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Two Head Semi-Automatic Volumetric Bottle Filling & Pneumatic Crimping Machine

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Abstract - *Today the use of robotics has boosted the production rate of Industries which technically increases the initial cost of machines, which are not preferable for small scale Industries. Currently automation is taking on the manual operations that are being carried out in the industries. So we are manufacturing a machine which will not be fully automated and which will satisfy both initial cost and production rate for the small scale industries. At present, there is no such semi-automatic machine which has two heads and which will fill & crimp the bottle simultaneously. The aim of the project is to introduce crimping and bottle filling operation on same machine. The expensive PLC boards that are used in large scale bottle filling industries are replaced by ARDUINO UNO board which is much cheaper than PLC's. For crimping the filled bottle, pneumatic operation is used.*

Key Words: **Solenoid valve, Pneumatic cylinder, Fluid pump, Stepper motor, Collet**

1. INTRODUCTION

Liquid filling machine is a machine that is specially developed in order to fill liquid products such as shampoo, lotions, perfumes, oils (motor oil, and cooking oil), etc. Liquid filling machine is majorly used for filling free flowing liquids. Liquid filling machine also known as liquid filler and liquid dispenser which is suitable to fill 20ml to 5000ml of any liquid in bottles, cans, jars, tubs. Desired speed can be achieved by liquid filling machine by adding filling heads.

Crimping operation is done with the help of pneumatic system. We provide an extensive range of 2 Head Filling Machine, which is high in performance, low on maintenance and of optimum quality. In these machines, the bottles are placed below the filling heads and the head will fill the bottle in accordance with the preset level. When the preset level is filled then the head will stop filling and the operator can do the required operations like manually placement of caps, brushes & labels.

All the operations are done on the round disc conveyor by the operator and almost finished product is obtained. Then the bottle face is closed with cap and sent for packaging. Stepper motor is used for round disc conveyor. It is used for 90 degree rotational (four stations) stop for the operator to carry out his work.

1. WORKING PRINCIPLE

1.1 Bottle Filling

The required components for bottle filling are Arduino, relay, bread board, solenoid valve, fluid pump, wires, nozzles and pipe. The power supply to the arduino is given by a mobile charger adaptor. The connections from arduino are given to the bread board and then to the relay .

The relay acts as an electric switch which takes command from the arduino. The connections are made with the help of the wires.

The fluid pump is used to pump the fluid from the fluid tank to the input of the solenoid valve. A solenoid valve is an electromechanically worked valve. The valve is controlled by an electric current through a solenoid. Their undertakings are to stop, discharge, and measurements, disperse or blend liquids. Solenoids offer quick and safe exchanging, high unwavering quality, long administration life, low control power and minimal plan. The solenoid valve acts as a control valve for the fluid flow through it. The solenoid is controlled by the arduino in which the timer is set for filling the fluid in bottle through programming of arduino. The solenoid valve is then closed after filling the bottle to the required level.

Fig -1: Solenoid valve

1.2 Pneumatic crimping

The required components for pneumatic crimping are pneumatic cylinder, air compressor, crimping tool (collet), control valves, etc. The force required for crimping the cap of bottle is generated by compressor which generates compressed air which in turn applies the force on the crimping tool (collet) to crimp the cap.

Fig-2 -: Crimping collet

1.3 Round Conveyor

There is a nylon round disc which is couped to a stepper motor. There are four station on the disc. There has a specific working operation. So the disc should stop rotating so some interval at this station. As per ergonomics time required for pressing a switch is 10 sec and for doing other operation such time are consider. These all factors are consider while timing the ardunio coding.

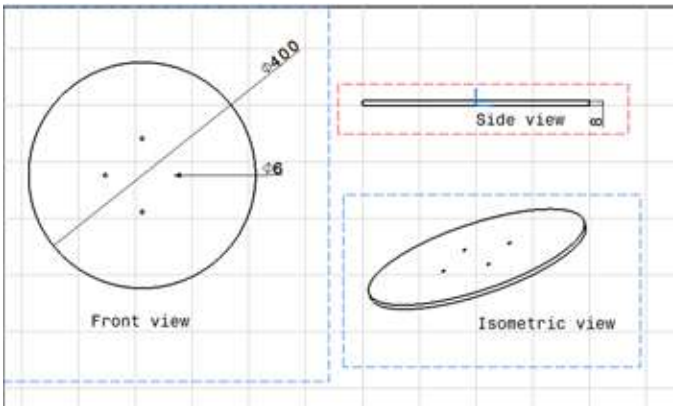

Fig-3 -: Rotating Disc

2. Flow chart

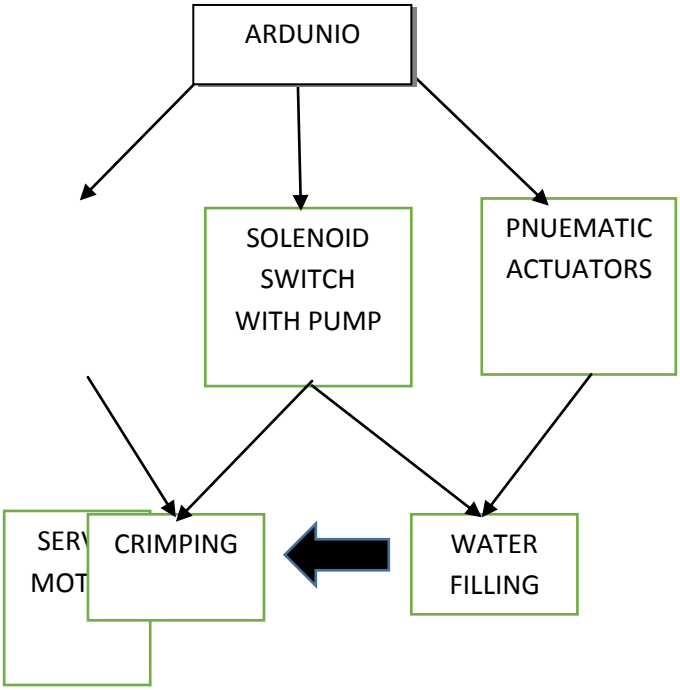

Chart -1: Flow chart

3. RESULT

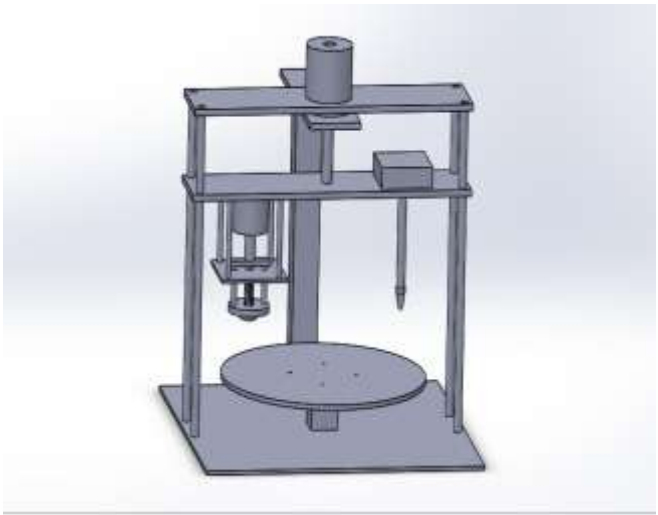

Fig-4 -: Final Product

4. CONCLUSIONS

PLC's are replaced by Arduino for controlling operation. As two different work operation machines are combined with each other so there will be less consumption of area. Only single operator is required for obtaining the finished product.

- Increase the productivity to a large extent.
- Time Reduction.
- Saving of Energy & Resources.
- System can perform the task of autonomous quality control system.
- Cost of machine installation is cheap.
- Maintenance is low than fully automated machine.

5. FUTURE SCOPE

The machine will be useful for household traders and for small scale industries which have less economical backup. No skilled labour is required for carrying out the operator's work on the machine. The machine is user friendly for any operator who works on it. Precised crimping can be obtained for the bottle cap. Less area consumption of the machine is also an important factor for use in all the industries.

- Packing of dairy products
- Beverage bottles
- Perfume bottles
- Cans, jars, food product filling

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REFERENCES

➢ Tunggal, D. (2011). Review on modeling and controller design in pneumatic actuator control system. International Journal on Smart Sensing and Intelligent Systems, 4, 4.

➢ Bolzoni, Metal., n.d. Filling Systems in the Beverages Industry. [Online] Available at: http://www.ocme.it/adm/Media/gallery/Level_filler_en.pdf [Accessed 13 June 2016].

➢ Chamboko, T. & Mwakiwa, E., 2016. A review of smallholder dairy development in Zimbabwe 1983 to 2013: the effect of policies. Livestock Research for Rural Development, Volume 28.

➢ M. Shirgaokar, G. Ngaile, T. Altan, Stress Analysis and Evaluation of a Bullet Crimping Process of an LW30 Round Report No. ERC/NSM-01-31-B, 2002.

➢ S. Jayaraman, G.T. Hahn, W.C. Oliver, C.A. Rubin, P.C. Bastias, Determination of monotonic stress–strain curve of hard materials from ultra-low-load indentation tests, Int. J. Solid Struct. 35 (1998) 364–382.