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A Review on Shaper Machine

Dinesh Kumar Yadav, Lecturer,
Department of Mechanical Engineering, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India
Email Id- dineshkmr8412@gmail.com

ABSTRACT: ***A shaping machine (often referred to as a shaper) is primarily used to create flat surfaces that might be horizontal, vertical, or inclined. Shapers can sometimes create uneven or curved surfaces. While the first Ram travels forward in this Endeavour, the second Ram will simultaneously move in the opposite direction of the first. When the first ram moves forward, material is removed from the work piece; however, when the second ram moves backward, material is not removed. The stroke length of this dual ram shaping machine can be adjusted by altering the distance between the centre of the bull gear and the pivot pin. It signifies the pivot pin will move away from or towards the bull gear's centre. Both slots can be used for horizontal movement. It makes changing the bull gear position simple. The stroke length can be increased or decreased by moving the bull gear upwards the pivot pin. This twin ram shaper was designed to manufacture or produce two slots in a single operation while also cutting down on time.***

KEYWORDS: ***Contoured Surface, Reciprocating, Shaper Machine, Shaper Mechanism, Straight Line Elements,***

1. INTRODUCTION

Shaper is a reciprocating type of machine tool in which the ram moves the cutting tool backwards and forwards in a straight line [1], [2]. It is intended primarily to produce flat surfaces. These surfaces may be horizontal, vertical or inclined. In general, the shaper can produce any surface composed of straight-line elements. A shaper is used to generate flat (plane) surfaces by means of single point cutting tool similar to a lathe tool (Figure 1).

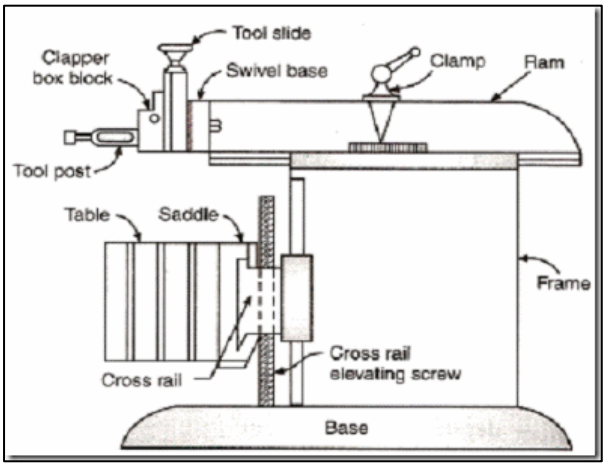

Figure 1: Shaper Machine

The shaping machine is used to machine flat metal surfaces, particularly when a significant amount of metal must be removed. Milling machines, for example, are far more expensive and better suited to remove tiny amounts of metal with greater precision. The mechanism inside the shaping machine moves in a reciprocating manner [3]. The top of the machine travels forwards and backwards as the disc rotates, pressing a cutting tool.

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The cutting tool removes the metal from a carefully bolted-down piece of work. James Nasmyth, an Englishman, invented the metal working shaper in the year 1836. Creating a flat or plane surface that can be horizontal, vertical, or angular in nature. Making keyways, slots, and grooves [4],[5]. Creating a concave/convex or a combination of these contours Flat surfaces are created with a shaper machine. On the job, Single Point Tool reciprocates. The job is fed into the tool. After the cross feed, the tool is moved downward. The length and position of the stroke can be altered. Surfaces are machined with a shaping machine. It has the ability to cut curves, angles, and a variety of other shapes. It is a popular machine in a workshop because of its simple operation and ability to generate a wide range of work.

The tool feed handle can be turned to slowly feed the cutting tool into the material as the 'ram' moves forwards and backwards. The strong machine vice holds the material securely. A small vice would not be suitable as the work could quite easily be pulled out of position and be damaged. The vice rests on a steel table which can be adjusted so that it ca be moved up and down and then locked in position. Pulling back on the clutch handle starts the 'ram' moving forwards and backwards.

2. DISCUSSION

2.1 Working Principal of Shaper

The tool holder, which is positioned to the ram, holds a single point cutting tool. The work piece is fastened directly on the table or held rigidly in a vice. The tables outside end may be supported. When the ram reciprocates, the cutting tool in the tool holder[6] goes forward and backward across the work piece. The material is cut in a typical shaper during the forward stroke of the ram. During the backward stroke, there is no cutting. The work piece is fed, and the depth of cut is changed by sliding the tool downward towards it. Because of the quick return mechanism, the idle stroke takes less time than the forward cutting stroke.

2.2 Shaper Mechanism

The mechanism housed within the column or machine converts the drive's rotary motion into reciprocating action of the ram. In a traditional shaper, metal is removed during the forward cutting stroke, but no metal is removed during the returning stroke. The shaper mechanism is designed to drive the ram holding the tool at a reduced speed during the forward cutting stroke, while allowing the ram to travel at a greater speed during the return stroke to reduce idle time. The rapid return mechanism is the name for this mechanism. Crank and slotted link mechanism, Whitworth quick return mechanism, and hydraulic shaper mechanism are the most common ways for obtaining the reciprocating movement of the ram and the rapid return mechanism of the machine [7].

2.3 Hydraulic drive quick return mechanism

A constant speed motor drives a hydraulic pumpwhich delivers oil at a constant pressure to the line [8]. A regulating valve admits oil under pressure to each end on the piston alternately, at the same time allowing oil from the opposite ends of the piston to return to the reservoir. The oil pulls the piston, which is connected to the ram by the piston rod and so pushes the tool-carrying ram [9]. With the help of trip dogs and a pilot valve, oil is alternately admitted to each end of the piston. A trip dog will trip the pilot valve, which operates the regulating valve, as the ram advances and completes its stroke (forward or return). The regulating valve will allow oil to flow

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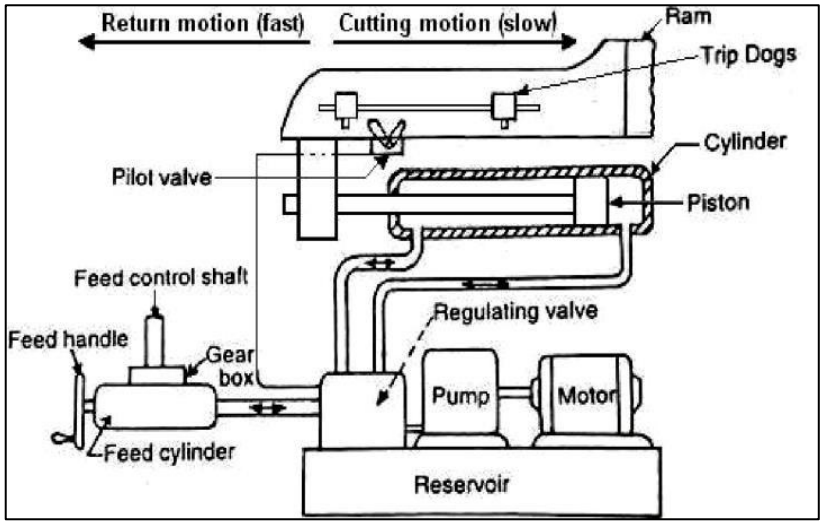
to the opposite side of the piston, reversing the ram's action (Figure 2). The length of the ram stroke will obviously be determined by the position of the trip dogs. Unclamping and repositioning the trip dogs to the desired positions can modify the length of the ram stroke [10]

Figure 2: Hydraulic shaper



The system described above is a constant-pressure system. The ram travel velocity will be proportionate to the fuel pump as well as the piston area that it is applied to. So because piston surface on which the oil pressure works is larger than the other end, where it is decreased by the piston rod, the return stroke is faster. A smaller feed cylinder is connected to another oil line, which converts hydraulically actuated to mechanical energy for trying to feed the work past the tool (Figure 3).

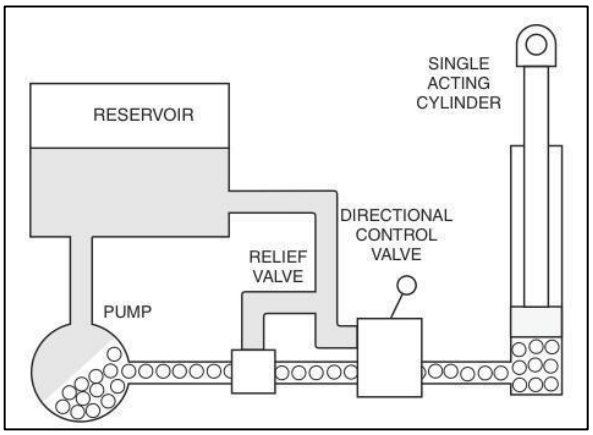


Figure 3: General Layout of Hydraulic system

2.3.1 Advantages of Hydraulic drive

- Lower first cost.
- Simpler in operation.
- Does not make any noise and operates very quietly.

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- Ability to stall against an obstruction without damage tothe tool.
- Ability to change length and position of stroke or speedwhile the machine is running.
- The cutting and return speeds are practically constantthroughout the stroke.
- The reversal of the ram is obtained quickly without anyshock as the oil on the other end of the cylinder provides cushioning effect.
- Offers great flexibility of speed and feed.

2.4 Surfaces Produced on Shaper

Surfaces produced on shaping machine are horizontal plain surface, vertical plain surface, inclinedsurface, grooved surface, slotted surface, stepped surface (Figure 4).

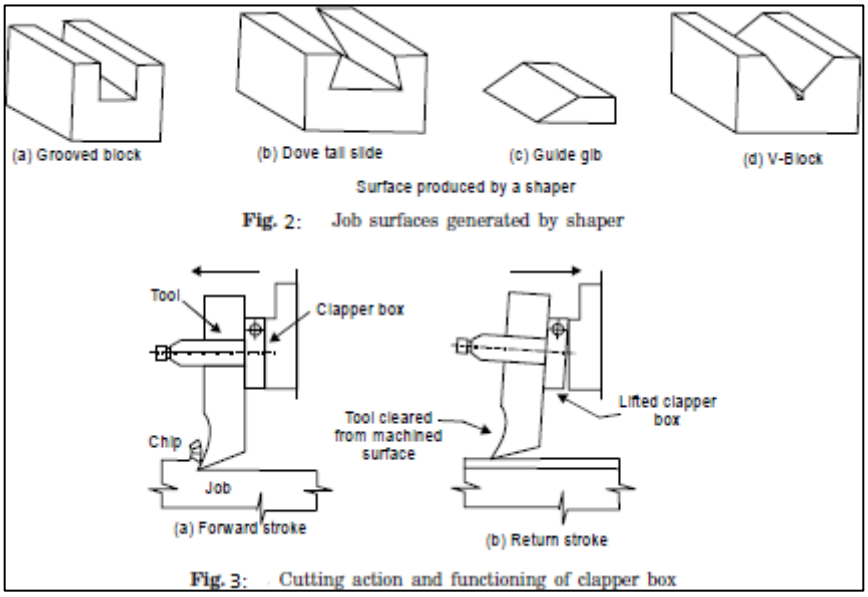

Figure 4: Different Surfaces Produces on Shaper Machine

2.4.1. Types of shapers

- Horizontal Shapers.
- Vertical Shapers.
- Crank Shapers.
- Gear shapers.
- Hydraulic Shapers.

2.5 Parts of Shaper Machine

Base- The base is the necessary bed or support required for all machines tools. All other parts are mounted on and above the base. The bed takes up the total dead weight of the machine as well as the dynamic load during machining operations.

Cross rail-The cross rail is mounted on the front of the body frame and can be moved up and down. The vertical movement of the cross rail permits jobs of different heights to be accommodated below the tool. Sliding along the cross rail is a saddle which carries the work table.

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Column-The column of the shaper is a hollow casting and is mounted on the base. It houses the drive mechanism for the ram and the table.

Table- The worktable of a shaper is fastened to the front of the column. The table moves across the column on cross rails to give the feed motion to the job.

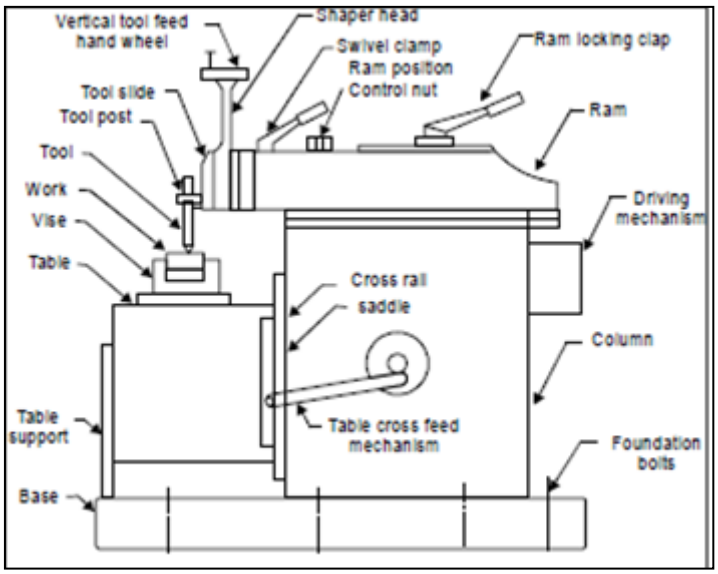

Figure 5: parts of Shaper

- *Ram*- The ram carries the tool head at its front end and travels in "guide ways" to give straight line reciprocating motion to the tool. The ram is either mechanically driven or hydraulically operated. A single point tool is fastened in the tool post.

- *Tool Head*- It holds the cutting tool and is fastened to the front of the ram. The tool is held in a tool holder/tool post similar to the lathe tool post. The tool post and the tool block fit snugly in the clapper box and is hinged at the upper edge.
- These types of machine tool are of rectilinear cutting motion therefore, the rotary motion of the drive is converted into reciprocating motion.
- The metal is removed in the forward cutting stroke, while the return stroke goes idle and no metal is removed during this period.
- The cutting mechanism is so designed that it moves at a comparatively slower speed during forward cutting stroke, whereas during the return stroke it allow the ram to move at a faster speed to reduce the idle return time.
- This mechanism is known as quick return mechanism.

3. CONCLUSION

This shaping machine is ideal for removing a substantial amount of metal from flat metal surfaces. The hydraulic system works on the basis of Pascal's Law, which states that a tiny torque can be converted into a huge force. Electric servo motors are now used to regulate hydraulic systems. The machine's high-power density makes it more appropriate for use. A shaping machine (often referred to as a shaper) is primarily used to create flat surfaces that

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