

Design of Conveying and Activation Mechanism

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ABSTRACT

Comfort coupled with safety and simplicity is what man strives for. Our project has been to bring about both. The culmination of our efforts has resulted in development of a new “Design and Fabrication of Automated Conveying and Activation Mechanism”. The project present a basic as well as very professional treatment of the subject in a very comprehensive, based on learning effort and understanding capability of today as per their levels. The mechanism is simple and comfortable. Basic calculation, drawing, designing is included in the project. The silent features of our mechanism can be listed as use is very simple, easy to operate, high skills are not required. Electric motors are used with stepped motion to obtain precise movement. To reach product having weight 8Kg, for this reason mechanism is constructed of strong material such as steel and designed to without large forces. Activation station is located at certain fixed position consequently they are constructed from lighter material.

Keywords— object, convey, activation, mechanism, safety.

I. INTRODUCTION

AUTOMATION:

Automation is the application of automatic control in all types of industrial as well as scientific areas. Automation has number of different meanings and it depends on the type of application. Automation system was basic machine which replaces one single manually performed operation by using mechanical, hydraulic, pneumatic, electrical, magnetically and computer based system that could control various process. The aim of automation is to perform specific task with more efficiency. It is a structural and comprehensive method necessary to achieve the desired result.

INDUSTRIAL AUTOMATION:

Industrial automation is the use of control system such as computers or robots and information technology for handling different processes and machineries in industries to replace human being. It is the second step beyond the mechanization in the scope of industrialization.

MOTIVATION:

The project is motivated by typical handling and activation of a product in industries. Products that are generally considered to have being potential to be hazardous under specific circumstances. The processing of a product to convey it and make it active is done in the production line. The line consists of various processes and each process is done in its unit. An inactive product is manually unloaded from storage and manually conveyed to target position. During this its activation is also done by manually. In between these processes sometime there is a chances of product breakage and it may lead to trouble for human safety. If most of the processes are made automated, then both chances of product failure and trouble for human safety can be reduced. Though unit is fully automated handling and automated activation mechanism becomes the requirement for the company. Automation is coming

integrated with the unit. In order to automate processes the custom made mechanical based solution is very important.

This project aims to eliminate these problems of product handling and its activation by using automation with small, handy and cheap mechanism. Mechanism can be installed in the existing production line.

II. PROBLEM STATEMENT

Design of conveying and activation mechanism

- i. An object of size 300 mm diameter, 200 mm height and 8 Kg weight is to be conveyed from storage to activation station in very safe manner. No load should be applied on top of object while conveying.
- ii. At activation station object has to be activated by removing a circular ring of 30 mm diameter and rotating a knob of semi-circular shape of 10 mm diameter.
- iii. Following activities are to be done:
 - a. Literature survey on automated of similar systems.
 - b. Configuration of object storage bins.
 - c. Configuration of conveying mechanism.
 - d. Configuration of activation mechanism.
 - e. Design of the above.

III. AIM

In this lab we are aiming to build a prototype of the machine which can be used to automate the product handling, activation and fabrication facilities. The need for each kind of automated instruments is already mentioned in the motivation. The main purpose of this equipment is to pick and place the product from one location to other. We aim to make prototype machine. This is the first stage of development. The other advancements which can be done to the same model include activation mechanism, which can activate the product with key and rotor motion.

IV. OBJECTIVE

- Lesser influence of human factor to technological process.
- Improved production reliability.
- Increased production speed and quality.
- Prevention of emergency situation.
- Improved production control and increased capacity.
- Reduces cost and process storage.
- Reducing damage of material during handling.
- Fast loading and unloading by improving equipment utilization.
- Reduction in the travel space or excessive wastage of space.

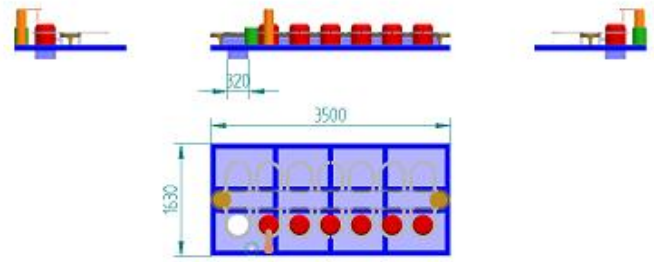


Fig. 2 Drafting of conveying mechanism

V. METHODOLOGY

1. Collected the information about raw material to be used in the project.
2. Design of the machine using solid edge/solid works software.
3. Collection of spare parts.
4. Building of frame work and assembly of parts.
5. The result of machine verified and noted down.

VI. CONSTRUCTION

As the problem statement gives two operations i. object should be conveyed from storage bin to activation station in the safe manner. ii. Then at activation station object has to be activated by activation mechanism the main project model contains two mechanisms to perform these two operations. Two mechanisms are as follows:

A. Conveying Mechanism:

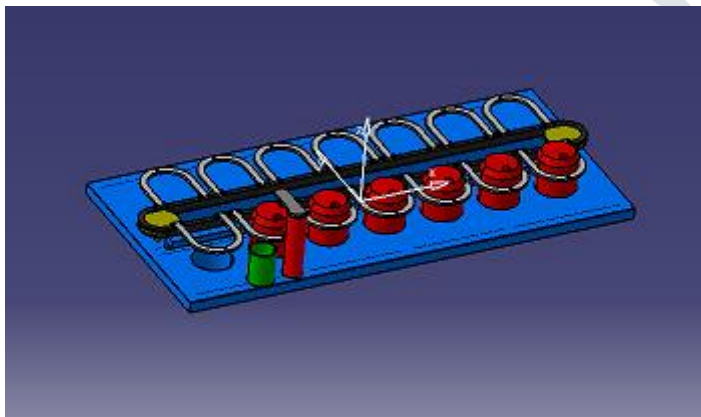


Fig. 1 Conveying mechanism

Components of conveying mechanism:

- i. Frame: Frame is the base part for whole assembly which can support the whole system. Frame is made up of M.S. also this frame consists rollers like pallet roller in conveyor.
- ii. Motor and Shaft: Stepper motor is used in the mechanism. Sprocket of the chain drive is mounted on the motor shaft.
- iii. Sprocket and Chain: Standard chain of 2 inch is used.
- iv. Chain Attachment
- v.

B. Activation Mechanism:

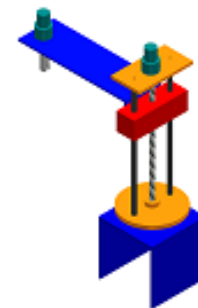


Fig. 3 Activation Mechanism

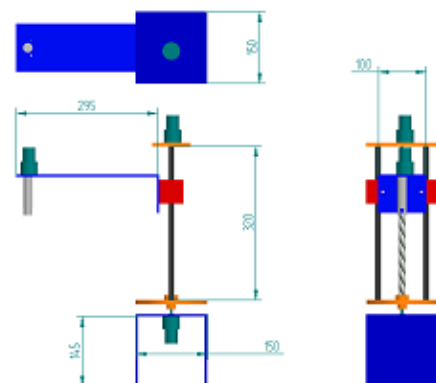


Fig. 4 Drafting of Activation Mechanism

Components of activation mechanism:

- i. Motor base plate: It is made up of M.S. of 3 mm thickness to support the motor.

- ii. Lead screw and rod guide block: It is made up of aluminium and it provides support to lead screw and rod.
- iii. Guide rod bar: It is M.S. bright bar.
- iv. Top plate: It is M. S. plate.
- v. Rotating disk: It is an aluminium disk.
- vi. Lead screw

VII. WORKING PRINCIPLE

Motion transfer is there through all components as per electric motors, here we are transmitting power from motor shaft to chain and sprocket mechanism. It works according to rotary motion. Chain attachment having gripper element adds the product and convey it from one position to other. There is roller attachment to the frame in such a way that during conveying product can move smoothly over roller in order to reduce friction between them. As it reaches to activation station, if an activation mechanism consisting hook and key. Hook removes the cap from product. A hollow semicircular key is inserted in the hole of 30 mm diameter which engages with knob inside hole. Since key is connected to the stepper motor. Hence motor rotates the key to activate the product entire vertical motion of hook and cap is controlled by the carriage and electric motors. Similarly for each product mechanism perform same operation automatically.

VIII. RESULT

Consideration in Machine Design When a machine is to be designed the following points to be considered: -

- i. Types of load and stresses caused by the load.
- ii. Motion of the parts and kinematics of machine. This deals with the type of motion i.e. reciprocating, rotary and oscillatory.
- iii. Selection of material & factors like strength, durability, weight, corrosion resistant, weld ability, machine ability are considered.
- iv. Form and size of the components.
- v. Frictional resistances and ease of lubrication.
- vi. Convenience and economical in operation.
- vii. Use of standard parts.
- viii. Facilities available for manufacturing.
- ix. Cost of making the machine.
- x. Numbers of machine or product are manufactured

IX. ADVANTAGES

- i. Mechanism works automatically hence it provides higher level of safety to the workers.

- ii. It increases productivity.
- iii. It saves overall time required to perform the operations.
- iv. Mechanism is more flexible, reliable, mobile and safe for operating it.

X. DISADVANTAGES

- i. Initially products should be loaded manually.
- ii. Products should be loaded in a particular orientation; small change in the orientation will not activate the product.

XI. APPLICATIONS

- i. To convey the products.
- ii. To activate the product.
- iii. Can be used as material handling equipment in industry.

XII. SCOPE OF FUTURE WORK

- Material handling plays an important role in manufacturing and logistic. Various materials handling equipment's can be interchangeable with such automated mechanism.
 - It allows quick and efficient transportation for a wide variety of materials which makes them very popular in material handling and packaging industry.
 - Capable enough to make much more production with better quality and cheap cost to meet increasing customer demands.
 - Quick strategy guide for the company who seeking sustainable growth in market.
 - Automation is changing our world and the production method used by state of the art manufacturing companies to ensure their long term competition.
 - a. Virtual commissioning
 - b. Machine and plant security
 - c. Industrial communication
 - d. Integrated energy management
- With this scenario anyone can start their path towards industrial 4.0 today.

XIII. CONCLUSION

The purpose of this work is designing, testing and implementing automation to conveying and activation mechanism for the given object given by the company. The limitations and earlier manual method for the system were analyzed and to increase the productivity and to eliminate workers fatigue, developing an economical as well as safety automation system was suggested. Accordingly the components and sub components are designed, fabricated and analyzed to get final solution on given problem statement. By this work the developed system is able to complete the material handling and the activation operation with more flexibility, reliability, mobility and safety with less required time. The company is able to increase productivity efficiently than earlier manual method.

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