

GENEVA MECHANISM OPERATED PAPER CUTTING MACHINE

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ABSTRACT

The design and fabrication of paper cutting machine using Geneva mechanism is accurate in terms of cutting the paper with in dimension and of equal size. The purpose of using Geneva mechanism operated paper cutting machine is to eliminate or reduces the paper cutting time and providing equal feed to paper with reduce in manual work. Geneva drive is nothing but the indexing mechanism which is used to convert the continuous motion into intermittent motion casing the paper to move forward. Paper cutting action is obtained by cam and follower mechanism and the cutter regains its original position with the help of spring effect. This paper cutting machine is useful in manufacturing industry with mass production. The machine will help to reduce the human error, material wastage and increases productivity.

Keywords: - Geneva wheel, paper cutter, paper cutter, cam and follower mechanism, Geneva mechanism.

1. INTRODUCTION

In the era of continuous advancement, there is need to develop an effective way of manufacturing the goods. All the requirements such as accuracy, increase in productivity, less time consuming should be fulfil by the method. The paper cutting mechanism using Geneva wheel is very precise in term of cutting the paper within dimensions. This mechanism is used in mass production. The mechanism is fabricated in less cost. The conventional Geneva mechanism is simple and inexpensive which is used to get intermittent motion from rotary motion. This mechanism consists of Geneva wheel, G guide wheel, rollers, cam and followers, cutter, DC motors, bearings. Geneva mechanism is used to reduce the paper making time and feeds the paper of equal length in each rotation. In Geneva mechanism, the rotating drive wheel (G guide wheel) has pin that reaches into a slot of the driven wheel advancing into it by one step. The driven has four slots thus advances by one step of 90 degree for each rotation of drive wheel. A 4-bar mechanism is 1 degree of freedom mechanism. A 4-bar mechanism is created by selecting four link lengths and joining the links with revolute joints to form loop. The machine is used to cut the various kinds of papers, plastic thin films, leather. The required shape and size of paper is deepened upon feed of paper through roller which is driven by Geneva mechanism. So indirectly the number of slots on Geneva are playing important role in feeding. According to material to be cut the cutter has to be select.

2. LITERATURE REVIEW

Vijay Kumar and Ghanshyam Kumarn in their research paper “Design and Analysis of paper cutting machine works on Geneva mechanism” provides the comparison of the position, velocity, acceleration, and jerk between the classical Geneva wheel mechanism and the proposed mechanism. a kinematic study of a mechanism incorporating a Geneva wheel and a gear train to achieve intermittent motion is briefly explained in this paper. [1]

Han Jiguang Yu Kang in his research paper “Analysis and Synthesis of Geneva mechanism with elliptic crank” provides a brief overview on analysis of internal and external Geneva mechanism. If the groove number of the Geneva wheel is a constant then kinematics coefficient of the Geneva mechanism 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. [2]

The paper named as “Cutting mechanism by giving feed through Geneva mechanism” by P.Kali sindhur and Y. Karthik states the design a mechanism for cutting by giving intermittent feed. This intermittent feed is given by continuous rotation of circular disk in Geneva mechanism. They have designed a belt a belt drive with the help of Geneva mechanism which is used for giving feed and gives smooth operation and smooth movement of the feed at required time interval. The feed from the Geneva drive was cut by using slotted lever mechanism which was designed using slider crank mechanism. [3]

Madhoo G. And Mugammed Sameer in their article “Force analysis of Geneva wheel and face cam used in automat” emphasizes on two main parts i.e. Geneva wheel and Face cam spindle which are used for their respective operations. Automat is driven using single motor for different operations. Geneva Wheel is used to index the drum which consists of 96 spindles. Due to this Geneva mechanism each of the spindles will hold the ceramic body when the drum is being indexed. Due to which there is a force which is generated in the Geneva wheel is in maximum and minimum position in Cutting mechanism by giving feed through Geneva mechanism. [4]

Hones J.A, and Nelson G.L., in their paper “Analysis of the Four-Bar Linkage” gives review on 4-bar mechanism. The 4-bar mechanism is a basic 1-degree of freedom mechanism. 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. In the Force analysis of the Geneva wheel and face cam in automat. [5]

3. WORKING PRINCIPLE AND COMPONENTS

The main parts of this model are Geneva wheel, G guide wheel, rollers, cam and followers, cutter, DC motors, bearings and springs. Two rollers are mounted over each other by keeping tension between them with help of spring effect. The shaft of roller is coupled with Geneva drive which is further coupled with motor shaft. Hence power is supplied from motor to roller. One of the roller is drive member whereas other is driven member. Cutter is fixed at one end. The cam and follower mechanism is used to perform the cutting action. Cam is connected to motor shaft. Follower is connected to cutter. As cam rotates cutting action take place as follow

- When cam is in its highest profile, the follower goes in upward direction. Hence cutter is in full open position.
- When cam rotates from higher to lower profile then the cutter goes in downward position and hence cutting action take place.
- When cam comes in its lowest profile position, the follower come in its original position and cutter faces are closed.

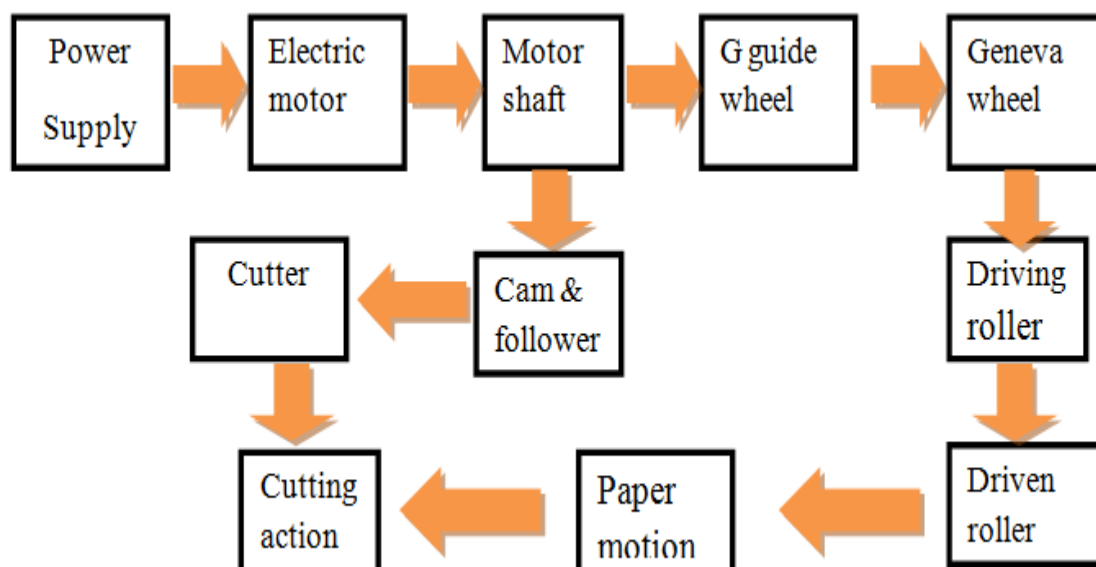


Fig.-1: Block Diagram of Mechanism

The main components are as follow:-

- Geneva wheel: - Four slots driven wheel is used so it advances by one step of 90 degree for each rotation of the drive wheel. This mechanism translate continues motion into intermittent motion the design of Geneva mechanism is initiated by specifying the crank radius, roller diameter, number of slot. The material we used is white fiber.

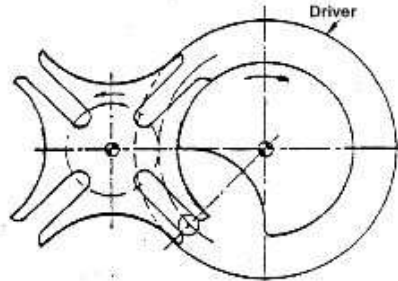


Fig.-2: Geneva wheel

- Rollers: - Rollers are used to feed the paper in forward direction. One is driven roller and other is drive roller. The rollers held in specific position with help of spring effect. The material used is fiber.
- Cutting blade: - the cutter is attached at one end which depends upon the shape, size and material which is to be cut. The blade has oscillation motion which is given by cam & follower. Carbon steel cutter is used.
- Roller shaft: - it is element which gives the motion to drive roller for feeding the paper. Generally M.S. shaft are used.

4. ADVANTAGES & DISADVANTAGES

4.1 Advantages

- Reduce the time for paper cutting.
- Less noisy.
- Accurate size of paper can be cut.
- Low manufacturing cost.
- Can be used for small scale industry.

4.2 Disadvantages

- Geneva wheel has to manufacture in close tolerance which is difficult.
- Motor should be step down before providing the voltage.
- For size variation of paper, design of Geneva wheel is to be change.

4.3 Future scope

- Implementation in large scale industry is possible.
- Machine can be modified to cut lather and thick sheets by changing cutter.
- Complete automation is possible.

5. CONCLUSION

For the small scale industry, the design and fabrication of paper cutting machine using Geneva mechanism is useful in mass production. The traditional paper cutting machine has demerits like large in size, high cost, need skill labours, high self weight etc. This demerits can be overcome by using machine with Geneva wheel as it is compact in size, has less manufacturing cost. This mechanism reduces the paper cutting time, reduces the wastage of raw material and simultaneously increases the productivity with accuracy.

6. REFERENCE

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