

# Modeling and Optimization of three axes Shaping Pantrouter Machine

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## Abstract

The essential project we've got completed was on the subject "THREE AXIS SHAPING PANTROUTER MACHINE" that's used for excessive pace approach of cutting, trimming, and shaping wood, steel, plastic, and a variety of other substances. A router is a woodworking device used to rout out (hollow out) a place inside the face of a chunk of wood. It turned into a tool specifically utilized by sample makers and staircase makers and consisted of a large-primarily based timber hand aircraft with a slender blade projecting properly beyond its base plate. A pantograph is a mechanical linkage related in a special way based totally on parallelograms in order that the movement of one unique point as it should be the motion of some other factor.

**Key words:- Modelling, Optimization, Pantrouter Machine**

## 1. Introduction

Routing is an excessive pace manner of cutting, trimming, and shaping wood, metallic, plastic, and a selection of different substances. A router is a woodworking device used to rout out (hollow out) an area within the face of a piece of wooden It became a tool specifically used by sample makers and staircase makers and consisted of a huge-based totally wood hand plane with a narrow blade projecting nicely beyond its base plate.

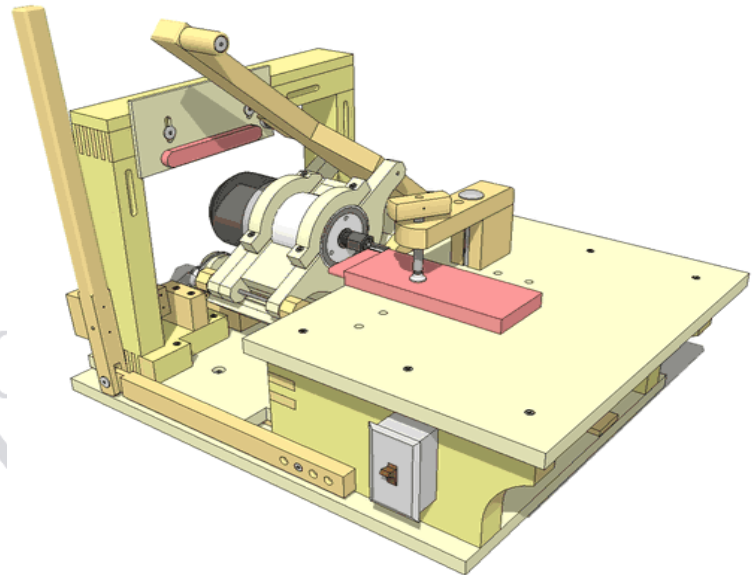


Fig.1 Three Axes Shaping Pantrouter Machine

A pantograph is a mechanical linkage associated in a unique way based on parallelograms simply so the movement of one unique thing efficiently the movement of some specific component. If a line drawing is traced through the primary point, an identical, enlarged or miniaturized reproduction may be drawn via a pen constant to the alternative. A pant router is a specialized system used for woodworking it genuinely is used for routing wood using pantograph strategies to copy a template and convey the equal in 2:1 scale Here we are running on 2Degree pantrouter, via this we must engrave any format on timber (the design may be engrave on metals if change the motor by way of the usage of the use of excessive power motor able to milling the

metals) To construct a four bar hyperlink mechanism, the pantograph, in which trace problem and engraving issue are in the ratio of 1:2 or 2:1. This amplification or reduce price scale may be change consistent with our want and slide the whole arrangement that allows you to govern the intensity of lessen made via the spindle motor.

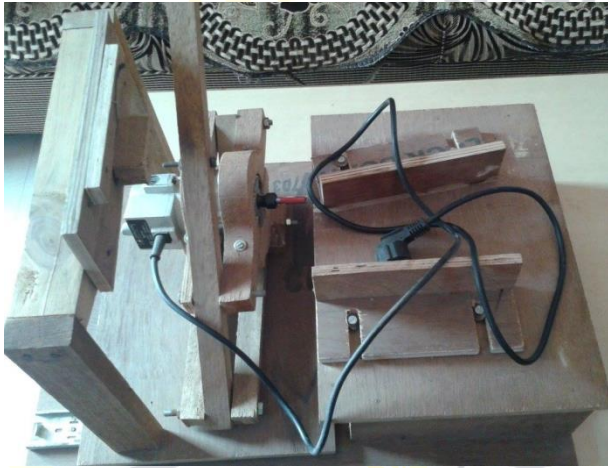


Fig.2 Wood working Machine

Features:-

- (1) Exact scaling
- (2) Scaling ratio may be change
- (3) No virtual like CNC
- (4) Cost effective
- (5) Manual operated
- (6) Various Designs can be made

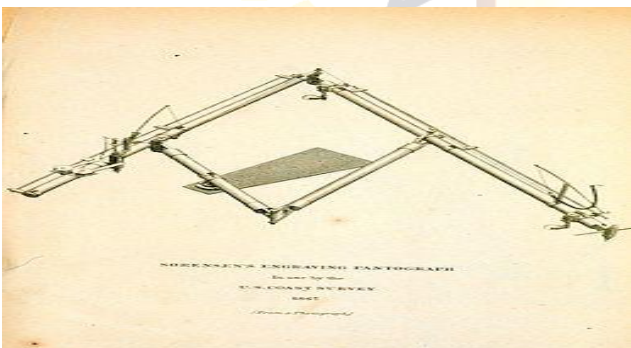
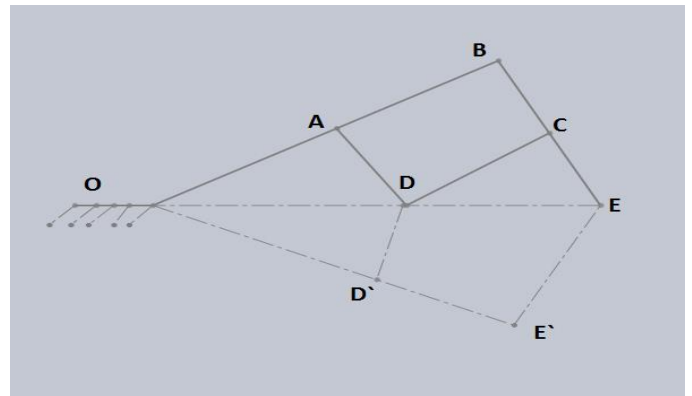


Fig.3 pantograph strategies

## 2. Working



Working is illustrated shape the following discern.

Fig.4 jointed parallelogram

It encompasses a jointed parallelogram ABCD as demonstrated in fig. It is made from bars linked through turning pairs. The bars BA and BC are extended to O and E respectively, Such that

$$OA/OB=AD/BE$$

Thus for all relative position of the bars, the triangle OAD and OBE are comparable and factors O, D and E are in a unmarried right away line.

It may be proved that issue E traces out the route as described thru factor D.

From Similar Triangle

OAD and OBE we find out that

$$OD/OE=AD/BE$$

Let element O be steady and Component D and E glide to 3 new functions D and E.

Then

$$OD/OE=OD'/OE$$

A little interest will show that the directly line  $DD'$  is parallel to proper away line  $EE'$ . Hence,

if  $O$  is consistent to the frame of machine thru a turning pair and  $D$  is hooked up to a degree in machine that is rectilinear motion relative to frame then  $E$  might also trace out a without delay line direction (motor is mounted at this component).

Similarly, if  $E$  is restrained to move in at once line, then  $D$  will hint out a directly line (a pencil factor is mounted right here), then  $D$  will hint out a right away line parallel to former.

### 3. Material Description

#### 3.1 Spindle Motor

A spindle motor is a small, excessive-precision, excessive-reliability electric powered motor this is used to rotate the shaft, or spindle. Among the alternative vital inclinations of spindle cars are small duration, low power consumption, immoderate reliability (collectively with the capacity to run for hundreds of hours and tolerate plenty of begin and save you cycles without failure), minimum wobbling and vibration (due to the tight tolerances of the platters and magnetic heads), low warm temperature output and minimum noise output.

A essential detail for lowering the wobbling of the shaft at the aspect of vibration and noise is the bearings. Spindle motors have long used ball bearings, which embody small steel balls that are

housed in a metal ring structure throughout the spindle motor shaft.



Fig.4 spindle motor excessive-precision



Fig.5 Ball Bearing

#### 3.2 Ball Bearing

(1) A ball bearing is a shape of rolling-detail bearing that uses balls to maintain the separation some of the bearing races. The purpose of a ball bearing is to reduce rotational friction and help radial and axial loads.

(2) It achieves this thru the use of as minimum races to incorporate the balls and transmit the hundreds thru the balls.

(3) In most applications, one race is table positive and the opportunity is established to the rotating meeting (e.g. a hub or shaft). As one of the bearing races rotates it motives the balls to rotate as well.



Fig.6 The bearing races rotates

Because the balls are rolling they have got a miles lower coefficient of friction than if flat surfaces were rotating on each one-of-a-type.

### 3.3 Clamps

A clamp is a fastening device to hold or comfy devices tightly together to save you movement or separation via the software of inward stress. There



Fig.7 Various types of tool

are many types of clamps available for masses precise talents. Some are quick, as used to region additives at the equal time as solving them together; others are imagined to be everlasting.

### 3.4 Steel rod

Steel is an alloy made through way of mixing iron and remarkable factors, the most not unusual of these being carbon. When carbon is used, its content in the steel is among zero.2% and more than one.1% with the aid of weight, relying on the grade. Other alloying elements every now and then used are manganese, chromium, vanadium and tungsten

### 3.5 Slider

A linear-movement bearing or linear slide is a bearing designed to provide free motion in a single length. There are many considered one of kind styles of linear motion bearings Ball bearing slides provide easy precision movement along a unmarried-axis linear format, aided by way of ball bearings housed inside the linear base, with self-lubrication residences that increase reliability. Ball bearing slide packages embody touchy instrumentation, robotic meeting, cabinetry, excessive-give up home system and smooth room environment.

### Conclusion

The Pant router is a simple Four bar link mechanism use to attract several form of format of particular scaling and its ratio of scaling can be several therefore. The nice aspect of this mechanism is that it could engrave diverse complex designs without the interference of any digital (the accuracy of layout is best rely on the clothier).This



mechanism can be utilized in present Modern age moreover for excessive pace process of reducing, trimming, and shaping wooden, metal, plastic, and a diffusion of different substances. A router is a woodworking tool used to rout out (hollow out) a place inside the face of a chunk of wood. It have become a tool particularly used by sample makers and staircase makers and consisted of a giant-based totally wood hand plane with a slender blade projecting well past its base plate.

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