



Shaper Machine: Definition, Working, Types, Operations, Specification, Advantages, Disadvantages, and Application (With PDF)

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Hello, readers in today's article, we will learn **how a shaper machine works also we learn about the parts, types, operations, specification, advantages disadvantages, and applications of a shaper machine.**

So let's start with the definition of shaper machine.

Shaper Machine Definition:

The **Shaper** is a reciprocating type of machine tool basically used to produce Horizontal, Vertical or Inclined flat surfaces by means of straight-line reciprocating single-point cutting tools similar to those which is used in [lathe operation](#).

The flat surface produced may be horizontal, vertical or inclined at an angle



Working Principle of Shaper Machine:

A shaper machine is working on the following principle:

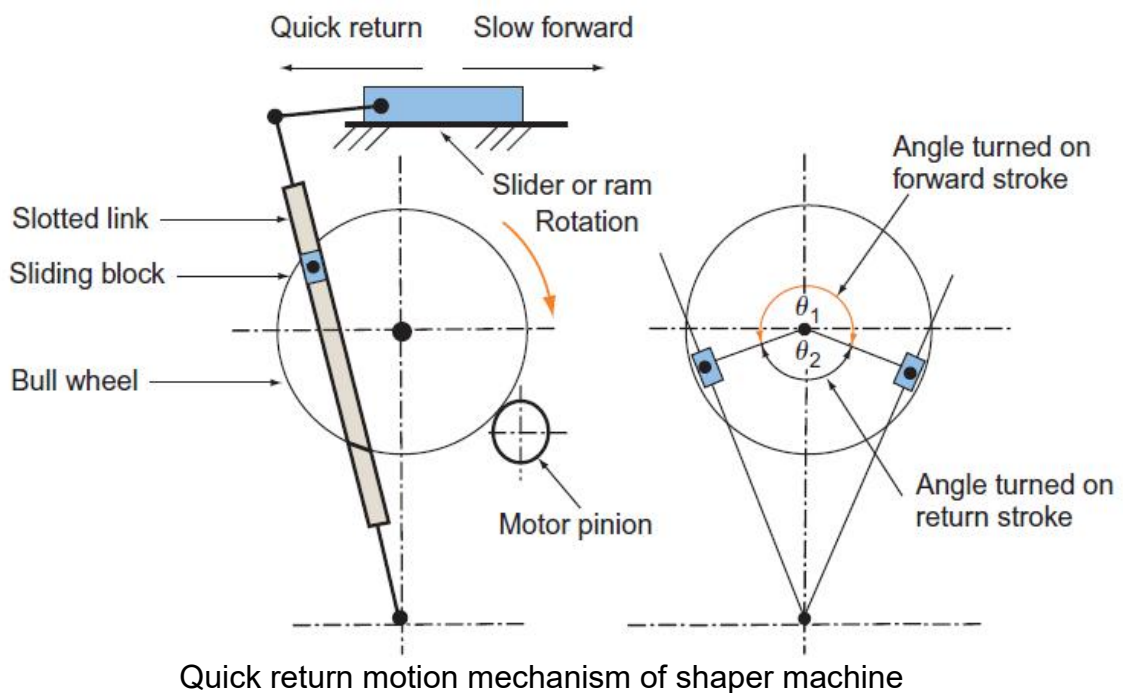
- A shaper machine holds the **Single point cutting tool** in ram and workpiece is fixed over the table.
- The ram holding the tool reciprocates over the workpiece and metal is cut during the forward stroke called a cutting stroke and
- No metal is cut during its return stroke is called an Idle stroke.
- The feed is given at the end of the cutting stroke.
- Generally, the cutting stroke is carried out at slow speed and the idle stroke is carried at high speed with the help of **quick return mechanism**.

In the shaper machine, there is another mechanism called **Quick return Motion Mechanism**.

So what happens in quick return motion mechanism is,

In the forward stroke, the Slider moves fast and removing the material from the workpiece.

Whereas in the return stroke, the Slider moves faster than the forward stroke that means Quick return, it takes less time to return, called a return stroke.



Quick return mechanism's animation video:

Types of Shaper Machine:

Based on the type of driving mechanism types of shaper machines.

- Crank type (Example: Quick return Motion Mechanism)



- **Geared type shaper**
- Hydraulic type (I mentioned the **working principle of hydraulic shaper machine** below in this article)

Based on ram travel types of shaper machines.

- Horizontal Shaper
- Vertical Shaper

Based on the table design types of shaper machines.

- Standard or Plain Shaper
- Universal shaper

Standard or Plain Shaper:

In this machine, the table has only two motion: crosswise in the horizontal plane and vertical movement (up and down).

The table is not provided with a **swiveling motion**.

Universal shaper:

This machine is similar to plain shaper except that the table can be tilted at a various angle, making it possible to inclined flat surfaces.

The table can be swiveled about 360 degrees about a central axis parallel to the cutting stroke direction and also perpendicular to it, that is, around two horizontal axes.

The table also has a movement in the horizontal plane and vertical direction (up and down) as in plain shaper.



A universal Shaper Machine (Source: AliBaba.com)

Based on cutting stroke types of shaper machines.

- Push type shaper machine
- Draw type shaper machine



Operations Performed on Shaper Machine:

There are **4-types of operations performed in a shaper machine**, and those are:

- Horizontal cutting
- Vertical cutting
- Inclined cutting
- Irregular cutting

Horizontal cutting:

Horizontal surfaces are machined by moving the work mounted on the machine table at a cross direction with respect to the ram movement.

The **clapper box** can be set vertical or slightly inclined towards the uncut surface.

This arrangement enables the tool to lift automatically during the return stroke. The tool will not drag on the machined surface.

Vertical cutting:

A vertical cut is made while machining the end of a workpiece, squaring up a block or machining a shoulder.



The feed is given to the tool by rotating the down feed screw of the vertical slide.

The table is not moved vertically for this purpose.

The apron is swiveled away from the vertical surface being machined.

Inclined cutting:

An angular cut is done at any angle other than a right angle to the horizontal or to the vertical plane.

The work is set on the table and the vertical slide of the tooth head is swiveled to the required angle either towards the left or towards right from the vertical position.

Irregular cutting:

A **round nose tool** is used for this operation.

For a shallow cut the apron may be set vertical but if the curve is quite sharp, the apron is swiveled towards the right or left away from the surface to be cut.

Parts of a Shaper Machine with Function:



Base:

The Base is designed to take the entire load of the machine tool and it is bolted to the floor of the shop.

This is made of grey cast iron to resist vibration and to take the compressive load.

Column:

The column is a Box like casting made up of cast iron and mounted on a base.

It is provided with accurately machined guideways on the top on which the ram reciprocates.

The guideways are also provided on the front vertical face for the movement of cross rail. The column encloses the ram driving mechanism.

Cross rail:

The cross rail is mounted on the ground vertical guideways of the column.

It consists of two parallel guideways on its top perpendicular to the ram axis is called as a saddle to move the table in crosswise direction by means of a feed screw.

The table can be raised or lowered to accommodate different sizes of the job by rotating elevating screw which causes the cross rail to slide up and down on the vertical face of the column.



Saddle:

It is mounted on the cross rail to hold the table firmly on its top.

The crosswise movement of the saddle causes the table to move crosswise direction by rotating the crossfeed screw.

Table:

It is mounted on the **saddle**.

It can be moved crosswise by rotating crossfeed rod and vertically by rotating the elevating screw.

The table is a box-like casting with accurately machined top and side surfaces. These surfaces having t-slots for clamping the work.

In Universal shaper, the table may be swiveled on a horizontal axis and its upper part may be tilted up or down.

In heavy Shaper, the front face of the table is supported by adjustable table support to give more rigidity.

Ram:

It is a reciprocating member of the shaper which holds the tool and the reciprocates on the guideways on the top of the column by means of quick return motion mechanism.

It houses the screwed shaft for altering the position of the RAM with respect to the work. The RAM is in semi-cylindrical form and heavily ribbed inside to make it more rigid.



Tool Head:

The tool head holds the cutting tool firmly and provides both vertical and angular movement to the tool with the help of down feed screw handle.

The head allows the tool to have an automatic relief during the return stroke.

The vertical slide of a tool head consists of a swivel base which is graduated in degrees. So, the vertical slide can set at any angle with the work surface.

The amount of feed or depth of cut may be adjusted by a micrometer dial on top of the down feed screw.

A tool head again consists of:

- Apron
- Clapper box and clapper block

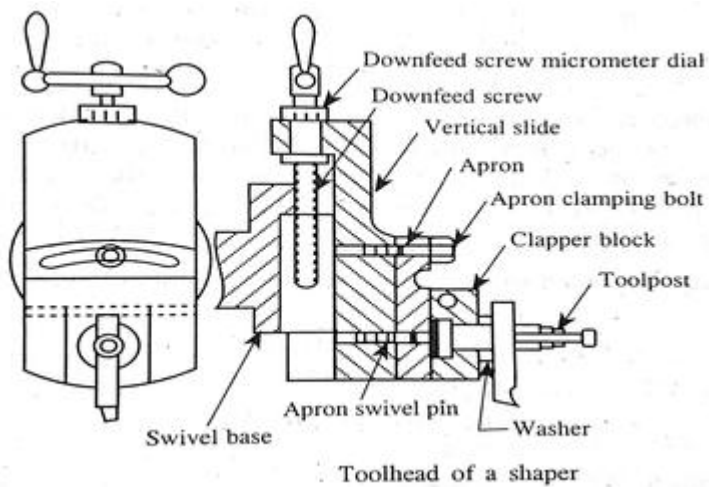
Apron consisting of clapper box and tool post is clamped on the vertical slide by the screw.

The **apron** Can be swiveled upon the apron swivel pin towards left or right.

The **clapper box** houses the **clapper block** by means of a hinge pin.

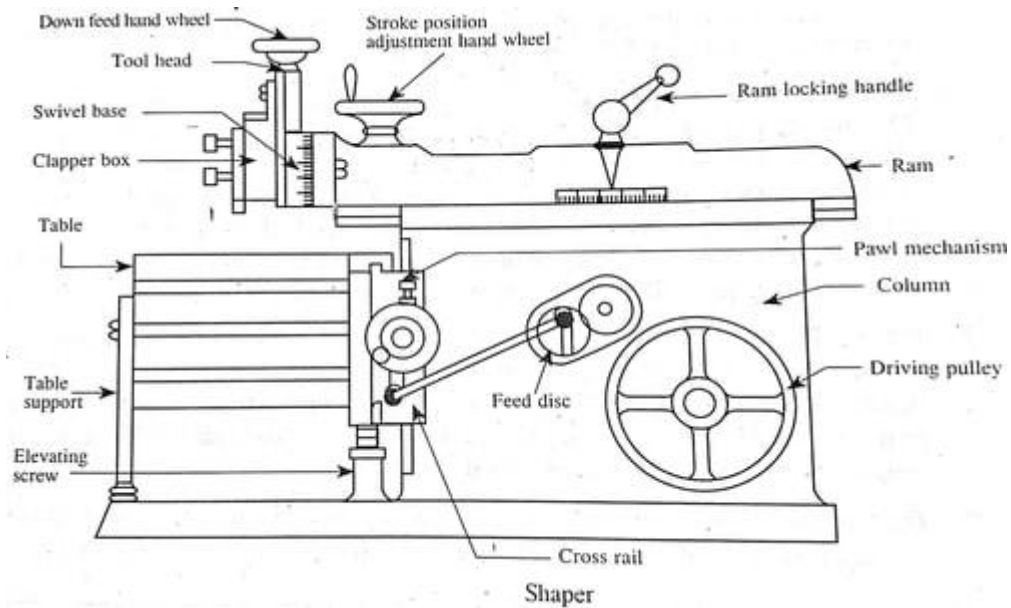
The **tool post** is mounted on the **clapper block**.

During forwarding cutting stroke the clapper block keeps the rigid support to the tool by fitting securely into clapper box and while returning stroke the tools slide over the work by lifting, the block out of clapper boxes shown in the above figure



Detailed diagram of tool head with parts

The below diagram is shown is a principal part of the Shaper Machine:





Specification of Shaper Machine:

The specification of shaper machine depends upon the following:

- The maximum length of stroke ram.
- Types of the drive (Crank, Gear and Hydraulic type)
- Power input of the machine
- Floor space required to establish the machine
- Weight of the machine in tonne.
- Feed
- Cutting to return stroke ratio.
- Angular movement of the table.

Advantages of Shaper Machine:

- The **single point tool** used which is inexpensive or we can say low tooling cost.
- The cutting stroke having a definite stopping point.
- The work can be held easily in the shaper machine.
- The set up is very quick and easy and also can be readily changed from one job to another job.



Disadvantages of Shaper Machine:

Machine:

- By nature, it is a slow machine because of its straight-line forward and returns strokes the single point cutting tool requires Several strokes to complete a work. (They are slow)
- The cutting speed is not usually very high speeds of reciprocating motion due to high inertia force developed in the motion of the units and components of the machine.

Applications of Shaper Machine:

- To generate straight and flat surfaces.
- Smooth rough surfaces.
- Make internal splines.
- Make gear teeth.
- To make dovetail slides.
- Make key ways in pulleys or gears.
- Machining of die, punches, straight and curved slots.

Hydraulic Shaper Mechanism in Shaper Machine:



In **hydraulic shaper machine**, a constant speed motor drives a hydraulic pump which delivers oil at a constant pressure to the line.

A regulating valve admits oil under pressure to each end on the piston alternately.

At the same time allowing oil from the opposite end of the piston to return to the reservoir.

The piston is pushed by the oil and being connected to ram by piston rod, pushes the ram carrying the tool.

The admission of oil to each end of the piston, alternately, is accomplished with the help of trip dogs and pilot valves.

As the ram moves and complete its stroke (Forward and Return) a trip dog will trip the pilot valve which operates the regulating valve.

The regulating valve will admit the oil to the other side of the piston and the motion of the ram will get reversed.

It is clear that the length of the ram stroke will depend upon the position of trip dogs.

The length of the ram stroke can be changed by unclamping and moving the trip dogs to the desired position.

A hydraulic shaper looks like this:



Hydraulic Shaper Machine (Source: IndiaMart)

Video lecture on Shaping Machine if you wish you can check this video for brief knowledge:



Conclusion:

So today we completed the Shaping machine topic, we discuss definition, parts, working, types, application, advantages, disadvantages, and specifications of a Shaper Machine, hope you understand the whole concept. In case you wanna read this type of article on the lathe machine tool and drilling machine you can check these article for that “[Lathe Machine Tool: Definition, Parts, Types and Operations](#)” & “[Drilling Machine: Definition, Parts, Types, and Operations](#)“

If you have any queries or doubts about the Shaper machine, you can ask me in the comment section or we have a dedicated Q&A platform for you where you directly post your question: [Click here to post your question](#), and also you can [join our facebook group](#). I will love to hear from you and glad to help you. Till then enjoy rest your day. Cheers