

Design and development of high-speed drip irrigation valve assembly machine

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Abstract

Drip irrigation is a trending market opportunity for the molding industries. The arts produced in these molding industries are of different types and categories such as multiple parts are assemble together after manufacturing to form the final product. Currently this assembly is done with manual labors ad involves some of the issues such as less productivity and errors in assembling through manual hammering process. Here in our project we are solving the issues of manual assembling of the drip irrigation valves with highest production speeds and reduced investment on the machine parts. Automating manual processes can be extremely difficult. To reduce the cost of machine we are using fully electric operation. Reduce uses of compressor and pneumatic pump through electric liner actuator and stepper motor which provides high torque and speed of operation. Thus, this project will help us to make the valve assembly process automated and achieves the benefits of high-speed production in molding industries.

Key Words: assembly, molding, product, valve, automated

1.INTRODUCTION

Manual Assembly of drip irrigation Lateral Valve in large quantity consumes time and energy. Also, there is no accuracy in manual assembly. In Drip Irrigation we are use many components to make irrigation possible and like that the valve used in drip irrigation, in drip irrigation the lateral valve is essential to regulate the flow of water through pipes that are connected to pipe. This machine will implement to assembly of valves of irrigation. The valve is typically made from plastics and the valves are made by manufacturing process of injection moldings, in injection molding the mold of drip valve and knob is made after that valve and mold are assembled together by manually but instead of manually simply using the machine it could be assembled. To operate the machine, we required one person to operate and assembled the valve this increases productivity. Here in our project we are solving the issues of manual assembling of the drip irrigation vales with highest production speeds and reduced investment on the machine parts. Automating manual processes can be extremely difficult. To reduce the cost of machine we are using fully electric operation. Reduce uses of compressor and pneumatic pump through electric liner actuator and stepper motor which provides high torque and speed of operation. Thus, this project will help us to make the valve assembly process automated and achieves the benefits of high-speed production in molding industries.

2. PROBLEM STATEMENT

1. Inefficient assembly.
2. Multitasking in human energy.
3. Required more than one operator.
4. Product damaging issues.

3. OBJECTIVE

1. To make fully electric machine which needs no compressor and pneumatic pump.
2. Cost optimization through stepper based linear actuator.
3. Higher products to be assembled.
4. To design high speed semiautomatic machine.

4.METHDOLOGY

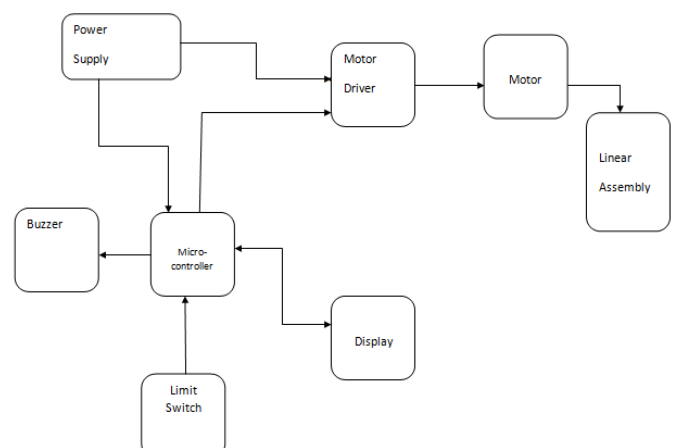
We supply the power to the motor Driver and Microcontroller after System Has sensor to sense the object (valve) after Sensing of the Valve Placed By the person the system Starts to rotate the stepper motor in clockwise direction which pushed the actuator in downward direction.

The Limit Switch allows the movement for specified direction movement range which depends on to the size and shape of the valve.

When bottom limit switch is sensed the micro controller will rotate motor anticlockwise direction and comes to the rest Position.

1.1 METHOD OF IMPLEMENTATION

1)block diagram



1.2 LIST OF MATERIAL

Sr.No.	Name of the material	Specifications	Cost
1	Stepper Motor	18KGCM	2200
2	TB6600 Stepper Motor Driver	4.5 Amp	650
3	Arduino Nano	Atmega328P	340
4	SMPS	24V, 5 Amp	400
5	Buck converter Module	LM2596S	300
6	Mechanical structure	Mild steel	2000

Table 1. List of materials

2.1 PROBLEM IN MANUAL ASSEMBLY

1. Multitasking-

Due to multitasking of work load of any kind in daily life is stressful and like that in also manufacturing products and goods we required multitasking machines which reduce stress of human body that helps to increase in manufacturing and it has only done with machines.

2. Workplace Stress-

In manually working process continuously working hours that develops stresses in human nature likewise in workplaces working of hours and hour that leads in unhealthy conditions which reduces human working ability which also reduced by using machines. Another reason for the accrued stress levels in a company is once your team members are being loaded down with too several tasks quickly. Imagine seeing your colleagues perpetually distracted by successive task that they have to figure on and not having the ability to focus their attention on one issue.

3. ADVANTAGES

1. High speed operation
2. Consumes less electricity
3. Silent operation
4. No need of mechanical air compressor
5. Compact size due to stepper motors
6. Portable device is easy to carry anywhere

4. LIMITATION

- There are doesn't have any critical limits but only have production per day synchronize with operator speed
- It required one operator to continuously operate the machine

5. CONCLUSION

Our machine will be a beneficial alternative for the molding industries for increasing the speed of assembling the different parts with low cost and expenditure. Our machine speed will be greater than 15000 pc per day (10 Hours of continuous working) with lowest cost. This alternative is completely making in India solution for empowering the molding industries.

This machine involves innovations such as high-speed stepper linear actuator and fully electric compact design. This system can also be powered through small battery backups for longer duration in future developments which enable its operation after power cuts.

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