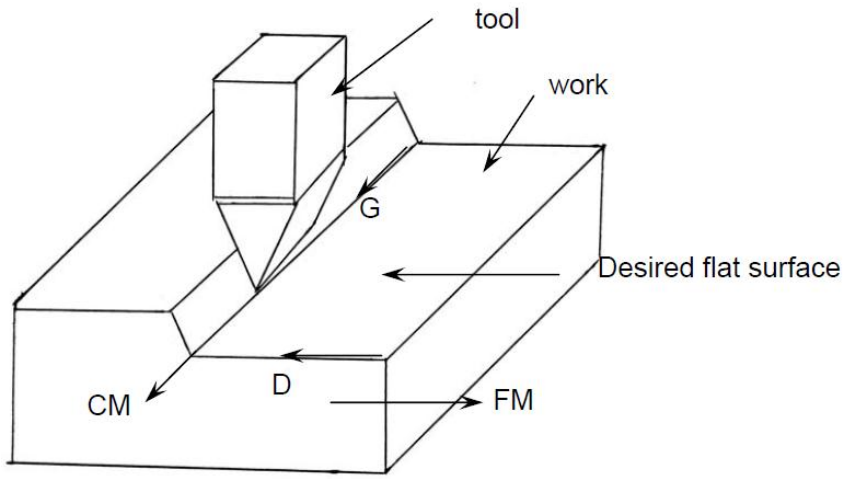
Shaping machine

The main functions of shaping machines are to produce flat surfaces in different planes. its basic principle of generation of flat surface by shaping machine. The cutting motion provided by the linear forward motion of the reciprocating tool and the intermittent feed motion provided by the slow transverse motion of the job along with the bed result in producing a flat surface by gradual removal of excess material layer by layer in the form of chips.

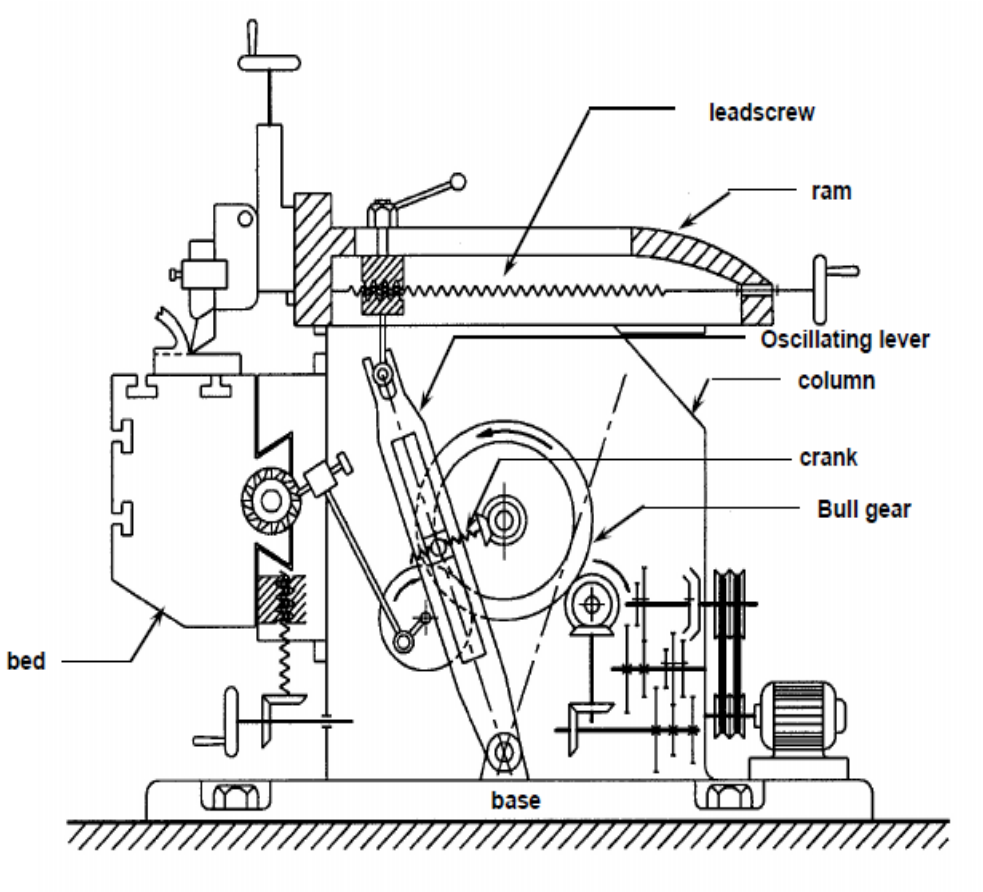
The vertical infeed is given either by descending the tool holder or raising the bed or both. Straight grooves of various curved sections are also made in shaping machines by using specific form tools. The single point straight or form tool is clamped in the vertical slide which is mounted at the front face of the reciprocating ram whereas the work piece is directly or indirectly through a vice is mounted on the bed.



Principle of producing flat surface in shaping machine

Kinematic system and working principles

The usual kinematic system provided in shaping machine for transmitting power and motion from the motor to the tool and job at desired speeds and feeds is schematically shown in Fig



The central large bull gear receives its rotation from the motor through the belt-pulley, clutch, speed gear box and then the pinion. The rotation of the crank causes oscillation of the link and thereby reciprocation of the ram and hence the tool in straight path. Cutting velocity which needs to be varied depending upon the tool-work materials, depends upon

- The stroke length, S mm
- Number of strokes per min.,
- N_s and o The Quick return ratio, QRR (ratio of the durations of the forward stroke and the return stroke)

$$\text{As,}\quad V_C - \frac{sxN_s}{1000}\left(1+\frac{1}{QRR}\right) m/\min$$

To reduce idle time, return stroke is made faster and hence QRR > 1.0

Since $QRR = \frac{2L + s}{2L - s}$

where, L = length (fixed) of the oscillating lever
and s = stroke length

The benefit of quick return decreases when S becomes less.
The changes in length of stroke and position of the stroke required for different machining are accomplished respectively by

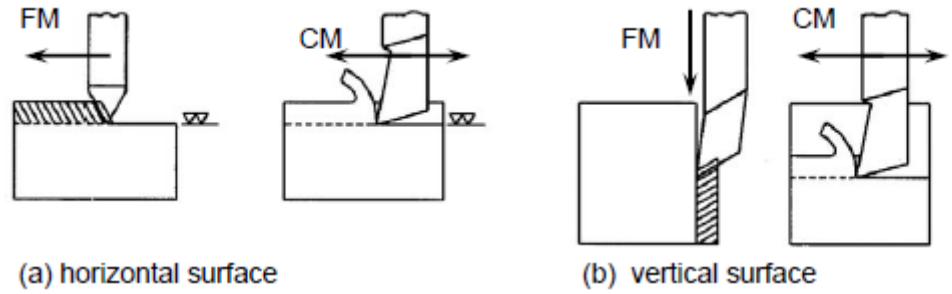
- Δ Adjusting the crank length by rotating the bevel gear mounted coaxially with the bull gear
- Δ Shifting the nut by rotating the lead screw as shown in Fig

The value of N_s is varied by operating the speed gear box.
The main (horizontal) feed motion of the work table is provided at different rate by using the ratchet – paul systen as shown in Fig. The vertical feed or change in height of the tool tip from the bed can be obtained either by lowering the tool or raising the bed by rotating the respective wheel as indicated in Fig.

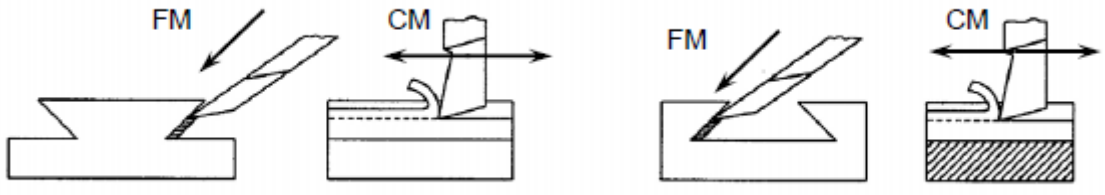
Various applications

It is already mentioned that shaping machines are neither productive nor versatile.
However, its limited applications include :

- Δ Machining flat surfaces in different planes. Fig. 4.4.7 shows how flat surfaces are produced in shaping machines by single point cutting tools in (a) horizontal, (b) vertical and (c) inclined planes.



(a) horizontal surface (b) vertical surface



(c) inclined surfaces (dovetail slides and guides)

- Making features like slots, steps etc. which are also bounded by flat surfaces. visualises the methods of machining (a) slot, (b) pocket (c) T-slot and (d) Vee-block in shaping machine by single point tools.
- Forming grooves bounded by short width curved surfaces by using single point but form tools. typically shows how (a) oil grooves and (b) straight tooth of spur gears can be made in shaping machine
- Some other machining applications of shaping machines are cutting external keyway and splines, smooth slitting or parting, cutting teeth