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Automatic Bottle Filling System

[1] Juliya KV, [2] Mohammed Anas MV , [3] Mubarak, [4] Muhammed Hazil
[1][2][3][4] UG Scholars, Semester 6, B.Tech Electronics and Instrumentation Engineering,
Royal College Of Engineering and Technology
[4] muhammedhazil08@gmail.com

Abstract: ***The field of automation has had a notable impact in a wide range of industries beyond manufacturing. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provides human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Filling is a task carried out by a machine that packages liquid products such as cold drinks or water. The bottle filling project serves as an interdisciplinary engineering design experience. It introduces aspects of computer, electronics and mechanical engineering, including the following five primary knowledge areas:***

1) Machining & Fabrication
2) Electronics circuit prototyping and Programming
3) Sensor and Actuator application
4) Mechanical design
5) Project Planning
6) Presentation Skills.

Keywords: Bottle Filling, Conveyor, Process Automation, Conveyor Systems.

I. INTRODUCTION

An embedded control is done by a special purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems control many of the common devices in use today. Embedded controllers are often the heart of an industrial control system or a process control application. The majority of computer systems in use today is embedded in other machinery, such as automobiles, telephones, appliances, and peripherals for computer systems. While some embedded systems are very sophisticated, many have minimal requirements for memory and program length, with no operating system, and low software complexity. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, and may lack human interaction devices of any kind.

2. BLOCK DIAGRAM

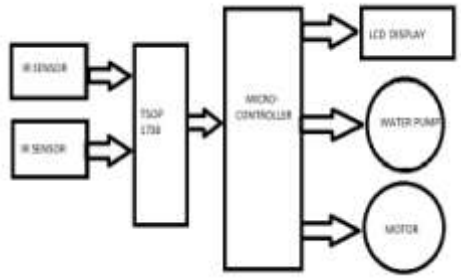

Fig-1: Block diagram of Automatic Bottle Filling System

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The most crucial block in this project is microcontroller. All the other units are interfaced to Microcontroller unit. Second important components are sensors; IR sensors are used for detecting the presence of bottle the driver ic is used to interface sensors to microcontroller. Output from microcontroller is given to LCD, pump and motor which drives the conveyor belt.

TSOP 1738:- Receiver of IR SENSOR's

3. Components Used

IR sensors, Microcontroller ATMEGA328, 12v DC Motor, Water Pump, Conveyor Belt, L293D Motor Driver

3.1 Layout

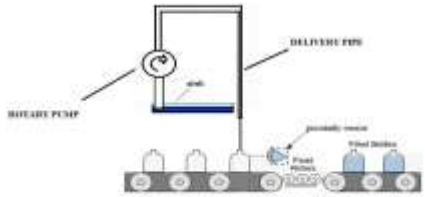

Fig-2: Layout of the system

3.1.1 Microcontroller ATMEGA328

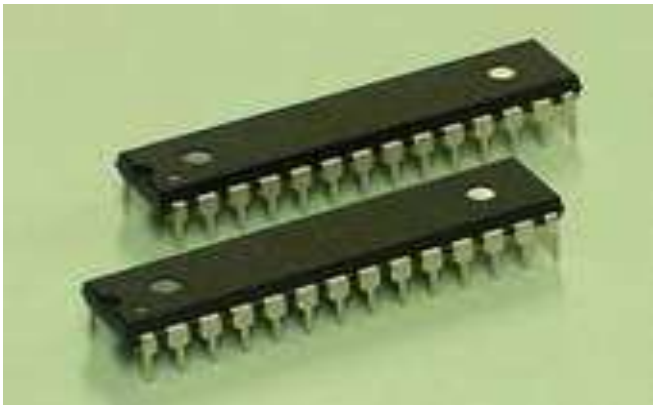

Fig-3: ATMEGA328 Microcontroller

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

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3.1.2 L293D Motor Driver

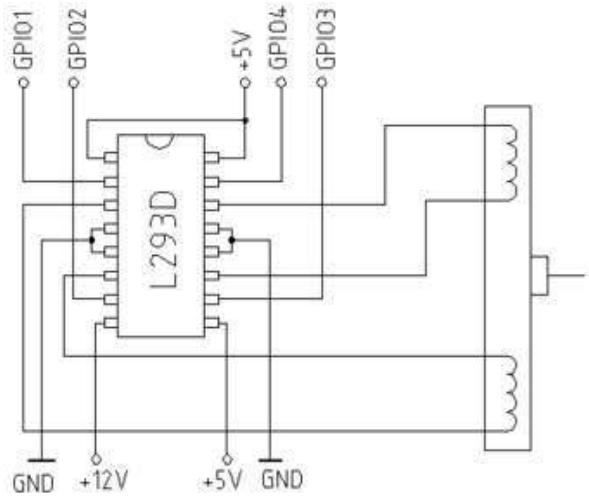

Fig-4: L293D Motor driver

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors .To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included .This device is suitable for use in switching applications at frequencies up to 5 kHz .The L293D is assembled in a 16 lead plastic package which has 4 centre pins connected together and used for heat sinking The L293DD is assembled in a 20 lead surface mount which has 8 centre pins connected together and used for heat sinking.

Connection of l293d with the 12v dc motor is shown in figure below

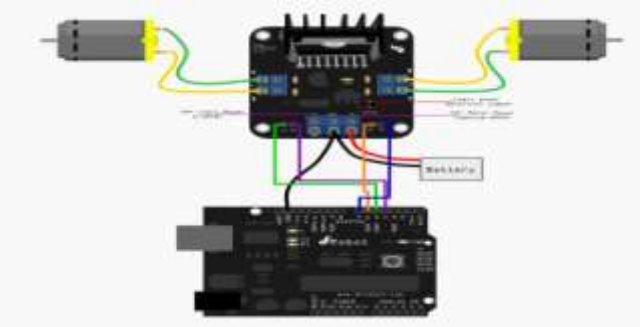

Fig-5: connection of L293D with motor & Arduino

3.1.3 IR Sensors

An Infrared sensor as shown in figure is a sensor which is able to detect the presence of nearby objects without any physical contact

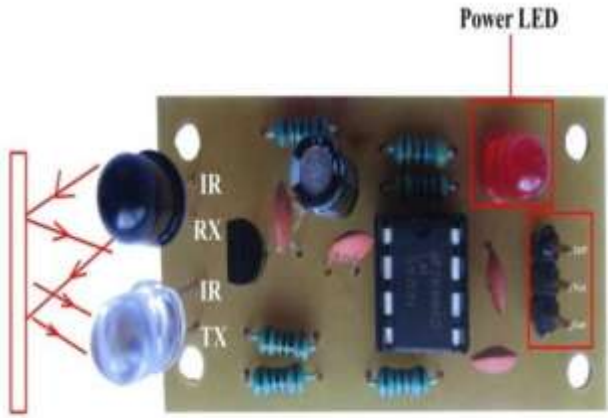

Fig-6: IR Sensor module

An Infrared sensor emits an infrared signal or a beam of electromagnetic radiation (infrared), and looks for changes in the field or return signal. The object being sensed is often referred to as the Infrared sensors target. Different Infrared sensor targets demand different sensors. For example, a capacitive or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target. The maximum distance that this sensor can detect is defined "nominal range". Some sensors have adjustments of the nominal range or means to report a graduated detection distance. Infrared sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object. Infrared sensors are commonly used on smartphones to detect (and skip) accidental touch screen taps when held to the ear during a call.

3.1.4 Display

Fig-7: LCD display

The system uses 2-line, 16 character LCD display as shown in figure 3. It has 4 bit interface. It is relatively easy to use once you have it mapped into your processor' s memory-mapped I/O. Then characters need to send to display, they show it up on the screen.

3.1.5 Rotary pump

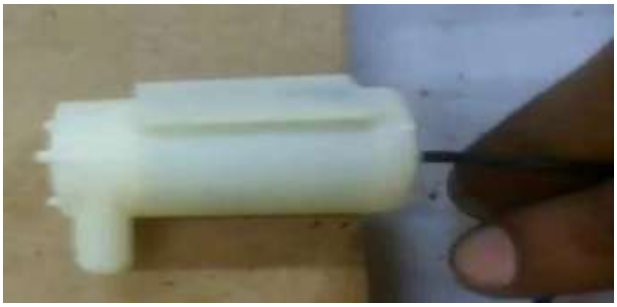

Fig-8: Rotary pump

A Rotary operated pump arrangement as shown in figure uses a rotary pump arrangement to provide a fixed volume of liquid to flow into the bottle according to time based on user input. Rotary pump According to user input the time is calculated to fill varying volumes of bottles.

3.1.6 DC Motor

Fig-9: DC motor

A DC motor is an essential part in the conveyor system. A motor is a rotary mover that allows for precise control of angular position, velocity and acceleration. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with motors. DC motors are a specific class of motor although the term motor is often used to refer to a motor suitable for use in a closed-loop control system. Dc motors are used in applications such as robotics, CNC machinery or automated manufacturing operations.

4. Working of bottle filling system

In Automated bottle filling system, the whole process of filling must be completed without human interference. This is achieved by following flow chart in figure 9.In this system, when start button is pushed, the motor starts running which gives translational motion to the conveyor belt.
When the start button is pushed the display shows the messages of " ENTER VOLUME TO BE FILLED" and " ENTER BATCH QUANTITY" . Once the user enters the values, the values are fed into the system and the volume is converted to the time delay of the pump. As soon as the user enters the values ,the conveyor is turned on and the bottles move on the conveyor. Once the bottle reaches the infrared sensor , it senses the bottles and gives feedback to arduino . The pump gets turned on and the bottles are filled. The process is then repeated for particular batch.

5. Advantages

Reduce production cost
Increased accuracy
Improved quality and reliability
Better floor space utilization
Reduce waste
Reduced human error
Increased safety
Higher volume production

6. Disadvantages

Less versatility
More pollution
Large initial investment
Increased unemployment
Unpredictable cost

7. Results

The project was completed successfully and the system worked properly without fail. The authority verified the result of the working of Automatic Bottle Filling System

8. Conclusions

The automated bottle filling system using pump filling concept was successfully implemented and studied. Various observations were taken which closely resembled the actual volume to be filled. The reason for deviations of the readings are studied accordingly. The automated bottle filling system was beneficial in reducing work, time and cost of filling. The fabricated model of Automated bottle filling system can be used where high precision is not necessary and time limits not bound. Hence it must be used application specific and must not be used in places where faster and more accurate methods of filling are available. The main objective of this project is to develop an automatic bottle filling machine based on certain specification.Lot of additional features like user defined volume specification etc. Can be added to this system depending on the size, shape and weight of the bottle. Filling and capping operations can be implemented to this by using a piston arrangement.

9. References

[1] Asutkar, Sachin More(2013), " Automated bottle filling using microcontroller volume correction" , International journal of engineering research and technology (IJERT). (vol 2, Issue 3, march-2013).

[2] Rajesh G. Khatod, Chandrashekhar Sakhale(2012), " Design & Fabrication of liquid dispensing machine using automatic control for engg. Industry" , International journal of innovative technology and exploring engineering (IJITEE). (Vol I, Issue 5, October 2012).

[3] A.S.C.S. Sastry, K.N.H. Srinivas(2010), " An automated microcontroller based liquid mixing system" , International journal on computer science and engineering. (Volume II, Issue 8, August 2010).

[4] T. kalaiselvi, R. Praveena(2012), " plc based automatic bottle filling and capping system with user defined volume selection" , International journal of emerging technology and advanced engineering. (Vol 2, Issue 8, August2012).

[5] http://winkitindia.com