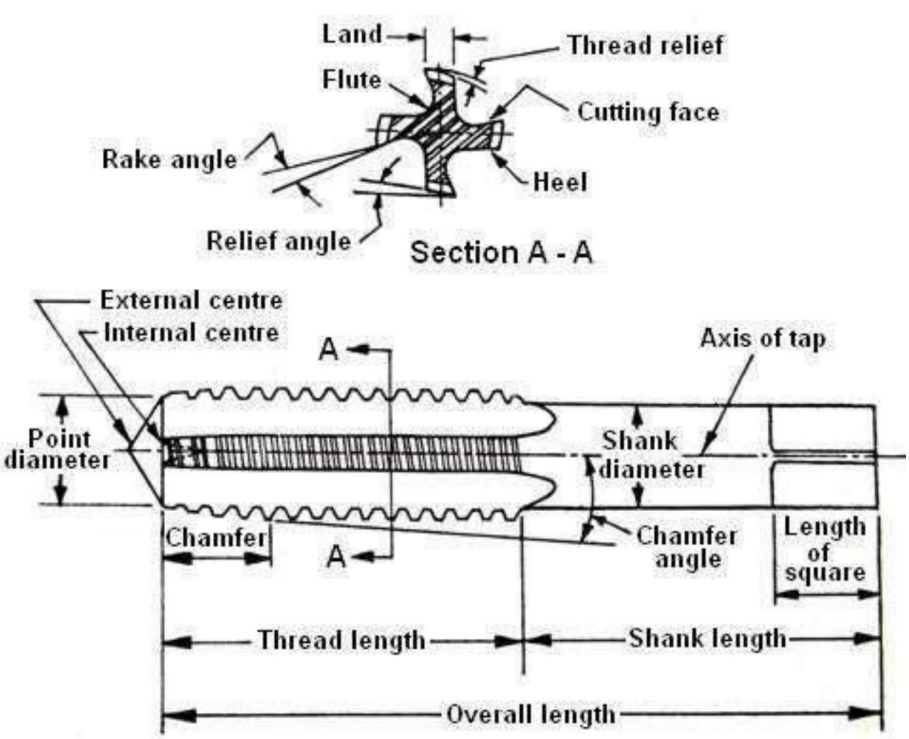

Fig. 3.14 Elements of a solid tap