IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 3, March 2016.
www.ijiset.com
ISSN 2348 – 7968

Design and Analysis of Shaft and Sprocket for Power Transmission Assembly

Ram Nath Yadav[a] ,Nitesh Kumar Varshney[b], Manish Mavi[c]

[a.] Ram Nath Yadav, Assistant Professor, IIMT College of Engineering Greater Noida.
Email: y.ramnath@ymail.com
[b].Nitesh Kumar Varshney, Assistant Professor, IIMT College of Engineering Greater Noida
Email: varshneynitesh013@gmail.com
[c]. Manish Mavi, Assistant Professor, IIMT College of Engineering Greater Noida
Email: manishmavi02@gmail.com

ABSTRACT

There is a rapid increase in automobiles all over the world. The net result is a lack of parking space. This is a problem that is faced by everyone in day to day life. Thus, our project deals with this problem and therefore, I suggest few measures that could be helpful in overcoming this problem. The present research paper emphasizes upon design and analysis of shaft and sprocket for power transmission assembly of vehicle for parking purpose. Two components were designed for giving transverse movement to the vehicle namely sprocket and shaft. After identifying the components, a 3-d model was created in solid works. Then load and boundary condition was applied and analytical designing was done. By adding these components in 3-d model of the existing system, it is found that the whole system is safe and can work practically. By designing the system and assembling it, we conclude that transverse movement of vehicle is essential for parallel parking.

Keywords: Transverse movement, Sprocket, Shaft, Parallel Parking.

1. Introduction:

In many areas, especially urban areas, parking is a serious problem. Shortages of parking space, complaints about high parking tariffs and congestion due to visitors in search for a parking place are only a few examples of everyday parking problems. Many cities and urban areas recognize these problems, but the solution proves to be very complicated. Delhi, the capital of India is facing an acute transport management problem. This primary problem leads to many more secondary problems such as air pollution, high-energy consumption, congestion, loss of productivity, increase in death accident rates etc.

1.1 Objectives of Study

- **Primary objective: -** Design & Analysis of transverse movement assembly in vehicle for parking purposes.
- **Additional objective: -**Implementation of primary objective proposed design in vehicle.

ISSN 2348 – 7968

1.2 Power transmission assembly

This assembly is compounded by the shaft and the sprocket. The shaft and the sprocket have a rigid connection in the assembly. The shaft has transmitted the torque to the sprocket and it is connected to the new shaft by the chain.

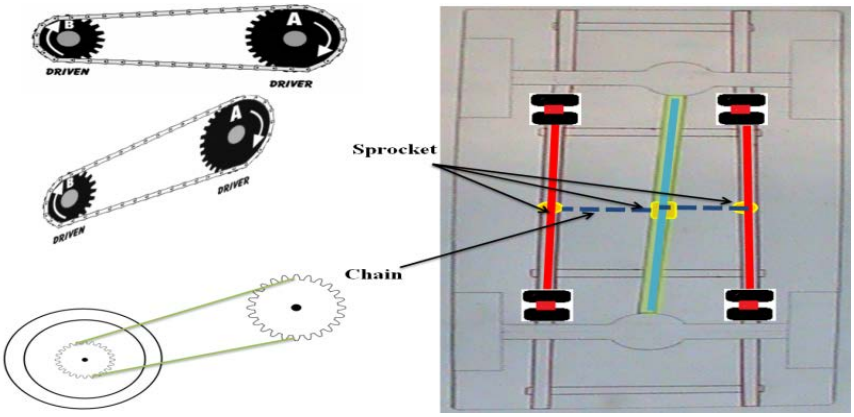

Figure 1.Power transmission assembly

2. Design of Shaft

Shafts form the important elements of machines. They are the elements that support rotating parts like gears and pulleys and in turn are themselves supported by bearings resting in the rigid machine housings. The shafts perform the function of transmitting power from one rotating member to another supported by it or connected to it. Thus, they are subjected to torque due to power transmission and bending moment due to reactions on the members that are supported by them. Shafts are to be distinguished from axles which also support rotating members but do not transmit power. Axles are thus subjected to only bending loads and not to the torque.

2.1 Modal and Design Analysis

2.1.1 Design Parameters:

The design parameters for the shaft are follows.

Parameter of the shaft	Symbol	Value	Unit
Diameter of shaft	D	3	Mm
Length of shaft	L	2400	Mm

Table1.The design parameters for the shaft

ISSN 2348 – 7968

2.1.2 Assumptions:

1. The shaft rotates at a constant speed about its longitudinal axis.
2. The shaft has a uniform, circular cross section.
3. The shaft is perfectly balanced, i.e., at every cross section, the mass center coincides with the geometric center.
4. All damping and nonlinear effects are excluded.

2.1.3 Modeling, Meshing and Boundary conditions for Design Analysis:

ANSYS v12.0 software is used to determine the maximum torsional stress of the shaft. Firstly, a three dimensional solid shaft 2400 mm long and 30 mm in diameter is modeled. The surface boundary conditions are applied to the shaft model as shown in Figure 6. Cylindrical support is applied at both end shaft, 183 Nm of torsion is applied on the mid of the shaft and 7500 N load applied at the distance of 50 mm both end of the shaft.

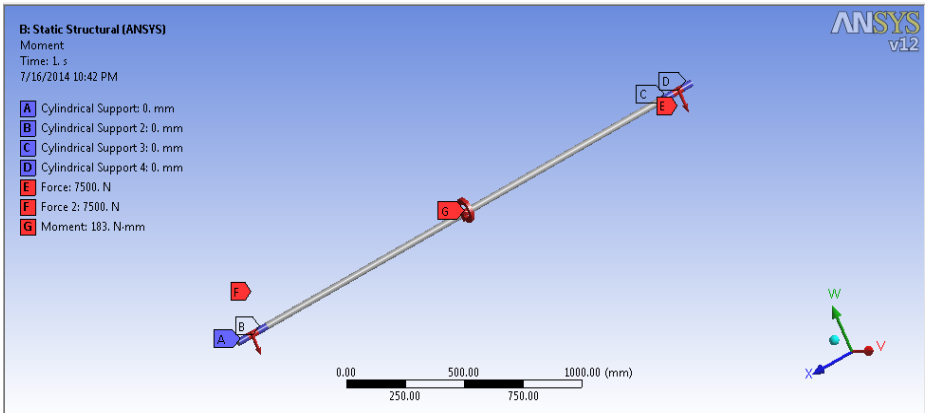

Figure2-Ansys Model with boundary conditions

3. Design of Sprocket:

3.1 Design Parameters:

The design parameters for the sprocket are follows.

Parameter of the sprocket	Symbol	Value	Unit
Diameter of sprocket	D	80	Mm
Thickness of sprocket	T	8	Mm

Table2.The design parameters for the Sprocket

ISSN 2348 – 7968

3.2 Modeling, Meshing and Boundary conditions for Design Analysis:

ANSYS v12.0 software is used to determine the different type of stresses and deformation of the sprocket. Firstly, a three dimensional solid sprocket 8 mm thickness and 80 mm in diameter is modeled. The surface boundary conditions are applied to the sprocket model as shown in Fig.7. Fixed support is applied at the hub of the sprocket and 500 N of force is applied on the top teeth of the sprocket.

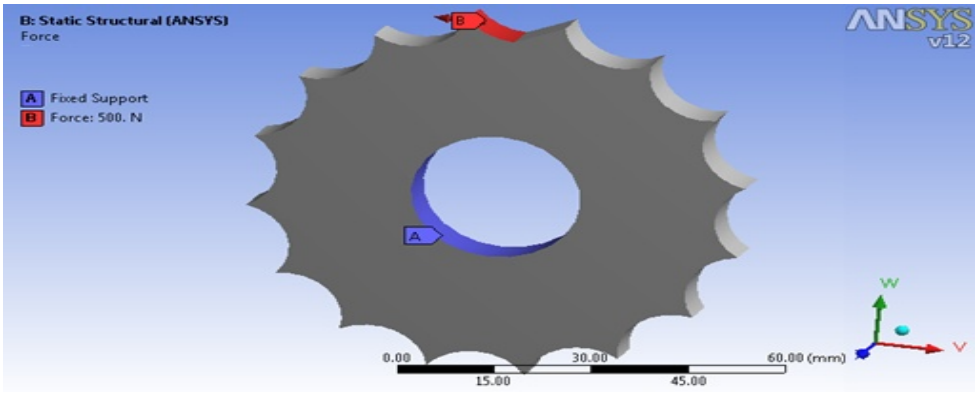

Figure3. Ansys Model with boundary conditions

4. Conclusions:

By designing the system and assembling we conclude that:

a) The vehicle can be driven from a parking lot if there is space from any of the four sides.
b) As there is need of the movement of adjacent vehicle so owners of the vehicle can take away the keys of their vehicle and the system enhances the security of vehicles and chances of theft and misuse are reduced as the vehicle is parked near to the place of work.
c) The system is also helpful at the time of changing the tyres.
d) From the above Study it can be conclude that, the stresses found out by analytical method. The shaft of vehicle designed is safe for 3041.667 N loads and 183 Nm torque. The sprocket of vehicle designed is safe for 3041.667 N loads and 183 Nm torque.

References:

a) Material Science and Engineering Book by Callister, WILEY INDIA Publication, 2013.
b) Mechanical Engineering Design book by Richard G. Budynas and J. Keith Nisbett.
c) VishalPrajapati, SirajFulum, Vishal Sevani, InderpreetArora, “Multi-storey carparking”
d) Automotion Parking system (press release) AutoMotion Introduces First FullyAutomated Parking Garage in N.Y.C.,December 18, ET.

ISSN 2348 – 7968

e) "An analysis of stress and displacement distribution in a rotating rim subjected to pressure and radial loads" By P.C.Lam and T.S.srivastam.
f) Stress Analysis of Wheel Rim International Journal of Mechanical Engineering and Research Volume 1 Issue 1 (page 34-37), ISSN: 2277-8128.