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DESIGN AND ANALYSIS OF CHAIN DRIVE POWER TRANSMISSION FROM STATIONARY TO OSCILLATING DEVICES

P. Ramesh[1], T. Abinesh[2], R. Aravind Babu[2], P.R. Jagadeesh Babu[2]

[1]*Asst Professor, R.M.K. Engineering College, Chennai, Tamil Nadu, India*
[2]*UG Student, R.M.K. Engineering College, Chennai, Tamil Nadu, India*

Abstract - *A conventional transmission system consists of the driver and driven in same axis. If driver axis is changed to 15° the axis of driven also must be changed to 15° or else failure of the machine element will take place. This work modifies the chain so which the driver can be placed stationary and driven can be oscillated by -45° to +45°. Here, the power can be transmitted from a stationary source to some of the oscillating devices like steering. This has a wide range of application where machine containing multi drives can be replaced with the single drive. In this design, a conical teeth is used which slides and locks automatically when the driven's axis is changed by maintaining the position of driver stationary.*

Key Words: Alternate transmission system, Chain drive, Oscillating devices, Structural Analysis

1. INTRODUCTION

The machine consists of a power source and a power transmission system, which gives the controlled application of the power. Merriam-Webster defines the transmission as an assembly of parts including the propeller shaft and the speed-changing gears by which the power is transmitted from an engine to the live axle. Chain drive is a way of transmitting the mechanical power from one place to another. It is often used to convey the power to the wheels of a vehicle, particularly in bicycles and motorcycles. It is widely used in a variety of machines besides vehicles.

1.1 ROLE OF CHAIN DRIVE:

Chain drive transmits the mechanical power from one place to another. It is often used to convey the power to the wheels of a vehicle, particularly in bicycles and motorcycles. It is widely used in the variety of machines besides vehicles. More often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, along with the teeth of the gear meshing with the holes located in the links of the chain.

The gear is turned, and this pulls the chain by using mechanical force in the system. Another type of drive chain called by the Morse chain, invented by the Morse Chain Company of Ithaca, New York, USA. This has inverted teeth.

Sometimes, the power becomes an output, by simply rotating the chain, which can be used to lift or drag objects. In other situations, the second gear is placed and the power is recovered by attaching the shafts or hubs to this gear. Though drive chains are often being a simple oval loops, they can also be going around the corners by placing more than two gears along the chain; gears that does not gives power into the system or transmit it out are generally known as the idler-wheels. By varying the diameter of input and output gears with respect to each other, the gear ratio can be altered. For example, the pedals of a normal bicycle can spin all the way around more than once for every rotation of the gear that drives the wheels.

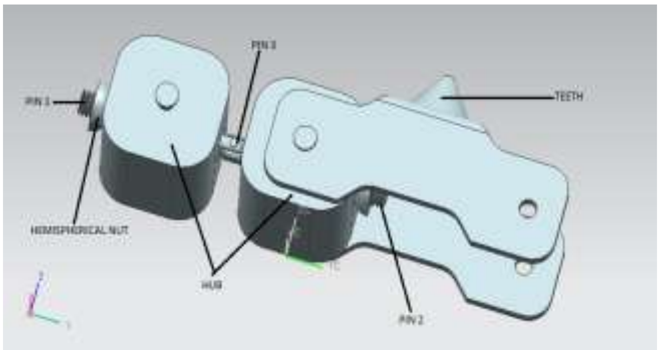
1.2 PROPOSED MODEL:

In this project, the chain is modified, so which the driver can be placed stationary and driven can be oscillated by -45° to +45°, so, the power can be transmitted from a stationary source to some of the oscillating devices like steering. This has a wide range of application where, machine containing multi drives can be replaced with single drive. In this design, a conical teeth has been used, which slides and locks automatically when the driven axis is changed by maintaining the position of driver stationary. The design of alternate transmission system consists of three sections, they are Chain section, Driver section and Driven section.s

2. DESIGN:

The design of this proposed model consists of 3 sections they are Chain section, Driver section and Driven section. The detailed representation of the chain parts are shown below,

ASSEMBLED SECTION:



ASSEMBLED SECTION OF CHAIN (SINGLE SET)

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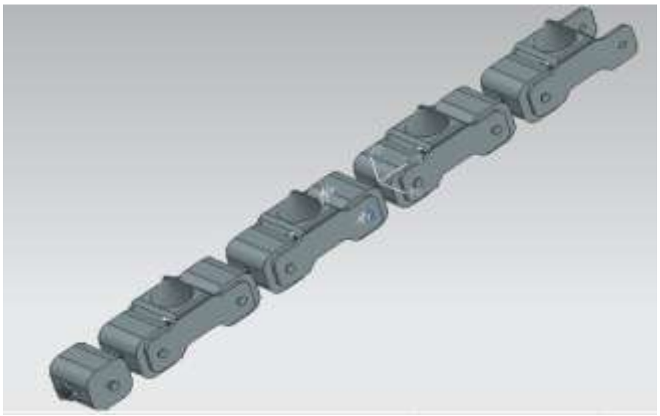
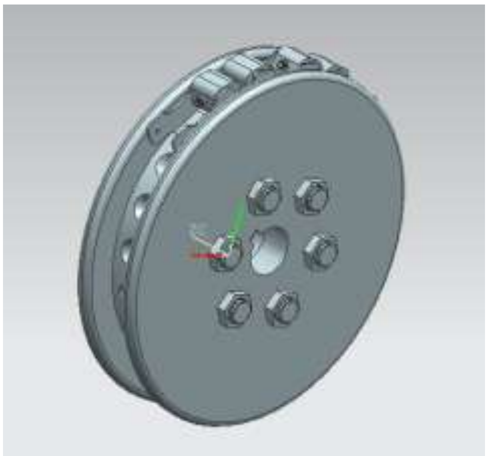
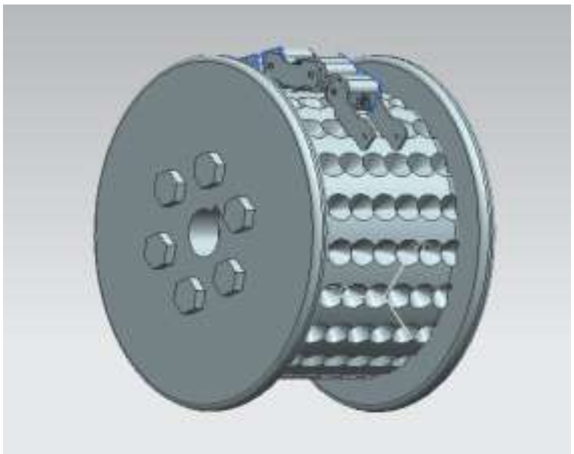


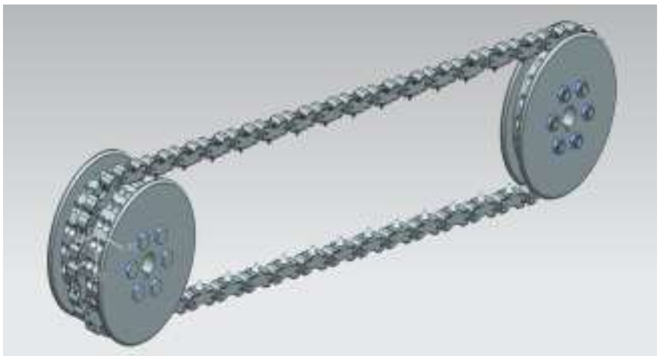
CHAIN SECTION



ASSEMBLED DRIVER SECTION



ASSEMBLED DRIVEN SECTION



FULL ASSEMBLY

3. CALCULATION

CALCULATION OF SOCKETED WHEEL DESIGN,

Distance between two conical teeth in chain section=12.400 mm

Distance between two conical sockets in wheel =24.392 mm

No. of sockets in a single wheel =10

So, circumference of the wheel is
=24.392*10
=243.92 mm

Radius calculation of wheel,

Circumference of the circle =2*3.14*R

So,

$$2*3.14*R = 243.92 \text{ mm}$$

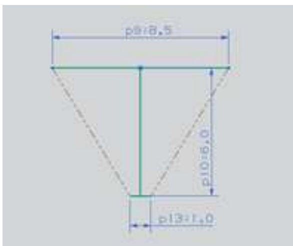
$$R = (243.92)/(2*3.14)$$

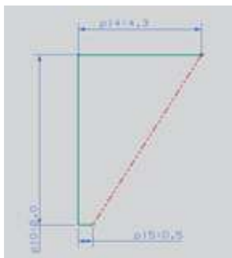
$$R = 38.8407 \text{ mm}$$

Since, the conical teeth is 6 mm high, the socket should be 6 mm deep.so, adding the radius with the height we get,

R = 38.8407 +6 = 44.8407 mm.

CALCULATION OF SOCKET ANGLE,





Therefore, the angle of the socket = 32 degree.

4. ANALYSIS OF CHAIN SECTION:

The analysis of chain section is done by using ANSYS tool. The ANSYS Mesh Tool provides a convenient path to many of the most common mesh controls, as well as to the most frequently performed meshing operations.

4.1 SMARTSIZING:

The SmartSizing algorithm first computes the estimated element edge lengths, for all the lines in the areas or volumes being meshed. The edge lengths on these lines are then refined for curvature and proximity of features in the geometry. Since all lines and areas are sized before the meshing to begin, the quality of the generated mesh is not dependent on the order in which the areas or volumes are meshed.

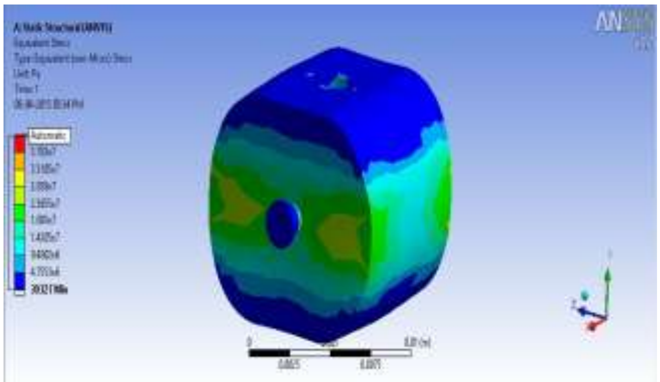
If quadrilateral elements are being used for area meshing, SmartSizing tries to set an even number of line divisions around each area, so that an all-quadrilateral mesh is possible. Triangles will be included in the mesh only on forcing all the quadrilaterals to create poorly shaped elements, or if odd divisions exist on boundaries.

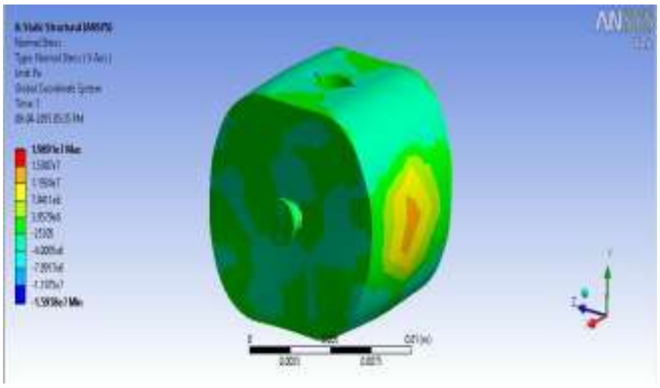
4.2 POSTPROCESSING

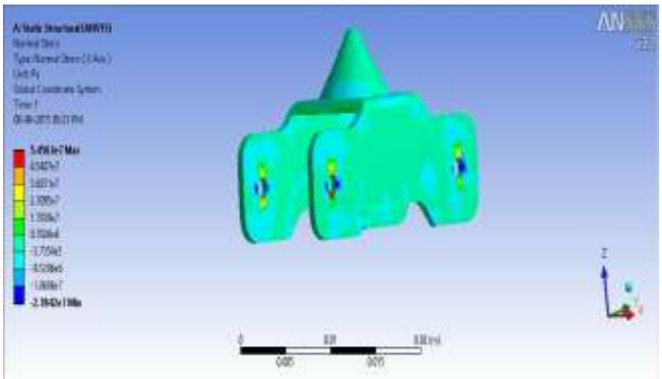
Postprocessing on solving allows you to use postprocessing tools while an analysis is still in progress. This feature is widely useful for analyses that produce the partial results such as all Static and Transient Structural, all Static and Transient Thermal, and Explicit Dynamics analyses.

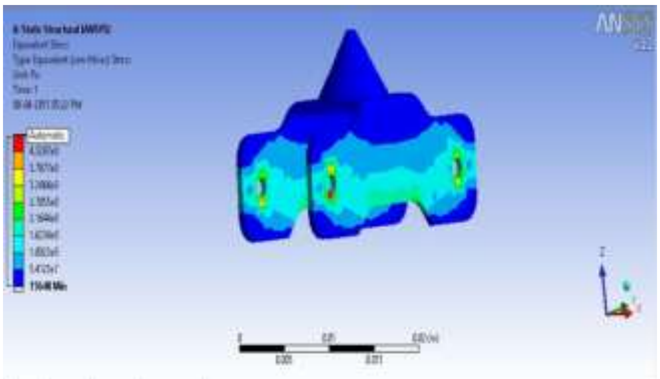
This feature is available only while solving an analysis on a remote computer or as a background process. When you run the solution as a background process, you can add up the new results under the Solution of the object or use the postprocessing features like viewing results contours, animation, min and max labels, and so on.

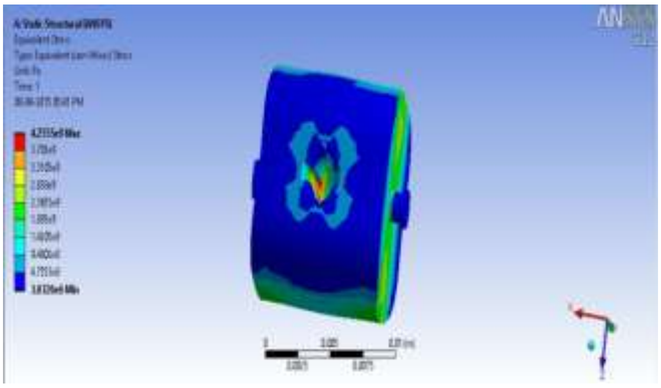
The analysis provides the optimum results as displayed below,











4. CONCLUSIONS

The main advantage of the work is to transmit power from some of the stationary power transmitting terminal to some of the oscillating devices. The conical teeth in the chain section promotes itself in the socket when any slippage occurs during the power transmission also.

The total mechanism of the work held in the hub portion which helps in changing the twisting angle of the chain according to the position of the driven socket wheel. Due to the large cross section of the driven socket wheel compared to the driver socketed wheel (about 6 times), while changing the angle, the slippage of chain from the driven socketed wheel can be avoided partly.

The usage of border adds up the full assurance in avoiding the slippage of the chain from the wheel. The materials of the border plate is weaker than the chain material so which the over erosion due to friction of the chain material can be avoided.

Once the border plate is avoided fully it is transferable. This work can used for future ideologies, for future works in producing new machineries.

This work may replace the usage of multi drives to single drives when it is studied and developed.

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