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Automatic PCB Track Design Machine

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Abstract:- This studies work layout of a mini Computer Numerical Control (CNC) track designer for perfect drawing layout. Someday for make PCB, we require extra time for designing, printing, etching etc. Consequently, for greater attempt & lessen time we are design this paper. It reduces the man power and draw complicated track easily. With the development of advanced system area, highly growing CNC machines in Technical Institutions, Educational Institutions and Laboratories required. The main required building block of mini CNC machine are power supply, computer, Advanced PIC Microcontroller PIC18F4550, stepper motor, servomotor, pen writer, motor drivers. Before everything the person design to transform any text file or image file into G-code using Eagle software and then send it to the machine using Processing software. The microcontroller transfer instructions to the motor driver of the machine. Motors are rotated clockwise or anticlockwise direction due to that the pen movement occurs automatically.

Keywords:- *G-code software, PCB, Advanced PIC Microcontroller.*

I. INTRODUCTION

The idea behind this design model is to form a mini CNC machine which is able to produce image/picture track on PCB. This model operate two stepper motor on each axis x and y worked as direct selector. While designing the proper synchronization of this entire three axes most important task is stepper motors. For logic 1 a bit reaches the surface & draw the line & for logic 0 leave the surface pick up in air at that time selector changes its position for new commands processing. The main criteria of this design to develop minimum cost automatic PCB track design machine. That can be preferred by the small scale industries and it can be helpful to avoid the workload of people. So that such kind of design motivates to develop minimum cost automatic track design machine. Similarly, it provide benefits to the workers as well as the industries. Hence such type of design implementation is helpful to avoid the use of expensive CNC Machine. Advanced PIC18F4550 microcontroller is operated for controlling the motors, and Eagle software is operated for executing the set of instructions as well as for machining applications. The controller has become relatively popular with people growing with electronics and for good l o g i c . In automatic PCB track design machine, executing logical instructions PIC microcontroller is used. The logical instructions in the form of code handed by microcontroller and it converted into machine language. Also, It can be used for logo design, image design, PCB track design, etc. The components used for this design are available at a minimum cost. The construction is very simple and robust.

A. Scope of Present Work:

The tracks size of manmade PCB is large as compared to the automatic tracks designed by machine. Due to that the short circuit is happened. By using the automatic PCB tracks designed machine size of tracks are reduced andshort circuit rate is minimized. Tracks are automatically designed through machine due to that the work loading ofworker is reduced. Due to the rate of short circuit reduced the perfection of the automatic designed PCB is more ascompared to the PCB designed through manually. By combining Eagle software, Advanced PIC Microcontroller software for smooth operation and give better perfection for design PCB. It is used to reduce the process of drawing and drilling. G-code makes position from layout design to move with proper position. Whenever need tostart and stop whole process will depend on you. By using PIC18F4550 IC, the setup is flexible and reduce work loading for make Printed Circuit Board (PCB).

B. objectives:

- To minimize collision and increase perfection.
- Ability to draw any congested path on PCB.
- To design less expensive automatic PCB track design machine
- To reduce people work load.
- To produce good accuracy for a diligent development.

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II. METHODOLOGY

The research follows block diagram, circuit diagram and schematic sketch.

A. Block Diagram:

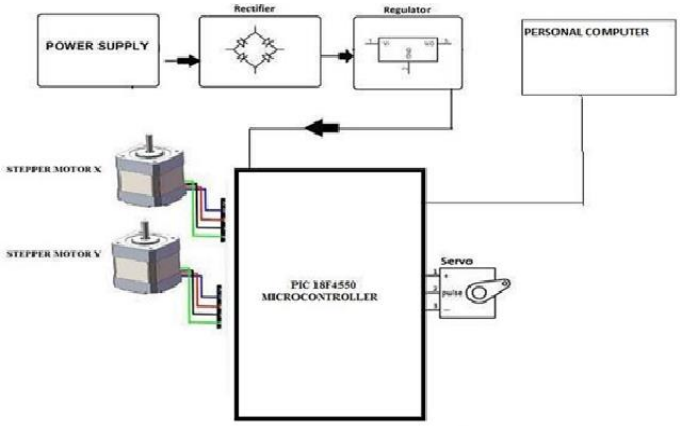

Fig 1:- Block Diagram Of Automatic PCB Track Design Machine

The figure 1 displays the infrastructure of the advanced system. The main intelligence device of our automatic track developer machine is pic 18F4550 microcontroller and it serves data from the computer. The modified G code interpreter programming used for PIC microcontroller and the 3 axes movement. power supply is major device of this system. Power supply produce two voltages i.e. +5 volt and +12 volt. 5volt supply is needed to pic microcontroller, whereas 12volt supply is needed to easy motor drivers. The infrastructure of the PCB track design machine include two stepper motors that's are associated with microcontroller as shown in the given figure.To controlling the movement of X and Y axis these two stepper motors are used. The path drawing machine is suitable for designing complicated path. Brushless, concurrent electric stepper motor that converts digital bits into mechanical shaft rotation in a number of equal paths. Based on an image to be drawn, the computer will create suitable co-ordinates and deliver them to the microcontroller through the USB port. The co-ordinates are passed to the controller by a separate program. We use eagle software to converting the image file into G code. The created G code is transfer to the microcontroller by providing instruction for the motor operation such instruction is used to draw the track. G code control the sketching axes. Again G code is uploaded on the microcontroller of the machine. Again the controller produce commands to motors and accessories that can repetitively and extremely correct design and sketch. The automatic pen movement for constructing sketch or drawing to gained by reprocessing G-code through the microcontroller. The servo motor will be used along with Y and Z axes. The z axis is used touch and lift the pen on to the PCB board. To move the sketching device i.e. pen in this system a servo motor is used and associated with the PIC microcontroller as shown in the above block illustration. Depending on the image to be drawn the computer will create the applicable co-ordinate and transfer them to the microcontroller through the USB port. The microcontroller interprets these co-ordinates and control the position of the motors to creates the image.

B. Pin Connection:

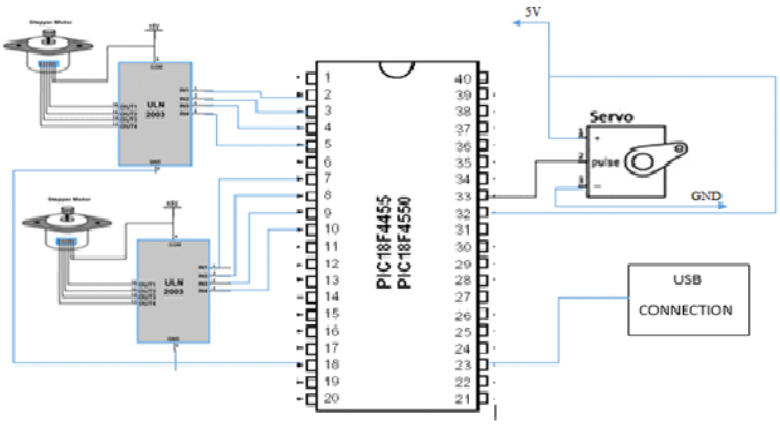

Fig 2:- Circuit Diagram of Automatic PCB Track Design Machine

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The figure 2 shows the pin connection also circuit execution of the Advanced system "Automatic PCB track design machine". Firstly, we have designed power supply unit to give regulated power supply to the circuit building blocks. Whole system all the circuit element needed regulated power for their working functionality. The mains provide 230v power supply. This 230v power supply is given to the transformer. The main function of transformer is stepped down it to 12v. Obviously, at the secondary winding output of the transformer is obtained 12v AC. But for all component needed DC power therefore converting AC output of the transformer into DC we use full wave bridge Rectifier. The output of the rectifier is 12v DC. This 12v DC is send to the regulator IC. The Regulator IC is LM7805.It has 3 pins. The output of rectifier is given to pin no.1of the regulator and the output is obtained at pin no.3 of the regulator IC and pin no.2 of theregulator IC is grounded. The 5v from the regulator IC is transformed to PIC microcontroller. Two capacitors are used at starting and ending of the regulator to remove the ripples in the signal therefore it is called as ripple remover capacitor. Here one servo motor and two stepper motor are used. The servo motor is used to move up and down as per the commands fed to the microcontroller. This servo motor is connected to the microcontroller and controlled by commands. The ground pin VCC of the servo motor is connected to the ground and VCC is connected to the VCC of the picmicrocontroller and and remaining controlling wire is connected to the pin no. 33 of the microcontroller as shown in the figure. Two stepper motors are interfaced with the controller for controlling the X and Y axis movement. These stepper motors are controlled by driver circuit ULN2003 driver. These motor driver circuit needed 12v regulated power supply for the operation. To control these stepper with the microcontroller each one is handed through a motor driver as shown in above figure. The stepper motor has several advantages compared to the DC motor. It can be controlled at a minimum cost and get high torque at beginning and low speeds. The rotation angle of the motor is proportional to the input pulse and the motor has full torque at deadlock. The washer also plays an important part in stabilizing the apparatus. Stepper motor produces a lot of vibration, therefore affecting the writing/ plotting. Rubber soles or mutes are installed at the architecture to reduce vibration.

C. Working:

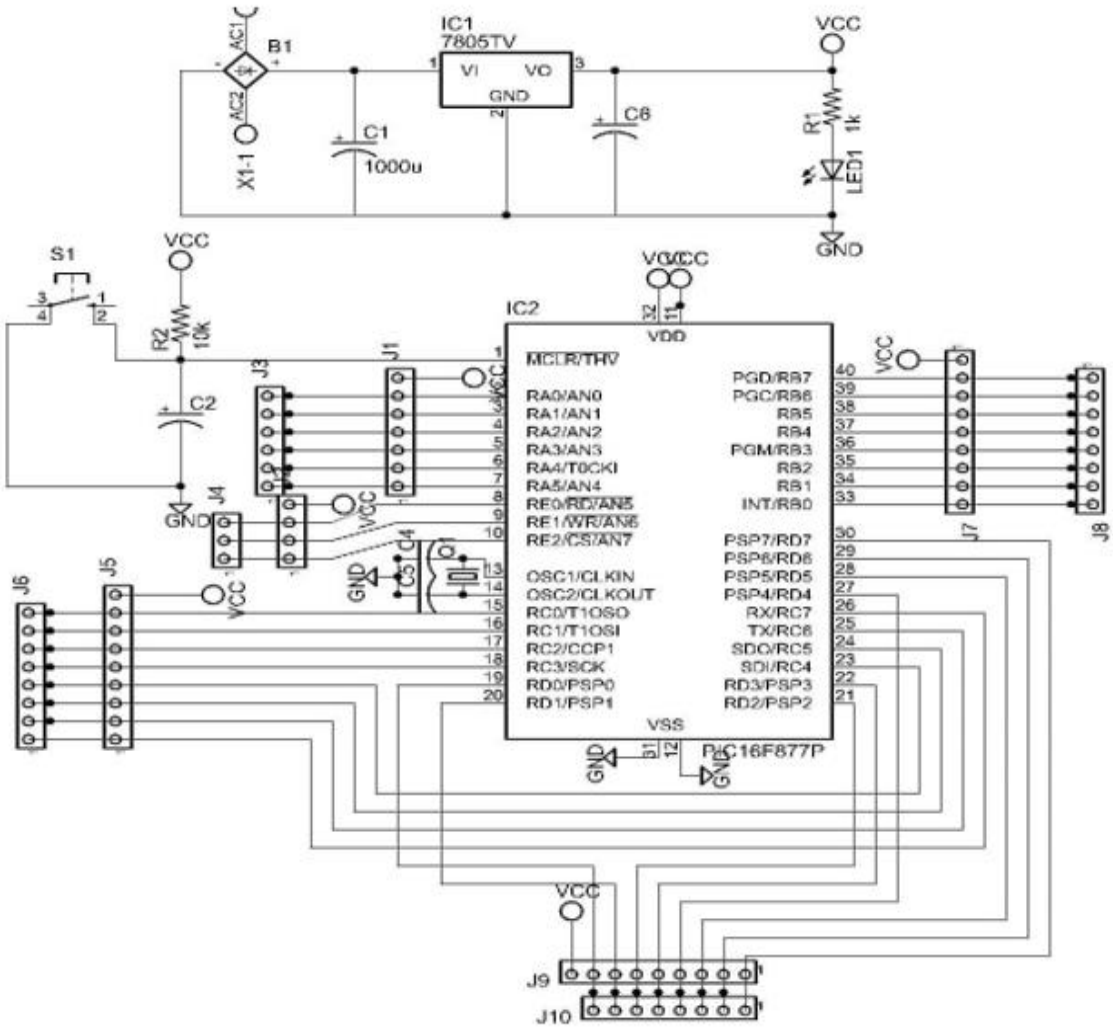

Fig 3:- Schematic Sketch of System

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This proposed system is able to draw complicated track on PCB. The X and Y co-ordinates are coded into PIC microcontroller by a separate program. eagle software convert an image file into G code. Then the code is send to the microcontroller. Microcontroller send commands to the motor and instructed motor design the sketches. The motor can move clockwise or anticlockwise. Depends upon the image the computer create the appropriate co-ordinates and transfer them to the microcontroller through the USB port. G code control the drawing axes movement. After that the controller produce commands to motors and accessories of motor correct design and sketch again and again. The pen movement for constructing sketch or drawing to gained by reprocessing G-code through the microcontroller is done automatically. For logic 1 a bit reaches the surface & draw the line & for logic 0 leave the surface pick up in air at that time selector changes its position for new commands processing. Drawing will be done on the surface where the positioning will be controlled by stepper motors. The two axes pen movements can be precisely and automatically positioned along their lengths of travel by a servo motor and two stepper motors. To processing the machine language obtained from microcontroller motor drivers are used that turn run the motors in clockwise or anticlockwise directions so as to obtain the expected pen movement. The PCB is designed at the edges of the proposed system.

III. EXPERIMENTAL SETUP AND OUTPUT RESULT

A. Experimental Setup:

Fig 4:- Experimental setup of automatic PCB track design machine.

B. Output Result:

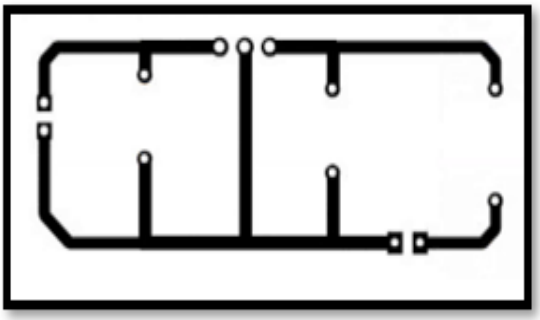

Fig 5a:- Power supply Track

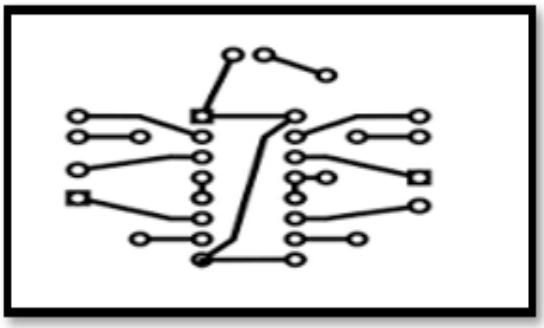

Fig 5b:- Motor Driver Circuit Track

IV. CONCLUSION

In this paper, we presented an automatic PCB Track Design machine which helps to draw circuits on PCB with lot more perfection and less number of errors. The planed system is better than the existing system in terms of accuracy, size, cost and portability. Therefore, the planed system is expected to work more efficiently than the existing system. It iseconomic because it is made out of old DVD writers. At this stage, collect the information about all theparameters which is required for project like software's, components and also find the ways to remove the drawbacks of old system. In this proposed system Automatic PCB track design machine produce precise accuracy therefore it is equipped with correct movement. By using this setup with a G- code controller software forsmooth operation and give better accuracy for design PCB**.** This device can be used in automation where the processing of the image is on small scale.

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REFERENCES

[1]. Kajal Jmadekar, Pooja phadetare, Kranti Nanaware & Vikas Mane, "Characterization of Automaticmini CNC machine for PCB drawing and drilling" *International Research Journal of Engineering and Technology (IRJET).*

[2]. A.P. Kuldhar, K.P. Kuldhar, V.C. Pune & S.T. Patil," Arduino based automatic sketching machine"*International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 02 | Feb2019*

[3]. Mya Thandar Kyu & War War Htun," Design and Implementation of XY-Plotter", *International Journal of Science, Engineering and Technology Research (IJSETR) Volume 7, Issue 7, July 2018, ISSN: 2278 - 7798.*

[4]. Uday Shankar singh , Shubham Singh, Abhijeet Mitra, Dhaneshwari Verma & Prof.Seema Mishra,"Arduino Based Mini Sketching CNC Machine", *International Journal of Inovative Research computer and communication Engineering,vol.(7)*

[5]. Prabhanjay Gadhe , Vikas Jangir , Mayur Yede & Wasim-Ul-Haq,"Design and Implimantation of PCB using CNC machine", *International Research Journal of Engineering and Technology (IRJET) volume 4 Issue2 Feb-2017.*

[6]. Shaikh Noor Farooque, Javed Shaikh & Pragati Pal, "Automated Pcb Drilling Machine With Efficient Path Planning", *International Journal of Advanced Research In computer communication Engineering (IJARCCE), Volume 4, Issue 4, April 2015.*

[7]. Rajesh Kannan Megalingam, & Swathi Sekhar," Design and Implementation of CNC Milling Bot for Milled Circuit Board Fabrication", *International Journal of Engineering and Technology.*

[8]. Ms. V. Divyasree, Ms. P. Srija, Ms. G. Mounika, Ms. U. Manaisha & Ms. S. Hema Malini," Automated Sketching Machine",*InternationalJournal of Engineering Technology Science and Research(IJETSR). Volume 5, Issue 4,April 2018.*

[9]. M. Aditi ,S. Karpagam, B. Nandini & B. S. Murugan," Automated Writing and Drawing Machine",*International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181.*

[10]. Kumar, M. A., Krishnaraj, J., & Reddy, R. B. G. S. (2017). Mini CNC 2D sketcher for accurate building drawing. International Journal of Civil Engineering and Technology, 8(6), 543-549.

[11]. *Patel, M. P. N., Pavagadhi, M. S. D., & Acharya, S. G. (2019). Design and development of portable 3-Axis CNC router machine. International Research Journal of Engineering and Technology (IRJET), 6(3), 1-452.*