



Review On Paper Cutting Using Geneva Mechanism

Prof.Husain Shaikh¹, Bhagwat Jejerao Suryawanshi², Vikas Devakar³, Ramchandra Ajgaonkar⁴,
Mohd Mubashshir Mohd Shabbir Ahmad⁵

¹Assistant Professor Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and
Technology ,Lonavala

²³⁴⁵Student Mechanical Engineering Vidya Prasarini Sabha's College of Engineering and Technology
,Lonavala

ABSTRACT

The design and fabrication of paper cutting machine using Geneva mechanism is very useful to cut papers in equal and accurate dimensions. Geneva drive is an indexing mechanism that converts the continuous motion into intermittent motion. Due to the intermittent motion, the paper is moved between the time intervals of cutting periods. Then the paper cutting is achieved by the crank and lever mechanism. The cutter will be back to its original position by the spring effect.

INTRODUCTION

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 connected to the cutter will bring the cutter back to its original position.

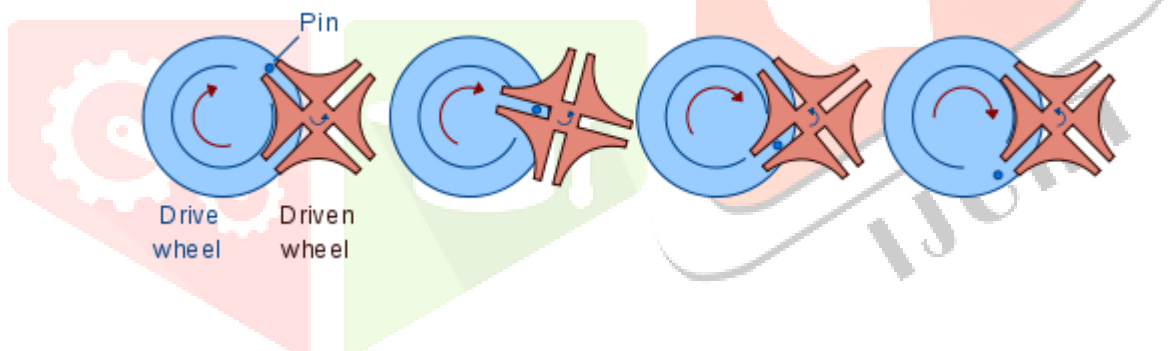
The main purpose of this machine is to reduce time for marking the papers. Hence, this machine is working fully based on timing.

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. One of the most commonly used devices for producing intermittent

rotary motion, characterized by alternate periods of motion and rest with no reversal in direction. It is also used for indexing (i.e., rotating a shaft through a prescribed angle). The Geneva mechanism is a timing device. According to Vector Mechanics for Engineers for Ferdinand P. Beer and E. Russell Johnston Jr., says, “ It is used in many counting instruments and in other applications where an intermittent rotary motion is required.” Essentially, the Geneva mechanism consists of a rotating disk with a pin and another rotating disk with slots (usually four) into which the pin slides.

The Geneva mechanism was originally invented by a watch maker. The watch maker only put a limited number of slots in one of the rotating disks so that the system could only go through so many rotations. This prevented the spring on the watch from being wound too tight, thus giving the mechanism its other name, the Geneva Stop. The Geneva Stop was incorporated into many of the first film projectors used in theaters.

The name derives from the device's earliest application in mechanical watches, Geneva, Switzerland being an important center of watch making. The *Geneva drive* is also commonly called a Maltese cross mechanism due to the visual resemblance when the driven wheel has four spokes. Since they can be made small and are able to withstand substantial mechanical stress, these mechanisms are frequently used in watches. 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 rotation of the drive wheel.



Because the mechanism needs to be well lubricated, it is often enclosed in an oil capsule.

Now the project mainly concentrates on designing a suitable operating system. To maintain simplicity and economy in the design the locally fabricated unit has been used. Our project achieves higher safety, reduces human effort, increases the efficiency, reduces the work load, reduces the fatigue of workers and reduces maintenance cost.

OBJECTIVE OF THE PROJECT

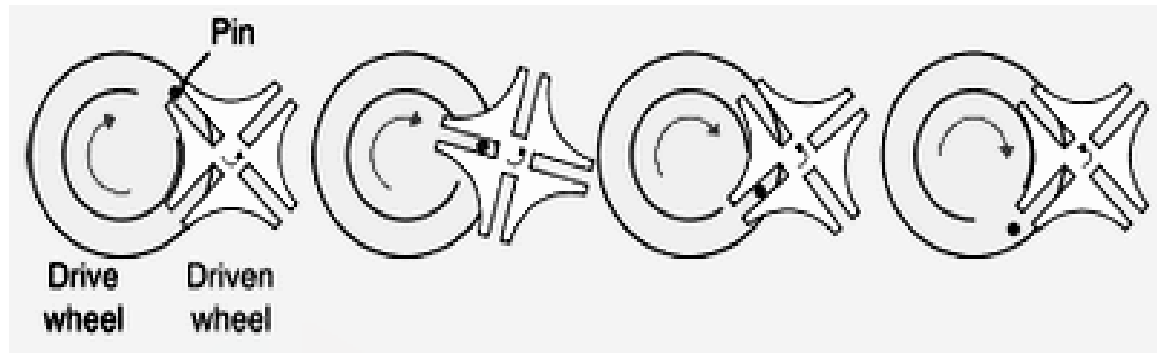
- To understand the basic principal of the our project
- Describe the construction and working of various parts of our project
- Development of the working model of the our project
- To cut the paper in accurate and equal dimensions.
- To reduce the time for marking the dimension in paper.
- To get the paper cutting machine in low cost.

➤ To design the machine in compact size

LITERATURE REVIEW

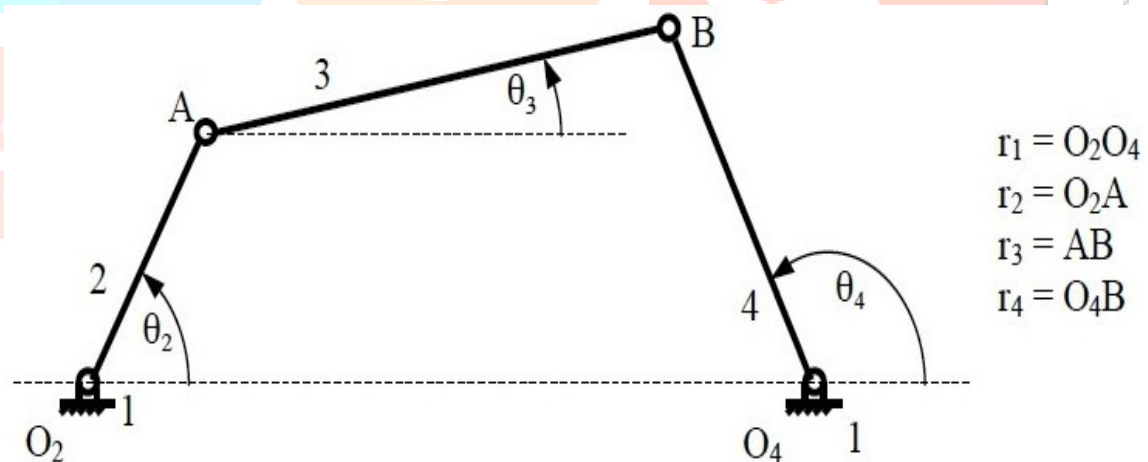
Geneva wheel mechanism

The Geneva mechanism is used here to get the intermittent motion. This Geneva mechanism is also called as indexing mechanism.



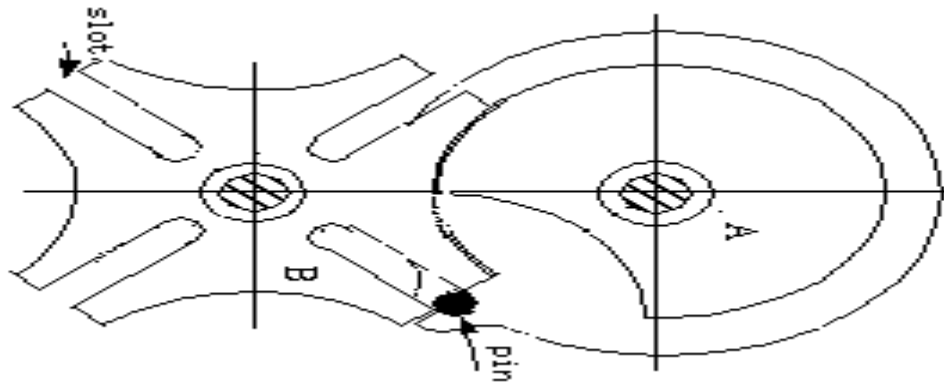
Crank And Lever Mechanism

Here the sprocket (crank) is connected to the lever (cutter) by a connecting link (string). When the crank rotates, this rotation is converted into oscillating motion. Hence the cutter gets oscillating motion to cut the



Geneva wheel:

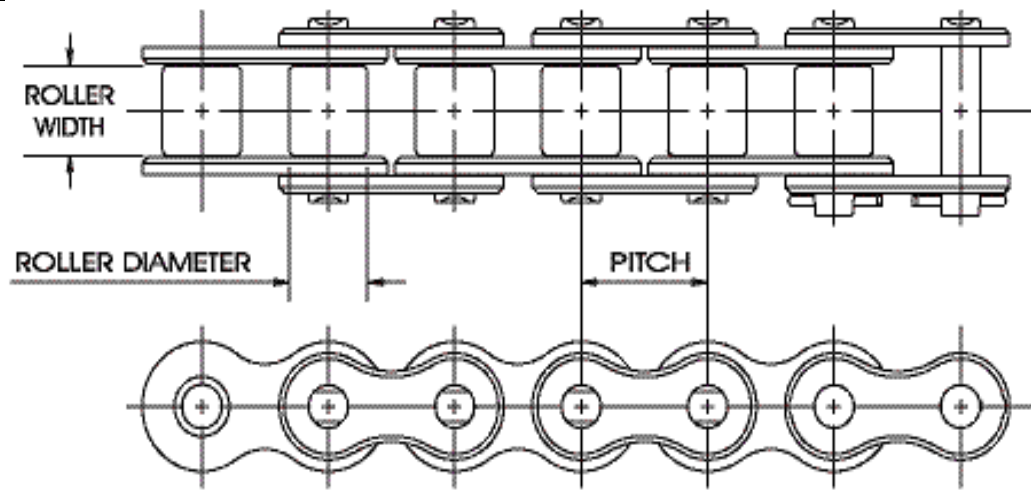
In our Geneva, the driven wheel has four slots and thus advances by one step of 90 degrees for each rotation of the drive wheel. Hence the intermittent motion is achieved for $\frac{1}{4}$ of the 360 degrees.

**Sprockets:**

A sprocket or sprocket-wheel is a profiled wheel with teeth, cogs, or even sprockets that mesh with a chain. The sprockets are used for the power transmission between two shafts through the roller chain.

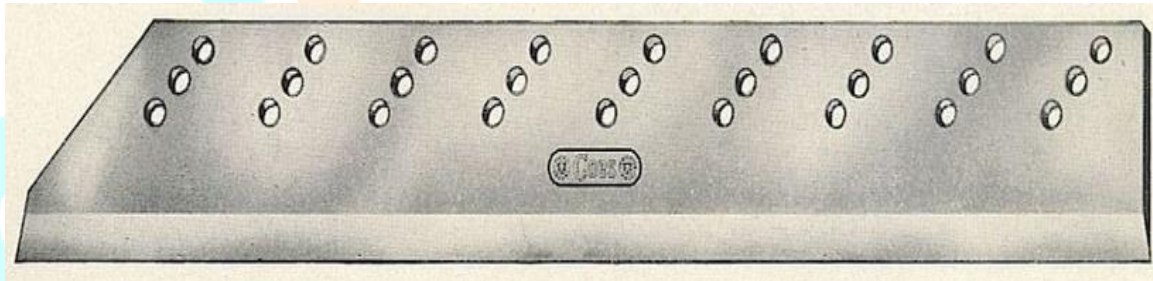
**Roller Chain:**

Roller chain is the type of chain drive most commonly used for transmission of mechanical power between two sprockets. It consists of a series of short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket.



Paper Cutter:

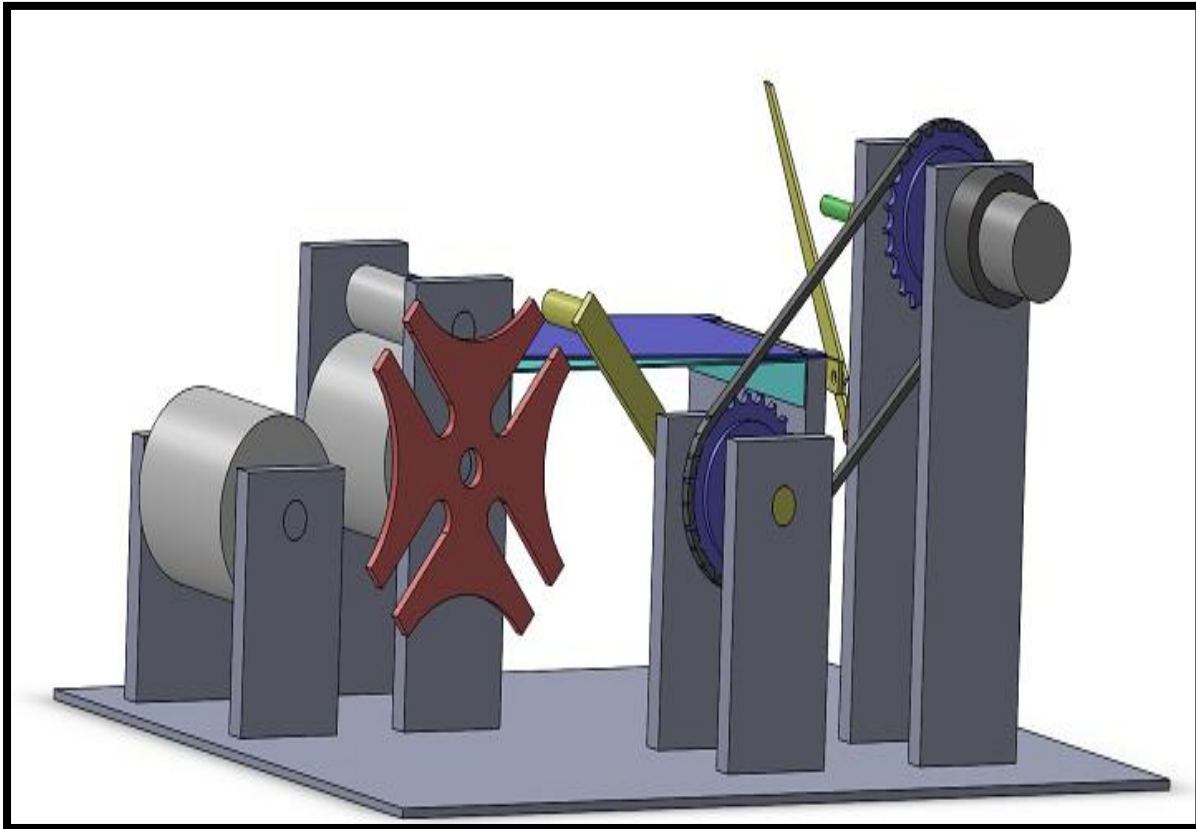
A paper cutter is a tool, designed to cut the paper with a straight edge. Paper cutters vary in size. This paper cutter is used as the oscillator in the four bar crank and lever mechanism.



Parts used in the project

- Geneva wheel
- Sprockets
- Roller chain
- Paper cutter
- Coil spring
- Shaft
- Paper roller

DESIGN OF THE PROJECT



WORKING OF THE PROJECT

The handle is fixed to the crank (sprocket). If the handle is rotated by using motor,

1. When the cam pin is in extreme right position i.e. engage position, the crank shaft will be at extreme bottom position. Hence the cutter is in full open position and the spring will be in rest position.
2. When the cam pin is in extreme bottom position i.e. disengaging position, the crank shaft will be at extreme left position. Hence the cutter is in partial cutting position and the spring will be in partial tension.
3. When the cam pin is in extreme left position i.e. disengage position, the crank shaft will be at extreme top position. Hence the cutter is in full cutting position and spring will be in full tension.
4. When the cam pin is in extreme top position i.e. disengage position, the crank shaft will be at extreme right position. Hence the cutter is in partial cutting position and the spring will be in partial tension.

Thus the paper cutting is achieved by the above four process of the Geneva and cutter.

BASIC CONCEPT OF PROJECT DESIGN:

Decision making comes in every stage of design. Consider two cars of different makes. They may both be reasonable cars and serve the same purpose but the designs are different. The designers consider different factors and come to certain conclusions leading to an optimum design. Market survey gives an indication of what people want Existing norms play an important role. Once a critical decision is made, the rest of the design features follow. For example, once we decide the engine capacity, the shape and size, then the subsequent course of the design would follow. A bad decision leads to a bad design and a

bad product.

Design may be for different products and with the present specialization and knowledge bank, we have a long list of design disciplines e.g. ship design, building design, process design, bridge design, clothing or fashion design and so

TYPES OF PROJECT DESIGN:

There may be several types of design such as

1. Adaptive design

This is based on existing design, for example, standard products or systems adopted for a new application. Conveyor belts, control system of projects and mechanisms or haulage systems are some of the examples where existing design systems are adapted for a particular use.

2. Developmental designs

Here we start with an existing design but finally a modified design is obtained. A new model of a car is a typical example of a developmental design .

3. New design

This type of design is an entirely new one but based on existing scientific principles. No scientific invention is involved but requires creative thinking to solve a problem. Examples of this type of design may include designing a small vehicle for transportation of men and material on board a ship or in a desert. Some research activity may be necessary.

FACTORS TO BE CONSIDERED IN PROJECT DESIGN

There are many factors to be considered while attacking a design problem. In many cases these are a common sense approach to solving a problem. Some of these factors are as follows:

- (a) What device or mechanism to be used? This would decide the relative arrangement of the constituent elements.
- (b) Material
- (c) Forces on the elements
- (d) Size, shape and space requirements. The final weight of the product is also a major concern.
- (e) The method of manufacturing the components and their assembly.
- (f) How will it operate?
- (g) Reliability and safety aspects
- (h) Inspectibility
- (i) Maintenance, cost and aesthetics of the designed product.

ADVANTAGES OF THE PROJECT

Advantages of the project as per following like as:

1. No need for marking the paper.
2. It will reduce the time for marking the paper.
3. The dimension of the paper will be accurate.
4. Manufacturing cost is less.
5. No noise pollution.
6. Compact in size.
7. Can be used for small scale industries.
8. Can able to change the machine elements easily

DISADVANTAGES OF THE PROJECT

Dis-advantages of the project as per following like as:

- High installation cost
- Operating speed is low
- Maintenance cost high
- Operating cost is high
- Skilled operator required

APPLICATION OF THE PROJECT

Our project should use for following various applications like as:

- It can able to use in paper cutting industries.
- It can able to use in paper crafting.
- It can be used in many small scale paper industries.
- It can be used to cut the color papers for designing.
- It can be used in stationary stores.

LIMITATIONS:

1. Can't able to cut the papers above 15 cm width.
2. Can't able to cut bunch of papers i.e. more than 5 papers.
3. Can't be used for large scale industries

FUTURE SCOPE OF THE PROJECT

1. The Geneva drive is in movie projectors: the film does not run continuously through the projector.
2. Geneva wheels having the form of the driven wheel were also used in mechanical watches, but not in a drive, rather to limit the tension of the spring, such that it would operate only in the range where its elastic force is nearly linear. If one of the slots of the driven wheel is occluded, the number of rotations the drive wheel can make is limited. In watches, the "drive" wheel is the one that winds up the spring,

and the Geneva wheel with four or five spokes and one closed slot prevents over winding (and also complete unwinding) of the spring. This so-called Geneva stop or "Geneva stop work" was the invention of 17th or 18th century watchmakers.

3. Other applications of the Geneva drive include the pen change mechanism in plotters, automated sampling devices, indexing tables in assembly lines, tool changers for CNC machines, banknote counting and so on. The Iron Ring Clock uses a Geneva mechanism to provide intermittent motion to one of its rings.

CONCLUSION

Our project is successfully implemented for the design and fabrication of paper cutting machine using the Geneva mechanism is will be very useful in small scale industries. There are many machines based on paper cutting but it has some demerits like large in size, costly, need skilled people to operate and it needs electrical input. But our machine will overcome these demerits by compact in size, less cost, no need for skilled people and there is no need for electrical input. The design procedure is done for fabricating the Geneva wheel and other elements of this machine. The main aim for this machine is to reduce timing for paper cutting and neglect the time for marking the paper, this aim is achieved in our paper cutting machine using Geneva mechanism.

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