

FORM 2
THE PATENT ACT 1970 &
The Patents Rules, 2003
COMPLETE SPECIFICATION
(See section 10 and rule 13)

TITLE OF THE INVENTION:

SEMI AUTOMATIC PAPER CUTTING MACHINE USING GENEVA MECHANISM AND INDUSTRIAL INTERNET OF THINGS (IIOT)

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PREAMBLE TO THE DESCRIPTION

<p>PROVISIONAL</p> <p>The following specification describes the</p>	<p>COMPLETE</p> <p>the following specification invention. Particularly describes the invention and the manner in which it is to be performed.</p>
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FIELD OF THE INVENTION

[01] The paper cutting is one of the main processes in paper and printing industries. In medium and small-scale industries the paper cutting machine is manually operated. Since it is a hand lever cutting machine, it is not safe to operate. Also, every time the user has to adjust the paper to desired cut position and hold the paper before the machine cuts the paper. It is a time consuming and tedious process to take a job to cut papers with different size. To overcome such problems, this automatic paper cutting machine is designed. This invention is used to reduce the time consumed in the paper cutting process. This system uses Geneva mechanism to cut the paper into equal lengths. An IOT assisted feature of this machine ensures remote operation of machine and knowing its production details.

BACKGROUND OF THE INVENTION

[02] Paper cutting is the art form of cutting paper with sharp scissors or a knife. It can be as simple or intricate as the paper artist chooses. The paper roll cutting machine run with the principal of paper cutting used in industrial application. Paper cut occurs when a piece of paper is placed in other thin or sharp material. If we can use a loose paper sheet which is usually too soft to cut, it can be very thin, being then able to exert high levels of pressures enough to cut. Paper cutters vary in size, usually from about 30 centimetres in length on each side for office work to 841 millimetres in design workshops. 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.

[03] Now days, there is a lot of competition in the market. So, there is need for developing a new method or process for effective manufacturing. That process or methods should fulfil the requirement about accurate productivity. Also, automation plays an important role in mass production. So this invention presents the automatic paper cutting machine by using Geneva mechanism. Geneva mechanism is commonly used in indexing mechanism where an intermittent motion is required. 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.

[04] There are many machines based on paper cutting but it has some demerits like large in size, costly, need skilled people to operate. But this equipment is very accurate to cut the papers. This concept will be mainly used in the paper manufacturing industry to cut the papers in huge numbers. The equipment is fabricated in less cost and efficient. The aim of this process is to reduce the human fatigue and time savings in industries by eliminating the paper marking time. It has got wide application area in books or notebook manufacturing industry, visiting cards or labels manufacturing industry etc.

PRIOR ART STATEMENT

1. CN205905106U - Paper cutting machine - 2016
2. WO2020124907A1 - Machine head for graphic paper feeding and cutting machine– 2018
3. JP6718194B2 - Corrugated sheet printing equipment - 2016
4. EP3576911B1 - Method for checking the correct operation of a pre-cutting and rewinding machine - 2018
5. JP2018051754A - Slitter, sheet cutting machine, and sheet processing device– 2017
6. CN207824972U - A kind of pocket Semiautomatic paper cutting machine - 2017
7. WO2019085136A1 - Portable semi-automatic paper cutter - 2017
8. CN209812459U - Semi-automatic paper cutting machine - 2019
9. WO2020062785A1 - Automatic abrasive paper punching and cutting machine - 2019
10. WO2019100939A1 - Automatic rotary die-cutting machine– 2018

REFERENCES

1. Han Jiguag Yu Kang, Analysis and Synthesis of Geneva Mechanism with Elliptic Crank, International Journal of Hybrid Information Technology, 8(8), 2015,253-260.
2. Haraga and Elena Ionita, Aspects Theoretical and Practical based on the Finite Element Analysis and Modeling of Geneva Mechanism, IJASTR, 1(2), 2015, 20-40.
3. Madhoo G, Mohammed Sameed, Mohsin Ali and Ashwin C Gowda, Force Analysis of Geneva Wheel and Face Cam Used In Automat, International Journal of Engineering Research and Applications, 4(6), 2014,73-88.
4. P.Kalisindhur, Y.Karthik, T.Vijay, Y.Sasikanth and G.SriHarsha, Cutting mechanism by giving feedthrough Geneva Mechanism, IJSET,2(4), 2015, 1172-1175.

OBJECTIVE OF THE INVENTION

[05] The main objectives of this invention are,

- To cut papers in equal and accurate dimensions.
- To reduce the manual work of paper cutting.
- 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.
- To operate the machine from any location.

SUMMARY OF THE INVENTION

[06] The traditional hand lever cutting machine has drawbacks. It doesn't provide safety to the operator. It is not user friendly because every time the user has to adjust the paper to desired cut position and hold the paper before taking cut. It is a time-consuming process to cut papers in different size in such machine. Also, the accuracy of job taken on this machine depends on operator skills. To overcome these problems, automatic paper cutting machine is designed, in order to reduce the time for marking and cutting the papers.

[07] Geneva mechanism is commonly used indexing mechanism where an intermittent motion is required. In this type of paper cutting machine where Geneva mechanism is used along with crank and lever mechanism to carryout cutting action. Geneva mechanism is an indexing mechanism which converts continuous motion to an intermittent motion. So, the continuous motion applied by hand power is converted to intermittent motion by Geneva mechanism and is utilised to roll the paper. On the other hand, crank and lever mechanism converts rotary motion of camshaft to oscillating motion which induces the cutting action to paper cutter.

[08] The paper cutting machine is designed, in order to reduce the time for marking and cutting the papers. 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. A counter sensor and ON-OFF sensor connected to the machine is linked to cloud database ensuring the features of IOT. On-Off sensor is connected to the motor which is activated remotely by cloud database. Once instruction from the user reaches the cloud, the same is communicated to the on-off sensor through internet. Counter sensor is placed near the cutter to count the number of cuts. The data related to the production is fed into the cloud database. By accessing the cloud database user can verify the production details of the machine.

[09] The main principle of this invention is to reduce the human fatigue and time consumption by eliminating the marking time required to cut paper in equal lengths. This system cuts variable size paper in equal and accurate dimensions based on Geneva mechanism. It proves to be low-cost solution in production and can be used in educational institutes, stationary shops and small-scale industries. .

DETAILED DESCRIPTION OF DIAGRAMS

The description for **Fig.1** is given below:

[10] Geneva wheel:

Four Slot driven wheel, we are using thus its advances by one step of 90° for each rotation of the drive wheel. Hence the intermittent motion is achieved for $\frac{1}{4}$ of the 360°. A mechanism that translates a continuous rotation into an intermittent rotary motion, using an intermittent gear where the drive wheel has a pin that reaches into a slot of the driven wheel and thereby advances it by one step, and having a raised circular blocking disc that locks the driven wheel in position between steps.

[11] Chain Drive:

A roller chain is the type of chain driven most generally used for transmission of mechanism power between two sprockets. It consists of a series of short cylindrical rollers seized together by side links. It is driven by a toothed wheel called a sprocket.

[12] Paper cutter or cutting blade

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

[13] Paper roller shaft

It is the element which we are using to feed the paper while intermittent motion. Paper roller is used to feed paper without any damage.

[14] Gear box: Worm drive can reduce the rotational speed or transmit higher torque. The image shows the section of gear box with a worm gear driven by a worm. A 60 tooth worm gear reduces the speed by the ratio of 60:1. It is a special case of spiral gears in which angle between the two axes is generally right angle. The smaller of the two gears is called worm which has large spiral angle

[15] Motor: In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when it is placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As we know that in magnets, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current carrying conductor and an external magnetic field to generate rotational motion.

[16] On-off Sensor: This device is connected to the motor circuit. Sensor receives signal from the cloud database in binary form either '1' or '0' to switch on and off the paper cutting machine.

[17] Counter sensor: Counter sensor is fitted near the scissors provided in the cutting machine. This counts the number of cuts and informs the data through the aggregator.

[18] Data aggregator: Both the sensors namely counter sensor and ON-OFF sensor is connected to the aggregator. Aggregator is the gate way for cloud database. Aggregator has the capacity to receive data from one or more sensors. It also passes and receives data from cloud database.

[19] Cloud database and display device: Cloud database may be flat file system or relational database system (RDBMS). Data from the user and machines are stored in cloud database. This database is always connected to internet and acts as a interface between user and machine. Users enters the data using the display device like the count of paper and start time of machine.

I / We Claim,

The invention, "**SEMI AUTOMATIC PAPER CUTTING MACHINE USING GENEVA MECHANISM AND INDUSTRIAL INTERNET OF THNGS (IIOT)**"

[1] Uses Geneva Mechanism for paper cutting.

[2] Integration of sensors and remote monitoring of paper cutting machine.

[3] Reduces the time for marking the paper.

ABSTRACT OF THE INVENTION

The design and fabrication of paper cutting machine using Geneva mechanism cuts the paper as per the fixed and required dimension given by the people. The objective of this concept is to design the Geneva mechanism operated paper cutting machine which eliminates the most time taking process of paper marking and helps in feed equal dimension paper in each rotation. The Geneva drive is an indexing mechanism that converts continuous motion into intermittent motion. By means of this mechanism the continuous rotary motion of the sprocket wheel is converted into intermittent rotary motion of roller. Due to which paper is moved between the equal intervals of cutting period. The paper cutting is achieved by the crank and lever mechanism. The sprocket will act as a crank, and then the cutter will act as a lever. These two links are connected by a connecting link. Then the cutter will be back to its original position by the spring effect. The machine is also connected to cloud using Industrial Internet of Things (IIOT). Two sensors are provided in the machine to switching ON and OFF the motor of the machine and one sensor is provided for counting the cuts. This ensures that user can set the quantity of paper he need to cut and when to switch on and off the machine from a remote location. This machine is also used to cut the various kind of paper products, plastic, thin film, leather, slice of nonferrous metal etc. It reduces the manual work of paper cutting, and also it saves the time. It is very useful for the paper manufacturing industry and it avoids the human errors. It can be also used in school, colleges, stationary shop's, paper stores, etc.