

PNEUMATIC STAMPING MACHINE

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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 operators. 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. 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. The general purpose of the present invention, which will be described subsequently in greater details, is to provide a portable automatic pneumatic stamping machine which 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, so thereby making such automatic stamping machine are very economically to available to the public

Keyword: - Pneumatic, Manual, Stamping, Different Operation

1. INTRODUCTION

1.1 Pneumatic Systems:

Though most of us do not realize it, we are surrounded by systems based on pneumatics. Below are some examples.

1. Air brakes on buses and trucks are formally known as compressed air brake systems. These systems use a type of friction brake in which compressed air presses on a piston, and then applies the pressure to the brake pad that stops the vehicle.
2. Exercise machines can be built on pneumatic systems. A pneumatic cylinder creates resistance that can be adjusted with air pressure.
3. Compressed-air engines, also called pneumatic motors, do mechanical work by expanding compressed air. Usually the compressed air is converted to mechanical action by rotary or linear motion.

1.2 CONCEPT

1. The idea behind the project is to create a pneumatic stamping machine at a very low cost.
2. For branding or stamping, logos is needed and identification of product.
3. Create impressions on sheet metals for small thickness.
4. It can create impression on papers

2. ACTUAL PROJECT DIAGRAM

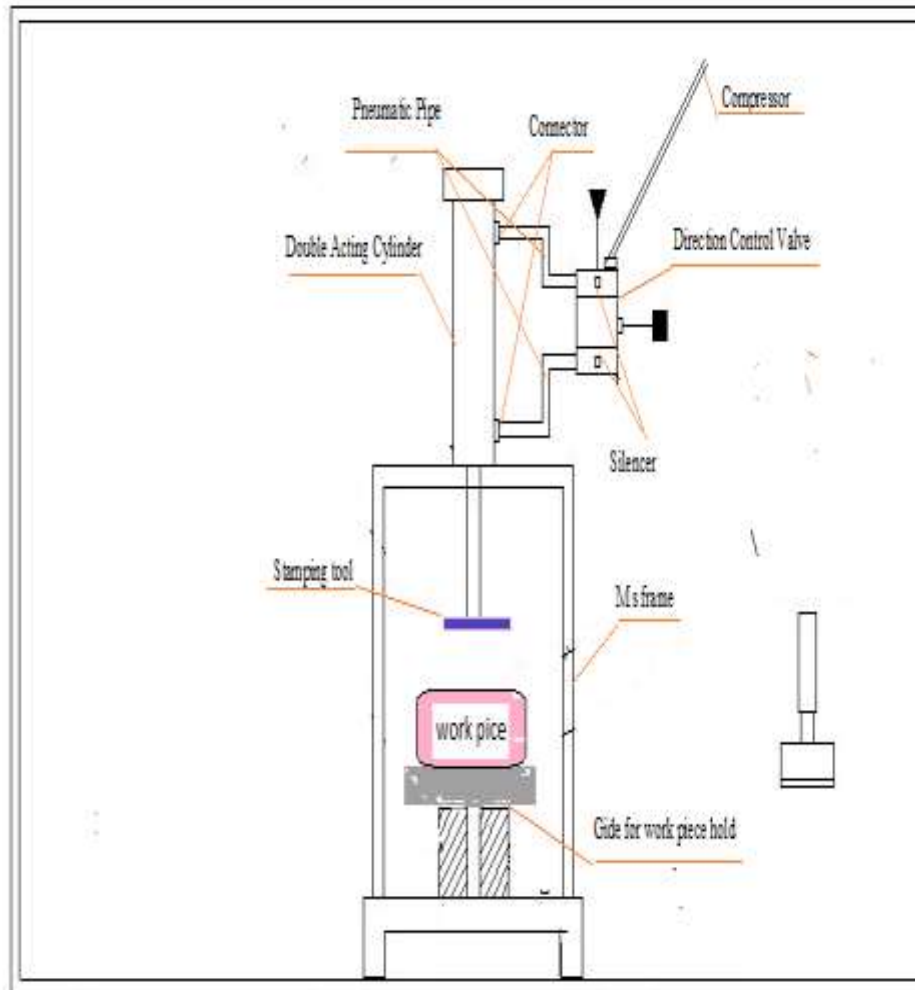


Fig -1: Actual Project Diagram

2.1 WORKING

1. When the power supply is ON, the compressor starts working the air is filtered and the air is passed to compressor.
2. The compressed air is passed through pipe to the double acting cylinder at a required amount of pressure
3. Through double acting cylinder valve the piston is actuated up or down motion on work piece the operation is carried out.
4. For different operations the time required is different ex. cutting, embossing, punching and stamping operations.
5. Based on the hand motion the valve is reversed and air passing to the cylinder valves which will be making the piston to reciprocate up the cylinder is a double acting cylinder.

3.DESIGN PARAMETERS STATEMENT FOR DESIGN:-

The Pneumatic stamping machine is to be designed to operate at the maximum pressure of 10 bar and the lever operating force required is 150N, with the operating temperature of 2000 C. Cylinder Sizing Calculator The air cylinder sizing calculator below performs the following steps:

Calculate the area of the cylinder piston Area = $\pi \times r^2$. Multiply the piston area by the air pressure to be used Area x Pressure = Force Output

Note: The force output on the rod end of a cylinder will be slightly less due to the displacement of the rod. The real force output of a cylinder will be less than the theoretical output because of internal friction and external side loading. It is best to use a cylinder that will generate from 25Material: Al. fs= 210kg/cm²Bolt material: M.S. ft = 280 kg/cm²Design a cylinder of internal diameter for Di=8 cm, Internal air pressure P= 25 kg/cm Max. Ft=210kg/cm and max. fib= 280 kg/cm.

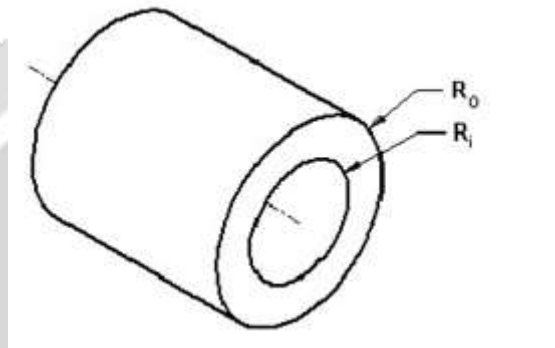


Fig:-2 Cylinder dimensions

For safety purpose we will design the cylinder using factor of safety as Therefore

$$t = 4 \times 0.2 = 0.8 \text{ cm}$$

To find the outer diameter of the cylinder,

$$\text{Outer diameter } D_o = D_i + 2(t) = 40\text{mm Width}$$

In side diameter of cylinder, $D_i = D_o - (2 \times \text{width of packing})$

$$= 40 - (2 \times 2.5) = 40 - 5 = 35 \text{ mm}$$

$$D_o = 40 \text{ mm}$$

$$D_i = 35 \text{ mm}$$

Maximum presser 10kgf/cm² = 145 psi

PRESSURE MEASUREMENT

$$1 \text{ Bar} = 100\text{Kpa} = 100\text{KNm}^{-2} = 145 \text{ PSI}$$

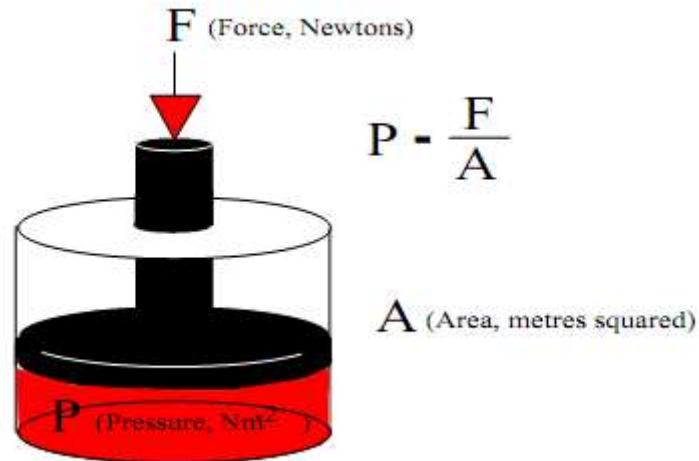


Fig-3 Punching parameter

Equation: $P = F/A$

$$P = 10 \text{ bar} = 1.01 \text{ N/mm}^2$$

Diameter of piston = $d = 40\text{mm}$

$$A = (3.14 / 4) * (d * d)$$

$$= (3.14 / 4) * (40 * 40)$$

$$= 1256 \text{ mm}^2$$

$$P = F / A$$

$$1.01 = F / 1963$$

$$F = 1250 \text{ N}$$

$$F = 125 \text{ Kg.}$$

So, we have selected pneumatic cylinder move 125 Kg. Of force at 10 bar pressure.

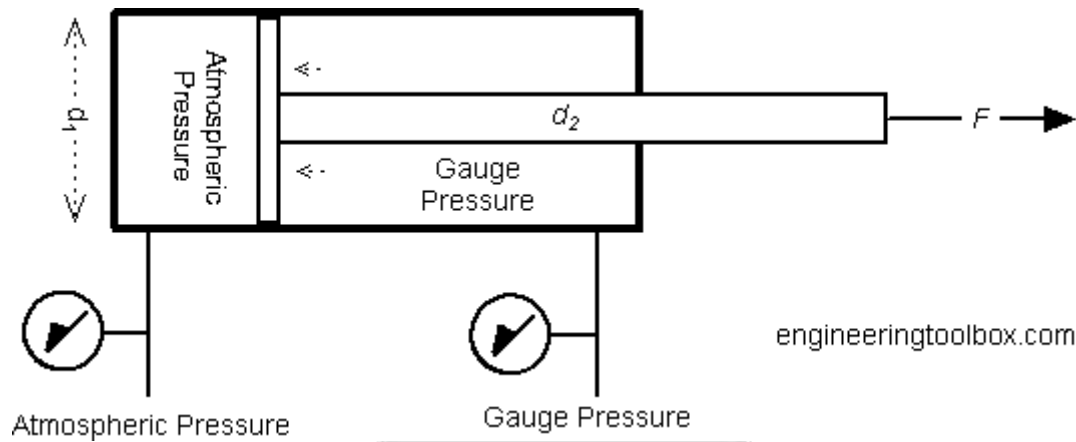


Fig-4 Double acting cylinder

The force exerted by double acting pneumatic cylinder on outstroke can be expressed as . The force exerted on in stroke can be expressed as

$$F = p \pi (d_1^2 - d_2^2) / 4$$

$$F = 11.8 \text{ N}$$

Where

F = [force](#) exerted (N)

p = gauge pressure (Pressure (kPa) 1 bar = 100 kpa)

d = full bore piston diameter (m)

d₁ = full bore piston diameter (m)

Force output stroke 11.8 N

4. ADVANTAGES

Pneumatic control systems are widely used in our society, especially in the industrial sectors for the driving of automatic machines. Pneumatic systems have a lot of advantages:-

A) Simple design

1. The designs of pneumatic components are relatively simple.
2. They are thus more suitable for use in simple automatic control systems.

B) High adaptability to harsh environment

1. Compared to the elements of other systems, compressed air is less affected by high
2. Temperature, dust, corrosion, etc.

C) Safety

1. Pneumatic systems are safer than electromotive systems because they can work in inflammable environment without causing fire or explosion.
2. Apart from that ,overloading in pneumatic system will only lead to sliding or cessation of operation.
3. Unlike electromotive components, pneumatic components do not burn or get overheated when overloaded.

D) Environmental friendly

- 1) The operation of pneumatic systems does not produce pollutants.
- 2) The air released is also processed in special ways.
- 3) Therefore, pneumatic systems can work in environments that demand high level of cleanliness. One example is the production lines of integrated circuits.

E) Economical

1. As pneumatic components are not expensive, the costs of pneumatic systems are quite low. Moreover, as pneumatic systems are very durable, the cost of repair is significantly lower than that of other systems

F) High effectiveness

1. Many factories have equipped their production lines with compressed air supplies and movable compressors.
2. There is an unlimited supply of air in our atmosphere to produce compressed air.
3. Moreover, the use of compressed air is not restricted by distance, as it can easily be transported through pipes.
4. After use, compressed air can be released directly into the atmosphere without the need of processing.

G) High durability and reliability

1. Pneumatic components are extremely durable and cannot be damaged easily.
2. Compared to electromotive components, pneumatic components are more durable and reliable.

5. DISADVANTAGES

Although pneumatic systems possess a lot of advantages, they are also subject to many limitations.

A. Relatively low accuracy

1. As pneumatic systems are powered by the force provided by compressed air, their operation is subject to the volume of the compressed air.
2. As the volume of air may change when compressed or heated, the supply of air to the system may not be accurate, causing a decrease in the overall accuracy of the system.

B. Low loading

1. As the cylinders of pneumatic components are not very large, a pneumatic system cannot drive loads that are too heavy.

C. Processing required before use

1. Compressed air must be processed before use to ensure the absence of water vapour or dust.

2. Otherwise, the moving parts of the pneumatic components may wear out quickly due to friction.

D. Uneven moving speed

1. As air can easily be compressed, the moving speeds of the pistons are relatively uneven.

E. Noise

1. Noise will be produced when compressed air is released from the pneumatic components.

6. APPLICATIONS:

Automatic pneumatic stamping machine has various applications by which some may not be applied now but in further extension of this, the main application of this machine is stamping.

- 1) Creating impression on metal sheets with small thickness.
- 2) It can also be used as a punching machine as its pressure range is sufficient for it.
- 3) It can create impression on paper and also on low ductile materials.
- 4) In further extension it can also be used a sheet bending machine.

7. CONCLUSION

The general purpose of the present invention, which will be described subsequently in greater details, is to provide a portable automatic pneumatic stamping machine which has many advantages of the low power consumption and effective performance and many specified features of the system, which is not anticipated. 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, so thereby making such automatic stamping machine are very economically to available to the public.

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