International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 9, pp: 630-632 www.ijaem.net ISSN: 2395-5252

Design and Fabrication of Belt Conveyor Using Geneva Mechanism

R. Syam Sudhakar Rao[1]
[1] *Professor, Dept. of Mechanical Engineering, GNITC, Ibrahimpatnam, Telangana, India.*

Date of Submission: 15-11-2020 Date of Acceptance: 30-11-2020

ABSTRACT. The Geneva mechanism is a gear mechanism that translates a continuous rotation into an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheel advancing it by one step. The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps.

Geneva mechanism has many applications such as in watches, projector, etc. But we used Geneva mechanism for converting rotary motion into an intermittent motion in production line. Geneva mechanism can be used in material handling in an industry. The proposed concept will help in production line where many workers are used for the material handling purpose it also reduces the cost and threshing time requirement of a greater number of workers will be completely eliminated as only two workers can carried out the complete operation.
Generally,abeltconveyorconsistsofamotortodrivether ollersandinourprojectahandle is attached to driving wheel. The drivingwheel is operated by using hand.
Key words: Geneva wheel, Dc motor, belt conveyor, material handling, industry**.**

I. INTRODUCTION [1]

The Geneva mechan is misagearmechanism thattranslatesacontinuous rotationinto an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheelad vancingitbyonestep.Thedrivewheelalsohasaraisedcirc ularblocking disc that locks the driven wheel in position betweensteps.Geneva mechanism has many applications such as in watches, projector, etc. But we used Geneva mechanism for converting rotary motion into an intermittent motion in production line. Geneva mechanism can be used in material handling in an industry. The proposed concept will help in production line where many workers are used for the material handlingpurposeitalsoreducesthecost and threshing time requirement of greaternumber of workers will be completely eliminated as only two workers can carried out the complete operation. Generally,abeltconveyorconsistsofamotortodrivether ollersandinthisproject a handle is attached to driving wheel and the conveyor is operated by usinghand.

1.1 Methodology [2]

The design of Geneva mechanism includes the Geneva drive and driven. The centre distance, drive radius, driven radius, driving pin diameter, driven slot length and width are the important parameter which are required for the design of Geneva mechanism.Withoutproperdesignthe workingofthemechanismisimpossible.

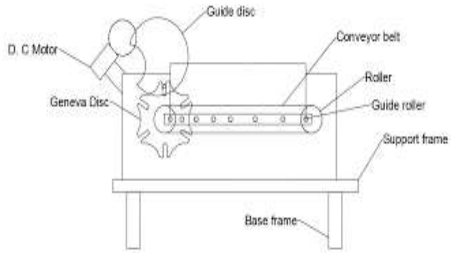

Fig.1 Belt conveyor using Geneva mechanism

The time interval is the dwell period of the Geneva driven. By the drive pin and the driven slot, the mechanism is produced. For the one revolution of the driver, the driven will move depend upon the number of slots present in the driven wheel. The time between the two motions of the driven is known as time interval. The time interval must be considered before the design of Geneva.The jerking motion is requiredintheGenevaoperatedpapercuttingmachine and is produced due to the intermittent motion.

1.2 Working [2]

In the working of Geneva mechanism, a continuous rotary motion is converted into the intermittent rotary motion. The Geneva drive consists a handle or motor which is used for rotate the driver. The Geneva driver consists a pin and driven consists a slot, when the pin inserts on the slot it advances by one step at a time. The Geneva driven is coupled to a roller when the driven advances by one step, the rollers also rotates and the belt present on the rollers also moved and the material is transferred from one

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 9, pp: 630-632 www.ijaem.net ISSN: 2395-5252

position to other.

II. DESIGN

2.1. Design of Geneva mechanism[3][4]

Center Distance, C = 800 mm
Diameter of Roller, $D_1 = D_2$ = 100 mm
Length of the Belt, L
$= \pi (r1 + r2) + 2c + (r2 - r1)^2 / x$ = 1914 mm
No. of Geneva slot's (n) =4
One rotation of wheel
= 1/4 rotation of Geneva wheel
Assumed that the material has to be transferred within 4 seconds through the whole distance and every rotation of driving wheel the conveyor belt will move 200 mm (2 Rr = 200 mm)
r = (200 / 2 x π) = 31.83
Geneva wheel radius, r
= 31.83 x no. of slots r = 1 27.32 mm
Taking Drive pin diameter p = 20 mm
Allowed clearance t = 4 mm
Centre distance between driver and Geneva Wheel (c) = a / sin (α/ n) = a / 0.707
The Geneva Wheel Radius= $\sqrt{c^2 - a^2}$ = 127.32
$\sqrt{(a/0.707)^2 - a^2}$ = 127.32, a = 127.19 mm
C = a / 0.707 = 127.19/0.707 = 179.9 mm
Slot length on Geneva Wheel, S
= (a + r) – c = 74.6 mm
Slot width, W = p + t = 24 mm
Stop arc radius, y = a - (p x 1.5) = 97.19 mm
Stop disc radius, Z = Y- t = 93.19 mm
Clearance arc, V = r z / a = 93.25 mm

2.2. Design of Belt drive [3][4]

Speed of Geneva drive, N = 60 rpm
The Angular velocity of the Geneva drive, ω
$=2\pi N/60$= 6.283 rad/sec
Torque, T = W x r = 0.1121 Nm.
Linear velocity of belt, v = 0.2 m/sec
The angle of contact between the belt and pulley, θ =180 degrees = 3.14 rad
$T_1/T_2 = e^{\mu\theta}$,
μ = coefficient of friction = 0.3
T_1/T_2 = e^0.3x3.14 = 2.56 T_1 = 2.56T_2
P = ($T_1 - T_2$) vP =$2\pi NT/60$
0.1121 x 6.283 = (2.56T_1 - T_2) x 0.2
0.7043 / 0.2 = T_2 (1.56)
3.5215 = T_2 (1.56), T_2 = 2.257 N,
T_1 = 2.56 T_2 = 5.778 N

2.3 Creating a 3-D Model In CatiaV5R20

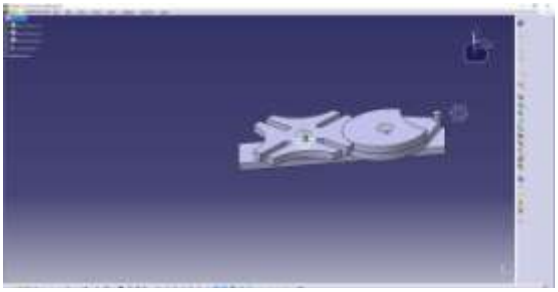

Fig.2 3D structure of Geneva mechanism

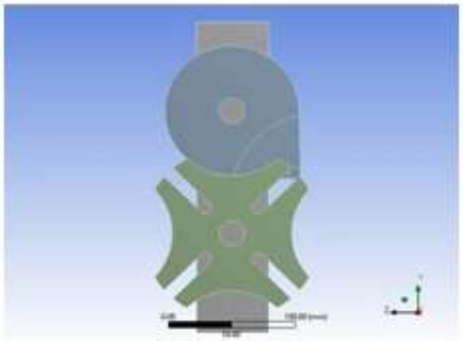

Fig.3 Model of Geneva wheel in static structure analysis

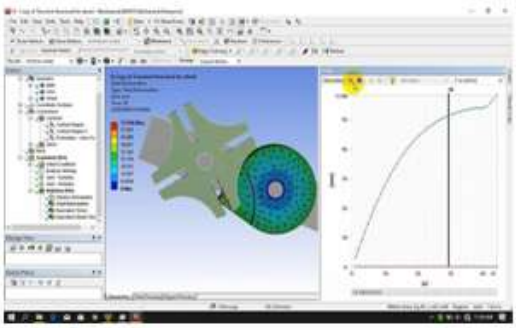

Fig.4 Total deformation of the driving wheel

III. RESULTS AND DISCUSSUIONS

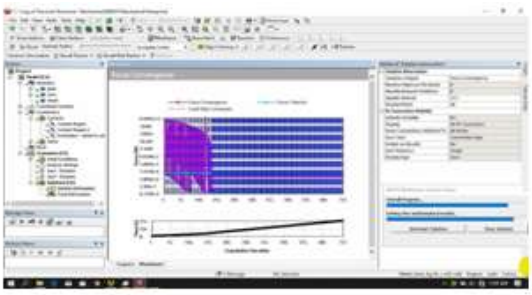

Fig.5. Force convergence analysis of Geneva mechanism

The design and fabrication of the Geneva operated belt conveyor is completed within the limited time and the results obtained from this project is good. Due to the decrease in dimensions the result obtain is little bit less than expected. But the working is in proper condition. The Geneva drivepinissmoothlyinsertingontotheGenevadrivenslot ,duetothistheworkingisdoneproperly. A shaft is used as a roller and it is welded to driven wheel. Because of this joint the roller will able to rotate with the driven. This tends to the movement of thebelt.

Generally,thebeltusedfortheconveyorisaleat herorrubber.Butinthisathinlightweight belt is required. Because it is not required to bear high loads. Due to this a thin paper is used as a conveyor belt and for the demo, it is sufficient. The required conveyor belt movement is obtained bythis project.ThesmoothrunningofGenevamechanismisobta ined.

IV. CONCLUSIONS

TheangularvelocityandaccelerationoftheGen evawheel is successfully calculated. The time required by the material to cross the entire belt for the designed Genera wheel and the roller conveyor is calculated accurately. The entire modelling of the project is done with the help of CATIAV5.

REFERENCES

[1]. P. Kali Sindhur, "Cutting mechanism by giving feed through Geneva mechanism", International journal of innovation science, Engineering & Technology, vol 2 issue 4, April2015

[2]. Han Jiguang Yu Kang, "Analysis & Synthesis of Geneva mechanism with ellipticcrank", International journal of hybrid information technology, vol 8 No.8, 2015. Page no: 253 – 260

[3]. David B. Dooner, "Kinematic geometry of gearing", April 2012.

[4]. Brown, S.C.Large, "Belt conveyor system".

[5]. Konakalla Naga Sri Ananth, "Design & Selecting the proper conveyor belt", Internationaljournal of advanced engineering technology, E – ISSN0976-3945.

[6]. https://en.wikipidia.org/wiki/Geneva_drive