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Design and Fabrication of Adaptive Steering Controlled Headlight

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***Abstract*: According to traffic accident data in India, the majority of severe road accident occur at night. Many people have lost their lives while travelling, due to a road accident. To overcome this cause, propose an adaptive steering controlled headlight system. The system can be adopted in any type of four-wheel vehicle/trucks or trailers etc. Without being an economic burden on the end user. So, we felt that need of developing a mechanism that incorporates few simple components like gears, linkage etc. And it can be readily fitted into any steering column without much of design variation. This setup contains a gear mounted on a steering column and is meshed with the circular gear which is mounted on the axis parallel to the steering column. A linkage or wire mechanism is used to transmit the rotating motion to the headlight. It can rotate about its axis.**

***Keywords*: Design, steering wheel, headlight, gears**

1. Introduction

In current vehicle there is fixed path of emanation of beam light in front direction only. Due to this many accident happens in hilly area, because of fixed path of headlight.so that we go for an adaptive steering controlled headlight. By this we can avoid some accidents happens in hilly area. In this system, when the steering turned at certain angle the headlight rotates by using the simple gear mechanism. So that the path of emanation of beam light tilted about certain angle. The spur gear is attached to pinion. It is connected to the steering column. Due to this mechanism also enables us to save some fuel and also done by different filament of the bulb for required effects of "high beam" or "low beam". In this project the headlights move from left to right more particularly to a direction corresponding to the steering wheel rotate. The whole system involved in this mechanism and parts are headlight, steering column, linkages, gears etc. The design can be done in computer based designing software like Solid works. It is highly desirable to create a mechanism to solve the above problem that to can be adapted at an economical cost.

2. Literature review

Before doing this project, perform a survey with the truck drivers, who travel to curvy road and hill areas often. Based on their suggestions we had done in this project. According to [1] related to turning headlight a vehicle lamp is provided with a movable reflector and by turning the movable reflector in the steering direction by an amount steering angle of the steering wheel, the light distribution pattern of the front lamp is changed in the direction of vehicle's turn so as to increase visibility at the time of cornering. However, according to the earlier art, the light distribution pattern of the front lamp is changed in the steering direction of the steering wheel by an amount corresponding to the steering angle when the vehicle turns on a cornering bend destination cannot be beamed brightly enough before operating the steering wheel. Therefore, an art capable of beaming the cornering to operation of the steering wheel has been demanded

Also according to [2] It includes a headlight structure, a gear and a server, the headlight structure being mounted through a rotatable shaft at the front side of the vehicle server receives a proof flip signal to turn and to transmit a force to the shaft to drive the main shaft to create the headlamp turn left or right, following the movement of the steering wheel. In view of the above arts, the mechanisms available either require more vertical space or do not provide a mechanism which can be engaged or disengaged at the will of the driver. Hence, there's a requirement to develop a mechanism that is compact, cost effective and can be engaged or disengaged at the will of the driver.

Therefore, the current development relates to a vehicle front headlamp distribution system capable of raising visibility at the time of cornering by controlling light distribution means of the front light source. It provides methodology for steering controlled headlights turning with a non-significant increase within the turning effort. And it was absolutely necessary that this extra mechanism doesn't hike the value of the vehicle. Also, it was necessary to inspect that the mechanical system used doesn't turn out to be increasing the maintenance costs

Designing

To design the improved steering-controlled headlight mechanism in Solid works we have a tendency style each part involved in the mechanism separately and then assembled the whole parts in the Solid works to achieve complete the mechanism. At the very first step of designing we design the headlight in Solid works by taking the quality dimension from the offered light within the market. A disk is hooked up at the rear aspect of the headlight and a hole is made eccentric to the axis of rotation of the headlight. This eccentric hole helps in

rotation of headlight in leftward or rightward.

Then Steering Column is designed and a spur gear is mounted on the steering wheel to transmit the motion of rotation of wheel to the headlight with the help of semi-circular spur gear and the linkage mechanism. The spur gears are used because of simple structure design, high power transmission at low rpm and reliability when the power is to be transmitted in parallel axis. Also the axis of rotation of spur gear mounted on steering column is parallel to the axis of rotation of semi-circular spur gear.

Then the semi-circular spur gear is designed which is in mesh with the spur gear mounted on the steering wheel. It is used because to rotate the headlights up to extreme left or extreme right position only half of the gear profile is sufficient and if full gear is used then it would add unnecessarily weight to the improved steering control mechanism.

Then the linkage is designed according to the length offered between steering column and therefore the light. The linkages are of 2 types one is solid and the other one is slotted. One the linkage is made slotted because during the rotation of headlight the length of linkage first increases and then decreases and then increases. Additionally, slotted mechanism provides a sleek movement with the rotation of semi-circular spur gear and rotates the headlight accordingly to the desired left or right position.

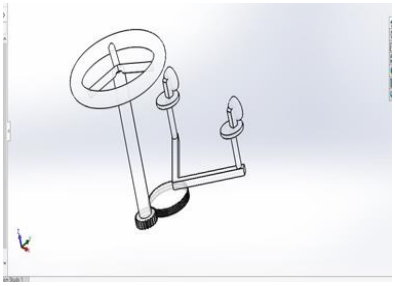

Fig. 1. Complete assembly model

Table 1
Design table

Parameters	No. of teeth	Diameter
Spur gear	72	144
Pinion	18	36

3. Fabrication

As the wheel rotates, the gear mounted on steering column also rotates and the rotation is further transferred to the spur gear due to meshing of spur gear with steering column gear. At the initial stage the headlight is at mean position and the pivot point of the gears moves in the slotted plate. At the mean position the pin is at the midpoint of the slot and with the movement of headlight towards extreme left or right position, the pin also transverses the distance away from the mean position of pin in the slot. Now when the spur gear rotated the linkage attached to the spur gear also rotates and it helps to transmit the motion to the headlight. If the steering wheel is rotated clockwise then spur gear rotate in anticlockwise direction. Then the left side linkage will pull the headlight and this will result in the rotation of headlight in leftward in the same way the headlight is rotate in the rightward direction.

Additionally, one among the ideas behind the steering control headlight is the voluntary engaging and disengaging of the headlight with the steering column at the drivers will. This makes the mechanism more versatile and contributes significant advantages over the previously designed mechanisms. During engaging the pivot moves inside the curved path over the guide plate which makes the spur gear to move towards steering column gear and get mesh with it. Engaging mechanism is advantageous on terrain having sharp turns such as hilly areas in night where visibility at turns will contribute significant part to the overall safety.

A. Calculation

Total angle turned by headlight =180^{o}
Total angle made by steering wheel=720^{o}
Steering ratio=720÷180=4
Let min no teeth on steering column gear=18
No of teeth on other gear=72
Let module of gear=2mm
Now, using m=d/T
Diameter of steering column gear=36mm
Diameter of circular gear=144mm

4. Conclusion

This paper has bestowed the “Development of an adaptive steering controlled headlight for low value vehicles” in which the headlights rotates with a same angle like which the front wheel of the vehicle rotates by the rotation the steering wheel. The linkage mechanism of steering controlled light proved to be cost effective choice which might be employed in vehicles especially in heavy duty vehicles to transmit the rotation motion of the steering wheel to the headlights once the mechanism is engaged. It additionally increases the safety of drivers likewise as passengers by providing appropriate field of view during ride in night and hilly areas which consists of frequent sharp turns. Moreover, other existing mechanisms for steering controlled headlight such as electrically controlled mechanism, adaptive headlight mechanism it is simple, economical and can be easily customized for the any king of vehicles. Unlike other available systems it does not require any external source for power for its commencement, only a little effort is applied to interact the system by using lever mechanism.

The mechanism consist a gear mounted on the steering column and a spur gear is mounted on an axis parallel to the steering column to mesh with the steering gear. A linkage is employed to transmit the rotary movement of steering wheel to the turnable headlight by meshing the two gears.

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