

Design and Fabrication of Belt Conveyor using Two Wheel Geneva Mechanism

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Abstract— Geneva mechanism is a one type of indexing mechanism, where the continuous motion is converted into stepwise circular motion. Belt conveyor system is a mechanical system used for to carry material from one place to another place, it is works as material handling equipment. The purpose of this project to increase the dwell time or delay time of belt conveyor which necessary during various process like bottle filling, box packaging, material filling in the boxes.

Keywords: Geneva Drive, Belt Conveyor, Dwell Motion

I. INTRODUCTION

External geneva drive is one of the most commonly used indexing mechanisms because of its simple structure, reliability. The Belt conveyor consist of two rollers, belt, motor this two rollers are mounted on two supports the distance between this rollers sets according to the length of belt. geneva drive consist of driver wheel and driven wheel, the driver wheel is circular disk with the pin or shaft which is coupled with the motor , the driven wheel consist of circular disk with the several slots the drive wheel is place before the driven wheel. In this project we are using two driven wheel and two driver wheel, if first driver wheel completes its one rotation than $1/4^{\text{th}}$ angular motion is supply to the second driven wheel which mounted on the roller. The main aim of this project is to increase the delay time of belt conveyor which required in the various application. This delay can increase by the increasing the no. of slots on driven wheel.

II. LITERATURE REVIEW

H.P.LEE [1]. This paper is to design a geneva mechanism with curved slots by using the parametric polynomials mainly focusing to modify the kinematics characteristics of geneva mechanism without reducing the delay time and the motion time. During analysis observed that for $n=4$ (curved slots) the velocity and the acceleration curves are exactly same for all trajectories numerical methods.

JYH-JONE LEE, BIN -HENG JAN [2]. In this paper the systematic method using theory of envelope to improve the geometry of geneva mechanism. In this also undercutting and double point terms are investigated. The curves of the geneva drive is modify which is served this both condition undercutting and double point.

K.S.H.SADEK, J.L.LLOYD [3]. The geneva mechanism is suffered inherent shocks and the jerks due to geometry of geneva mechanism. In this paper the authors suggested the modification of basic geometry by using circular drive pin and tapered cross section which reduces the shock & jerks which is suitable for high load.

DR. S.V.MUKKAWARI [4]. Geneva mechanism is used in belt conveyor, belt conveyor is used in industries to carry heavy material, objects from one place to another place so geneva drive is to achieve intermittent rotatory motion which is required during in operation. During box filling or

other material carried out on the conveyor some delay is required that can achieved by this method.

III. METHODOLOGY

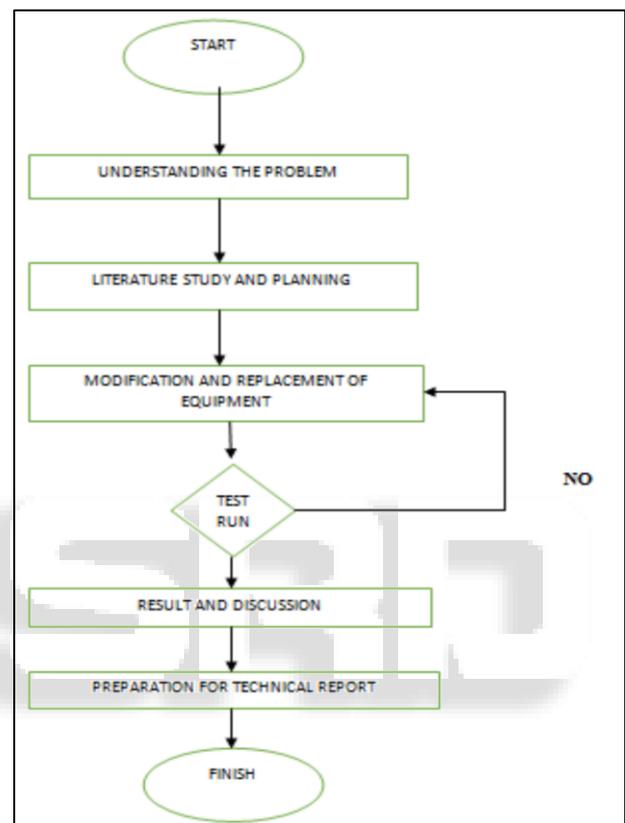


Fig. 1: Methodology chart.

The methodology of our project starts with identifying the problem. After clarification of problem we start literature survey means how much work is finished on this problem? And which is in research area. The planning is done after the survey which involves planning the all work related to such project. After planning mostly concentration is done on modification of given project work. During the working the crank pin got braked so we are replaced with solid circular pin which reduces the inherent shocks, than testing is done in which we tested the manufactured components as well overall assembly which should run according requirements. Than giving results and after preparing of technical report is started.

IV. DESIGN

In project we are used the CATIA V5 software for preparation of 3-D model. Under design include material selection and calculation. The geneva drive have its terminology according to it's the calculation is done

A. Material:

Material selection is most important task while making any project or prototype, best material should select which will perform better work in both industrially and commercially. In project we making prototype of our idea. So we selected the wood (plywood) material for making such prototype.

COMPONENTS	MATERIAL USED
Geneva Drives.	Wood
Driven wheel.	Wood
Rollers.	Fibre
Stand.	Wood
Conveyor belt.	Rubber.

Table 1: Material

B. Specification of Wood:

Thickness-5-6 mm
Category- Plywood for Stand.
Plain wood for Geneva drive and geneva driven

C. Calculation:

Assume,
Centre distance between rollers, $C = 50\text{cm}$
Diameter of rollers, $D1 = D2 = D = 10\text{cm}$
Length of belt= 50cm
Assumed that the material has to be transferred within 4 seconds through the whole distance and for every rotation of driving wheel the conveyor belt will move 12.5cm.
Taking the slots on the Geneva wheel is 4.
One driving wheel rotation = 1/4 rotation of Geneva wheel
 $2\pi r = 12.5\text{cm}$
 $r = 1.98\text{cm}$
For Geneva wheel, $r = 1.98 * 4 = 7.95\text{cm}$
Taking,
Drive pin diameter, $P = 5\text{mm}$
Allowed clearance, $t = 1\text{mm}$
Assume $N = 25\text{rpm}$
The angular velocity of the Geneva drive, $\omega = 2\pi N / 60$
 $\omega = 2\pi * 25 / 60 = 2.61\text{rad/sec}$
Torque, $T = \omega * r$; $T = 0.0516\text{ N/m}^2$
Time delay 20 sec

D. 3-D Model:

In this project we are used CATIA V5 software is used for creating 3d model of our project. Following figures showing the 3D solid models of various components of project by using modelling software CATIA V5.



Fig. 1: Geneva wheel

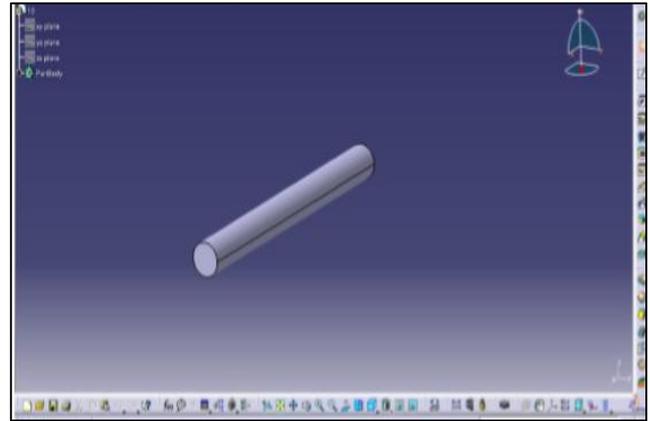


Fig. 2: Shaft

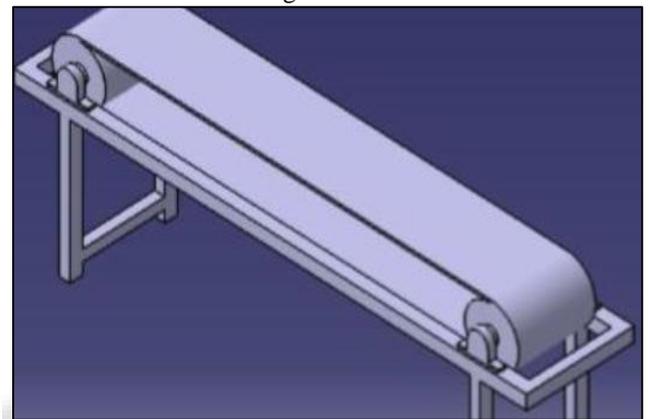


Fig. 3: Belt Conveyor

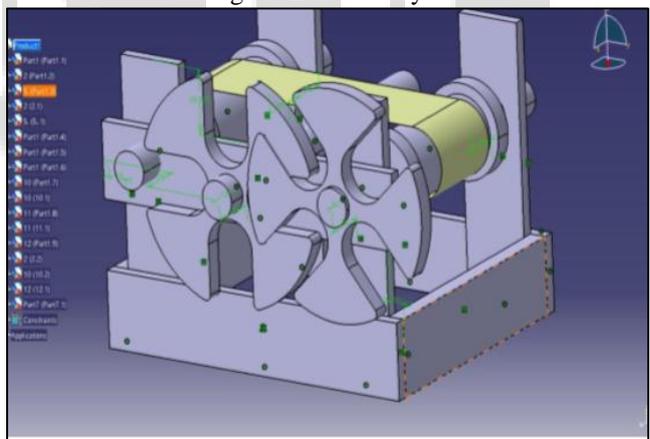


Fig. 4: Assembly of project

V. FABRICATION

Fabrication is process of manufacturing components using different operations cutting, drilling, and fitting. In the fabrication of this project wide, thick plywood is used for making stand and by using the portable Bosch wheel cutting machine rectangular wood sides is cut with required dimensions. These rectangular sides were attached together with the help of gum and nails to get the stand with required dimensions. A portable drilling machine is used to make holes on the stand with required dimensions. Then the bolts and nuts are tightened. A fiber solid shaft is used as rollers. A thick plain wood was taken and placed on the fixed table jig saw machine. On this machine, the profile cutting of the Geneva driven (wheels) was done and slots making was also

carried out. The circular shape geneva drive was cut with the help of portable jig saw machine. The geneva drives and driven (wheels) were drilled using portable drilling machine and even radial drilling machine. After all the holes were obtained, the geneva mechanism was fixed on the shafts that were fixed on the frame.

VI. RESULT AND DISCUSSION

After successfully completion of all fabrication process results obtained from this project are good. Due to the new design and new dimensions the result obtain is little bit less than expected. The geneva drive pin is smoothly inserts on to the driven wheel slot, due to this they work smoothly. The first geneva drive when rotates with the help of hand applied force, it drives the Geneva wheel. The geneva wheel along with Geneva drive on its surface drives the geneva wheel which is attached to the shaft of the roller. The roller rotates and the belt transmits power to another roller causing the movement of conveyor belt further. Future scope for our project is, in this we can used the electronic sensor for counting the material which pass.

VII. ADVANTAGE

- Available in a wide variety of sizes.
- Less wear and tear.
- The delay can be vary by slots of Geneva wheel.
- Low cost.
- Its reduces the manpower.
- Less maintenance.

VIII. APPLICATION

- It is applicable in various industries like automobile,
- Petrochemical industry where time delay in material handling equipment is required.
- In various process like bottle filling, food processing, logistics.
- They are many industries like agriculture, aerospace, and packaging industries.

IX. CONCLUSION

We have successfully did the reverse engineering for the two geneva wheel mechanism. In this we have successfully achieved the main aim of this project. The 3d modelling is done with the help of CATIA V5. During this project we have gain lot of knowledge related manufacturing, design, purchasing. The purpose of this project to increases the dwell time or delay time of belt conveyor, which useful in material handling in various industries.

ACKNOWLEDGEMENT

We consider ourselves fortunate to get Prof. Rahul.K.Patil as a guide for our semester project. We thank him for his invaluable guidance. This project would have been difficult without the guidance of Patil sir. We are thankful to our college and the department for giving us the opportunity to do something new.

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