

# Shapers and Planers

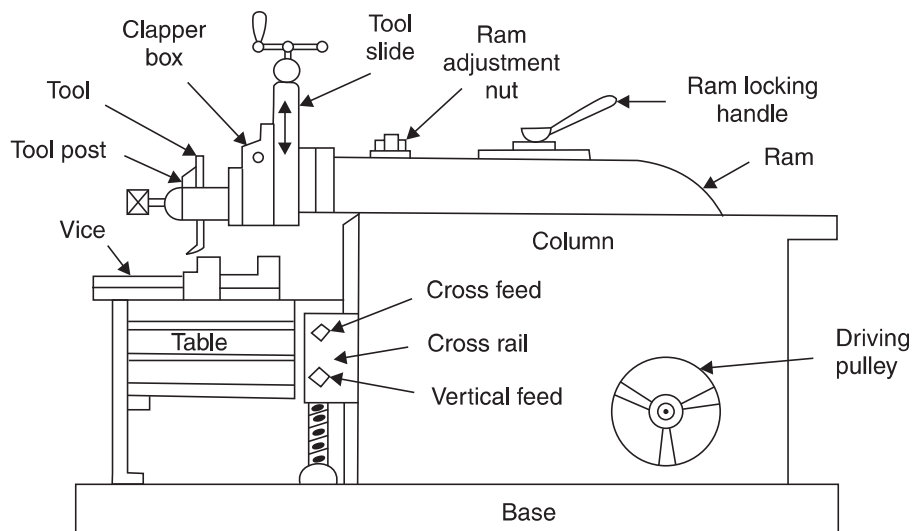
## INTRODUCTION

Both shapers and planers are machine tools which produce a flat surface. They are capable of machining a horizontal, vertical or inclined flat surface. They employ single-point cutting tools which are essentially similar to single-point cutting tools used on lathe. In both these machine tools, the cutting tool is subjected to interrupted cuts, the tools cuts in forward direction and is idle in the return direction.

## SHAPING MACHINES OR SHAPER

### Principle of Working

Principal parts of a shaper are shown in Fig. 2.1.



**Fig. 2.1** Principal parts of a shaper

Shaper consists of a hollow machine bed made of cast iron which rests on the ground. Inside the hollow portion the machine drive mechanism is housed. This mechanism is called slotted lever quick return mechanism and it drives a horizontal ram which reciprocates in the guide ways provided on the top surface of the machine frame. In the front face of the ram, a tool post is fitted. This is a very special kind of tool post. It carries a slide which can be operated by a hand wheel and the entire tool post can be lowered or raised. Besides, the tool slide can be swivelled in a vertical plane and its inclination to the vertical (amount of swivelling) can be read off on a scale marked in degrees. The tool is inclined, when an inclined surface has to be machined.

In the front portion of the base, a table is fitted. The table can be raised or lowered to vary its height. It can also be moved horizontally to left or right. A vice to hold the work piece is provided on the table top.

The tool does useful work *i.e.*, cutting only in the forward stroke of the ram. It does not cut *i.e.*, it is idle during the return stroke of ram. In order that while returning, the tool may not rub and spoil the strip of the metal machined in the forward stroke, a special device called the “clapper box” is provided in the tool post. It lifts the tip of the tool during the return stroke.

## DRIVE

Since useful work is done only during the forward stroke of ram, the mechanism driving the ram is so designed that the return stroke is completed in much less time than the forward stroke. The slotted lever quick return mechanism is illustrated in Figs. 2.2(a) and 2.2(b).

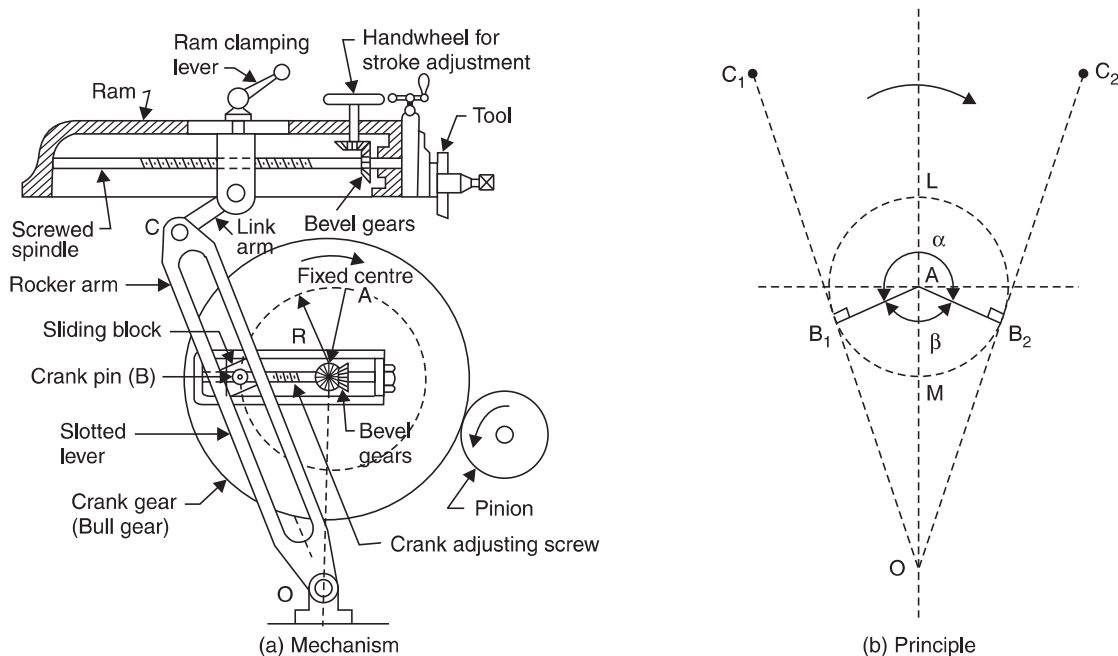


Fig. 2.2 Quick return mechanism

The crank  $AB$  (of adjustable length  $R$ ) rotates with a uniform angular speed. The crank pin  $B$  is in the shape of a die block which is free to slide inside the slot in the slotted lever  $OBC$ . This slotted lever is pivoted at  $O$  and the other end  $C$  is connected to the ram by a short link arm as shown in Fig. 2.2 (a). When the crank  $AB$  rotates clockwise from position  $AB_1$  to  $AB_2$ , the ram moves forward from left to right and when it rotates from position  $AB_2$  to  $AB_1$  the ram returns back to its original position.

Clearly the time taken to complete forward stroke is proportional to angle  $\alpha$  (refer to Fig. 2.2 (b)) and the return stroke is completed in less time which is proportional to angle  $\beta$ .

### CUTTING TOOLS USED IN SHAPING

The cutting tools for shapers are generally made of H.S.S., either solid or with brazed tips. Due to interrupted cuts, tungsten carbide tools are not preferred for shaping work. These tools are made sturdy with fairly generous size for shank and tip. Various types of tools useful for shaping are shown in Fig. 2.3.

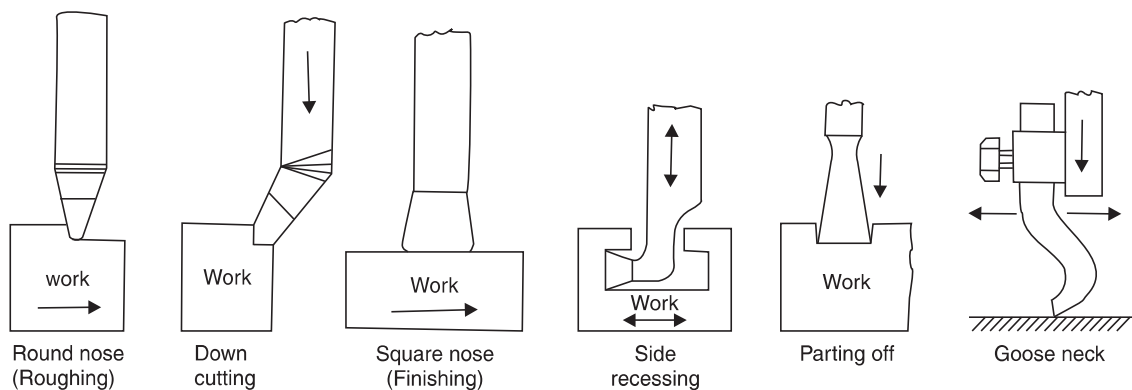


Fig. 2.3 Cutting tools used in shaping work

### OPERATIONS PERFORMED ON SHAPERS

On a shaping machine, relatively small jobs can be machined. The size of a shaper is denoted by the maximum length of stroke of its ram and work pieces longer than the maximum stroke cannot be machined.

The first step in machining a job is to mount the job on the shaper-table and clamp it tightly in the vice or on the table by means of  $T$ -bolts etc. The second step is to adjust the stroke of ram according to the length of work piece. The ram stroke is kept about 60–70 mm longer than job. The stroke can be reduced or increased by altering the length of the crank  $AB$  (refer to Fig. 2.2). Now by changing the position of the location where short link arm is connected to the ram, the stroke is made to overlap the job, so that the stroke starts 30–35 mm before the job and covers the whole length of work piece and ends 30–35 mm beyond it.

A tool is now selected and clamped in the tool post. The depth of cut is given by rotating the hand wheel and lowering the tool slide. Depth of cut is not given by raising the table height. Table