Review on Design and Fabrication of Automatic Pneumatic Punching Machine

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Abstract— The sheet metal punching process is an important part in the industries. Normally the sheet metal punching machine is manually hand operated in the small and medium scale industries. The design used for mechanical and automation are microcontroller and sensors. It involves the specification of designing and implementing different part of machine considering the forces and ergonomic factor for people. This work deals study and review of design of pneumatically controlled small scale punching machine to carry out piercing operation on thin sheet (1-2 mm) of different material (aluminum and plastic). Different design approaches for pneumatic punching machine are reviewed in this research paper. This review can be helpful for defining new problem statements in punching machine design and solution for that.

Keywords: Punching, Automatic, Microcontroller, Sensors

I. INTRODUCTION

A pneumatic punching machine is always better than of hydraulic punching machine for manufacturing the same product if it is suited for the method. It is comparatively more economical for production of large quantities of product. Pneumatic cylinder uses the compressed air instead of some other hydraulic fluid which is expensive. A pneumatic punching machine uses compressed air to generate high pressure applied on the piston. A solenoid valve control directional flow of air in and out of the cylinder. Polyurethane tubes are use for pressure transmission from the pneumatic cylinder to the punch assembly. The high pressure air fed to the punch, forces it on the material and as punch descends upon the sheet, the pressure exerted by the punch first cause the plastic deformation takes place in a localized area and the sheet materials adjacent to the cutting edges of the punch and die edges becomes highly stressed, which causes the fracture to start both sides of the sheet as the deformation progresses. is a machine that takes in air, gas at a certain pressure and delivered the air at a high pressure. Pneumatic transfer system are employed in many industries. Pneumatic tubes can carry objects over distances. Pneumatic devices are also used where electrical motor cannot be used for safety reasons. Such as mining applications where rock deals are powered by motors. The need for electric motor deep in the mine where explosive gases may be present. Pneumatic cylinder are generally less expensive than Hydraulic cylinder of similar size and capacity. The keep part of any facilities for supply of compressed air is by means using reciprocating compressor. A compressor

II. LITERATURE REVIEW

Different research papers published by researchers and their work is studied and it is as given below.

Anand Kumar Singh: He presented the Design and development of pneumatic punching machine. He said that the pneumatic punching machine is better than the hydraulic system and mechanical system in terms of maintenance, cost, accuracy, productivity based calculation project model work on punching force. [1].

S. R. Majumdar: He says that the manufacture industries are going for automation to increase the productivity and to overcome shortage of skilled labor. The extension of this paper is to reduce the manufacturing time by replacing drilling machine and riveting machine by pneumatic punching machine for drilling operation. The concept is that sheet metal plate having different sizes and thickness are drilled on drilling spindle and then riveted on riveting spindle. Both operation perform on same machine. This paper gives the detail information about the design, fabrication and analysis of machine. [2]

Giridh Gharat: He proposed that the pneumatic system has the large amount of importance in a last few years. This important due to its accuracy and low cost. This convenience in a operating the pneumatic system has made to design and fabricate this unit for the project. The pneumatic tool has working in low pressure that is 6 bar also and we hope it can be used also the semi-skilled operators. Different types of requirements for the punching can be got by the pneumatic punching machine. [3]

Chickering Daniel J.: He represent Portable punching machine. He said that his invention related to improvement in portable punching machine especially adapted for the purpose of punching hole in the surface of logs or poles, as telephone or telegraph poles preparatory to impregnating the wood of the pole with a preservative, such as carbolineum, which was applied as by depping the punch pole into a vat or container for the preservative. The machine was motor operated and manually control and manipulated and utilized a gang of reciprocating tools for punching the surface of the pole. The machine was self-contained and it is operating part which were few in number were compactly arranged for speed in there movements and for quickly and satisfactorily puncturing or punching the pole. [4]

P. Goyal: He said that project deals with design of pneumatically controlled small scale punching machine to carry out piercing on thin sheet (1-2 mm) of different material aluminum and plastics. Reducing the punching force is the main aim of the project is obtained by the modification of the punching tool design.

Ranjeeta singh: She present development of PLC-Based controller for pneumatic presssing machine in Engine-Bearing manufacturing plant. She said that the pneumatic press machine in the engine bearing manufacturing process has been successfully designed and developed. The PLC based automation will reduced manufacturing time by
cutting down the delay occurring at every state, which is unavoidable in manual mode.[5]

Manish Kale: The manufacturing industries are going for automation to increase the productivity and to overcome shortage of skill labor. The extension of this paper is to reduce the manufacturing time by replacing drilling machine and riveting machine by pneumatic punching machine for drilling operation. The concept is that sheet metal plate having different sizes and thickness are drilled on drilling spindle and the riveted on riveting spindle. Both Operation perform on same machine. This paper gives detailed information about design, fabrication and analysis of machine.

Sudeep Kelaginamane, Shreedhar. D.R In this paper design and control method of sheet metal punching machine is explain by using programmable logic controllers as the controllers of the whole system, good and easy control over the system can be achieved. Manufacturing lead time of the system is reduced by developing automatic feeding mechanism, workers safety is increased by reducing. The labours in the processes.

III. COMPONENTS

Researchers used different approaches of design for Pneumatic punching machines. Major components used for this are pneumatic cylinder, pressure regulator, solenoid direction control valve, flow control valve, compressor, mounting table.

The cylinder is used for up and down motion of the punched tool which performs the punching operation on the sheet of aluminum/plastic material.

The compressor provides compressed air to the cylinder, which causes movements of the piston rod. Pneumatic automation component expensively used sealing material made out of rubber compounds. For efficient and trouble free working of these seals, they need to be oiled or lubricated to reduce friction and corrosion.

Also we can say that to lubricate compressed air actuated equipment, the most efficient and economical method is to inject the lubricant into the compressed air that powers this equipment. Solenoid control valve is used to control the direction of the air.

IV. CONCLUDING REMARKS

From this review, it is observed that,

Hand operated punching has many advantages and disadvantages, like hand punching has accuracy and job availability but due to late work complete, accident and high cost, alternate source and operation started.

For this Pneumatic punching machine gives high accuracy with before time completion. It is not dangerous and second does not worried about slot of job.

Development of portable punching machine was good step and it can lead to future work.

Use of pneumatics and hydraulics can be beneficial for application of force.

REFERENCES