Design and Fabrication of Automatic Variable Size Bottle Filling System

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Abstract— In today's era, 'automation' plays a vital role in all industries. The bottle filling mg process, which is carried out manually in old days, is now upgraded with the help of automation. By using automation, many more developments can be seen in bottle filling sector. Bottle filling may be about filling of different products in liquid forms. We have observed that, if we want to fill two different sizes of bottles then we have to send the bottles in lot according to respective sizes. The main objective behind developing this project is to fill different sizes of bottle in one single lot on the same conveyor. This system mainly focused on job production and not on mass production. The main aspects in this project consist of mechanical, electronic and electric components. They are as follows: 1] Machining and fabrication 2] Electronic circuits and programming 3] Sensors and actuators, 4] Project Planning, 5] Mechanical Design.

Keywords: Bottle Filling System

I. INTRODUCTION

Automation reduces human efforts and increases productivity. Automation is the one time investment which help in economy and productivity. Automation has a very large impact on bottle filling industries.

Our paper presents the filling of bottles of different sizes on single conveyor with the help if PLC. The two main sections of our project are 'sensing' and 'filling'. As the bottle moves on the conveyor the proximity sensor senses the size of the bottle. Then the bottle is filled according to the respective size with the help of solenoid valve. Thus in the same way the filled bottle moves in front direction and next bottle size is sensed by the proximity sensor and the process is carried out.

II. COMPONENTS OF BOTTLE FILLING SYSTEM

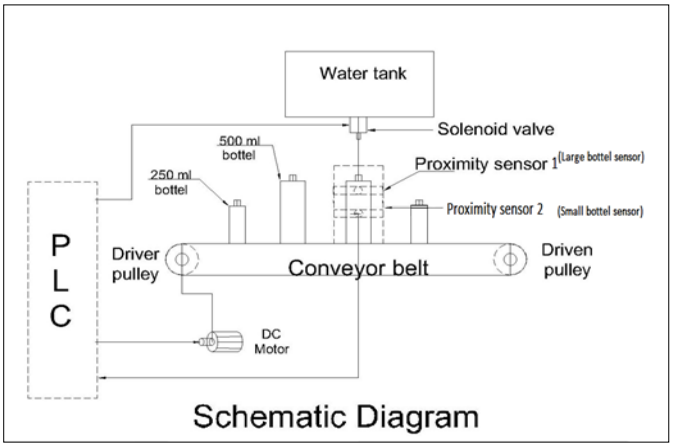

Fig. 1: Schematic Diagram

A. Components

1) PLC (Allen Bradley Micrologix 1400)

A PLC (i.e. Programmable Logic Controller) is a device that was invented to replace the necessary sequential relay circuits for machine control.

A Programmable Logic Controller, PLC is a digital computer used for automation of industrial processes, such as control of machinery on factory assembly lines.

The PLC works by looking at its inputs and depending upon their state, turning on/off its outputs. The user enters a program, usually via software, that gives the desired results.

2) Proximity sensors

A basic proximity sensor is used to sense the presence of objects or materials. What differentiates them from other sensors is that they don't make physical contact with the object being sensed, and hence they're also known as non-contact sensors.

Fig. 2: Proximity sensor

3) Solenoid valv

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

Fig. 3: Solenoid valve

4) Conveyor belt

Flat belt conveyors are some of the most frequent and versatile belt conveyor systems in common use. Flat belt conveyors use a series of powered pulleys to move a continuous flat belt of natural or synthetic fabrics such as polyester, nylon, regsin or other materials.

Two roller which is drive from DC gear motor with chain drive

5) Gear motor

A gear motor delivers high torque at low horsepower or low speed. These motors use gears typically assembled as a gearbox to reduce speed. Which makes more torque available. Gear motors are most often used in applications that need a lot of force to move heavy objects.

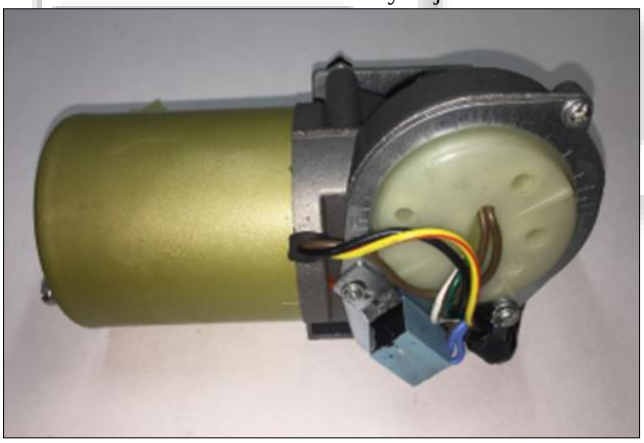

Fig. 4: Gear motor (12V 17W.Lucas-TVS)

III. LADDER LOGIC DIAGRAM

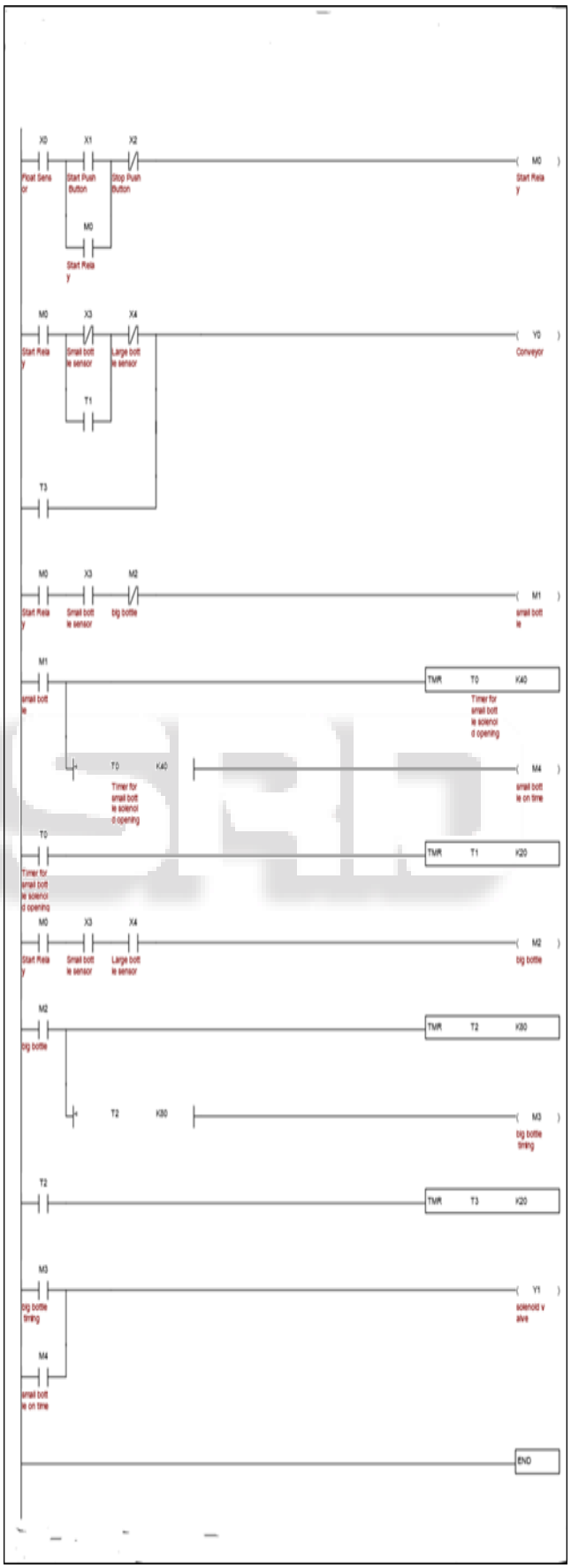

Fig. 5: Ladder logic diagram

IV. LAYOUT

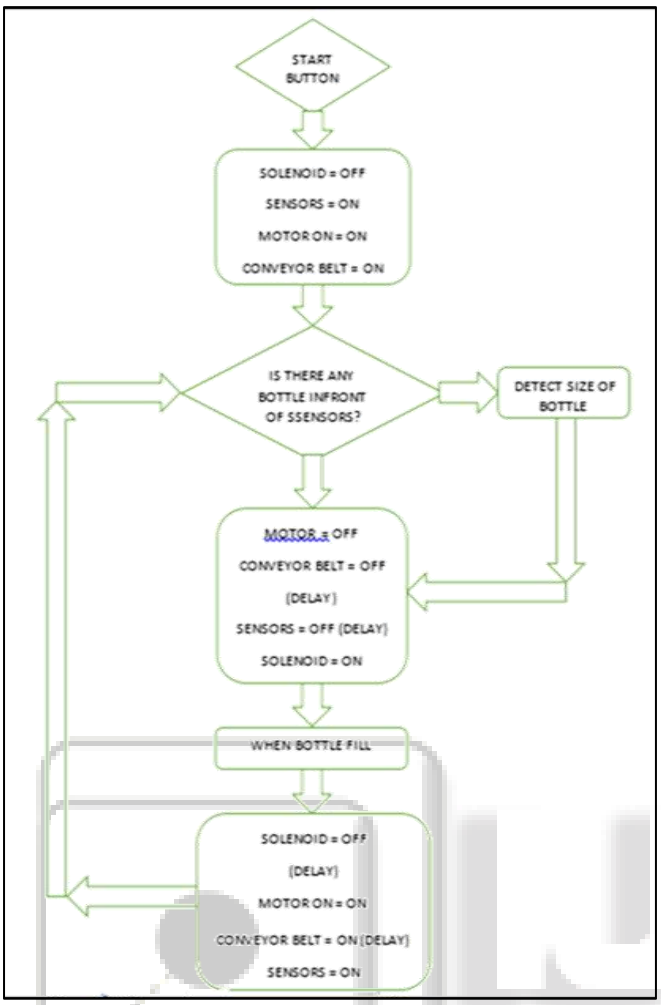

Fig. 6: Layout

V. CONCLUSION

The manual filling process has many shortcomings like spilling of water while filling it in bottle, waste of time while filling two different lots, waste of capital for setting up separate machine for different lot size. This problems faced by small scale industries compels us to take up this project. With this system that operates automatically, every process can be smooth and can reduce human operations and will consequently also reduce time needed for production. The system operates by the program that designed to do the operation. The machine is also easy to operate and user friendly, where simple steps are needed to handle the machine.

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