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## Automatic Paper Punching And Cutting Machine Using Geneva Mechanism

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**Abstract :** In this project automated paper punching and cutting machine based on Geneva mechanism. The machine cut the papers equal lengths as well as punching based on Geneva mechanism. The machine uses a 12 V motor in order to drive the entire system. A shaft was used in this machine which is directly connected to the motor and cam drive by the support(frame). This shaft has a sprocket which is connected to scissors by a chain in order to drive the cutting mechanism for cutting paper and also the cam drive is employed with slider crank mechanism which gives the motion to punching motion. Now another sprocket is connected to a Geneva mechanism wheel. This wheel was used to drive paper feed into the cutter mechanism. When the motor is run through battery and the cam drive rotates clockwise direction then punching is doing on paper as well as cutting through chain drive here punching and cutting is doing on single operation with this machine save the lot time.

**Keywords** – Cutting, Geneva Wheel, Motor, Punching, Sprocket

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### I. INTRODUCTION

Now a day's peoples use the paper as per their need and requirement in various size. So we introduce paper cutting and punching machine by using Geneva mechanism. In this machine we can get paper as per their need and required dimension. Based on the size of Geneva wheel, we can change the size of paper. And also, by the automatic movement of this machine we can reduce human effort. So, there is need of developing a new method or process for effective manufacturing. That process or methods should fulfil the requirement about accuracy Productivity. This paper represents the automatic paper cutting machine by using Geneva mechanism. This equipment is very accurate to cut the papers. The equipment is fabricated in less cost and good efficient. The aim of this is to reduce the human effort and save time by eliminating the paper marking time. Here it has analysed to use Geneva Mechanism. This mechanism is used to get intermittent motions. The paper cutting machine is designed, in order to reduce the time for marking and cutting the papers. Geneva mechanism is commonly used indexing mechanism where an intermittent motion is required. The fabrication of conventional Geneva mechanism is generally simple and inexpensive because there is no special curved profile on any of the components except straight lines and circular arcs. The paper cutting is done by crank and lever mechanism. After cutting, the spring connect to the cutter will bring the cutter back to its original position. The main purpose of this machine is to reduce time for marking the papers. Hence, this is working fully based on timing.

### Project Objective

The objective of Automatic Cutting and Punching Machine is to make automatic machine for paper industry and automobile parts with the help of Geneva mechanism. The machine of this invention comprises a Geneva wheel on its rotation the cutting and punching works together in one go the machine will cut and punch simultaneously. The punch head provided with a plurality of punch/die pairs for effecting punching operations of a paper. The purpose of this project is to study the punching and cutting mechanism and implement it with the help of pneumatic power. For this purpose, we first construct a frame to withstand and support the punching and cutting system. We

then assemble the pneumatic piston and hole support mount into the frame so as to achieve the best punching results. Now we connect the pipes to the cylinder with necessary valves and use a electronic control mechanism to control punching using the pneumatic piston. The system is integrated with motorized rollers needed to feed the metal sheets into the machine. It consists of a metal detection system that automatically detects metal sheets and starts punching process and also pushes the sheet out of another end once done. The electronic system is used to trigger the valves into releasing necessary amount of air into the piston pushing it in needed direction with force needed to punch through the material placed on the bed mount.

## II. LITERATURE REVIEW

Vidhate Pankaj, Vavhare Sagar, Wagh Sandip, Bajaj Vaibhav, Agale Ratnadeep, Kathar Nitesh, [1], , "Design and Fabrication of Hacksaw Machine Using Scotch Yoke Mechanism", International Journal of Advance Research and Innovative Ideas in Education (IJARIIE), vol-3, Issue-3, PP- 2357- 2362, 2017.

Kundan Kumar 2017 [2], he proposed system a design and fabrication of auto roll punching machine without Geneva mechanism in place of this mechanism uses motor and commutator and punching on work pieces based on we propose a punching on paper as well as sheets thus saving the lot of time

Han Jiguang Yu Kang 2015 [3], it has been analysed that for both internal and external Geneva mechanism, the kinematics coefficient of the Geneva mechanism is a constant if the groove number of the Geneva wheel is a constant. The elliptic crank using as the drive crank of the Geneva wheel is equal to the mechanism which has a variable length and a variable speed along the elliptical moving crank. Therefore, the kinematics coefficient of the Geneva mechanism can be changed

Hrones and Nelson 2003 [4], in their paper on Analysis of the Four-Bar Linkage gives review that a 4- bar mechanism is a basic I-DOF (degree of freedom) mechanism. A 4-bar is created by selecting four link lengths and joining the links with revolute joints to form a loop. A wide variety of paths are possible by arbitrarily choosing a point on the coupler curve. These different curves can be obtained by constructing a physical model of the mechanism and viewing the path of various points without detailed mathematical analysis

Prajapati Ankur, Patel Chinmay, Pankhania Dhwanit, Kanjia Brijen, Dubey Aakash, 2017 [5] "Review on Geneva Mechanism and its Applications", International Journal of Advanced Engineering & Research Development, Volume: 4, Issue: 2, Feb- 2017.

Srivastava Sharad, Srivastava Shivam 2014[6], Srivastava Sharad, Srivastava Shivam, "Multi-Function Operating Machine: A Conceptual Model", Global Journal of Researches in Engineering: A Mechanical and Mechanics Engineering, Volume 14, Issue 4, Version 1.0, PP- 35- 42, 2014.

Figoliolini. G and Angeles. J year 2002. [7], A suitable algorithm for the kinematic synthesis of conjugate Geneva mechanisms with curved slots and for that of their pure-rolling cam-equivalent is proposed. The kinematic equivalent pure-rolling cam mechanisms are obtained by using the centrodes of the relative motion between crank and Geneva wheel. The proposed indexing mechanisms are compared by using the pressure angle as a figure of merit of force transmission

From the article titled, Automatic Paper Cutting Machine Using Geneva Mechanism [1] (Sunil H V, Ankit Yadav, Shivu L, Santosh Choudri) the design process involved was considered. In this project, a lever mechanism in combination with the Geneva mechanism was used. This resulted in a reduction in markup time and human fatigue. But the use of lever mechanism limited the operations that could be carried out. The fabrication of this tool was done using Mild Steel which contributed to its bulkiness.

A machine that could carry out multiple operations, at different positions of the base frame has been described in the paper, Multi-Function Operating Machine [2] (Mr. Pradip R. Bodade, Mr. Rangnath B. Tarmale, Mr. Aniket

G. Nathe, Mr. Rajat R. Manalwar). This model involved the use of a Scotch Yoke mechanism, for carrying out the cutting operation through a hacksaw.

Review on Geneva Mechanism and its Applications (Ankur Prajapati, Chinmay Patel, Dhwanit Pankhania, Brijen Kanjia, Aakash Dubey) was also studied. In this article different journals have been reviewed with reference to the authors' project work. The project work carried out was the "Semi-Automatic bar Cutting Machine". By using Modification of the Geneva Paper Cutting Tool the Geneva Mechanism, the intermittent motion of the Geneva wheel was used as a feed mechanism for their machine.

### III. METHODOLOGY

This machine consists of three sections. One section is automatic feeding mechanism and the second section is conversion of rotary motion into linear reciprocating motion of punching tool (slider crank mechanism) and third one cutting paper of equal lengths. The first section consists of Geneva wheel disc keyed to shaft at one end and the punching in another side and the other end is connected with chain sprocket wheel. This Geneva wheel shaft is supported on nylon bushes. The sprocket is attached to wheel and transmit the rotary motion from the Geneva wheel to the feeding rollers through a chain drive. Hence when the Geneva wheel is rotated, the paper also moved for punching operation. The second section consists of electrically operated DC motor, nylon bush, crank wheel with a pin, connecting rod and punching tool. The second section is used to convert the rotary motion of the crank wheel into reciprocating motion of punching tool. The rotating shaft is keyed to the crank wheel at one end and the other end is connected to DC motor. This shaft is supported on nylon bush. The punch tool slide is reciprocated by the connecting the crank wheel through the connecting rod. The paper is fed automatically by the rotation of Geneva wheel. The third sections consist of paper cutting it consists of scissor connected to a sprocket through a shaft this scissor should be operated by spring action the entire section connected to a motor shaft. In these two operations are performed during the operation one is punching and another one is cutting paper of equal length.

#### Working

When the motor is powered the cam drive disc is rotated. The linear rod which is attached to the cam drive disc with eccentricity from the center is reciprocated on the punching machine. The punching machine consists of a punch head, when the linear rod is moved down it presses the punch head. The punch head consists of punch tools which punches the paper in required manner. The rotating drive wheel has the pin that reaches into a slot of the driven wheel advancing into it by one step.

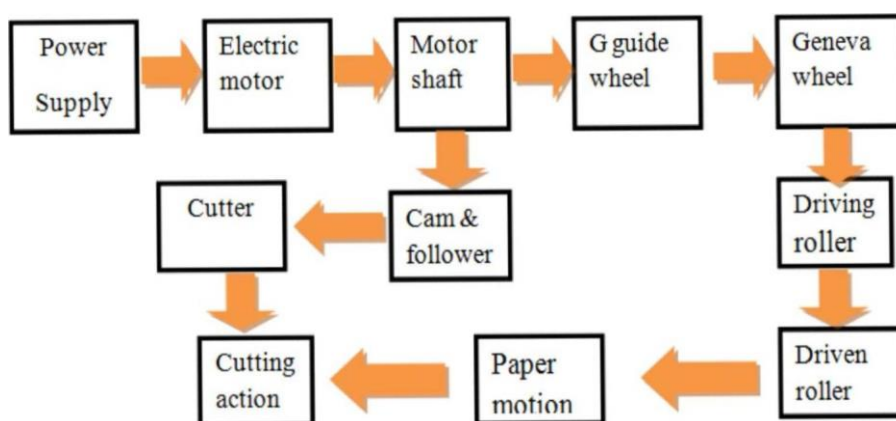


Fig.3.1 Block Diagram

The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps. The Geneva drive or Maltese cross is a gear mechanism that translates a continuous rotation into an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheel advancing it by one step.

The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps. In the most common arrangement, the driven wheel has four slots and thus advances by one step of 90 degrees for each rotation of the drive wheel. If the driven wheel has  $n$  slots, it advances by  $360^\circ/n$  per full wheel rotation of the drive wheel. This driven wheel has sprocket connected to a rollers through chain drive which draws the paper after punching and then push the paper for cutting. At the cutting section by the four mechanism the cutting will takes place on paper of equal lengths.

### 3.2 SELECTION OF COMPONENTS

#### GENEVA WHEEL

In Geneva wheel, the driven wheel has four slots and thus advances by one step of 90 degrees for each rotation of the drive wheel. If the driven wheel has  $n$  slots, it advances by  $360^\circ/n$  per full rotation of the drive wheel.

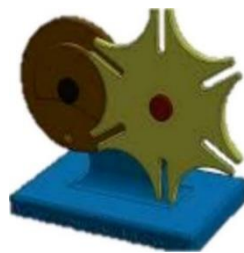


Fig.3.1.1 Geneva Wheel

The drive wheel is connected to the sprocket which rotates by the roller chain. The Geneva wheel is connected to the shaft which has the paper roller. This paper roller is kept to feed the paper. The driver sprocket drives the pin to rotate in the sprocket axis. When pin mesh with the Geneva, it rotates the Geneva wheel by sliding in between the slots given. The Geneva is the driven wheel which moves with an intermittent motion. Hence the power is transmitted to the roller with a given interval.

#### SPROCKET

A sprocket or sprocket-wheels a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.



Fig.3.1.2 Sprocket

#### ROLLER CHAIN

Roller chain is the type of chain drive most commonly used for transmission of mechanical power on many kinds of domestic, industrial and agricultural machinery, including conveyors, wire and tube drawing machines, printing presses, cars, motorcycles, and bicycles. It consists of a series of short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket. It is a simple, reliable, and efficient means of power transmission.



Fig.3.1.3 Roller Chain

The roller chain design reduces friction compared to simpler designs, resulting in higher efficiency and less wear. The original power transmission chain varieties lacked rollers and bushings, with both the inner and outer plates held by pins which directly contacted the sprocket teeth; however, this configuration exhibited extremely rapid wear of both the sprocket teeth, and the plates where they pivoted on the pins. This problem was partially solved by the development of bushed chains, with the pins holding the outer plates passing through bushings or sleeves connecting the inner plates.

#### PAPER CUTTER

A paper cutter is a tool, designed to cut a large set of paper at once with a straight edge. Paper cutters vary in size. The surface will usually have a grid either painted or inscribed on it, often in half-inch increments, and may have a ruler across the top. At the very least, it must have a flat edge against which the user may line up the paper at right-angles before passing it under the blade. It is usually relatively heavy, so that it will remain steady while in use.



Fig.3.1.4 Paper Cutter

#### PAPER ROLLER

Paper roller is an element which is used to roll the paper while the intermittent motion. The paper roller used here is a shaft. A shaft is used to roll the paper. A shaft is a rotating machine element which is used to transmit power from one place to another. There are two types of shaft which are transmission shaft and machine shaft.



Fig.3.1.5 Paper Roller

## PUNCHING MACHINE

A punching machine is a machine tool for punching and embossing flat sheet- materials to produce form-features needed as mechanical element and/or to extend static stability of a sheet section.

## SELECTION OF COMPONENTS

Table.4.1

Sr no.	PARTS	MATERIAL	NO. OF PARTS	COST
1	GENEVA WHEEL	MILD STEEL	1	3000
2	SPROCKETS	CAST IRON	2	1500
3	CHAIN	STAINLESS STEEL	1	600
4	ROLLER	MILD STEEL	2	500
5	CUTTING BLADE	MILD STEEL	1	600
6	PUNCH	MILD STEEL	1	500
7	GEAR MOTOR	-	1	600
8	PAPER ROLL	-	1	500
9	FRAME AND BASE	WOOD	-	800

## IV. CONCLUSION

The design and fabrication of a automatic paper punching and cutting by using Geneva mechanism is very use full for small scale industries There are machine based on paper cutting and punching but it has demerits like large in size, costly, need skilled labours to operate and it need electrical input. But we have our machine which will overcome this demerit by compact size, less cost no need for skilled people and there is no need of electrical input. The main aim of this machine is to reduce timing for paper cutting and neglect the time for marking the paper. And it very useful for marking series of holes of same diameter and constant it can be useful for punching applications and also one advantage when cutting is not required we pitch thus can able to remove chain from the motor to cutter and punching is carried out This aim can be achieved by our machine.

## V. RESULT

The design and fabrication of a machine will very cost effective and user friendly to use it will give very accurate cut and punch in paper as per given dimension. The main aim of this machine is to reduce timing for paper cutting and neglect the time for marking the paper.

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