

Cam Operated Punching Machine

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Abstract - From time immemorial, man has striven to achieve perfection. This thought has led him to make significant development in any stream that has come across him. One such stream is engineering. Many researches have been done to improve quality at faster production rate. The casual observer seldom takes any interest in its development. The project "CAM OPERATED PUNCHING MACHINE" is compact and portable, handy equipment, which is skillful and is having something different from the ancient conventional punching process. Most of the material is made available by our College. The sub-components we could easily manufacture in our college work shop. Its manufacturing price is also less. This project gives us knowledge, experience, skill and new ideas of manufacturing. It is a working project and having guarantee of success. Punching m/c is one of the most important m/c in Metal workshop. It is designed for punching the punch has been made by exerts a large Cutting Force on the work clamped on a Die. The automation strategy when being implemented is believed to result in Machine Size, Cost & Improved Product Quality

application of lasers are inefficient or technically impractical. It is designed for punching the punch by exerting a large Cutting Force on the work clamped on a Die which can be operated Hydraulically, Pneumatically or Mechanically. 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 work pieces can be produced within one work cycle to optimize production. The automation strategy when being implemented is believed to result in Machine Size, Cost & Improved Product Quality.

2. METHODOLOGY

Methodology used for whole processing of Mini Cam Operated Punching Machine is given below; this methodology gives way about how work is to be carried out in systematic way. It is standard process of describing process, how it is done in simplest manner.

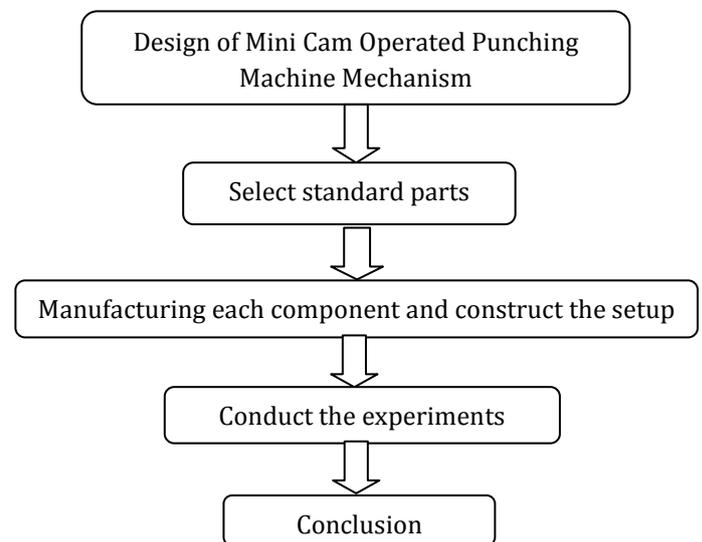


Chart -1: Methodology

Key Words: Motor, Cam, Price, Slider Crank mechanism, Punching Mechanism.

1. INTRODUCTION

This Punching Machines are one of the most important machines in Industry. Punching is metal forming process that uses a punch press to force a tool, called punch. Punch presses are developed for high flexibility and efficient processing of metal stampings. There is an increase in technological methods in all daily activities in the industries. This is done to improve the quality, efficiency and cost deduction of a particular product. The main areas of application are for small and medium runs industries. This type of punching machine is used to create a hole in thin Aluminium sheet. The punching is the major operation performed in industry, and to perform this operation in mass number the manpower is require which results in to high cost of production, more time require to complete the operation, affect the accuracy of product so for automation in system we are trying to do a work on new system in punching. Those machines are typically equipped with a linear die carrier (tool carrier) and quick change tools. Punching is a metal forming process that uses a punch press to force a tool, called a punch, through the workpiece to create a hole via shearing. The punch often passes through the work into a die. Today the method is used where the

3. CONSTRUCTIONAL FEATURES

3.1 Raw Material Purchase:

The first step involved in the fabrication process is the finding of all the required raw materials. Mild Steel is the material used for most of the components. After obtaining all the required raw materials, the various parts are machined.

3.2 Fabrication of Frame:

The various rectangular components like vertical beam, top cover plate, bottom cover plate and side plates are machined to the required dimensions using a shaper. Then surface grinding is done to finishing of the components. Holes are drilled into the surface by the vertical drilling machine. Finally Red color painting was done on the rectangular structure.

3.3 Slider Crank Mechanism:



Fig -1: Slider Crank Mechanism

Slider crank mechanism converts rotary motion into reciprocating motion. There is very little difference except that at P there is an extra link, a piston constrained to move horizontally. This is sometimes termed a constrained slider. In a constrained slider the on is restricted to a specified path. This slider-crank system is such that the slider translates along the path PO and the motion of the connecting rod, PB, produces rotation of the crank OB.

3.4 Motor:



Fig -2: Motor

Motor convert mechanical energy into electrical energy. "Rotating" part of the motor. Magnetic field from the stator induces an opposing magnetic field onto the rotor causing the rotor to "push" away from the stator field. It is the main component use for the driving of agitator. A Three Phase, Flame Proof Enclosure A.C. Induction Motor is used in the product, which is having power up to 1 hp and can rotates up to 1440 rpm. Motor is mounted on the bearing housing using nut and bolts.

3.5 Cam:

The device used for changing rotary motion into linear or straight line motion is known as cam. It has one or more high spots or lobes. A cam rotates a follower riding on the cam will either move away from or toward the cam. Cam

is a rotating, oscillating or reciprocating machine part with surface or groove formed to transmit intermittent motion by rolling or sliding contact to another machine part termed as follower or tappet.

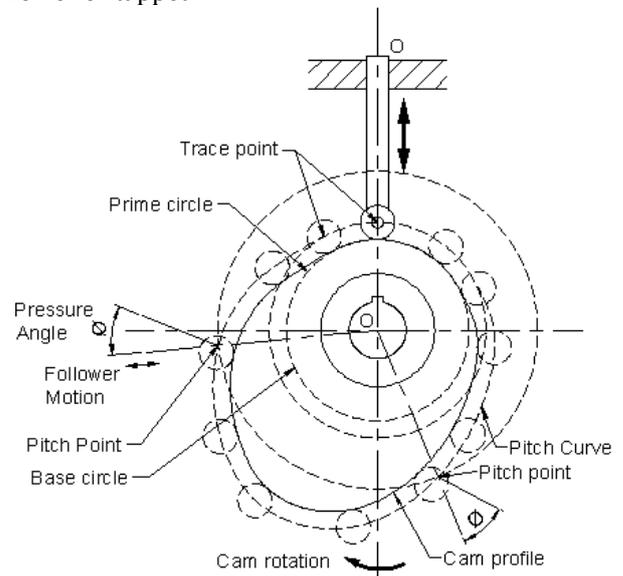


Fig -3: Nomenclature of Cam

3.6 Punch Tool:

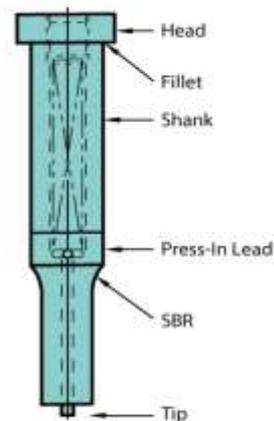


Fig -4: Nomenclature of Punch Tool

The punching tool is made of High Carbon steel. It is fitted at bottom of the vertical beam. When the force exerted by cam pushes the rod in downward direction the tool fitted at bottom of rod make a punch on the object.

3.7 Spring:

The cam pushes punch tool downward to carry out punching operation which automatically compresses spring. The compressed spring now exerts force on the vertical bar and lifts it up, enabling the operator to remove the work piece and load another work piece. Before punching, the spring keeps the vertical bar and punching tool up, so that the work piece can be loaded without obstacle of our spring is twofold. After the punching, the spring is used for a return

mechanism to push the punching tool up. Then work piece has got punched successfully.



Fig -5: Spring

4. EXPERIMENTAL SETUP

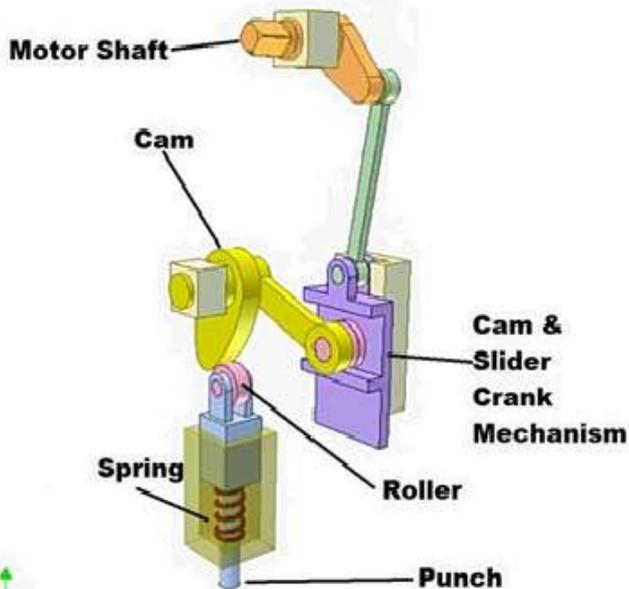


Fig-6: Experimental Setup

5. OPERATION

A 3 Phase 1 HP motor is continuously driven by three phase 240 volts 50 hz A.C. power supply. The speed of motor shaft is controlled by the speed reduction gear box of ratio 1:15. Motor shaft is connected to the shaft of reduction gearbox by using coupling which is also rotating same as the motor shaft. Output shaft of Gearbox is connected to Slider crank mechanism by means of gudgeon pin which reciprocates vertically. Link 2 is connected to slider crank mechanism. Slider crank mechanism is connected to the cam which converts vertical reciprocating motion into partially rotating or oscillatory motion. There is physical contact between roller bearing and cam. The purpose of roller bearing is to reduce friction and to carry out smooth operation. Cam will push down the roller against spring force due to which oscillatory motion is get converted into punching force that is vertical reciprocating motion. Spring is enclosed in a

protective chamber with tool to protect from changes in atmospheric condition and dust particles. Due to punching force from the cam and roller mechanism we get finished punched product. Due to the stiffness of spring punch will again return to its original position. In this way punching operation is carried out by cam operated punching machine.

6. WORKING SETUP



Fig-7: Working Setup

7. CONCLUSION

The project carried out by us will make an impressing mark in the field of small scale industries. This project has not only reduced punching time but also reduced the cost involved in the concern. The project has been designed to perform the required task at low floor space with greater accuracy. This also punches sheet repeatedly with specific interval of time. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of wear and tear.

REFERENCES

- [1] K. Mahadevan, Design Data Handbook, Third edition, Reprint 2002, CBS Publishers & distributors.
- [2] Aditya Polapragada, Sri Varsha, "Pneumatic Auto Feed Punching and Riveting Machine", International Journal of Engineering Research & Technology (IJERT), Vol. 1 Issue 7, September – 2012, ISSN: 2278-0181.
- [3] P.M.Pradhan, "Experimental Investigation and Fabrication of Pneumatic Punch", International Journal of Innovative Research in Science, Engineering and

Technology, Vol. 2, Issue 6, June 2013. Yiemchaiyaphum S., Masahiko J., Thipprakmas S.,

- [4] "Die Design in Fine-Piercing Process by Chamfering Cutting Edge", Key Engineering Materials, (2010), Vol. 443, pp 219-224.
- [5] U.P. Singh, "Design Study of the Geometry of a Punching tool", Journal of Materials Processing Technology, 33 (1992) 331-345 Elsevier.
- [6] Ha JL, Fung RF, Chen KY, Hsien SC (2006). Dynamic modeling and identification of a slider-crank mechanism. J. Sound Vib., 289(4):1019-1044. Machine Design; Prof V.B. Bhandari
- [7] Advance Manufacturing process; Prof Dr. Apurbha

BIOGRAPHIES



Akshay K. Kharat received Diploma and Bachelor's degree in Mechanical Engineering in 2014 and 2017 respectively. And has experienced various production related terms and techniques while working in Industries.



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Hemant S. Yeole is pursuing Bachelors from Savitribai Phule Pune University. He has two and half years of experience in Production Department. He is also aware of production processes that happens in the organization.



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