Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 5, May -2017

Design And Fabrication Of Movable Headlight System

Ajay R. Pawar[1],Shivraj S. Salekar[2],Tejas U. Mandhare[3],Sachin D.Pawar[4],Sanket S. Unune[5]

Under the guidance of

Prof.D.D.Ubale

[1,2,3,4,5]*Mechanical Engineering, Dnyanshree institute of engineering & technology, Satara, Maharashtra*

Abstract-*In today's fast moving vehicle scenario, road safety is ofmost importance. Many people have lost their lives while travelling, due to a road accident. So we should reduce such accidents if we wish to travel safely. To cater this cause, we propose an adaptive steering controlled headlight setup with only one headlight movable and one fixed according to turn. The system can be adopted in any type of four wheel vehicles/trucks or trailers etc. without being an economic burden on the end user. The idea of steering controlledheadlight is not new, but its adaptability according to the turn is its novel part. A lot of companies have developed technologies that incorporate turn able headlight to better illuminate the path, but these technologies are quite expensive and continue to be distant from the majority of car owners. So we felt the need of developing a mechanism that incorporates few simple components like gears, linkages etc. and can be readily fitted onto any steering column without much of a design variations. The setup contains a rack and pinion gear mechanism with steering column and some other mechanical parts. The headlight is used so that it has 1 degree of freedom i.e. it can rotate about its axis. This setup will be of huge aid to the driver, as it will permit him to see the incoming obstructions in hilly areas or in the regions with sharp turns as it provides a better illuminated path as compare to previous adaptable headlights system with both movable.*

Keywords-*Design, Headlight Mechanism, one movable, Rack And pinion gear.*

I.INTRDUCTION

Preventive and active safety of road vehicles is one of the top priorities in car design and development now adays. Passive and active safety systems have been developed in R&D activities to produce vehicles that will perform at the highest level of safety and ensure comfortable driving under various conditions. In the present scenario, a headlight of an automobile has a fixed path for the emanation of beam of light in front direction only. So when the vehicle takes a turn, the beam of light follows the tangential path as a result some part of the roads remains dark, thereby creating a dead angle of illumination and such lack of visibility poses danger in driving at night or on steep turn. This causes a lot of accidents.

Headlight System is an active safety system, where the head lamp orientation control system rotates the right and left headlights independently and keeps the beam as parallel to the curved road as possible to provide better night time visibility to driver. In this system use rack and pinion arrangement which give drive to the optical axes on which headlight are mounted so when a tie rod arms are moved with steering arm that give predefined motion to the wheel as well as headlights.

II. DESIGN OF COMPONENTS

1. DIMENSIONS OF PINION:

Figure 1.Pinion
Pinion type: Helical
No of Teeth=4
Diameter=16 mm
Length=35 mm

2. DIMENSIONS OF RACK:

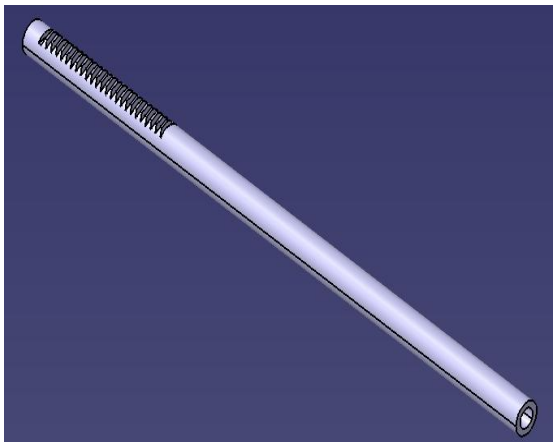

Figure 2.solid modelling of rack

No. of teeth on rack = 24
Length of rack = 545 mm
Outer Diameter=23 mm
Inner Diameter=14 mm
Pitch=2 mm

3. TAPER ROD:

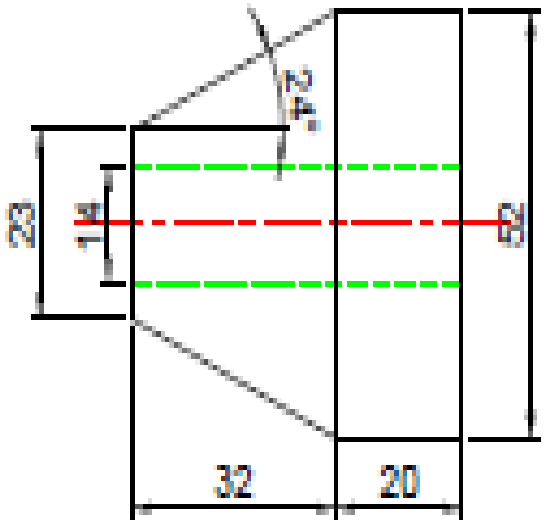

Figure 3.2D Drawing of Taper Rod

3.1 PROCESS SHEET FOR TAPER ROD :

Table No.1 Process Sheet For Taper Rod

SR NO	OPERATION	TOOL	DIMENSION(mm)
1	Facing	Single Point Cutting Tool	(2x45°)
2	OD Turning	Single Point Cutting Tool	3
3	Taper Turning	Single Point Cutting Tool	(32x24°)
4	Central Drill	Drill ø5	8
5	Drill of ø12	Drill ø12	52
6	Internal Threading M12.5	Drill of ø12.5	52
7	Chamfer	Single Point Cutting Tool	2

4. LINKAGE:

Material for Linkage-Mild Steel
Cross Section=(20x20) mm
For Roller Follower:
Diameter of Roller = 20 mm
Width of Roller = 15 mm

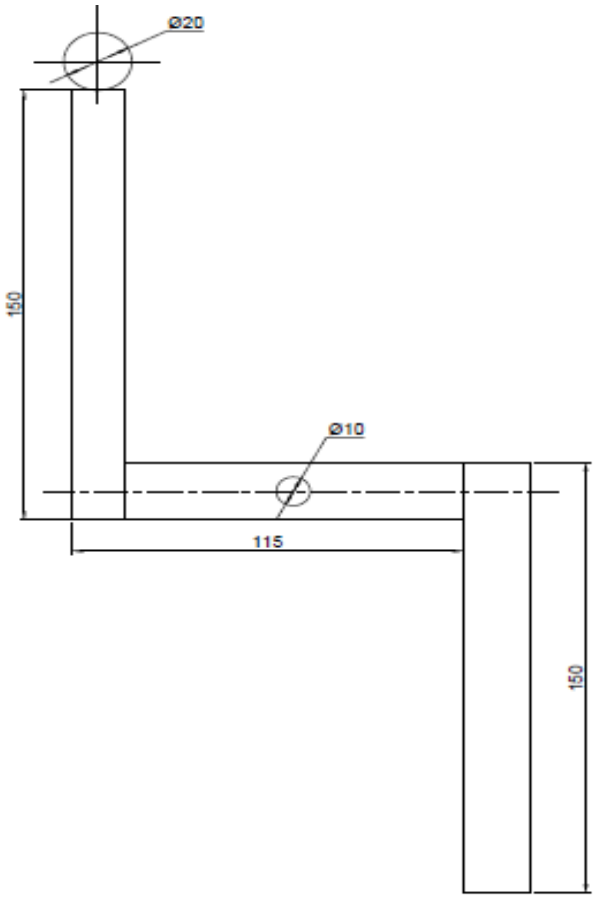

Figure.4. 2D Drawing of Linkage

5 SPRING:

Figure 5. Helical compression spring

Type of Spring - Helical compression Spring
Material for Spring - Hard Drawn Carbon Steel
Modulus of Elasticity,
$E = 207\times10^3$ N/ mm^2
Wire Diameter,
d = 1.4 mm
Inner Diameter of Coil,
d_i=12.6 mm
outer Diameter of Coil,,
$D = d_i + d$
D =14 mm
No. of Total Coils,
N_t =50
Total Length of Arm,
L = 140 mm
No. of Active Coils,

$$N_a = \frac{Nt + L}{3\pi d}$$

=17
Angle of Deflection,
$\Theta = 30^0$
Minimum Diameter After Deflection,

$$D_m = \frac{D \times Nt}{Nt + \Theta}$$

D_m=13 mm
Force applied=100 N
Bending Stress,

$$\sigma_b = \frac{(32\times T)}{\pi d^3} \times \frac{(4C2-C) - 1)}{4C\ (C-1)}$$

σ_b = 3585 N/ mm^2
Torque,

$T = \frac{P \times D}{2}$

$T = 560\ N/mm^2$

Spring Index,

$C = \frac{D}{d}$

C = 10 mm

6. MISCELLANEOUS PARTS:

6.1 Battery:

12 V Battery
60 A Current

6.2 Headlight:

Voltage=12 V
Current=4 A

III.ASSEMBLY

Steps Of The Assembly:

1. To support various parts we made the frame with sufficient weight and balance.
2. The rack and pinion is assembled as one part and mounted on frame.
3. After assembly the rack and pinion mechanism, we assemble taper rod to the rack by using studs**.**
4. After assembling taper rod to the rack we assemble tie rods to the taper rod.
5. Wheel drums are attached to the tie rods by using nut and bolt.
6. We mount the linkage such that it will come in contact with the taper rod when the wheel position is straight ahead.
7. The headlights are mounted on linkage whose one end is attached to headlight and another end is connected to roller. This roller is contact with taper part which is mounted on rack.
8. The steering wheel is mounted on the frame and the Tie rods are attached to the wheel drums. The steering wheel is supported by a rod which is welded to the base.

Final Assembled View:

IV.CONCLUSION

In existing movable headlight systems both headlights are movable and these system have ECU along with sensors which increases cost of the system.In this work we have developed movable headlight system in which only inside headlight is movable. Movement of this headlight takes place according to steering. We observe there is considerable increase in visible area during night.

An advantage of the developed headlight system is in its high adaptability as it can be easily configured to fit within space confines of a variety of vehicle designs.Furthermore, the system is of inexpensive, simple and easy to assemble.

V. REFERENCES

[1] N.Laxmi, B.Anil Kumar, D.kiranvarma, Design and Fabrication of A Steering Controlled Headlights in Automobile, International Journal & Magazine of Engineering, Technology, Management and Research, July2015,98-102

[2] Automobile engineering by Dr.kirpalsinghvol 1, pub; 2010, chapter: front axle steering systems

[3] A Textbook of "Design of Machine Elements" by V.B. Bhandari , McGraw Hill publication, third edition, Chapter:Design Of Spur Gears

