

Design and Fabrication of Pneumatic Sheet Metal Cutting Machine-A Review

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ABSTRACT- Normally the sheet metal cutting machine is manually hand operated for medium and small scale industries. This paper gives an insight about the automatic sheet metal cutting machine. Any automatic machine aimed for economical use of man. In this paper, pneumatic cylinder is used for cutting in easy way which can be use in small scale industries at lower cost. The sheet metal cutting machine works with the help of pneumatic double acting cylinder. The piston is connected to the moving cutting tool which is used to cut the sheet metal. The cutting process is operated by a direction control valve by using compressor. In manual method sheet metals goes to the scrap sometime because of wrong dimensions, improper cutting etc. Hydraulic machines are also used for sheet metal cutting. But this machines are used for heavy metal cutting and its cost is very high. Hence, we are using a pneumatic system for sheet metal cutting in a easy manner. The main advantage of pneumatic sheet metal cutting machine is to improve product quality, repetition of work and increasing production rate.

Key words- Pneumatic Cylinder, Control Valve, Compressor, Sheet Metal.

INTRODUCTION

The sheet cutting machine is the heart of sheet metal industries. In some industries, hand sheet cutter is used which is operated manually. In these machine, we are using pneumatic cylinder for sheet metal cutting. These machine should be easy to operate and maintain also. Hence, we are introducing a pneumatic sheet metal cutting machine which will reduce manufacturing cost and minimize industrial labor problems which is the biggest headache for human . The main objective of our project is to perform job holding operation effectively with less human efforts by using a machine with the pneumatic power. This will also reduce the time required for metal cutting. By using these machine we can increase the production rate and automatically the industry will be in profit. Automation plays an important role in mass production. Automation can be achieved through pneumatic form. The main advantage of pneumatic system is economically cheap and easy to handle. The manufacturing operation is being atomies for the following reasons.

- To reduce human efforts
- To increase production rate

- To increase efficiency of industry
- To reduce the work load
- To reduce production time

LITERATURE REVIEW

In cutting operation as or blade descends upon the metal, the pressure exerted by the blade first caused the plastic deformation of the metal, since the clearance between to blade is very small. The plastic deformation takes place in localize area and the metal adjacent to the cutting edges of the blade edges become highly stress, with courses the facture to start on both side of the sheet as the deformation progresses and sheet is shear.

Types of cutting machine:

- Pneumatically operated
- Hydraulically operated
- Rack and pinion operated
- Spring operated

Brief description of all the type is as follows

Pneumatically operated:

Here is the advancement of the header which is carried out in the upward and downward direction using the pneumatic double acting piston and cylinder unit arrangement along with the foot operated direction control valve. In this type of machine high pressure air is used as the working fluid for the transfer of power and the motion.

Hydraulically operated:

Here the lowering and raising of the header which is carried over using the hydraulic piston and cylinder arrangement. To actuate the piston and cylinder, the oil is allow to enter the cylinder for front or back side of the piston. But the oil is comparatively cost layer and it is leakage may cause so many problem.

Rack and pinion operated:

Here the lowering and raising of the header carried out manually using the rack and pinion arrangement. In this case the required pressure is applied manually using direct hand pressure on the rack

using pinion and lever arrangement. Since the machine robust and required large pressure, hence it is not suitable.

Spring operated:

The working of spring operated machine is similar to rack and pinion operated machine but differs for it in construction. Here the lowering and the raising of the heating handle are carried out manually and it required too much pressure for its operation also there possibility to having damage to the work piece if not handled carefully.

To prepare any machine part, the type of material should be properly selected, considering design, safety. Selection of material for engineering application is given by following factor

1. Availability of material.
2. Suitability of the material for the required component.
3. Cost of the material.

The machine is basically made of mild steel the reason for the selection are mild steel is readily available in market. It is economical to use and it is available in standard size. It has good mechanical properties. It has moderate factor of safety, because factor of safety result in unnecessary wasted of material and heavy selection. Low factor of safety result in unnecessary risk of failure, it has high tensile strength, low coefficient thermal expansion. The material of the sheet to be cut are takes as aluminum and plastic as they replacing many metal in the present scenarios because of their distinguished properties of features.

ADVANTAGES

- Easy maintenance and repair
- Low investing cost
- Air is available every wear can be stored easily
- High speed operation performed
- Relatively low cost is produced
- Continuous operation is possible without stopping
- All movement are pneumatically operated
- Clear and non pollutant
- Technology can be easily learned
- Simple in construction
- No fire hazard problem due to over loading

DISADVANTAGES

- Silencer must be use while compressing the air
- High torque cannot be obtain
- Load carrying capacity is low

APPLICATION

- This machine is very useful for small scale industries
- These machines use to cut roller sheet metal
- All industrial applications
- Car bodies
- Air plane wings
- Medical tables
- Roof s for building (architectural) and many other things
- Sheet metal of iron and other material with high magnetic permeability, also known as laminated steel cores, has application with transformer and electric machine
- Historically, important use of sheet metal was in plate armor worn by cavalry, in sheet metal continue to many decorative uses, including in hours tack

CONCLUSION

The design and fabrication of pneumatic sheet metal cutting machine is totally economical in human effort and useful in improvement of cost factory, show and work place layout and design of plant and equipment. Now we now that pneumatic machine is very cheap as compare to hydraulic cutting machine. The range of cutting machine and thickness can be increased by arranging the high pressure compressor and installing more harden blades, this machine is advantages to small sheet metal cutting industries as they cannot afford the expensive hydraulic cutting machine.

FUTURE SCOPE

Since old age man always time to gain more and more luxurious. Man is always trending to develop more and more modified technique with the increasing the ascetic look and economic consideration, hence there is always lot of scope but being the diploma engineers and having the ability to think and plan but due to the some time constraints, and also due to lack of font , we only have thought and put in the report the following future modification.

- It can be made hydraulically power operated by installing the gear oil pump at the place of air compressor and pneumatic air arrangement
- It can be made as rack and pinion operated or spring an lever operated, by replacing pneumatic circuit by rack and pinion arrangement by the square threaded screw and nut arrangement
- The place where there is scarcity of the electricity the electric motor operate

compressor is replace by an IC engine install compressor

- In this machine, compress air is use to move the cutting tool for carrying our cutting operation. After the completion of the cycle the air moves out through the outward of control valve, this air is release to the atmosphere. In future the mechanism can be develop to use this air again for the working of cylinder

9. Machine Design by R. S. Khurmi.

10. Manufacturing Process by Khanna and Lal.

Thus in future there are many modifications, which we can make to survive the huge global work of computation.

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