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Basic Advancements in Stepper Motor

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Abstract

Stepper motors are mainly used in open loop position control systems. But open loop control of stepper motor can cause loss of steps or slip of steps. To overcome these problems, closed loop position control is developed. In Order to show if any wrong position (i.e. due to loss of steps or slip of steps) of stepper motor have been achieved. So in the present paper, a system is described by microcontroller program which can control the position of stepper motor properly. Therefore, the identification and control of the composition and related characteristics of these materials are important. Thus, if a compound semiconductor thin film (binary, ternary or still more complex) is to be prepared by various deposition techniques, it is usually necessary to have the evaporant charge in a compound form with homogeneity and stoichiometry. Here we have developed a setup of microprocessor based stepper motor control to get homogeneous growth of compound material by continuously mixing the evaporant charge kept in vacuum sealed quartz ampoule at high temperature using furnace.

Keywords: Compound semiconductor; Stepper motor; Microprocessor; Power Supply& Sensors

Introduction

The Stepper motor based positioning system is very much useful and popular requirement in the industry. The industries where the environment is hazardous, it is very much essential to adopt this type of system to handle and place object. This is in nut cell considered as a robot of one degree of freedom. In the electroplating industries Compensators e articles need to be deep in the chemical, in the annealing industry the articles need to be handled in adverse environmental condition for heating and cooling at different media. In the above-mentioned industries the stepper motor-based position control system is very much required and useful. The spray painting and drying units also have the application of this system. There are different commercial products available in the market for position controlling. The application of embedded technology made the system design so versatile that the system can be designed with minimum hardware and maximum facility.

Driver Motors

Since Microprocessor 8085 and supporting chips does not provide sufficient current to DRIVE/RUN the stepper motor, additional driver circuit for stepper motor is developed

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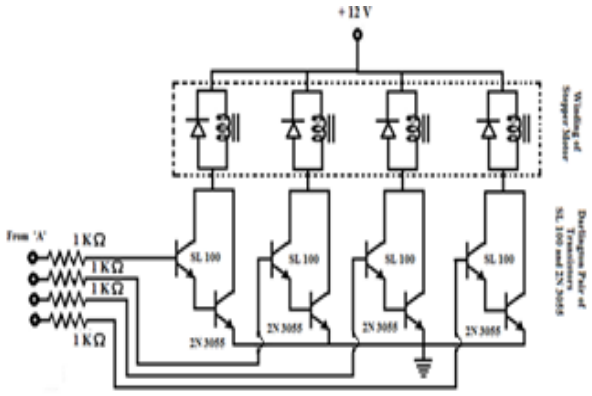
which is shown in Fig.4. The most common and importantconsideration for applications of stepper motor is the use ofproper and appropriate drive circuits. Driving a steppermotor requires the switching of current from one winding to another. This switching function is provided by driver circuit which arranges, distributes and amplifies pulse trains from the signal circuit. The windings of the stepper motor are excited by specific sequence. The stepper motor has four different coils. Therefore total four driver circuits are required for motor. Two NPN transistors (SL 100 and 2N 3055) are used and configured as Darlington pair [12] in design of each driver circuit for stepper motor. The windings of the stepper motor are connected to the collector of Darlington pair transistors. The transistors are switched ON/OFF by the microprocessor 8085 through the ports of 8255 (Port A) and buffer (74LS 245).



Stepper Motor

The stepper motor works on the electromagnetic principle. Its input is in the form of digital pulses and output is corresponding mechanical shaft rotation. Stepper motor has a many advantages like cheap brushless, not tough to design, good reliability. It has very high torque even at low speeds with accuracy of motion. The stepper motor is basically a digital motor. This characteristic makes it very suitable for digital interfaces such as with a microprocessor. Stepper motors are comparetively cheap as compared to other motor types. Most important is the fact that a stepper motor can basically be used without any type of feedback loop. I.e. stepper motors are ideal for open loop control. When digital pulses are applied to the base of the transistors, it starts conducting. A magnetic field is developed around coil. So, motor starts to rotate. Since the motor moves in distinct steps as defined by a steep angle, we need to count the number of steps to position the motor accordingly.

Stepper motor used here is permanent magnet type. One can determine the speed of motor using following formula.

1) Total number of steps in one revolution = One full rotation / Step Angle

2) Total number of digital pulses in one second (PPS) = (Required RPM / 60 seconds) Y (No. of steps in one revolution)

This tells us how much number of steps is required in one second to get the required speed of stepper motor in RPM.

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