

Design and Fabrication of Geneva Conveyor for Material Inspection & Noise Reduction

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Abstract— In our project we are using the Geneva conveyor for material handling and noise reduction in industries. It consists of motor, rollers, belt and IR sensor. Two rollers are mount on the stand, according to the required distance. The belt is mount on the rollers on which the materials are placed. The roller shaft is coupled with the Geneva drive. The Geneva drive shaft is coupled with the motor shaft, hence when power is supplied to the motor the rollers rotate with a certain time stoppage according to the Geneva drive and the belt moves along the rollers. Thus material handling is carried out. With the help of Geneva drive, the time stoppage can be achieved which avoids the use of stepper motor thus reduces the cost involved. The main aim of this project is to optimize the measuring length of work piece and to reduce the noise of conveyor. Normally the plug gauges are used to inspect the components. Instead of using manual inspection, automatic system via pneumatic comparators is used.

Key words: Material Inspection, Noise Reduction

I. INTRODUCTION

Geneva mechanism is one of the most commonly used stepping mechanisms because of its simple structure, reliability and accuracy. The belt conveyor consists of two pulleys, with a continuous loop of material - the conveyor belt - that rotate about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the driven pulley while the unpowered pulley is called the idler. The companies providing common material handling type belt conveyors do not provide the conveyors for bulk material handling such as those moving boxes beside inside a factory and bulk material handling such as those used to transport industrial and agricultural materials, such as grain, coal, ores, etc.

II. LITERATURE REVIEW

P.Kali Sindhur, [1] This paper is to design a mechanism for cutting by giving intermittent feed. This intermittent feed is given by continuous revolving of circular disk in Geneva mechanism. We have designed a belt drive with the help of Geneva mechanism is used for giving feed and gives smooth operation and movement of the feed at required time interval. The feed from Geneva drive was cut by using slotted lever mechanism. It was designed using slider crank mechanism. It is placed at right angles at the end of the Geneva mechanism and overall analysis are calculated at each link.

Han Jiguang Yu Kang, [2] For both inner and outer Geneva mechanism, the kinematics coefficient of the Geneva mechanism is a stable if the groove number of the Geneva wheel 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 speed along the elliptical moving crank. Therefore the kinematics coefficient of the Geneva mechanism is able to be changed. In this paper the analysis method of the combined Geneva mechanism is presented. The combined Geneva mechanism is put forward based upon the kinematics coefficients. The calculation method of the extreme kinematics coefficient is proposed. In the end, the design example is given.

David B. Dooner¹, [3] This paper is about kinematic study of a mechanism incorporating a Geneva wheel and a gear train to achieve intermittent motion. The goal of this mechanism is to eradicate the acceleration jump at the beginning and end of the Geneva wheel motion. An epitrochoidal path replace the circular path for the driving pin in a classical Geneva wheel drive. The epitrochoidal path is generate using a gear train and results in zero velocity, acceleration, and jerk at the beginning and end of the Geneva wheel motion. Presented a comparison of the position, velocity, acceleration, and jerk between the classical Geneva wheel mechanism and the proposed mechanism. Subsequently, the motion of the Geneva wheel is modified by introducing a non-circular gear pair to alter the timing of the epitrochoidal path. The motion of the non-circular gear pair is determined by dropping the extreme jerk of the Geneva wheel.

N.Sambathkumar, [4] This paper is to optimize the measuring height of work piece. Generally the plug gauges are used to measure the components. As an alternative of using manual inspection, automatic system by means of pneumatic comparators is used. The manual inspection is not so capable. So, few improvement is needed in this measuring device. In this device the dimensions are measured by using the comparator setup. The components are transferred from one place to another with the help of Geneva conveyor. It is necessary to reduce the workers involved in it. We have designed a conveyor with Geneva drive which is useful in industries. So, here a conveyor model which is used for material transformation from one place to another is implement. The size of the specimen is determined by the dimensions.

Brown, S.C. [5] Large, outdoor Belt Conveyor Systems for mass materials are major sources of industrial noise and often become an environmental emissions problem for many existing and proposed plants. Deficiency in the industry's understanding of the complex, underlying conveyor noise generate mechanisms has meant there are relatively few practical and cost-effective noise management strategies. Alternatively, pressure from regulators and the community generally has often led to impossible conveyor noise specifications. This paper presents the results of an innovative programme of research and testing of conveyors and components. Conveyor noise is shown to be a composite of noise generating

mechanisms, the most leading of which is the dynamic interaction at the belt/idler roll interface.

Konakalla Naga Sri Ananth1, [6] Belt conveyor is the moving of material from one location to another. Belt conveyor has high weight carrying capacity, huge length of conveying path, easy design and maintenance and high reliability of operation. Belt Conveyor system is also used in material movement in foundry shop like deliver and distribution of molding sand, molds and elimination of waste. This paper is to design the conveyor system used for which include belt speed, belt width, motor selection, belt specification, shaft diameter, pulley, gear box selection, with the help of standard model calculation.

III. MATERIAL HANDLING SYSTEM

The various Material Handling System are includes Bag Stackers, Truck Loaders, Inclined Belt Conveyors & Flat Top Conveyors. All material handling products are planned and made following set industry strategies and parameters, confirming its secure operations and consistent performance for a longer period of time.

A. Belt-Conveyor:

A belt conveyor consists of two pulleys, with an unbroken loop of material - the conveyor belt - that rotates about them. One or both of the pulleys are powered, transferring the belt and the material on the belt forward. The powered pulley is called the driver pulley while the unpowered pulley is called the idler. There are two main industrial classes of belt conveyors.

Those in common material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transfer industrial and agricultural materials, such as grain, coal, ores, etc. commonly in outdoor locations.

Normally companies providing common material handling type belt conveyors do not provide the conveyors for huge material handling. In addition there are a number of industrial applications of belt conveyors such as those in grocery stores. The belt consists of one or two layers of material. Many belts in general material handling have two layers. An beneath layer of material to supply strength and shape called a carcass and an over layer called the cover. The carcass is often a cotton or plastic web or mesh. The cover is frequently various rubber or plastic compounds specified by use of the belt. Covers can be made from more exotic materials for unusual applications such as silicone for heat or gum rubber when grip is essential.

B. Motor:

In any electric motor, function is based on simple electromagnetism. A current-carrying conductor generate a magnetic field; when it is placed in an outer magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the outer magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is intended to harness the magnetic interaction among a current-carrying

conductor and an external magnetic field to generate rotational motion.

C. Geneva:

A mechanism that transform a continuous rotation into an intermittent rotary motion, using an intermittent gear where the drive wheel has a pin that reach 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.

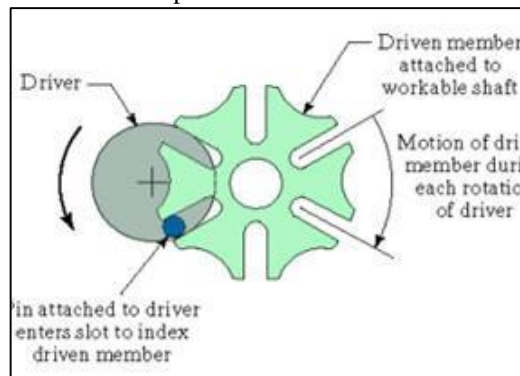


Fig. 1.1:

D. Geneva Mechanism:

Geneva mechanism, is otherwise called as Geneva Stop, one of the most commonly used devices for producing intermittent rotary motion, characterized by alternating 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 driver A carries a pin or roller R that fits in the four radial holes in the follower B. Between the slots there are four concave surfaces that fit the surface S on the driver and serve up to keep the follower from rotating when they are fully engaged. In the position shown, the pin is toward the inside one of the slots, and, on further rotation of the driver, it will shift into the hole and rotate the follower through 90°. After the pin leaves the slot, the driver will rotate through 270° while the follower dwells—i.e., stands still. The lowest practical number of holes in a Geneva mechanism is 3; more than 18 are seldom used. If one of the hole positions is uncut, the number of turns that the driver can make is limited.

E. Proximity Sensor:

A Proximity sensor container notice substances disadvantaged of physical communication. A proximity sensor frequently crops an electromagnetic arena or sunbeam and look for change in the field. The object being sensed is often referred to as the proximity sensor's goal. Different proximity sensor boards demand different sensors. For example, a capacitive or photoelectric sensor power be fit for a plastic goal, an inductive closeness sensor requires a metal panel.

F. IR Sensor Unit:

Infrared transmitter is one type of LED which emit infrared rays commonly called as IR Transmitter. Similarly IR Receiver is used to get the IR rays transmitted by the IR

transmitter. One important point is both IR transmitter and receiver should be positioned straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it pass the IR rays to the receiver. The IR receiver is coupled with comparator.

The comparator is constructed by LM 741 operational amplifier. In the comparator circuit the reference voltage is supplied to inverting input terminal. The non inverting input terminal is connected IR receiver. When interrupt the IR rays among the IR transmitter and receiver, the IR receiver is not conducting. So the comparator non inverting input terminal voltage is greater than inverting input. Now the comparator output is in the range of +12V. This voltage is given to base of the transistor Q1. Hence the transistor is conducting. Here the transistor is act as switch so the collector and emitter will be closed. The output is taken from collector terminal. Now the output is zero.

1) Block Diagram:

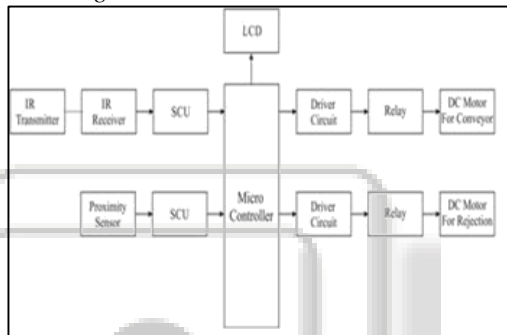


Fig. 1.2:

G. Rollers:

Rollers means a cylinder that rotates about a central axis and is used in various machines and device to move, flatten or spread something. The two types of rollers used in conveyor are driving and driven roller. Driving rollers are rollers or cylinders upon which something is rolled along. The material of driven roller should be softer than driving roller.



Fig. 1.3:

H. Noise Reduction:

The noise produced by conveyors is becoming an increasingly significant consideration to their designers and operators, especially when the conveyor or conveyor system is located in a populated area, as is the case with many ship loading terminals. When designing and functioning a conveyor it is significant to know in advance what the likely noise performance of its components will be so that the design specifications set for the system are

not too low – foremost to the purchase of unacceptable components, or too high – leading to components that are overly costly.

We are using damping material is coated over the belt of 20mm thickness to reduce noise of the conveyor during running condition. It has High tensile strength and Reduction in abrasion, Excellent resistance to mineral, vegetable and animal oils. They are Recommended for transporting highly abrasive materials.

1) Design of Geneva Conveyor:

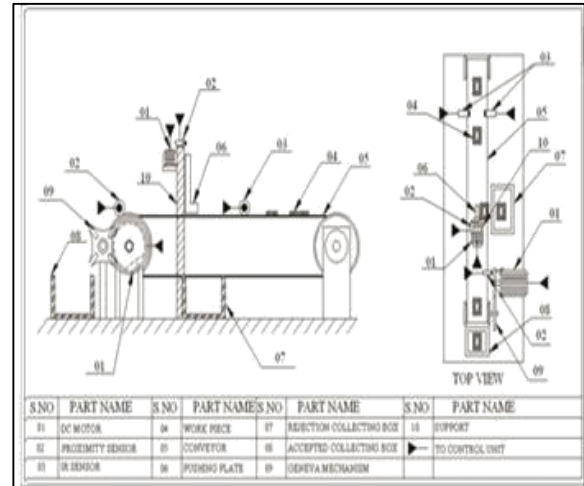


Fig. 1.4:

IV. WORKING

When the electrical supply is given to dc motor, shaft of the motor tends to rotate. The rollers shaft is coupled with the Geneva drive. The Geneva drives shaft is coupled with the motor shaft hence when power is supplied to the motor rollers rotate with a certain time delay according to the Geneva drive and the belt moves along the rollers. Thus material handling is carried out. Conveyor is used for carrying the objects from one end to another end. We have IR sensor in conveyor for detect the objects when they comes. If the object is detected means it will send a low pulse to Micro controller. Then the controller can identify the object is came and analyzes the quality.

Then the controller can identify the object is came and analyzes the quality. If the object is bad quality means it will on the DC motor to rotate the rod in to place in the bad quality box. If the object is 1st quality means the controller will not ON the DC motor. So the object can be placed in the 1st quality box, which is in the conveyors another end. This Process will go repeatedly when sensor sense the another object.

A. Advantages:

- To reduce labour costs
- To increase production rates
- To reduce work-in-process
- To minimize distances moved between operations
- To achieve specialization of operations
- To achieve integration of operations
- To reduce noise of the conveyor
- To save time

B. Applications:

- It is applicable in the production industries and in automobile industries for mass production. Applicable where time delay is necessary in material handling
- They were in many industries such as automotive, agriculture, bottling, food processing, aerospace and packaging.
- They were used in industries for sorting, storing, pick up etc.

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