

Design and Development of Automatic Paper Cutting Machine with Mechanism of Geneva

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Abstract - For cutting papers to precise dimensions, the design and construction of a paper cutting machine based on the mechanism of Geneva is advantageous. The Geneva wheel is an arrangement device that changes continuous motion to intermittent motion, allowing paper to be delivered at uniform intervals between cutting phases. A crank and lever mechanism is then used to slice the paper. The idea of this concept is to design a mechanism of Geneva that drives paper cutter that reduces the amount of hour specified for paper marking and also aids in the of equal-sized paper in each revolving. It saves time due to its automated operation. This machine is useful in the paper manufacturing sector since it eliminates human errors. It can also be used in schools, colleges, stationary stores, and paper stores.

Keywords:- Geneva, six slots, cutting are all terms that come up in the index, Mechanism of Geneva, lever-crank mechanism, Paper Cutter, Paper Roller, Sprocket.

1. INTRODUCTION

People nowadays utilise paper in various sizes. based on their requirements and needs as a result, we present a Geneva mechanism-based paper cutting machine. We can receive paper from this machine according to our needs and dimensions. We can adjust the size of the paper depending on the size of the Geneva wheel. We can also reduce human labour by having this machine move automatically. As a result, a new development for effective fabrication is required. That process or procedures must meet the accuracy Productivity criterion. This document depicts a Geneva mechanism- based automatic paper cutting machine. To cut the papers, this equipment is quite precise. This idea is used mostly in the business of paper production to cut large quantities of paper. The equipment is made at a low cost and with high efficiency. The goal of this approach is to eliminate paper marking time in industries, reducing human tiredness and saving time. It has been examined in this article to employ the Geneva Mechanism. This is the process that causes the motions to be intermittent. The machine for cutting paper is created to cut down on the time it takes to mark and cut Papers. The paper is sliced using a crank and lever system. The spring attached to the cutter will return the cutter to its original position after cutting. The main goal of this project is to cut down on the amount of time it takes to mark papers. As a result, this solely relies on time to function.

2. LITERATURE SURVEY

1. S.R. Durai Raju, Arun Kumar. C, Karan Kumar. R, Thiagarajan. A. conducted a review on the study and testing of design and discovery of Geneva mechanism and that is the specification of the Geneva mechanism and design can be changed and the needed wheel lengths can be selected based on the needs of the user. Lubrication isn't required. The high pressure in this wheel is attained, and the crank reduces pin fluctuation, allowing for the best output. It was accomplished using a four-slot Geneva mechanism.
2. Automatic Paper Cutting Machine Using Mechanism of Geneva, Sunil H V, et al. The purpose of this proposal is to develop a paper cutting machine using mechanism of Geneva that reduce the time-consuming task for marking the paper. This machine is particularly valuable in the paper manufacturing sector since it eliminates human errors. It can also be used in schools, colleges, stationery stores, and paper stores. It was accomplished using a four-slot Geneva mechanism.
3. Jung-Fa Hsieh of the Far East University's Department of Mechanical Engineering in Tainan built and analysed a curved slots of Geneva mechanism. Using the homogeneous coordinate transformation approach and conjugate surface theory, The mechanism for indexing was discovered.
4. Design, Cad Modeling, and Fabrication of Geneva Operated Roller Conveyor by M. V. Ingalkar, A. R. Sonekar, and Y. D. Bansod, the object's transport time to cover the entire conveyor 3D modelling of Geneva Operated Roller Conveyor using CATIA V5 R20 Software, design of Geneva wheel using four-slot Geneva mechanism
5. P. KaliSindhur, Y. Karthik, and others devised a cutting mechanism that used the Geneva Mechanism to deliver feed. I designed a belt drive using the Geneva mechanism as a guide. To regulate the length of the feed, use a four-slot Geneva mechanism to change the depth of the slots in the Geneva wheel.
7. Anupam Chaturvedi, Hiren Trapasiya, Jayesh Sevra, Mitkumar Patel, Anupam Chaturvedi, Hiren Trapasiya, Jayesh Sevra, Mitkumar Patel, Anupam Chaturvedi, Hiren Trapasiya, Jayesh Sevra, Mitkumar Patel, Anupam Chaturvedi, Hiren Trapasiya Automation can also reduce the amount of time it takes to complete a task. Pneumatic Crushing Machines now on the market take a long time to cut the paper and are extremely noisy while doing so. Torque Capacity Increased Pneumatic Paper Cutting Machine

8. Rakesh Prajapati, Purvik Patel, and Saurabh Modi designed and development of machine to perform stamping and cutting operations to lessen the time spent marking and cutting of papers. Moving the paper between cutting stages is easier with intermittent action. It was accomplished using a four-slot Geneva mechanism.

9. Ankur Prajapati, Chinmay Patel, Dhwanit Pankhania, Brijen Kanjia, Aakash Dubey, and others review the Geneva process and its applications. The Maltese cross mechanism is another name for the Geneva drive. It converts continuous rotation into a rotational motion that occurs just once in a while. It was accomplished using a four-slot Geneva mechanism.

10.
3. WORKING PRINCIPLE AND COMPONENTS USED

When power is supplied to motor, Geneva wheel rotates the rollers with specified time delay, and the chain drive follow the rollers. The chain sprocket is attached to the motor, and the gearwheel is connected to the Geneva mechanism. The Geneva wheel has one roller attached to it, and another roller is attached to it. The paper is inserted into the rollers, and both rollers are mounted as stated to the specified interval. The roller shaft is connected to the Geneva wheel. The cutting wire is attached to the motor shaft, and the cutter rotates downward, cutting the paper. This is a Geneva mechanism-based automatic paper cutting machine.

For conduction, the steps are as follows.

- The crank shaft will be in extreme bottom position when the cam pin is at extreme right position, i.e., engage position. As a result, the cutter is fully open.
- The crank shaft will be at in above top end when the cam pin is in extreme left end, i.e., releasing spot. As a result, the cutter is in full cutting mode.

3D view of the proposed model

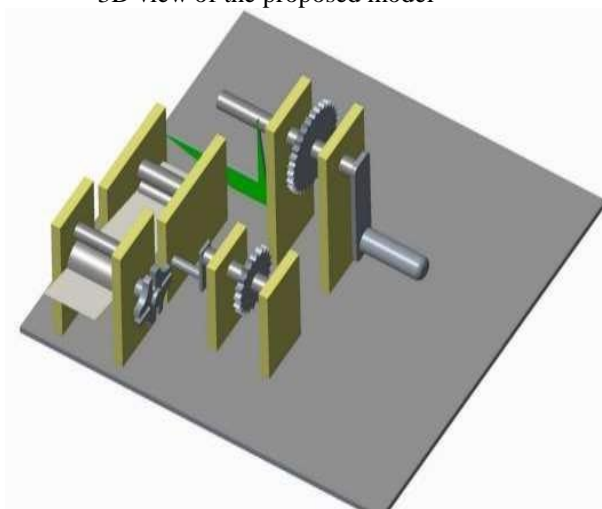


Figure 1: Image of Paper cutting Device

4. PROJECT'S OBJECTIVES

- To reduce the number of people on the job
- To lighten the workload
- To lower the cost of manufacture
- To shorten the time, it takes to complete a project
- To reduce the amount of material handled

- To help workers feel less tired
- To reach a high level of product quality

5. THE MODEL IS CONSTRUCTED USING THE MAIN COMPONENTS

- The wheel of Geneva
- Sprocket
- Rolling chain
- a cutting blade or a paper cutter
- Shaft of a paper roller
- Motor
- Electricity supply

The wheel of Geneva

For each rotation of the drive wheel, we use a four-slot driven wheel that advances by one step of 90°. As a result, intermittent motion is obtained for 14 of the 360°. An intermittent gear with a pin will extend into a hole on the driven wheel, advancing a step, and increased revolving blocking of disc that will lock the driven wheel between the steps and changes the continuous rotation to an intermittent rotational motion.

Sprocket

A curved wheel with teeth, prongs, that combines with a chain. The sprockets transmit power between two shafts via the roller chain.

A chain of rollers

Most common sort of chain-driven mechanism for supplying power between two sprockets is a roller chain. It makes up a sequence of small cylindrical rollers that are connected each other by side links.

Paper cutter or cutting blade

Paper cutters are meant to cut the papers with accurate and comes in different sizes. This paper cutting machine is the oscillator in the four-bar mechanism of crank and lever.

A shaft of paper roller

It is the part that enables us to feed the paper in a random pattern. The paper was fed through the roller without being damaged.

Motor

Any electric motor's operation is based on simple electromagnetism. When a current-carrying conductor is exposed to an external magnetic field, it will be subjected to a force that is proportional to both the current in the conductor and the strength of the external magnetic field. As you may remember from your early experiences with magnets, opposite polarities (North and South) attract each other, but like polarities (North and South, South and South) repel each other. The motor is 12 volts, 4.5 amps, and rotates at 30 revolutions per minute.

Electricity supply

The voltage of alternate current, which is usually 220 Volts, is attached to a transformer, that converts it to the

required dc output level. A diode rectifier produces a full-wave rectified voltage, which is then altered by a usual capacitor filter to generate a dc voltage. The result in dc voltage frequently gets some ripple or variation in ac voltage.

6. MECHANISM OF GENEVA

The Geneva is one of the first intermittent motion devices, and it uses continuous rotation as its input. It is, without a doubt, the most widely utilised. Geneva are off-the-shelf from a variety of manufacturers in a variety of sizes. They are less expensive than cams or star wheels, and depending on load factors and other design criteria, they provide adequate to good performance. The Maltese cross, also known as the Geneva wheel, is a gear system that converts a continuous rotation into an intermittent rotating motion. A pin in the rotating drive, also known as a cam drive or cam wheel, extends into a slot in the driven wheel, moving to another step.

Design of Geneva Mechanism is examined



Figure 2: Traditional four-slot Geneva wheel

With a Geneva mechanism paper cutting machine is used for cutting sheets in same and accurate dimensions can be developed. Arrangement mechanism is used which converts continuous motion to intermittent motion, allowing paper moves between cutting intervals. The paper is then sliced using a crank and lever mechanism. By spring action, the cutter will return to its original position. [1]

The Geneva mechanism was used to develop and construct an automated multiple water filling system, which was studied and investigated. The machine's main function is to fill bottles with water automatically utilising a sliding bottle plate. This project combines the Geneva and electrical synchronous motor systems. This project is divided into four stages, all of which are managed by Geneva: loading, bottle plate, and filling. Overall, the method is more versatile and time-saving. [2]

Han Jiguang Yu Kang conducted research into the testing and combination of a Geneva mechanism and an elliptical crank. If the groove number of the Geneva wheel is a constant, the kinematics coefficient of the Geneva mechanism is a constant for internal and

external Geneva mechanisms, according to this study.

The mechanism that has a variable length and speed along the elliptic moving crank is the same as the elliptic crank utilised as the Geneva wheel's drive crank. As a result, the kinematics coefficient of the Geneva mechanism can be changed. This research uses an integrated Geneva mechanism analysis technique. The kinematics coefficients are used to propose a synthesis approach for the combined Geneva mechanism. The extreme kinematics coefficient computation method is proposed. [3] **As a cutting mechanism, feeding via Geneva is used.** P. Kalisindhur, Y. Karthik, T. Vijay, Y. Sasikanth, and G. Sri Harsha developed a cutting system that delivers intermittent feed utilising the Geneva mechanism. The Geneva mechanism's constant spinning of a circular disc provides this intermittent feed. The Geneva mechanism was used to produce a belt drive that delivers feed and ensures plane functioning and motion of the feed at predefined intervals. A slotted lever mechanism made with a slider crank mechanism was used to cut the feed from the Geneva drive. [4].

7. METHODOLOGY

The Geneva wheel drive is a technique for switching from continuous to intermittent motion. As a result of this action the paper passes between the same intervals of cutting time. The cutter cuts the paper to the required dimensions at the same time. The method is automatically replicates. The paper is inputted into the rollers, and both rollers are mounted as stated by to the specified interval. The roller shaft is connected to the Geneva wheel. The Geneva wheel turns rollers with a set time reduction as power is circulated to the motor, and the chain drive goes along with the rollers. The motor is attached to the chain sprocket, and the sprocket is connected to the Geneva mechanism. Motor starts rolling the Geneva in preparation for the paper roll to commence. The Geneva wheel has one roller attached to it, and another roller is connected to it. The spring that links the cutters is secured in place. The cutter wire is attached to the motor shaft, and the cutter rotates downward, cutting the paper. This is a Geneva mechanism-based automatic paper cutting machine.

- Material handling and manufacturing lag times are longer.
- Worker safety is compromised.

8. THE SUGGESTED MACHINE'S ADVANTAGES, DISADVANTAGES, AND FUTURE SCOPE

Merits:

- The time allotted for marking the paper will be shortened.
- The paper's dimensions are accurate.
- Manufacturing costs are lower.
- There will be less noise pollution.
- Small-scale industries can benefit from it.

Demerits:

- It was impossible to cut the papers wider than 15 cm.
- I was unable to trim a stack of papers.
- Large-scale industries should not be utilised.

Future plans:

- Large-scale industries may be able to implement.
- We may cut paper with different designs by adjusting the shape of the cutter.
- We can cut multiple standard sizes of paper by altering Geneva slots.
- The machine can be customized to cut thick sheetslike lather.

CONCLUSION

In small size companies, the design and manufacture of a paper cutting machine based on the Geneva mechanism will be quite valuable. There are numerous paper-cutting machines available, but they all have drawbacks such as being enormous, expensive, requiring expert personnel to operate, and requiring electrical input. However, our machine will overcome these disadvantages due to its small size, low cost, lack of qualified personnel, and lack of electrical input. Only a small amount of manual input is required to rotate the handle. The design procedure is completed in order to fabricate the Geneva wheel and other machine components. The paper feed can be changed by altering the roller's circumference. Thus, the intermittent motion provided by the Geneva mechanism allows for accurate paper cutting without the need to mark the paper. Between the cutting phases of the crank and lever mechanism, this intermittent motion is employed to feed the paper. The paper is sliced with the help of the crank and lever mechanism. When the Geneva is disengaged, this mechanism activates the cutter. As a result, the necessary intermittent motion is achieved. As a result, a crank and lever system feeds and cuts the paper. The major goal of the mechanism is to reduce the time required for paper cutting while ignoring the time required for paper marking; this goal is achieved in our paper cutting machine by employing the Geneva mechanism.

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