DRILLING ON A METAL ROLLER USING 3 STEPPER MOTOR WITHOUT ANY USE OF LABOUR

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ABSTRACT:

This project will help manufacturer to automate machine in way that it can remove the worker problem, it can work with high accuracy and it can also provide fast production. These all benefits can be obtained with low cost .A bipolar stepper motor are used to move following items with the use of drivers like first stepper motor is used to move the roller in a circular direction, second stepper motor is used to move the roller in horizontal direction and the third stepper motor is used to move up and down that is in a vertical direction. When the frequency rises the power also rises but at a certain frequency level we get is the peak point and there after the power starts decreasing.

KEY WORDS: Stepper motor, Drivers

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1. Introduction

A manufacturer of textile processing machine, need to implement automation on drill machines. They drill on the metal roll at periodical distance. For that they required minimum 3 workers. But after allowing 3 workers, manufacturer did not get accuracy as well as speed of work. Hence he needs automation on that machine. The below figure provide exact identification of requirement.

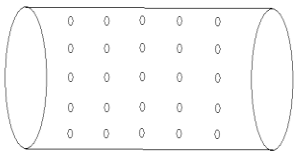

FIGURE:1 Metal Roller

For textile Product manufacturers automation as following requirements:

- Production at increased speed
- Less rework
- Reduced energy requirements
- Reduced manpower

2. Current Project Study:

As discussed above, many people are less aware about these new innovations related to this project. In most sectors of textile manufacturing, automation is one major key to quality improvement and cost competitiveness.

A drilling machine, called a drill press, is used to cut holes into or through metal, wood, or other materials (Figure 2). Drilling machines use a drilling tool that has cutting edges at its point. This cutting tool is held in the drill press

To stand in market, manufacturer has to build the quality in product at reduced price. Textile industry works at very thin margins hence production rate also matters.

3. Problems and Weakness of Current System:

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4. Project analysis:

A bipolar stepper motors are used to move following items:

1. Stepper motor – 1 is used to move roller circular
2. Stepper motor – 2 is used to move roller Horizontal 3. Stepper motor – 3 is used to move Drill Machine up-down (Vertical)

The program is a detailed set of commands to be followed by the machine tool. Each Command specifies a position in the Cartesian coordinate system (x, y, z) or motion (work piece Travel or cutting tool travel), machining parameters and on/off function.[5]

by a chuck or Morse taper and is rotated and fed into the work at variable speeds. Drilling machines may be used to perform other operations. They can perform countersinking, boring, counter boring, spot facing, reaming, and tapping (Figure: 3).[5]

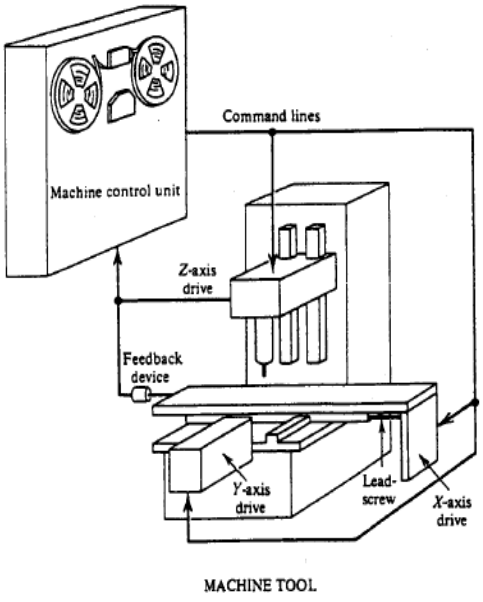


FIGURE:2 Machine tool (lathe, drill press, milling machine etc)[5]

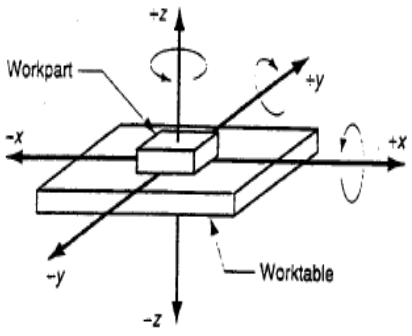


FIGURE:3 Cartesian coordinate system (x,y,z)[5]

The sharp edges at progressions of tool from

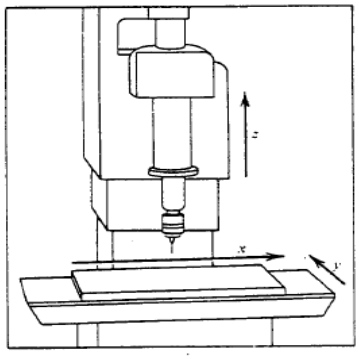


Figure:4 is of moving a drilling machine in a vertical direction.[4]

A microcontroller unit will control all motors simultaneously to complete work function of machine. The software will develop in c language using Keil complier. The software is developing in such a way that all the requirement of industry will fulfill by us. The driver of respective motor will control by microcontroller unit and hence motor.

According to settable parameter microcontroller decide the circular distance

Circular distance = Circumference / no. of holes

After calculating circular distance in mm controller give command to motor 1 via driver to move roller circular at the calculated distance. Controller further gives command to motor 3 via driver to move drill machine vertical (down) and drill on metal roller. After completion of drill motor 3 move drill on up side. The process will continue as per no. of holes required.

Then after motor 2 will energized by microcontroller via driver to move drill machine horizontally as per settable data. Microcontroller performs above steps to work

point to conical and from conical to cylindrical are rounded to protect the tool from initial wear and to increase the tool life. Small amount of parting paste is applied on tool prior to the friction drilling operation in order to prevent the material transfer from work piece to the tool and to protect the tool from early wear. The friction drilling set up with the work piece is shown in Figure: 5.

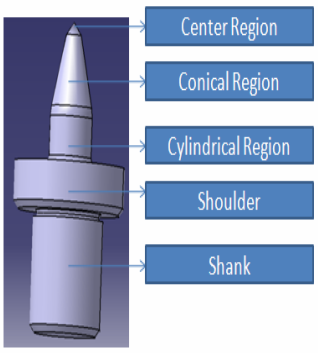
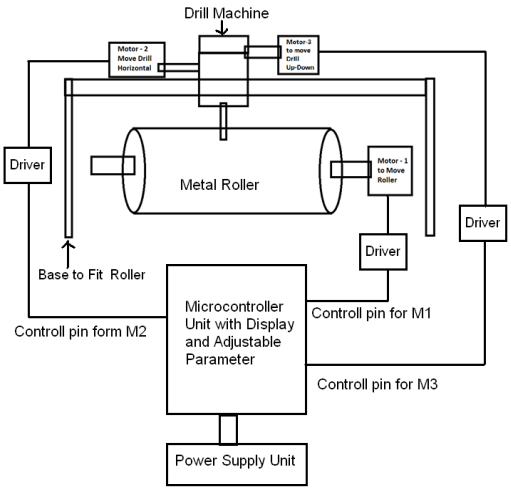


FIGURE:5 Conical sections in order to provide the primary contact area to reduce tool wear[1]

5.Block Diagram:



further.

The tools have the standard geometry viz. point, conical section, cylindrical section, shoulder and the shank. Also four parallel lobes have been grounded on cylindrical and conical sections in order to provide the primary contact area to reduce tool wear.[1]

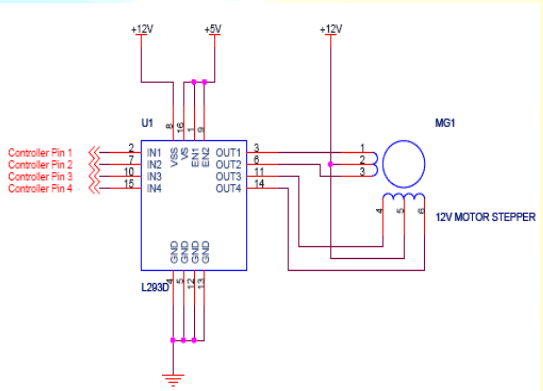


FIGURE:7 Pin Diagram of a stepper motor

This kind of motor can be wired in several configurations:

1. Unipolar and Bipolar with series windings. This gives higher inductance but lower current per winding.
2. Bipolar with parallel windings. This requires higher current but can perform better as the winding inductance is reduced.
3. Bipolar with a single winding per phase. This method will run the motor on only half the available windings, which will reduce the available low speed torque but require less current.
4. Stepper motor performance is strongly dependent on the driver circuit. Torque curves may be extended to greater speeds if the stator poles can be reversed more quickly, the limiting factor being the winding inductance.

FIGURE:6 Block diagram

6. Stepper motor:

An 8-lead stepper is wound like a unipolar stepper, but the leads are not joined to common internally to the motor.

7. M880A Driver:

7.1 Introduction:

The M880A is a high performance micro-stepping driver based on pure-sinusoidal current control Technology. Owing to the above technology and the self-adjustment technology (self-adjust current control parameters) according to different motors, the driven motors can run with smaller noise, lower heating, smoother movement and have better performances at higher speed than most of the drivers in the markets. It is suitable for driving 2-phase and 4-phase hybrid stepping motors.

8. **Hardware view:**

To overcome the inductance and switch the windings quickly, one must increase the drive voltage. This leads further to the necessity of limiting the current that these high voltages may otherwise induce.

Bipolar motors have a single winding per phase. The current in a winding needs to be reversed in order to reverse a magnetic pole, so the driving circuit must be more complicated, typically with an H-bridge arrangement (however there are several off-the-shelf driver chips available to make this a simple affair). There are two leads per phase, none are common.

Dithering the stepper signal at a higher frequency than the motor can respond to will reduce this "static friction" effect.[7]

Hardware model(b)

8. Results:

Data for Stepper Motor With load

FIGURE:8 Hardware model(a)

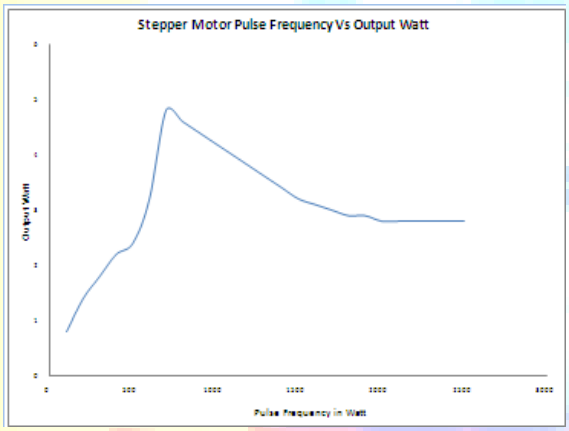


FIGURE:9 Pulse frequency in watt versus Output power in watt

From the above graph we observe that when the frequency is increased the power is also increasing but at a certain frequency level we get the maximum power i.e. we get the peak point and there after the power starts decreasing and after sometimes it becomes constant.

9. Application:

- Industrial control
- Medical systems
- Access control

Sr. No.	Pulse Frequency in Hz	Output Power in Watt
1	100	0.8
2	200	1.4
3	300	1.8
4	400	2.2
5	500	2.4
6	600	3.2
7	700	4.8
8	800	4.6
9	900	4.4
10	1000	4.2
11	1100	4
12	1200	3.8
13	1300	3.6
14	1400	3.4
15	1500	3.2
16	1600	3.1
17	1700	3
18	1800	2.9
19	1900	2.9
20	2000	2.8
21	2100	2.8

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- Point-of-sale
- Communication gateway
- Embedded soft modem
- General purpose applications
- CNC

10. Conclusion:

This project will help manufacturer to automate machine in way that it can remove labor problem, it can work with high accuracy and it can provide fast production. These all benefit can be obtained with low cost automation. The drilling unit can drill with proper accuracy will help to work roller for a long time. The accuracy of drilling will be higher as bipolar series stepper motor will used for this project.

When the frequency is increased the power is also increased but at a certain frequency level we get the maximum power i.e. we get the peak point and there after the power starts decreasing.

Any students who work in this field can be enhance this project with the help of servomotor and it can get accuracy of 0.1 mm from servo motor.

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