

Design of Multipurpose Wood Working Machine

Anmol Bhatia^{1*}, Anmol Jatwani², Arpit Nalwa²

¹Assistant Professor, Mechanical Engineering Department, The NorthCap University, Gurugram

*Corresponding Author E-mail: anmolbhatia@ncuindia.edu

²U.G. Scholars, Mechanical Engineering Department, The NorthCap University, Gurugram

Abstract: This paper aims to present a model of a machine that can perform multiple operations on wood which is efficient and reliable than machines that already exist. The paper can help the common man, the daily worker, the carpenter that toils away by providing him with a tool at his disposal that can save his time, money and labor. The multipurpose wood working machine is unique in the manner that it utilizes a single multi-point tool to conduct all its operations and is operated by a single motor to save energy. The multipoint tool not only replaces multiple other tools but also saves energy by utilizing a single motor as compared to multiple motors which would be required if there were multiple tools. This also decreases the area the machine will take up making it more portable and lighter. By utilizing a single tool, there is an increase in the safety of the machine, as multiple tools mean multiple hazards. The tool will function in a manner similar to a routing machine. It is fixed in a module which holds it perpendicular to the vice which will be holding the work piece. The tool can transverse in all three directions using sleeves which are wrapped around threaded rods. Actuator motors then inhibit motion in all 3 dimensions using a control board. By doing so, the multipoint tool can work to its full potential and perform various multiple operations such as cutting, planing, drilling and slotting.

Keywords: Multipurpose Machine, Portable Machine, Cutting and Drilling

I. INTRODUCTION

Technology has continuously evolved the tools required to successfully maneuver wood. In this study, an attempt is done to bring about another valuable addition to the list of successful wood modifying machines known to man. The machines that exist or used to exist in the market all have one thing in common which is the fact that they all require multiple tools to do the different operations expected of the machine. This is a waste of space and energy as the machine requires multiple workspaces for the different tools and they have their respective motors as well. This ends up taking a lot of space, creating a lot of noise as few machines have the mechanism to allow a single motor to operate the different tools by continuously engaging and disengaging which is an intricate process. This also leads to wastage of energy as multiple tools run while only one is worked upon. If we stop to look at the safety hazard, these machines rank quite low on that scale as well. The proposed model of the machine uses one multi point tool in place of multiple tools. This tool will be attached to the setup of drilling machine which will subsequently be mounted on a module which will always be perpendicular to the work piece. The tool will have the ability to transverse in all 3 dimensions thereby allowing it to function independently as per the requirements. This movement of the tool will be actuated by motors and controlled by a master switch control board.

II. LITERATURE REVIEW

Ravi Teggin et al [1] designed a multipurpose wood cutting machine that is capable of performing drilling, planing, cutting simultaneously. The paper shows that the machine is economically viable and efficient. Pratik P Bargode et al [2] designed a machine which is capable of performing multiple operations, this machine also proved to be better in performance as compared to the existing machines in the market.



W A J Chapman[3] said in his book that by means of this machine various operations can be performed using same power,so this multipurpose device is used for various operations with a less amount of investment. R. A. Kubde et al [4] made the machining operations like grinding, and wooden cutting operations etc. very easy without electricity but through pedalling.




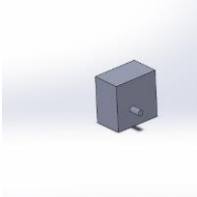
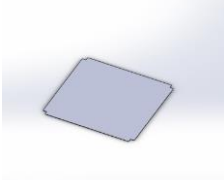
The existing products in the market focuses more on the installment of multiple tools , but fail to incorporate a simple design. The market survey reveals that the current machines are not upto the mark in terms of usability. In previous products additional motors are required for working the other tools. In the modeled product a multi-point tool is used so as to make all processes possible using only one tool. After thorough and complete study on the research papers and the patents, it is clear that none of the current products in the market completely address the basic needs of the worker. Although they provide a standard level, they don't meet the basic worker needs i.e. simple design and low cost.

III. DESIGN OF MACHINE

The design objective to be considered while designing the machine is that the machine should be light in weight, it should be durable, it leads to profitability, machine shall be economical and suits the pocket of the carpenter, there should be very less movable parts, Dimensions of the vice can be adjustable and operations are to be completed in a very less time. In order to meet these objectives, the design calculations were performed, and existing literature were referred. In accordance to that a suitable dimension of the machine was chosen which is light in weight and most economical. Table-1 shows the different parts of the machine with the model of the same.

Table 1: Components of the machine

S. No.	Item name	Prepared prototype
1	Slides	
2	Threaded rod	

3	Motor	
4	Drill chuck and motor	
5	Frame	
6	Gear box	
7	Base	

IV. ASSEMBLED MACHINE

Figure 1 shows the proposed model of the machine. The machine utilizes a multipoint tool which can perform operations like a drilling, but its end point has a sharp crosshair which enables it to do multiple operations like cutting and slotting other than the usual drilling operation. The tool can move in all the x, y and z dimensions. It does so by using sleeves and threaded rods. There are 6 rods in total, 2 for each axis, the movement is operated by 3 motors, one for every axis. This movement will be controlled by switches, one for every direction. The vice can be bolted at any position in the framed bottom floor to hold the workpiece at our desired location.

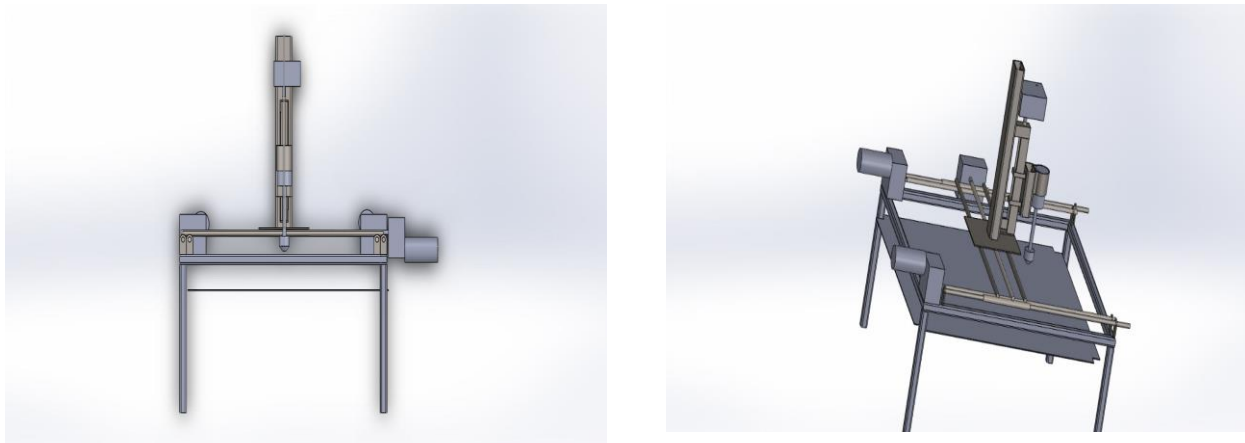


Fig 1: Assembly of the machine

V. CONCLUSION

In this study, a model was proposed wherein a machine with a single multipoint cutting tool will do the work of multiple tools by using up less space and less power, also making the machine much safer and portable. The machine costs less than its other alternatives as it is smaller and has only one tool. While different limitations were overcoming by incorporating this model. The sturdiness of the frame is improved so that it can be used for large scale production by industries as well and plan on increasing the work envelope is there so that bigger projects can also be handled. Another interesting approach in the process of the future development of this project is to automate it using an arduino micro-controller and making it a full-fledged routing machine.

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical statement: The authors declare that they have followed ethical responsibilities.

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