Geneva Mechanism Conveyor For Noise Reduction, Material Inspection & Automated Bottle Filling System

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ABSTRACT

In our project we are using the Geneva conveyor for material handling and noise reduction in industries. It constitute of motor, rollers, belt and IR sensor. Two rollers are mounted on the stand, according to the sufficient distance required. The belt is mount on the rollers on which the materials are placed. The roller shaft is linked with the Geneva drive. The Geneva drive shaft is coupled with the motor shaft, hence while power is supplied to the motor the rollers rotates with a required time of stop according to the Geneva drive and the belt moves along the rollers. Thus material handling is carried out. With the assistance of Geneva drive, the time stopping 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. Usually the plug gauges are used to inspect the components. As an alternate of using manual inspection, automatic system via pneumatic comparators is used in our Project.

The field of automation has a notable impact in a wide range of industries beyond manufacturing. Automation plays an increasingly important role in the world economy. Filling is a task carried out by a machine that packages liquid products such as cold drinks or water. In past, humans were the main method for controlling a system. More recently, electricity has been used for control and electrical control is based on microcontrollers for various purposes like medicines, pharmaceutical plants, chemical plants etc.There microcontrollers control the complete working of the system. It is common to use microcontrollers to make simple logical control decision. The automation in bottle filling industry comes with increased electrical components. Essential requirements of each component in the system is important to be studied in ordered to understand how each part works in coordination with other parts in the system.

This study mainly includes design, fabrication and control system for automated bottle filling system. The main part is control system which includes C programming in Arduino microcontroller to control various components in system. A conveyor system with sensors and electromagnetic valve is fabricated for this purpose. The entire sequence of operation is controlled by arduino microcontroller. In small industries bottle filling operation is done manually. The manual filling process has many shortcomings like spilling of water while filling it in bottle, equal quantity of water may not be filled, delay due to natural activities of human etc.

This problem faced by small industries compels to design this system. This proposed system is meant for small industries. It aims to eliminate problem faced by small scale bottle filling system. With this system which operates automatically, every process can be smooth and the process of refilling can reduce worker cost and operation cost.

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.

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 important 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.

The current scenario in industries is to embrace new technologies to proceed towards automation. The same vision is exercised in bottle filling plants. To meet the customer demands and accelerate the filling of bottles, all operations are nearly automated. The automation of bottle filling involves use of PLC for control but it is costly. Despite of all such advance technologies small industries are still involved in manual filling of bottles. They might be discouraged to adapt to new technology due to high cost involved in automation. The study emphasize on reduction in cost using arduino microcontroller. The arduino microcontroller is relatively cheap and widely available. In small industries bottle filling operation is done manually. The manual filling process has many shortcomings like spilling of water while filling it in bottle, equal quantity of water may not be filled, delay due to natural activities of human etc. This work generally emphases on small industries. It aims to eliminate problem faced by small scale bottle filling system. . With this system that operates automatically, every process can be smooth and the process of refilling can reduce the man power cost and operation time.

LITERATURE REVIEW

N.Sambath kumar Kumar.et.al. (2016) investigated with the aid and concept of Geneva mechanism, he has designed and fabricated the material inspection under the naming of "Design & Fabrication of Material Inspection". 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.et.al. (2004) has worked to create a conveyor for the purpose of noise reduction with the basic principle of Geneva mechanism and as discovered "Conveyor Noise Specification and Control". 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

Bipin Mashilkar.et.al. (2015) has taken his efforts towards the invention of "Automated Bottle Filling System". 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.

T.Kalaiselvi.et.al.(2012)in his research paper aimed at filling and capping bottles simultaneously. The filling and capping operation takes place in a synchronized manner. It also includes user defined volume selection menu through which the user can input the desired volume to be filled in the bottles. The entire system is more flexible and time saving.

The filling and capping operations are controlled using a programmable logic controller. This is because PLC'S are very flexible, space efficient and reduces complexity.

DESCRIPTION OF EQUIPMENT BELT-CONVEYOR

A belt conveyor consists of two pulleys, with an unbroken loop of material - the conveyor belt - that rotates about them. One or two of the pulleys are powered, transferring the belt and the material on the belt forward. The powered pulley is known as driver pulley while the unpowered pulley is said as 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. Usually companies providing common material handling type belt conveyors do not provide the conveyors for huge material handling. In addition, there are number of industrial applications of belt conveyors such as in grocery stores. The belt contains of one or two layers of material. Many belts in general material handling have two layers. A beneath layer of material to supply strength and shape called a carcass and an extra layer called the cover layer. The carcass is often a cotton or plastic web or mesh. The cover is frequently various rubber or plastic compounds as mentioned by use of the belt. Covers can be acquired from more exotic materials for different applications such as silicone for heat or gum rubber when grip is essential.

MOTOR

In any electric motor, function depends 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 kids playing with magnets, opposite (North and South) polarities attract each other, while like polarities (North and North, South and South) repel each other. 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 orbital motion.

GENEVA MECHANISM

Geneva mechanism, is otherwise called as Geneva Stop, one of the most widely used devices for generating intermittent rotary motion, characterized by alternating periods of motion and rest with no reversal in direction. It is also used for indexing.

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 internal 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.

PROXIMITY SENSOR

A Proximity sensor container notice substance limited the physical communication. A proximity sensor constantly crops an electromagnetic arena or sun beam and look for change in the field. The object being sensed is mostly 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 precision sensor needs a metal panel.

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.

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 important 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.

ARDUINO 2560 MEGA MICRO CONTROLLER

Arduino board 2560 Mega is used to write programs & create interface circuits to read switches & other sensors. The power of the Arduino is not its ability to

crunch code, but rather its ability to interact with the outside world through its input-output (I/O) pins. The Arduino has 14 digital I/O pins labeled 0 to 13 that can be used to turn motors and lights on and off and read the state of switches. Each digital pin can sink or source about 40 mA of current. This is more than adequate for interfacing to most devices, but does mean that interface circuits are needed to control devices other than simple LED's. In other words, you cannot run a motor directly using the current available from an Arduino pin, but rather must have the pin drive an interface circuit that in turn drives the motor. A later section of this document shows how to interface to a small motor.

To interact with the outside world, the program sets digital pins to a high or low value using C code instructions, which corresponds to +5 V or 0 V at the pin. The pin is connected to external interface electronics and then to the device being switched on and off.

ROTARY PUMP

A Rotary operated pump arrangement uses arotary pump arrangement to provide a fixed volume of liquid to flow into the bottle. According to time based on user input. According to user input the time is calculated to fill varying volumes of bottles.

COMPONENTS

The fabrication of "Geneva Mechanism Conveyor For Noise Reduction, Material Inspection & Automated Bottle Filling System consists of the following components to full fill the requirements

The project consist the following parts

- ➢ Belt-Conveyor
- ➢ Motor
- ➢ Geneva
- ➢ Geneva Mechanism
- ➢ Proximity Sensor
- ➢ Rollers
- ➢ Noise Reduction (Damping Material)
- ➢ Arduino 2560 Mega Micro Controller
- ➢ Rotary Pump
- ➢ Pneumatic Comparator
- ➢ Infrared Sensor for Automatic Bottle Filling

WORKING PRINCIPLE

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 come. 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.

In Automated bottle filling system, the whole process of fillingmust be completed without human interference. In this system, when start button is pushed, the motor starts running which gives translational motion to the conveyor belt.

When the start button is pushed the display shows the messages of "ENTERVOLUME TO BE FILLED" and "ENTER BATCH QUANTITY. Once

the user enters the values, the values are fed into the system and the volume is converted to the time delay of the pump. As soon as the user enters the values ,the conveyor is turned on and the bottles move on the conveyor. Once the bottle reaches the infrared sensor , it senses the bottles and gives feedback to arduino.

The pump gets turned on and the bottles are filled. The process is then repeated for particular batch.

MERITS

- To reduce labour costs
- To increase production rates
- To reduce work in progress
- To minimize distances moved between operations
- To achieve specialization of operations
- To achieve integration of operations
- To reduce the noise of the conveyor
- To save time
- To avoid error while filling a bottle
- Greater level of accuracy can be obtained

DEMERITS

- Initial Cost may be high but can be regained as Return On Investment (ROI)

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

- They are useful in all types Bottle filling companies.

CONCLUSION

From this paper, we concluded with the aid of the application of Science and Mathematics and from all the study of above mentioned research and project papers, we have observed that the Geneva

Mechanism can be applied in the huge field of real life applications such as Automatic vessel filling system, in pharmaceutical application, paper cutting, automated bottle filling system, material inspection and gear train from our study of above research papers we have discovered this mini conveyor for the purpose of noise reduction and material inspection, with lot of hope and positivity that this mini conveyor concept would be useful for many industries.

The automated bottle filling system using pump filling concept was successfully implemented and studied. Various observations were taken which closely resembled the actual volume to be filled. The reason for deviations of the readings are studied accordingly. The automated bottle filling system was beneficial in reducing work, time and cost of filling. The fabricated model of Automated bottle filling system can be used where high precision is not necessary and time limits not bound. Hence it must be used application specific and must not be used in places where faster and more accurate methods of filling are available.

BIBLIOGRAPHY

[1] N.Sambath kumar Kumar "Design & Fabrication of Material Inspection" March 2014.

[2]Brown S.C. "Conveyor Noise Specification and Control" Nov, 2004.

[3]Bipin Mashilkar, Pallavi Khaire, Girish Dalvi

(2015), "Automated BottleFilling System".

[4]T.Kalaiselvi,R.Praveena(2012),

"plc based automatic bottle filling and capping system with user defined volume selection", International journal of emerging technology and

advanced engineering. (Vol 2, Issue 8, August2012).