

DESIGN AND DEVELOPMENT OF PNEUMATIC PUNCHING MACHINE

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Abstract: *Pneumatic is a branch of engineering that deals which study of air/gas characteristic and also their use in engineering appliances either in atmospheric or above atmospheric pressure. Now a day number of application increases in pneumatics system due to high carrying capacity, low maintenance cost and most important not dangerous. Either compressed air or inert gas are generally used, this paper deals with different components of punching machine (proto type) and their assembly and also their related diagrams.*

I. INTRODUCTION

Pneumatic is a branch of engineering that deals which study of air/gas characteristic and also their use in engineering appliances either in atmospheric or above atmospheric pressure. Now a day number of application increases in pneumatics system due to high carrying capacity, low maintenance cost and most important not dangerous. Pneumatic systems are power systems using compressed air as a working medium for the power transmission. Their principle of operation is similar to that of the hydraulic power systems. An air compressor converts the mechanical energy of the prime mover into, mainly, pressure energy of the compressed air. This transformation facilitates the transmission, storage, and control of energy. After compression, the compressed air should be prepared for desired work. A pneumatic system is a system that uses compressed air to transmit and control energy. Pneumatic systems are used in controlling train doors, automatic production lines, mechanical clamps etc. Pneumatic cylinder(s) (sometimes known as air cylinders) are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner, and do not require large amounts of space for fluid storage. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. For example, in the mechanical puppets of the Disney Tiki Room, pneumatics are used to prevent fluid from dripping onto people below the puppets. A pneumatic motor (Air motor) or compressed air engine is a type of motor which does mechanical work by expanding compressed air. Pneumatic motors generally convert the compressed air

energy to mechanical work through either linear or rotary motion. Linear motion can come from either a diaphragm or piston actuator, while rotary motion is supplied by either a vane type air motor, piston air motor, air turbine or gear type motor. Pneumatic motors have existed in many forms over the past two centuries, ranging in size from hand-held motors to engines of up to several hundred horsepower. Some types rely on pistons and cylinders; others on slotted rotors with vanes (vane motors) and other uses turbines. Many compressed air engines improve their performance by heating the incoming air or the engine itself. Pneumatic motors have found widespread success in the hand-held tool industry,[1] but are also used stationary in a wide range of industrial applications. Continual attempts are being made to expand their use to the transportation industry. However, pneumatic motors must overcome inefficiencies before being seen as a viable option in the transportation industry.

HVAC (Heating, Ventilation& Air Conditioning)

HVAC equipment needs a control system to regulate the operation of a heating and/or air conditioning system. Usually a sensing device is used to compare the actual state (e.g. temperature) with a target state. Then the control system draws a conclusion what action has to be taken (e.g. start the blower).

Why we choose the Pneumatic system?

- High effectiveness
- High durability and reliability\
- Simple design
- High adaptability to harsh environment
- Safety
- Easy selection of speed and pressure
- Environmental friendly
- Economical

Punching Machine

A punching machine is a machine tool for punching.

Principle of Operation

After programming the work pieces and entering length of bars the control automatically calculates the maximum number of pieces to be punched (for example 18 pieces of a bar of 6000 mm). Once the desired number of work pieces is entered, the bar is pushed toward the stop. The machine is fully automated once the production process is launched.

The third CNC axis always moves the cylinder exactly over the tool, which keeps the wear on the bearings and tools to a minimum. All pieces are sent down a slat conveyor and are pushed sideways on a table. Any scrap is carried to the end of the conveyor and dropped into a bin. Different workpieces

can be produced within one work cycle to optimize production.

CNC Punching

Punch presses are developed for high flexibility and efficient processing of metal stampings. The main areas of application are for small and medium runs. Those machines are typically equipped with a linear die carrier (tool carrier) and quick change tools. Today the method is used where the application of lasers are inefficient or technically impractical.

Programming

Programming is done on a PC equipped with appropriate software that can be part of the machine or a connected external workstation. For generating a new program engineering data can be imported or pasted per mouse and keyboard. Through a graphic and menu-driven user interface previous CNC programming skills are not required. All the punches in a work piece are shown on the screen making programming mistakes easily detected. Ideally each program is stored in one database, in this manner it is easy to recover them by search and sort functions. When selecting a new piece, all the necessary tooling changes are displayed. Before transferring it to the control unit the software scans each program for possible collisions. This eliminates most handling errors.

Tool changing system

The linear tool carrier (y-axis) has several stations that hold the punching tools and one cutting tool. Especially for flexibility and efficient processing are setup times a crucial cost factor. Downtimes should be reduced to a minimum. Therefore, recent tool systems are designed for fast and convenient change of punches and dies. They are equipped with a special plug-in system for a quick and easy change of tools. There is no need to screw anything together. The punch and die plate are adjusted to each other automatically. Punches and dies can be changed rapidly meaningless machine downtime.

II. LITERATURE REVIEW

Manish Kale, 2015 - Most of the manufacturing industries are going for automation to increase the productivity and to overcome shortage of skill labour. The purpose of this paper is to reduce the cycle time by replacing drilling machine and riveting machine by special purpose machine (SPM) for drilling and riveting operation. The concept is that the plate having different size and thickness are drilled on drilling spindle first and then riveted on orbital riveting spindle. Both the operation performs on same machine having two separate spindles. In this paper gives the detail information of design, fabrication and analysis of special purpose machine and compare the cycle time with conventional method. This machine is containing automation by using pneumatic system. Modeling is done using CAD software and analysis by FEA tool. The design is analysed for induced stress on work piece due to various load condition.

Girish Gharat, 2015 - The pneumatic system has gained a large amount of importance in last few decades. This importance is due to its accuracy and cost. This convenience in operating the pneumatic system has made us to design and fabricate this unit as our project. This unit, as we hope that it

can be operated easily with semi-skilled operators. The pneumatic press tool has an advantage of working in low pressure, that is even a pressure of 6 bar is enough for operating the unit. The pressurized air passing through the tubes to the cylinder, forces the piston out whose power through the linkage is transmitted to the punch. The work piece thus got is for required dimensions and the piece can be collected through the land clearance provided in the die. The die used in this is fixed such that the die of required shape can be used according to the requirement. This enables us to use different type punch dies resulting in a wide range of products. Different types of punch as requirement can be thus got. According to the work material the operating pressure can be varied.

P. Goyal, 2015 - This project work deals with the design of pneumatically controlled small scale punching machine to carry out piercing operation on thin sheets (1-2 mm) of different material (aluminum and plastic). Reduction in punching force requirement being the main aim of this project work is obtained by modification in punch tool design i.e. by provision of shear on punch face. Subsequently it results in reduction in amount of punching force requirement. And further a CATIA model of the machine is developed on the basis of calculations with respect to punching force requirement.

AMIT M. GEDAM, 2014 - In today world, due to advance manufacturing process and advance machining process the time of production is reduced. Thus the productivity increases which effect on mass production and batch production. So it is essentially to products name plate parts to be the manufacture. There are a variety of crafts for an embossing machine that allow you to create unusual, signature pieces of artwork. Embossing machines come in several varieties. There are multi-tasking embossers available at craft and scrapbooking stores that allow you to embellish and cut card stock and paper pieces into a variety of different designs in a single motion. You can also use embossing machines that feature

Custom-made thick rubber dyes secured with hand-held or desk-mounted metal handles. These machines allow you to create personal monogrammed or logoed designs with a raised surface, and they can be ordered through office and business supply stores.

Baoren Li and Jinyun Li, 2008 - The Pneumatic Center in Huazhong University of Science and Technology (HUST) is one of the most active research center in fluid power transmission and control in China. The main fields of Pneumatic Center in HUST are component development and control technology of fluid power. Hydraulics research is the most important part of fluid power in the Pneumatic Center in HUST. Based on several decades of the research on the hydraulics in HUST, the further research and new application in this field are made, include underwater motion platform, automatic buoyancy regulation technology and new type hydraulic valve, etc.. From 1996, the Pneumatic Center in HUST focuses on the combination of electronics, computer technology and pneumatics, and the research achievement play a very important role in some state key engineering projects successively. The pneumatic research

and applications have been developed, such as the gas temperature control technology, pressure and vacuum servo control technology, leak-testing technology, pneumatic muscle platform and the high pressure pneumatic valve, etc.. In this paper the main research and application of hydraulic and pneumatic in Pneumatic Centre in HUST are introduced. Also some practical examples research projects and subjects in above fields are presented.

Yunxu SHI, 2005 - The air with certain pressure in a pneumatic cylinder is usually exhausted into the atmosphere after work process. It is of significant that the air energy can be saved and re-used. In this paper, the constitution of an exhausted-air reclaiming system for pneumatic cylinders is studied. To find the possible influence on the cylinder work process, the effect of the system on the cylinder velocity characteristics is also researched and different control switch points are tested. Experimental results show that attaching a reclaiming device would not cause bad influence on the velocity stability if the switch point could be properly controlled. Experiments also indicate that the switch control differential pressure ΔP_{sw} varies with P_c in the receiver and the supply pressure P_s would affect the velocity stability of cylinders. Therefore to reclaim more energy and make less influence on the cylinder velocity characteristics, the suitable differential pressure ΔP_{sw} and switching-point are also tested and suggested.

III. PROBLEM STATEMENT

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

Pneumatic punching machine give us high accuracy with before time completion and second most important, it is not dangerous and second does not worried about slot of jobs.

COMPONENT

Double Acting Cylinder



120psi Pneumatic double acting cylinder(60*80)

2. Solenoid valve



3. Solenoid coil



4. Solenoid valve wide switch



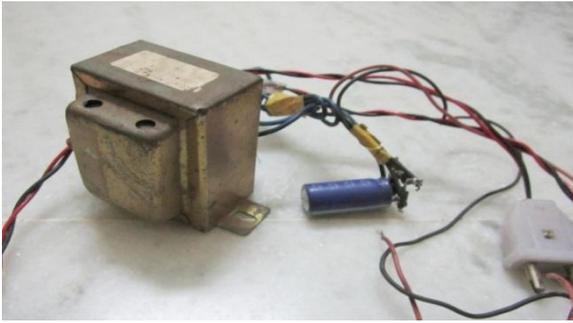
5. Tank- 120psi plastic round with 3 out put



6. Pipe- 190psi ,6mm pipe (air)



7. 12v D.C coil

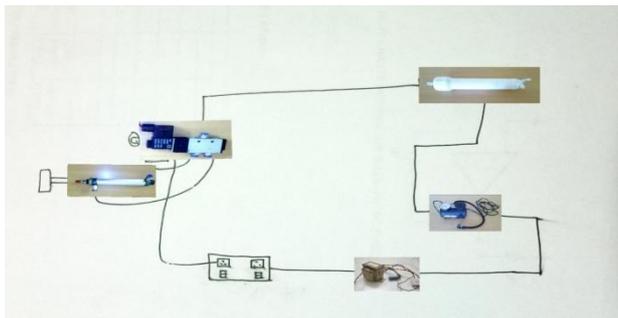


8. Compressor – 12v D.C , 300psi



Working Layout

$$C = \left\{ \frac{\pi}{4} D^2 (P + 1) L \right\} / 1000$$



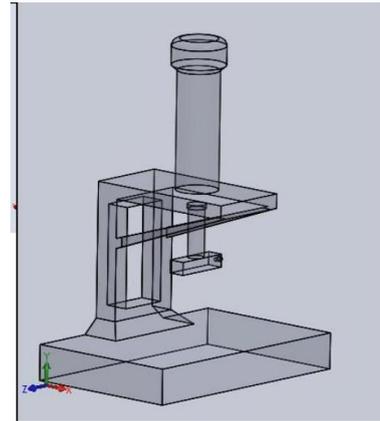
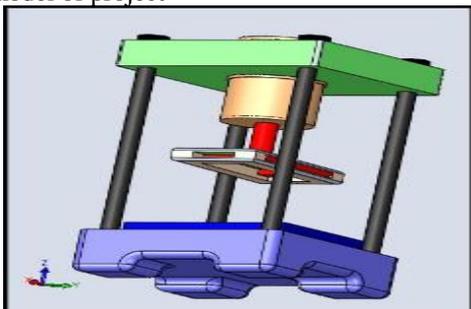
MODELING

Solid works is a computer graphics system for modeling various mechanical designs for performing related design and manufacturing operations.

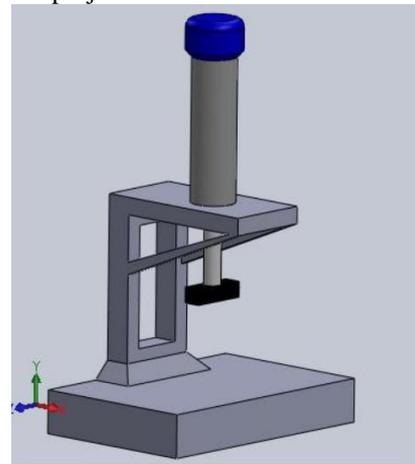
The system uses a 3D solid modeling system as the core, and applies the feature base parametric modeling method.

Solid works is a feature based parametric solid modeling system with many extended design and manufacturing application.

Desire model of project



Final model of project



IV. CONCLUSION

Pneumatic system is better than hydraulic system and mechanical system in terms of maintenance, cost, accuracy, Productivity. Based on calculation project model work on max 42 bar punching force.

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