Automatic Pneumatic Stamping and Counting Machine

Azhar Hussain [1] Rakshak Choudhary[2] Sushil Khatri[3] C. G. Nalawade[4]
[1,2,3]B. E. Student [4]Assistant Professor
[1,2,3,4]Department of Mechanical Engineering
[1,2,3,4]NBN Sinhgad School of Engineering, Pune, India

Abstract— The pneumatic system has gained a large amount of importance in last few decades. This importance is due to its accuracy and cost. It can be operated easily with semi-skilled operator's .This convenience in operating the pneumatic system has made us to design and fabricate this unit which is operated by pneumatics as our project. The project is further elaborated to the function of pneumatics with their behavior in several aspects. This machine has an advantage of working even at low pressures, that is even pressure of 6 bars is enough for the operation. The pressurized air passing through the cylinder, forces the piston out whose power through linkages is transmitted to the work piece. The work piece thus got it for the required dimensions and the impression is made on it. The stamping machine uses a mechanism of quick retrieval done by acting of pressurized air inside of it. The operation of the compressed air is done by using a solenoid valves. This project also elaborates about the other applications just by changing its arm.

Key words: Electrolysis, Hydrogen, Water Gas, Gasified System

I. INTRODUCTION

Few decades ago, the brand name was not of utter importance in the business sector. With time the brand value has eloped to a higher importance in brand goodwill. With course of time, pneumatic systems have gained importance across wide industrial perspective. Pneumatic stamping helps to emboss the brand name efficiently with time constraints, cost and mechanical automation. It helps to make the process more feasible and flexible from manufacturing point of view

With the modernisation in the 21st century, the number of products developed has increased magnanimously. Due to which it has become very tedious and hectic task to put on brand name manually over such vast production lines. Pneumatic stamping is a process through which the above objective is achieved with lesser time, cost and efficiency as compared to the manual set ups. With the usage of microcontroller and electrical set up, a logo stamp is pneumatically compressed over the rolled on product. most of them are time consuming or cost variant. Hence with the use of pneumatic system, we focus on increasing the speed and cost factor of the process.

Automatic pneumatic stamping machine consists of following component's which are helpful for the effective functioning:
- dc motor
- belt
- IR sensor
- microcontroller
- compressor
- actuator
- counter sensor
- LCD
- battery

II. MANUSCRIPTS

A. Components and Specifications

1) Dc Motor

A dc motor is an electrical machine that converts direct current electrical power into mechanical power. Most type produce rotatory motion; linear motor directly produces force and motion in a straight line.
- 50-100 RPM
- 12V DC motors
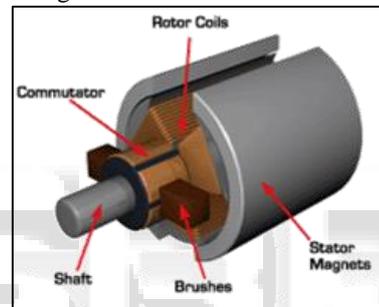- 6mm shaft diameter with internal hole
- 125gm weight.

Fig. 1: functioning of dc motor

2) Conveyor Belt

A continuous moving band of fabric, rubber, metal used for transportation of objects from one place to another.
- Thickness- 0.2cm
- length – 115cm
- Type of material used- nylon, waste rubber tyre tube

3) Battery/Transformer

The circuit consisting of a step-down transformer, rectifier, voltage regulator IC (7805) and some capacitors, used for filtering purpose.

The step-down converters are used for converting the high voltage into low voltage.
- Output voltage- 12 v
- Weight 44gms

4) IR Sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings.

An IR sensor can measure the heat of an object as well as detects the motion.

These type of sensors measure only infrared radiations, rather than emitting it, that is known as a passive IR sensor.

IR Obstacle Line Proximity Fire Colour Sensor fire detection, line sensing

Range of around 25 cm, Input Voltage: 5V DC

Fig. 2: showing IR sensor and diodes

5) Microcontroller

Arduino is an open source project that creates microcontroller based kits for building digital devices and interactive objects that can sense and control physical devices.

These systems provide sets of digital and analog outputs, pins that can interface to various expansion boards and other circuits.

‐ Arduino ATmega328P
‐ Digital I/O Pins: 14 (of which 6 provide PWM output)
‐ Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader.
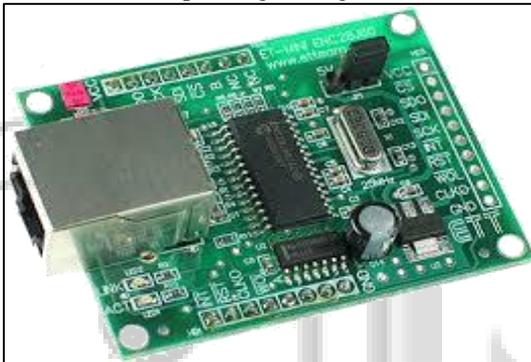‐ SRAM: 2 KB (Operating Voltage 5V)

Fig. 3: shows microcontroller arduino

6) Compressor

A mini air compressor is a very valuable compressor tool to have on hand.

There are plenty of uses of mini air compressor that can save a lot of time and manual labour.

It can be simply powered through a lighter in your vehicle with the long cord plug, it is incredible versatile and life saver in some instances.

Following are the specifications used:-
‐ 2L water bottle
‐ 15-20 psi
‐ presta valve
‐ Check valve

Fig. 4: Shows the compressor

7) Actuator

A components of machines that is responsible for moving or controlling a mechanism or system.

An actuator requires a control signal and a source of energy

The control signal is relatively low energy, may be electric voltage or current, pneumatic or hydraulic pressure or human power.

‐ Input voltage -240 v
‐ Max. load- 5 kg
‐ Max speed -230mm/sec

Fig. 5: Shows the actuator and the piston

8) Dye and Ink Used

Dye used in the stamping process is made up of rubber material. Specifically the dye is self-inked due to the reason of cost efficiency. In this mechanism, a flipper is introduced between the dye surface and the ink. Due to which instant applying of ink takes place. In the process, as dye starts moving back to its origin, the flipper flips off the upward force which in change inks the pad for the following stamping occurrence.

B. Coding of the microcontroller

As the cylinder is connected to solenoids and there-after to the compressor to run it as a automatic machine a controller is needed which is to be programmed. The controller is shown in below figure.

The coding that had executed for the controller board is written below

1) Code

```
int void()
solenoid 1 = 11
solenoid 2 = 12
compressor = 13
set up
pinMode (solenoid1, OUTPUT);
pinMode(solenoid2,INPUT);
{
digitalWrite(compressor, HIGH)
digitalWrite(solenoid1,HIGH)
delay(4000);
digitalWrite(compressor,LOW)
digitalWrite(solenoid1,LOW)
delay(3000);
digitalWrite(compressor, HIGH)
digitalWrite(solenoid2,HIGH)
delay(4000);
digitalWrite(compressor, LOW)
digitalWrite(solenoid 2, LOW)
delay(3000);
}
```

After preparing the code dump it in to micro controller using a USB. Here we are connecting controller to a relay so that the controller can be able to amplify its voltage and make the components to run

C. Assembly of the components

Before assembling of components and materials the layout should be planned for the placing of components on the wooden sheet as we are using wooden sheet as our basement.

Fig. 6: Shows the layout of the plan

After planning of the layout on a wooden sheet the components should be placed in their desired locations. The placements should be planned in such a way that there should be any over occupying of one component over another. The marked wooden sheet should be fixed to cast iron frame by drilling the holes in to the wooden sheet by proper measurement and then fix it by using bolts and nuts.

Components should be placed in their particular location where they are marked and drilled to the wooden sheet. Where we should prepare another cabin on the upper side to place the cylinder part.
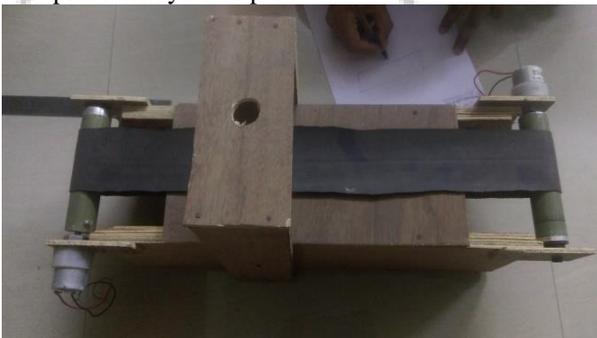

Fig. 7: show the wooden platform

After the components like compressor, transformer, solenoid valves and controller board should be placed. Compressor capacity of air withdrawing is checked by connecting compressor to the cylinder

Fig. 8: Shows the complete set-up of the model

D. Methodology

- Provide primary source of power using a 12v battery or a 230v AC transformer to the microcontroller (arduino), DC motor, LCD and actuator.

- As the DC motors start rotating in similar formations so as the belt, place the product at one end which is to be stamped.
- The IR1 sensor detects the good mid-way, sends signal to the microcontroller.
- Microcontroller detects the change and stops the DC motor. After this it sends signal to the pneumatic compressor.
- The gas filled air bottle compressor sends the signal to the actuator mounted next to it.
- Receiving the signal actuator piston moves in downward direction to press the stamp against the product.
- The actuator piston stays in the same position for some fixed relay time and pushes back to initial position
- Start the DC motor again in similar formation.
- IR2 detects the product which has been stamped at the other end of the conveyor belt, sends signal to counter.
- Arduino receives the IR2 signal and increments its counter value by 1 and displays on LCD.
- The above procedure continues in the same way for repetitive stamping.

E. Future Scope

The process and the work is done in the initial stages up to fabrication process and testing its performance on various materials and calculating its efficiency and characteristics. Its applications are also limited to stamping and punching with regarding to its die's and efficiency. Any further extension of this project will be heading in increasing its range of applications with improvement in its performance. Also there is a chance of improvement in the field of cost variant factor, energy efficiency factor, time consumption factor, human labor factor. The process can be made more environment friendly and less noise producing Also some flexibility can be provided towards the die manufacturing and usage section

III. CONCLUSIONS

The general purpose of the present invention, which will be described subsequently in greater details, is to provide a portable automatic pneumatic stamping machine It has many advantages of the low power consumption and effective performance and many specified features of the system, which is not anticipated The further objective of the system is, this is susceptible of a low cost of manufacturing with regards to both cost and labor, and which accordingly is then susceptible of low prices of sale to the public. thereby making such automatic stamping machine are very economically to available to the public.

REFERENCES

[1] Introduction To Hydraulics And Pneumatics By S.Iiango, V. Soundaranjanphi Learning Pvt. Ltd., 2011.

[2] Hydraulic And Pneumatic Controls By K. Shanmu-Gasundarams. Chand Limited, 2006.

[3] Hydraulics And Pneumatics By Andrew Parr, Butter-Worth- Heinemann, 1999

[4] The 8051 Microcontroller And Embedded Systems By Muhammad Ali Mazida, Janice Gllipscemazida, Rolin D. Mckinlaypearson Publications.

[5] Basic Electrical Engineering By Dc Kulshreshtha; Mcgraw-Hill Education, 2011.

[6] Www.Janaics.Com, Provided About The Required In-Formation About The Equipments To Be Preferable For The Machine.

[7] www.Fesco.Com, Provided Information About The Prices Of The Equipments Of The Stamping Machine.

[8] B.Raju Student, Dept Of Mechanical Engineering, Vits College Of Engineering, Sontyam, Anandapuram, Vizag.

[9] Marion Merklein, Michael Wieland* Institute Of Manufacturing Technology, Egerlandstraße 13, Erlangen D-91058, Germany

[10] Arun S, Shri Rajendra And Vijayvithya Bhongale, Iosr Journal Of Mechanical And Civil Engineering- Chennai

[11] Wang Wu-Rong, Chen Guan Long *Institute Of Advanced Research, Zuonzou China-

[12] Hacci Saglam, Faruk Unsacar, Hakan Isik Au J.T. 13(2): 128-133 (Oct 2009)