IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PLC-Based Automatic Stamping System

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Abstract: This paper represents the design project of the application of a stamping process. The stamping mechanism is controlled by PLC hence it can be implemented in small scale as well as big industries for faster operation and less labour requirement. Automatic stamping of object has received significant attention because automatic stamping is reliable and reproducible**.** This system uses Allen Bradley PLC, an integrated PLC with uploaded Ladder Logic Programming using Studio 5000 to control multiple machine operation for product sorting. Multiple machine operation of product includes Conveyor, start push button, stop push button, solenoid actuator, Inductive sensor. This current trend of stamping problems has made the small scale enterprises to lose large number of market share to the large scale manufacturing outfits. The need to make stamping process affordable, using easy to maintain machines and also complying to rood regulatory bodies necessitated the need for this work.

I. INTRODUCTION

Conventional method for object stamping is manual, it is very time consuming and in non-automatic form. Continuous stamping or printing results in hand fatigue requires lots of efforts and also affects the accuracy to result so the manual method must be replaced by PLC Automation. Automatic stamping of object has received significant attention because automatic stamping is reliable and reproducible. This not only reduce manual effort but also gives more time for marketing also prevent danger which might occur when human being works in hazardous environment. Automation greatly improves the profit and productivity, it is very scalable.

By using automatic stamping machine, it is easy to print the logo, name, sticker on blank paper, metal and leather. Hence to attempt this needs fabrication of automatic stamping machine is needed. Although paper is the most common material, it is also frequently done on metals, plastics, cloth and composite materials. On paper it is usually carried out as a large-scale industrial process and is a needful part of stamping. Automation can be defined as the "technology concerned with application of mechanical, electronic and computer-based systems to operate and control production". There are many reasons for automating the process. The reason may be to reduce manufacturing lead time, to increase labour productivity or to improve the worker safety, etc.

II. RESEARCH METHODOLOGY

The main components of Automatic Stamping Machine are **PLC I/O** which is the part of the PLC that connects the brain of the PLC, the CPU, to the outside world, the machines. In a PLC system there will usually be dedicated modules for inputs and dedicated modules for outputs. An input module detects the status of input signals such as pushbuttons, switches, proximity sensors, etc. to integrate the functioning Product Stamping.

2.1 Design

2.1.1 Components

PLC (Allen Bradley Compact Logix L24ER), Conveyor, Inductive sensor, Solenoid, Push Button.

2.1.2 Block Diagram

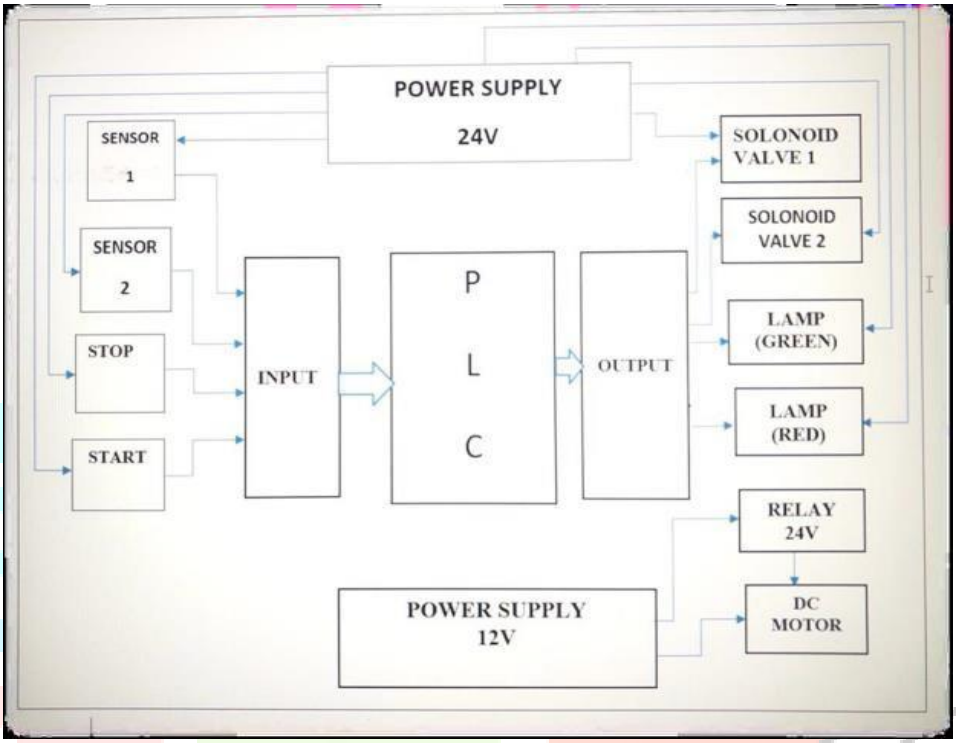

Fig. Block Diagram

A push-button or simply button is a simple switch mechanism for controlling some aspects of machine or a process. A push button is a momentary or non-latching switch which causes a temporary change in the state of an electrical circuit only while the switches physically actuated. An automatic mechanism (i.e., a spring) returns the switch to its default position immediately afterwards, restoring the initial circuit condition.

A Inductive Proximity sensor is an equipment used to discover the distance, absence, or presence of an object by using a light transmitter, often infrared, and a receiver. They are largely used in industrial manufacturing. An object is sensed when the object is passed through conveyor infront of proximity sensor. Automatic Stamping Systems are commonly used on equipment in industrial manufacturing and process control environments to provide visual and audible indicators of a machine's status to machine operators, technicians, production managers and factory personnel.

It is a form of andon - systems in manufacturing which identify errors as they happen. A Direct Current (DC) motor is a rotating electrical device that converts direct current, of electrical energy, into mechanical energy. An Inductor (coil) inside the DC motor produces a magnetic field that creates rotary motion as DC voltage is applied to its terminal. 12v operated DC solenoid valves are electromechanical device that control the position of Self inked Stamp. Solenoid form auxiliary air circuits Relay is an electrical switch that control (switch on & off) a high voltage circuit using a low voltage source. A relay completely isolates the low voltage circuit from the high voltage circuit.

2.2 PLC Programming

Studio 5000 is a highly accessible programming software application for Allen Bradley programmable logic controllers (PLC). With its modular editing interface, Studio 5000 integrates hardware configuration, network configuration, and motion control programming into the same editing platform. Our current implementation is based upon the software building for the project model. As mentioned initially, we are using Studio 5000 (V33.0) software for implementing the PLC ladder logic. The logic we have built is compiled error free in the software atmosphere.

Inputs of the Ladder Logic:

1) I0.0 - cycle_start_pb
2) I0.1 - proxy1
3) I0.2 - proxy2
4) I0.3 - cycle_stop_pb

Output of the Ladder Logic:

1) O0.0 - conveyor _start
2) O0.1 - cycle_on_lamp
3) O0.2 - pusher_1
4) O0.3 - pusher_2
5) O0.4 - cycle_stop_lamp

III. RESULTS AND DISCUSSION

Analysis includes the performance of the device with various inputs and by using different topologies applying to the device. The Allen Bradley PLC requires an Ethernet Cable in order to upload the respective ladder logic. In our performance testing, we placed several objects; the system was successfully stamping the objects based on the ladder logic.
The object placed on the conveyor belt is sensed by inductive sensor located under the belt and thus stamped as a finalized product. As soon as the product is sensed after a delay of 8ms, it will be forwarded into the corresponding box. The same operation is carried out in the above ladder logic.

IV. APPLICATIONS

It is very useful to Pharmaceutical industry to pack and stamped ready product boxes, We can use this in all types of Packaging industry, Can use all types of manufacturing plants such as Beauty products, food products, electronic goods etc. By using this system Industries can increase their production. We can use this in Steal Manufacturing Plants to fulfil our daily product requirement.

V. CONCLUSION

In this paper we conclude that “Automatic stamping machine using PLC” It is the reliable printing mechanism this replaces traditional hand stamping on any object. The general purpose of the present invention, which will be described subsequently in greater details, is to provide a portable automatic stamping system which has many advantages of the low power consumption effective performance and many specified features of the system.

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