



POWER HACK SAW ATTACHMENT TO A CENTER LATHE

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ABSTRACT

This work provides a simple and economical Hacksaw attachment on a Centre Lathe. The conventional hacksaw machines which are available in the market cost around 30,000 to 40,000 Indian Rupees where as our hacksaw attachment on Lathe costs around 10,000 to 15,000 Indian Rupees only. In this attachment we can obtain various cutting speeds from the Lathe and also variable cutting forces with the help of a movable dead weight where as in the conventional hacksaw machines variable cutting speeds and variable cutting forces are not possible. This attachment is most useful for small workshops where there is not enough space for accommodating both Lathe and Hacksaw machines. This Hacksaw attachment on a Centre Lathe uses a simple four-bar mechanism where the link adjacent to the smallest link is fixed and we get a Crank-Rocker mechanism. We can use the coolant mechanism available on the Lathe for cooling and lubrication. We can cut a variety of materials using this hacksaw attachment as variable cutting forces are available. We have designed each of the components in Unigraphics Nx-8.5, assembled and simulated the motion. We have manufactured the required components and purchased the standard components available in the market. We have calculated the cutting force and the force obtained from the attachment is more than sufficient for cutting. We have also found out the temperatures during cutting of different materials such as Aluminum and Mild-Steel bar stocks using a Laser gun temperature measuring device.

Keywords— Center Lathe, Power Hack Saw, Designing, Manufacturing, Force Analysis, Tests performed, Cutting force.

INTRODUCTION

1. Sawing Machine:

Purpose:

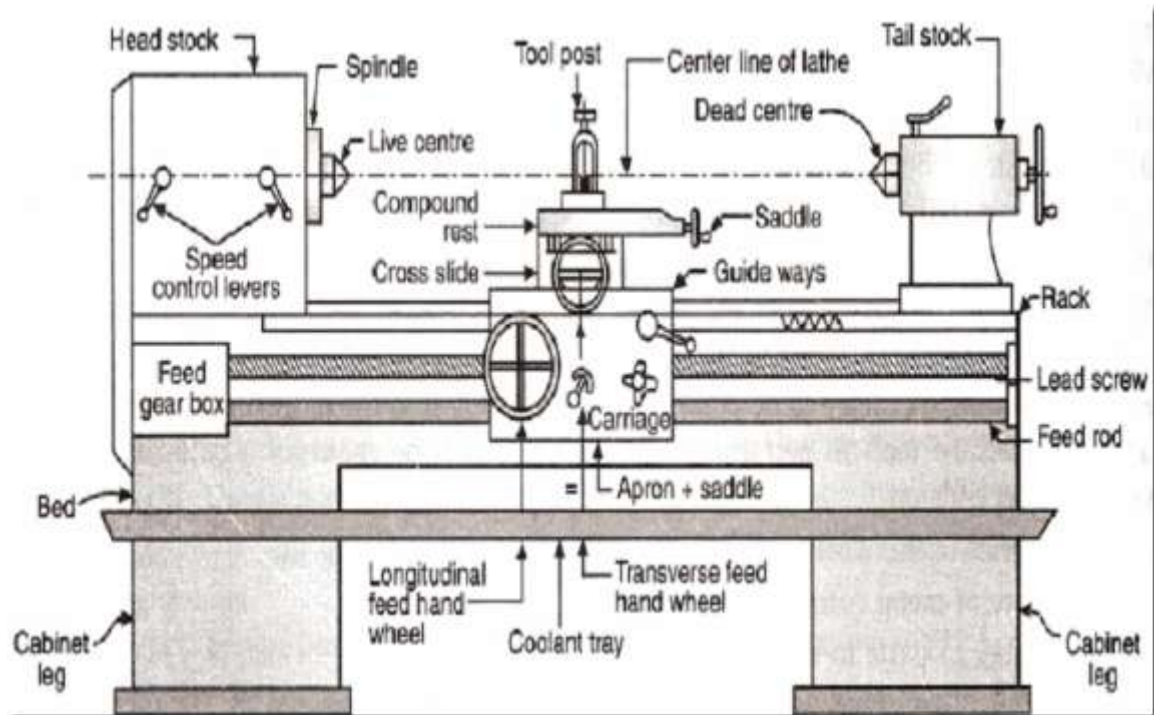
The sawing machine is a tool designed to cut material to a desired length or contour. It functions by drawing a blade containing cutting teeth through the workpiece. The sawing machine is faster and easier than hand sawing and is used principally to produce an accurate square or mitered cut on the workpiece.

Types:

The power hacksaw and the band saw are two common types of sawing machines used to cut metal in the machine shop. The power hacksaw uses a reciprocating (back and forth) cutting action similar to the one used in a hand hacksaw. The power hacksaw is used for square or angle cutting of stock. The band saw uses a continuous band blade. A drive wheel and an idler wheel support and drive the blade

2. Lathe:

The lathe is a machine tool used principally for shaping articles of metal (and sometimes wood or other materials) by causing the workpiece to be held and rotated by the lathe while a tool bit is advanced into the work causing the cutting action. The basic lathe that was designed to cut cylindrical metal stock has been developed further to produce screw threads, tapered work, drilled holes, knurled surfaces and crankshafts. The typical lathe provides a variety of rotating speeds and a means to manually and automatically move the cutting tool into the work piece. Machinists and maintenance shop personnel must be thoroughly familiar with the lathe and its operations to accomplish the repair and fabrication of needed parts.



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WHAT IS TO BE ACHIEVED

A. Objective

- To design and fabricate a Power Hack saw attachment on a Heavy Duty Lathe.
- NX software shall be used to design the power saw. Analysis of links will be carried out using ANSYS.
- Design of the mechanism will be carried out based on the forces acting on the links.
- To make the Power Hack saw machine affordable for small workshops.
- To utilize Lathe even for cutting bar stocks.

B. Specifications of Heavy Duty Center Lathe

- Admits between centers = 1035 mm.
- Centre height = 235 mm.

- Swing over Cross slide = 255 mm.
- Lead screw = TPI: 4
- Motor details: 3HP at 1440 RPM AC. 50 Hz, 3 phase.

C. Problem Definition

- Generally the conventional Power Hack Saw costs about Rs 60,000.
- Space is very important criteria for the small workshop. The conventional Power Hack Saw needs more space for its installation.
- Variable cutting speeds and variety of cutting speeds cannot be attained from the conventional Power Hack Saw.
- Variable cutting strokes cannot be attained in conventional Power Hack Saw.

D. Problem Solution

- This attachment costs around Rs15, 000-20,000 only.
- Already available Lathe can be used for cutting of bar stocks by using this attachment thereby saving the space.
- Variable cutting speeds can be obtained.
- Variable cutting strokes can be obtained.

E. Procedure Followed

- Designing of each component in Unigraphics NX8.5 software.
- Obtaining the dimensions of each component based on the available space limitations.
- Assembling the designed components in NX8.5 software.
- Giving motion to the assembly in NX8.5 software and obtaining the simulation.
- Calculation of force required for cutting.
- Calculation of force obtained from the Lathe and checking whether it is sufficient to cut or not.
- Manufacturing the components.
- Purchasing the standard components.
- Assembling of the manufactured components.
- Performing certain tests such as finding the temperature in the cutting zone for different materials, Finding the cutting time for different materials.

WORKING

The mechanism is similar to the Crank-Rocker mechanism. The Face plate is connected to the chuck in the Head stock with the help of Spindle and draws the power from the Lathe. This rotatory motion of the Face plate is converted to the angular motion of the Rocker arm.

From here the angular motion is converted to the translatory motion of the frame with the help of an extension from the Rocker arm and the connected to the Hacksaw frame.

The feed is provided with the help of a movable dead weight which is provided on the top of the frame with the help of Screw rod and Dead weight.

With the help of this movable dead weight we can get variable cutting forces for different materials. This dead weight can be moved along the frame length from the pivot point to the end of the frame on a screw rod, its position can be locked at any position with the help of lock nuts, and hence different forces can be obtained.

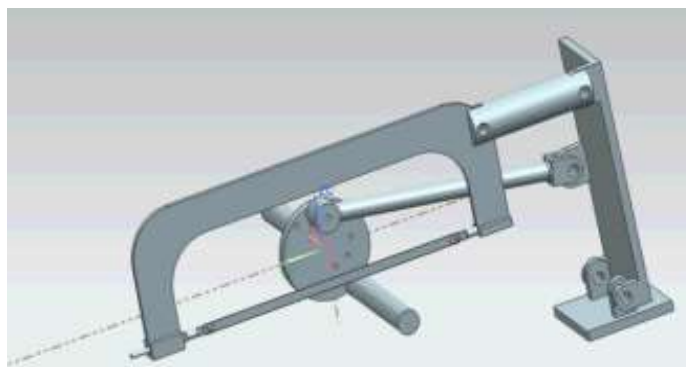
PARTS

- Face plate or Crank.
- Connecting rod.
- Rocker arm.
- Hack saw frame
- Hack saw Blade
- Vice for holding the work piece
- Carriage.
- Bearings used in all joints (I.D = 10mm, O.D = 30mm)
- Clamps for holding Carriage
- Movable Dead Weight along with Screw rod.

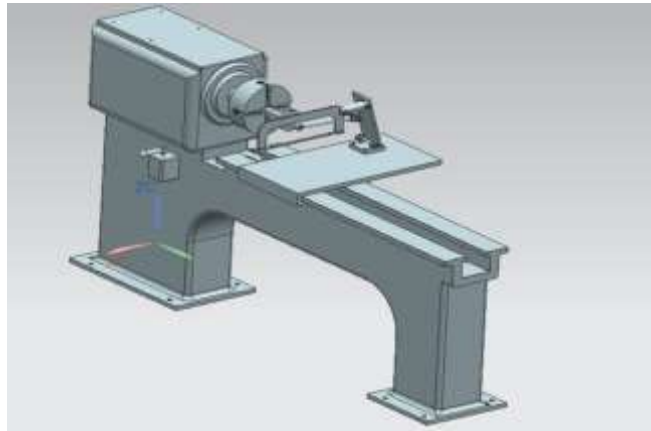


ASSEMBLY

The following figure shows the assembly of the designed parts



The final Assembly is as follows



RESULT

- *Designed each component and the dimensions were obtained successfully according to the Lathe specifications.*
- *Simulated the motion to the assembly in the Nx software and the design was correct.*
- *Identified which parts are to be manufactured and which parts are standard parts.*
- *Fabricated the Face Plate, Connecting rod, Carriage, Rocker-Arm, and Clamps and assembled them. Bought the standard parts such as nuts and bolts, vice etc. and assembled them.*

Fabricated the Power Hacksaw Attachment for a Heavy Duty Centre Lathe and the motion is successful.

The entire assembly is shown in the following figure



CONCLUSION

- The Gruebler's criterion for the Linkages is satisfied.
- Granovsky's equation is satisfied and used to find the cutting force.
- Lathe is able to provide the required cutting force to cut the work piece.
- Found the temperature in the cutting zone for different materials during cutting.
- Able to obtain the required motion of the Hacksaw frame after fabrication.
- Able to get variable cutting forces with the help of a movable dead weight.
- Design, Manufacturing and Analysis of Power hacksaw attachment is completed successfully.

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