



Auto Paper Cutting Machine Using Geneva Wheel Mechanism

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ABSTRACT Paper cutting machine design and fabrication applies Geneva mechanism in cutting papers to equal and accurate size. Geneva drive is a component changes continuous motion into intermittent motion using indexing mechanism. The paper is moved between the time intervals of cutting periods as a result of intermittent motion. The cutting action is achieved by the mechanism of crank and lever. The cutter will be pulled back to the original position as a result of spring effect.

Keywords- Portable die auto paper cutting machine, Geneva mechanism, Lever crank mechanism Design, Fabrication & Working of portable die auto paper cutting machine.

1. INTRODUCTION

1.1 BACKGROUND

Here we propose the design and fabrication of a fully automated paper cutter based on Geneva mechanism. Our proposed system cuts paper pieces of equal lengths based on Geneva mechanism. System uses a 12V motor in order to drive the entire system. We use a shaft which is directly connected to the motor. This shaft has a connecting rod which is connected to a scissor in order to drive the cutting mechanism for cutting paper. This motor shaft is connected to a sprocket which is in turn connected by a chain to another sprocket. This sprocket is now connected to a Geneva mechanism wheel. This wheel is used to drive paper feed into the cutter mechanism. Here we use Geneva mechanism driven by another connecting z shape rod. This mechanism ensures paper feed of equal length inserted at proper time intervals. System uses a supporting frame that maintains proper coordination between feed and cutting mechanism. burners in Stirling engines burn fuel continuously.

1.2 HISTORY

The history of DIY auto paper cutting machines using the Geneva wheel mechanism is rooted in the development of the Geneva wheel itself and its application in various industries, including printing and paper cutting.

The Geneva wheel, also known as the Maltese cross mechanism, was invented in the 17th century by Swiss watchmaker and engineer, Salomon de Caus. It was initially used in clock making to control the rotational movement of the hand of a clock. The Geneva wheel allowed for precise intermittent movement, making it ideal for applications requiring controlled stops and starts.

Over time, engineers and inventors recognized the potential of the Geneva wheel mechanism in other fields, including the printing and paper cutting industry. The mechanism's ability to provide intermittent rotary motion was leveraged to create automated paper cutting machines.

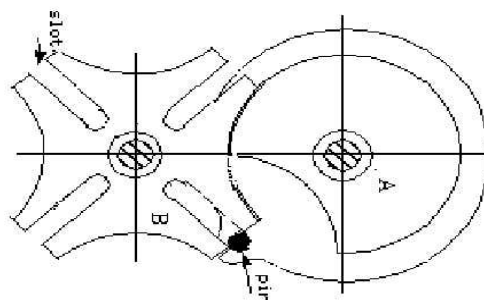
In the late 19th and early 20th centuries, the concept of DIY

auto paper cutting machines using the Geneva wheel mechanism began to emerge. Entrepreneurs and craftsmen devised ways to build their own automated paper cutters, using readily available materials and adapting the Geneva wheel mechanism to suit their specific needs.

As technology advanced, the DIY auto paper cutting machines using the Geneva wheel mechanism evolved. Today, with the rise of the maker and DIY communities, enthusiasts can find various guides, tutorials, and even open-source projects that offer instructions on building their own automated paper cutting machines using this mechanism.

Overall, the history of DIY auto paper cutting machines using the Geneva wheel mechanism reflects the ingenuity and creativity of individuals harnessing a centuries-old invention to make the paper cutting process more efficient and accessible.

GENEVA WHEEL



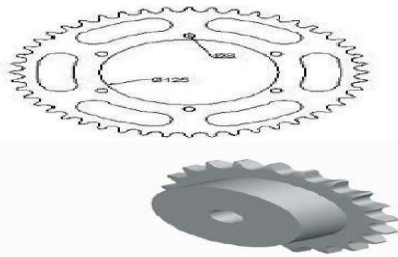
This Geneva, the driven wheel will have four slots and hence advances by steps of 90 degrees from each slot in every rotation of the drive handle. Therefore, for every $\frac{1}{4}$ of the 360 degrees the intermittent motion is achieved

2. COMPONENTS: -

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

2.1 Sprockets

A sprocket is a profiled wheel that has teeth, cogs and it can even be meshed with a chain. Power transmission by the sprockets are used for the power transmission between two shafts through the roller chain.

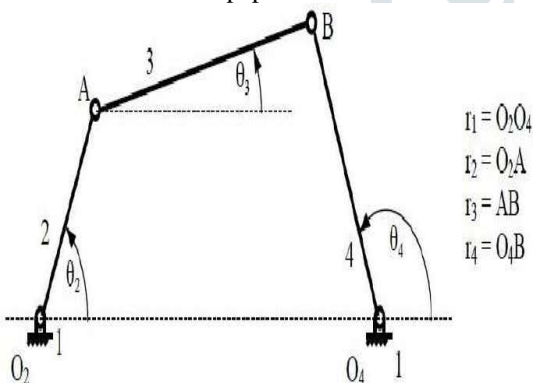


2.2 Roller chain

A block chain in which hollow transverse blocks or cylinders turning on steel pins act as rollers to lessen friction.

2.3 Geneva wheel

The connecting link is used to connect the sprocket to the lever. When the crank rotates, this rotation is changed to an oscillating motion. Therefore the cutter obtains an oscillating motion which cuts the paper.



3. Working Principle:

The handle is fixed to the crank (sprocket). If the handle is rotated, 1

When the cam pin is in extreme right position i.e. engage position, the crank shaft will beat extreme bottom position. Hence the cutter is in full open position and the spring will be in rest position.

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.

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.

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

Building a DIY auto paper cutting machine using a Geneva wheel mechanism can be a complex project requiring mechanical and electrical skills. However, I can provide you with a high-level overview of the process involved. Keep in mind that this is a challenging project, and it's important to prioritize safety precautions when working with moving parts and sharp objects.

Here's a general outline of the steps involved in creating a DIY auto paper cutting machine using a Geneva wheel mechanism:

3.1 Design and planning:

- Determine the desired size and specifications of the paper cutting machine.
- Sketch the basic design, including the Geneva wheel mechanism and cutting blade mechanism.
- Calculate the dimensions and tolerances required for precise movement.

3.2 Material selection and preparation:

- Choose suitable materials for the frame, gears, cutting blade, and other components.
- Acquire the necessary tools and equipment for cutting, drilling, and shaping the materials.
- Cut and shape the materials according to your design specifications.

3.3 Geneva wheel mechanism:

Create a Geneva wheel using a disc or plate with equally spaced slots or cutouts. Construct a driving wheel or pinion that meshes with the Geneva wheel.

Assemble the driving wheel and Geneva wheel, ensuring proper alignment and smooth rotation.

Cutting blade mechanism: Design and construct a mechanism to hold and move the cutting blade.

Incorporate a suitable motor or actuator to drive the cutting blade mechanism. Implement a system to control the movement and positioning of the cutting blade.

3.4 Power and control system:

- Choose an appropriate motor or actuator to provide the necessary power.
- Design a control circuit or system to regulate the motor's speed and movement.
- Incorporate switches, sensors, or limit switches for safety and precise operation.

3.5 Assembly and testing:

Assemble all the components together, ensuring proper alignment and functionality.

Test the machine's movement, ensuring that the Geneva wheel mechanism and cutting blade mechanism work smoothly.

Make any necessary adjustments or modifications to improve the machine's performance.

Remember, this is a high-level overview, and the actual implementation may involve additional steps and considerations. It's crucial to have a good understanding of mechanical engineering principles and experience with DIY projects. Additionally, always prioritize safety and take necessary precautions when working with machinery and sharp objects.

Top of Form

Regenerate response

Bottom of Form

4. Design Calculation for Paper Feeding:-

Length of the paper to be feed can be adjusted by..The paper feed length = (circumference of the roller)/no. of slots in

Geneva wheel $L = (2 * R) / n$ where n is the number of slots in the Geneva wheel .R is the radius of the roller, L is the length of the paper to be feed.

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4.1 Design Calculation for Cam Drive

Angle of locking section,
 $\gamma = \pi/2 (Z+2) = 270^\circ$

Semi-indexing angle(driven)
 $\alpha = \pi/Z = 45^\circ$

Semi-indexing angle (driver)
 $\beta = \pi(Z)$

$2)/(2Z) = 45^\circ$

Gear ratio
 $\epsilon = 1$ for $Z=45$.

Radius ratio, $\mu = R/r = 1.0006$.

Indexing time ratio,

$v = B/\pi = 0.2500$

4.2 Components Specification

Material Selection and No. of Materials

PART

S. No.	Part Name	Material Name	Quantity
1	Geneva wheel	Mild steel	1
2	Sprockets	Cast iron	2
3	Roller chain	Stainless steel	1
4	Paper cutter	Steel	1
5	Paper roller	Mild steel	1
6	Coil spring	Steel alloy	2
7	Shaft	Mild steel	3



Figure no. 4.1 Diy Auto Paper Cutting Machine

5.1 Merits :-

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

5.2 Demerits:-

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

6 Applications:

- 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.
- 4. It can be used to cut the color papers for designing.
- It can be used in stationary stores

6. Conclusion

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 this 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.

7. FUTURE SCOPE:

The future scope of DIY auto paper cutting machines using the Geneva wheel mechanism holds great potential in various industries and DIY communities. As technology advances and accessibility to information and tools improves, several exciting developments and possibilities are on the horizon:

Automation and efficiency: mechanism have the potential to streamline the paper cutting process for DIY enthusiasts, hobbyists, and small-scale businesses. With advancements in motor control, sensors, and automation, these machines can become more precise and efficient, saving time and effort for users.

Customization and Personalization: As DIY culture continues to grow, there will be an increasing demand for personalized and customizable products. DIY auto paper cutting machines can incorporate digital interfaces or software that allows users to create their designs and easily convert them into paper-cut patterns.

DIY auto paper cutting machines using the Geneva wheel

Integration with Digital Technologies: Future DIY auto paper cutting machines may integrate with digital platforms and software, enabling seamless connectivity to design tools, cloud storage, and online templates, further enhancing their versatility and user experience.

Educational Applications: DIY auto paper cutting machines can find utility in educational settings to teach engineering principles, mechanical design, and electronics. Students can build and program these machines, gaining practical skills and knowledge in the process

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