

Design and Fabrication of 3 Axis CNC PCB Milling and Drilling Machine - A REVIEW

¹A. N. Madne, ²A. S. Hande, ³Rohit Radake, ⁴Manthan Shambharkar

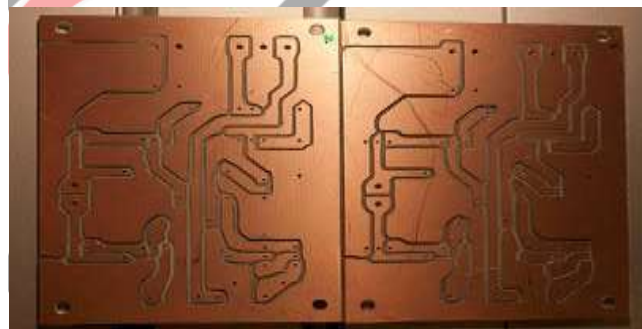
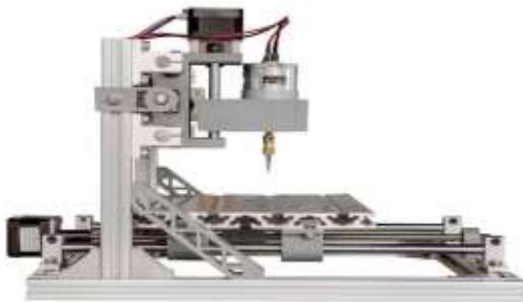
^{1,2}Assistant Professor, ^{3,4}Students
Department of Mechanical Engineering
Rashtrasant Tukdoji Maharaj University, Nagpur

Abstract: This paper presents the literature review of different author who have tried to build the PCB machines on small scale. Today CNC technology has major contribution in industries. In the industry the good quality of product is obtain due to contribution of CNC machine. This is based on schematic study of PCB milling, drilling and engraving operation and can be used for other operation.

Index Terms: PCB fabrication, Arduino, milled circuit boards.

I. INTRODUCTION

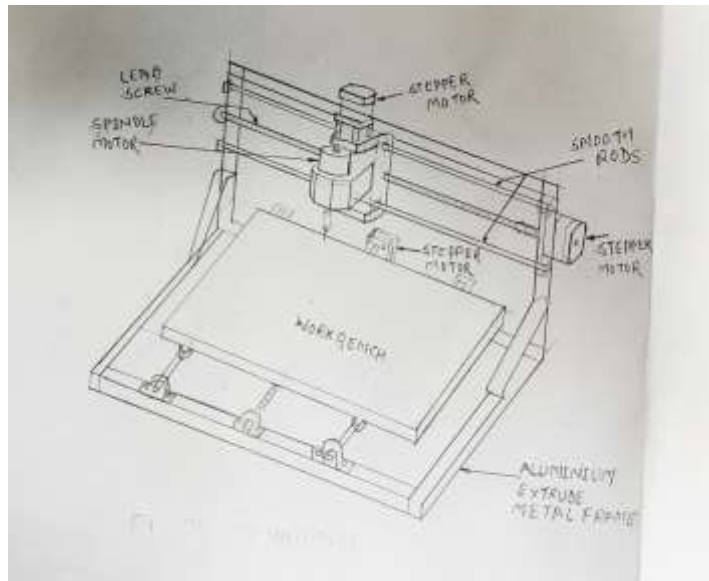
PCB stands for Printed Circuit Boards which helps in connecting the electronics components with pads, line, tracks incorporated on a laminated copper sheet. Which can be considered as an insulating material which can be developed using epoxy on which copper layer is laminated. Different software's are used for design of PCB. Before the inception of PCB professional used laboratories method of point to point wiring to connect the electronics components. This method was costly and complicated in design. To reduce the time and to make design simple this method was introduced. This was the revolution in the electronics industry with the lots of productivity and innovative ideas. PCBs are commonly composed of composite material, composite epoxy, and fibre glasses. In the electronics devices these are the most common components used which makes the design compact and sophisticated. PCBs are provided with different layers and multiple design. In some of the electronics device's PCBs are composed of single layer. Some of the most common hardware such as motherboard and graphic card multilayer PCBs are used. PCBs are widely used advanced electronic devices such as cameras, led, etc. as they are not associated with computers only. To increase the production rate with greater percent This can be the new invention in the electronics industries. Once you set all the parameter required, the machine will start working without any human interfere so we can call it as automation. Arduino based 3 axis PCB milling and drilling machine is inspired form today's technology revolutionary change in the world of electronics and microcontrollers. On basis of PCB drilling machine, the stepper motors are interfaced to the Arduino controller. The stepper motors are used to move plate of PCB in X, Y and Z direction



II. NEED OF PCB

In all the electronics devices printed circuit boards is very important either it is used for domestic purpose or for industrial purpose. PCB design service are used to design electronic circuit. Apart from electrically connecting it also gives mechanical support to the electrical components. The design of PCB can be created both manually or automatically. With the help of CAD drafting manual layout are created and the automatic router helps in creation of design automatically. Since they can implement their own ideas and technique the designer usually prefer the manual way.

III. CONCEPT



Mechanical Description

The main tools used in the mechanical design consist of work board which is of aluminium extrusion, smooth rods, lead screw, angle joints, stepper motor, ball bearing, support stands, anti-backlash nuts. The PCB is placed in the system then it is drilled automatically through path planning. By the PCB design software, it generates the coordinate in x, y, z direction. A high amount of current is passed in order to drive the motor exactly. There is another method which uses microcontroller c programming. To control the drill the system is consist of 3 stepper motor. The path planning method is not used in this project. The automatic PCB drilling machine uses a path planning algorithm, which locate the exact traversing path for the drill bit to move. In this project, the position of the drill hole is taken by the developed software. Then it calculates the previous and current co-ordinate and sends the coordinate information Micro-controller unit over USB cable. Stepper motors move on the basis of co-ordinate information to accomplish the drilling of the PCB.

IV. LITERATURE REVIEW

Manish Patil, Prof. Hredya Mishra published a paper under a title (**Literature review for designing a portable CNC machine**) in journal **International Journal for Innovative Research in Science & Technology** they discussed literature review of different authors who were tried to make CNC machine. They said that CNC machines are main reasons in the contribution of good quality products in industries.

R.Ginting, S. Hadiyoso and S.Aulia published a paper under a title (**Implementation 3Axis CNC router for small scale industry**) in journal **International Journal of Applied Engineering Research** in which they have realize the complex of 3 axis CNC machine which is based on microcontroller which is combined with spindle drill which can be used for cutting, engraving. Which can give more carving accuracy and more engraving accuracy.

Rajesh Kannan Megalingam, Shree Rajesh Raagul Vadivel, Sreekumar S, Swathi Sekhar, Thejus R Nair, Midhun RR published a paper under a title (**Design and implementation of CNC milling bot for milled circuit board fabrication**) in journal **International Journal of Engineering & Technology** in this paper they purpose a computer control milling machine which would be used for fabrication of double layer PCBs which are called as MCBs where the user can test the circuit without the need waiting of conventional PCB fabrication.

Kulkarni Bharat P, Mali Priyadarshani S, Mali Shriprasad S, Sutar Raghavendra R published a paper under a title (**Arduino based 3 axis PCB drilling machine**) in journal **International Journal of Emerging Technologies in Engineering Research** in this paper the PCB drilling machine is implemented using the Arduino controller. The whole operation is controlled by the open source software to reduce the man power and time.

Prabhanjay Gadhe, Vikas Jangir, Mayur Yede, Wasim-UI-Haq published a paper under a title (**Design and implementation of PCB using CNC**) in journal **International Research Journal of Engineering and Technology** in which they said that for making PCBs we required more time for various operation so to reduce the time this project is designed which will focus on the design and implementation of automatic PCB milling and drilling machine using Arduino.

V. RESEARCH METHODOLOGY

- Collecting the information of the necessity of milling and drilling machine.
- Gathering the data from literature review.
- Study of existing machine and focus on various modification.
- Identifying the proper mechanism and their role.
- Verify the design of PCB milling and drilling machine.

- Final result to be obtained.

VI. CONCLUSION

After studying the above papers, we can say that, CNC machine tools are better designed and construction and are more accurate than conventional machine tools. By fast tool changing methods It is necessary to minimize all non-cutting machine time and also minimize idle motions. We should note that it is the combined characteristics of the electric control as well as the mechanical design of the machine tool to determine the accuracy and productivity of the machine tool system. High productivity and accuracy might be opposed. Because high productivity requires higher feed, speed and depth of cut, which increases the heat and cutting forces in the system which will lead to higher deflections, thermal deformations and vibration of the machine, which would result in accuracy. Therefore, to achieve high operating bandwidth while maintaining relatively high accuracy, the structure should be more rigid and stiff than its conventional counterpart of the machine tool.

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