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Research Article

Fabrication and Testing of Pedal Driven Wood Turning Lathe Machine

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Abstract

Indian Power Sector has increased its installed power generation capacity from 1340 MW in the year 1947 to 2,50,000MW in the year 2016. In spite of such tremendous growth in power generation capacity still 5,25,000 villages and more than a million tribal areas are not having access to electrical energy. India has highest man power living in villages and rural areas whose main source of income is agricultural products only. Indian Government has taken several initiatives to improve income sources of these people by educating and funding them to set up small scale industries with locally available raw materials million tribal areas are not having access to electrical e. Results of these initiatives are not up to the mark as it requires electricity to run the machines used in most of the industries. Powering all these tribal areas and villages at this point of time is not possible as it requires huge amounts of investment and also Transmission & Distribution losses will be very high due to longer distances from power generation units. Hence to develop these areas it will be better if we can make machine tools which do not require electricity. As a part of our project dissertation we are fabricated and tested a pedal driven lathe machine which can turn wooden pieces without electrical energy at low cost.

Keywords: *Pedal Driven Wood Turning Lathe Machine etc.*

1. Introduction

Pedal driven wood lathe machine is a manually pedal operated system which can be used for wood cutting and wood turning.

The pedal driven setup has a simple mechanism operated with pedal and wheel arrangement.
It operates on the principle of rotating work piece and a feeding cutting tool.

It is different from normal lathe machine as we give the power to run the machine manually.

1.1 lathe machine

The lathe is an ancient tool, dating at least to ancient Egypt and known to be used in Assyria and ancient Greece. The lathe was very important to the Industrial Revolution. It is known as the mother of machine tools, as it was the first machine tool that leads to the invention of other machine tools.(Richard A. Maker, *et al* , 1993).

The origin of turning dates to around 1300 BCE when the Ancient Egyptians first developed a two-person lathe. One person would turn the wood work piece with a rope while the other used a sharp tool to cut shapes in the wood. Ancient Rome improved the Egyptian design with the addition of a turning bow. In the middle Ages a pedal replaced hand-operated turning, allowing a single person to rotate the piece while working with both hands. The pedal was usually connected to a pole, often a straight-grained sapling. The system today is called the spring pole lathe. Spring pole lathes were in common use into the early 20th century.

An important early lathe in the UK was the horizontal boring machine that was installed in 1772 in the Royal Arsenal in Woolwich. It was horse-powered and allowed for the production of much more accurate and stronger cannon used with success in the American Revolutionary War in the late 18th century. One of the key characteristics of this machine was that the work piece was turning as opposed to the tool, making it technically a lathe (see attached drawing). Henry Maudslay who later developed many improvements to the lathe worked at the Royal Arsenal from 1783 being exposed to this machine in the Verbruggen workshop (Philip H Buehrle , *et al* , 1929).

1.2 Pedal driven lathe machine

Ever since the arrival of fossil fuels and electricity, human powered tools and machines have been viewed as an obsolete technology. This makes it easy to forget that there has been a great deal of progress in their design, largely improving their productivity. Daniel M. Spohn, Jr , *et al* , 1978)

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The most efficient mechanism to harvest human energy appeared in the late 19th century: pedaling. Stationary pedal powered machines went through a boom at the turn of the 20th century, but the arrival of cheap electricity and fossil fuels abruptly stopped all further development. So, we are decided to manufacture a simple pedal driven lathe machine which doesn't need electricity.(Gary F. Thompson , *et al* , 1995)

2. Fabrication and Working

Pedal driven lathe machine consists of pedal, bed, tool post, lead screw, guide ways, chuck, bearings, as the main components. These are used for various purposes they are listed below;

2.1 Pedal

- Pedal is the main component in the machine through which the energy is transmitted by the wheel to pulley by manual effort.
- The rpm we obtained by pedalling is 200 to 400 approximately.
- Here we use simple sewing machine for pedaling.

2.2 Bed

- It is the main body of the machine on which all the components are bolted.
- The material we used is mild steel of dimensions (560x340) mm.

2.3 Tool Post

- Three pieces with each (80x80 mm) are welded together and drilled with five holes of 12mm and arranged as shown in below picture.
- This tool post is to hold the tool and to give sufficient depth of cut when we give the feed.

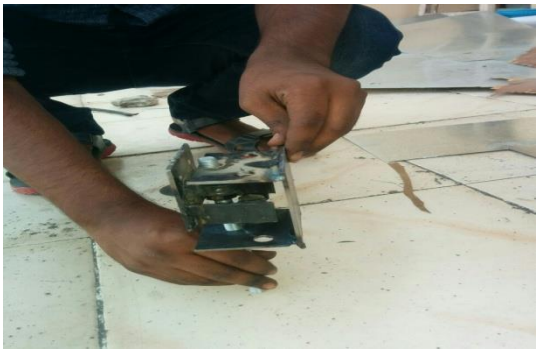

Fig 2.3 Tool Post

2.4 Guide Ways

- The guide ways take care of movement of tool post.
- We use two 12 mm shafts as guide ways.
- Guide ways are fixed through the holes of the slide plates on which movement of tool post takes place

Fig 2.4 Guide Ways

2.5 Chuck

- Generally chucks are used to hold the work piece or objects.
- Here chuck is fixed to the bearing shaft so that when the shaft rotates the work piece in the chuck rotates by means of pulley.

Fig: 2.5 Chuck

2.6 Bearings

- Here bearings are used to bear the load of the shaft.
- Bearings are mounted on a angles to match the height of work piece.
- In this machine we used the ball bearings through which chuck is fixed.

3. Working Operation

- A cylindrical work piece is mounted on a suitable work holding device (e.g. chucks, centers). A single point cutting tool is mounted on the tool post.
- The work piece is rotated continuously by pedaling operation and the single point cutting tool is fed against the circumferential area of the work piece.
- Unwanted material is removed and a cylindrical job with smooth surface finish is obtained.

Fig 2.6 Working Model

4. Advantages

- No electrical energy is required.
- Cost of machine is less and hence more no. of people can afford.
- Both the pedaling and turning operations can be performed by same person.

5. Disadvantages

- We cannot turn hard metals.
- Operations are limited to some of the metals.

6. Calculations

Depth of cut ap = 1mm

Feed per rev f = 0.3mm/rev

Dia of the w/p D= 12mm=12/1000m=0.012m

Speed of the chuck N = 300rpm

Cutting speed Vc = πd*N
= π*0.012*300
= 3600*π
=3.6*π
=11.304m/min

Specific cutting force (for teak wood cutting) kc 0.3 mm/rev= 1500mpa

Machine coefficient (μ) = 0.8

Actual cutting power $Pc = \frac{ap*f*pc*vc}{60*1000*n}$
=1*0.3*11.3*1500/60*1000*0.8
=105.93watts

As per survey it is found that a normal human can produced 200 to 300 watts power, as our lathe machines requires 105 watts power for turning 12mm dia to teak wood piece with above specified depth of cut and feed for revolution. The power requirement can easily met (Atsushi Senoh, *et al*, 1988). The calculation maximum dia of work piece that can be turned by pedaling considering

Ap = 1 mm

f = 0.3 mm/rev

N = 300 rpm

Pc = 300 watts, μ = 0.8

By this we can calculate maximum diameter of work piece that can be turned by pedaling

D = 33.9530 mm

Conclusion

Pedal Driven Lathe Machine which is low cost machining, the operating procedure of the system is very simple so any person can operate by using more technique; they can be modified and developed per the applications.

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References

Richard A. Maker (1993) Milling machine lathe attachment Application number: US 08/002,967,

Philip H Buehrle (Jul 2, 1929) Grinding attachment for lathes Publication number: US1719689

A Designing and Fabrication of Multipurpose Tool Post for Lathe Machine (IJSRD/Vol. 2/Issue 03/2014/033) All rights reserved by www.ijsrd.com 117

Daniel M. Spohn, Jr., Spohn Jr Daniel M (1978)Attachment for a rotary drive machine Publication number US4118141 A Application number US 05/744,628

Atsushi Senoh, Washino Engineering Company, Limited (1988)Machine tool for multiple surface machining Publication number US4730373 A Application number US 06/938,352

RichardL.Harris, Ralph W.Blader (1982) Multipurpose tool Publication numberUS4353399 A Application number US 06/117,633

Gary F. Thompson, Thompson; Gary F. (1995) Multi-purpose lathe Publication numberUS5471796 A Application number US 07/897,834