International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 08, August-2015

Selectable All Wheel Steering for an ATV

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***Abstract* - Selectable All Wheel Steering is a relatively new technology that improves maneuverability in cars, trucks and trailers. All wheel steering is used for parking and low-speed maneuvers but in this type of steering system the vehicle can be steered on both, two wheels & four wheels. The "Selectable All Wheel Steering" is the modified form of AWS (All Wheel Steering). In this, the engagement and disengagement of the four wheels steering can be done as per the driver requirement. This provides the benefits of both two wheel and four wheel steer. Thus, can be used as front wheel steer in long straight runs and can be used as all wheel steer when sharp and close turns are needed.**

The Mechanically Operated SAWS arrangement is among one of the most compact and cost effective systems which can be installed in an ATV without making many changes in the four wheel steering system.

Keywords- ATV, all wheel steering, spur gears.

I. INTRODUCTION

The steering system is a group of parts that transmit the movement of the steering wheel to the front, and sometimes the rear, wheels. The primary purpose of the steering system is to allow the driver to guide the vehicle. When a vehicle is being driven straight ahead, the steering system must keep it from wandering without requiring the driver to make constant corrections.

The steering system must also allow the driver to have some road feel (feedback through the steering wheel about road surface conditions). The steering system must help maintain proper tire-to-road contact. For maximum tire life, the steering system should maintain the proper angle between the tires both during turns and straight-ahead driving. The driver should be able to turn the vehicle with little effort, but not so easily that it is hard to control. [1]

"Selectable All Wheel Steering" enables the driver to choose between the two different modes of steering i.e. to switch from front wheel steering to all wheel and back from all wheels to front wheel as per the requirement.

II. BACKGROUND

General Motors 2002 GMC Sierra Denali was the first pickup to be equipped with four wheels steering, using a system that GM calls Quadrasteer. GM's Quadrasteer features. The Quadrasteer steering system offers a 21% reduction in turning radius. So if a vehicle is capable of making a U-turn in a 25-foot space, Quadrasteer allows the driver to do it in about 20 feet.

- Computer-controlled Quadrasteer can be switched on and off and has an effective trailer towing mode.
- A computer determines how much and in which direction the rear wheels should move, and whether the rear wheels should turn the same direction as the front wheels or in the opposite direction. The movement is variable up to a couple of inches.
- At slow speeds, the rear wheels move the opposite direction of the front wheels. This makes for easier parking and maneuvering.
- At highway speeds, the rear wheels move in the same direction as the front wheels for easier lane changing. If you're pulling a trailer you'll really appreciate this feature, since it allows your vehicle to change lanes without the snaking-effect you'd normally experience.
- In order to accommodate the steering mechanism and wheel movement, the Sierra Denali's track and fender width are wider than its conventional counterpart--but it's not as wide as the rear of a dually pickup.

Whether you are going off road, pulling a boat or trailer, driving on the Interstate, or parking in a tight spot, you'll notice a big difference in maneuverability when the rear wheels take part in the steering. Look for an increasing number of vehicles to be equipped with this maneuver enhancing feature. [2]

While the Mechanically Operated SAWS arrangement is among one of the most compact and cost effective systems which can be installed in an ATV without making many changes in the four wheel steering system. The Mechanically Operated SAWS arrangement is among one of the most compact and cost effective systems which can be installed in an ATV without making many changes in the four wheel steering system.

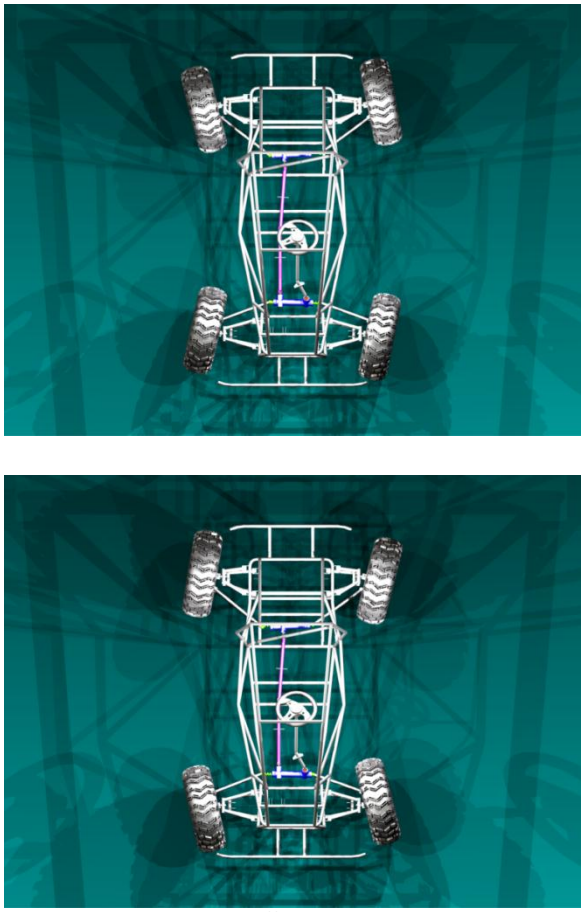

Fig 1. Different Steer positions

III. DESIGN

The gear box consists of four gears connected together to transmit the steering effort from front steering system to rear and to engage and disengage it. The box consists of two idler gear along with one input and one output gear. It has a central dog on which the idler gears are mounted which is also connected with the gear shifter lever which is mounted outside, on the casing. The gear shifter is operated with a T-shaped lever to engage and disengage the mechanism.

This gear box is placed and connected to the central shaft which transmits the steering torque from front steering system to rear steering system.

The casing of the whole arrangement is made up of MS plate, the dog shaft is mounted on the two bushing which are attached to the MS plate. The other holes on the plates have a bearing each on which input/output gears are mounted.

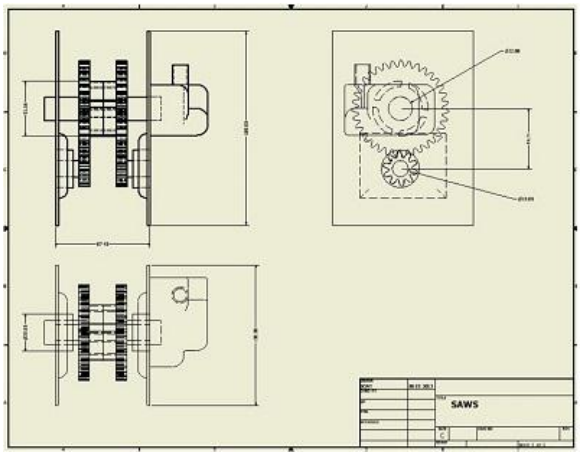

Fig 2. Drawing image

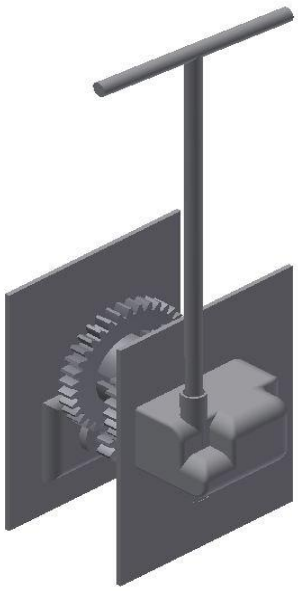

Fig 3. 3-D view of gearbox

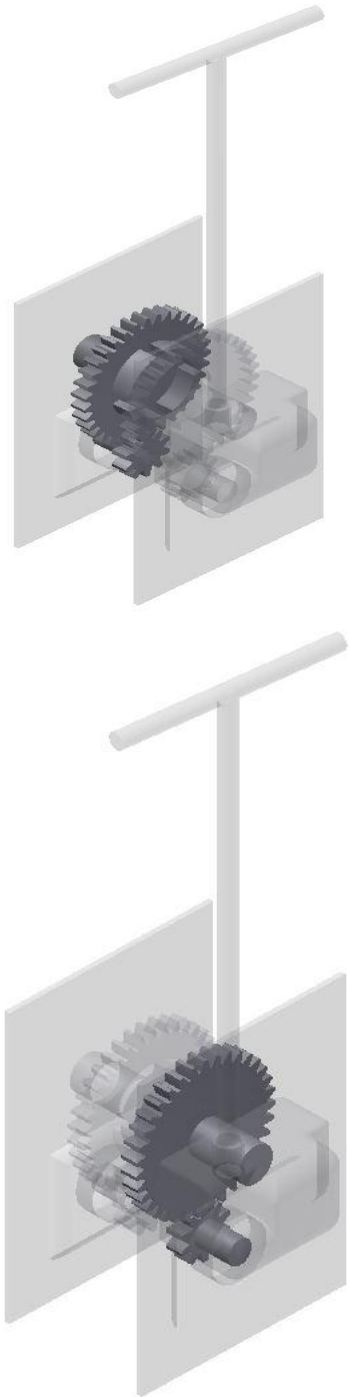

Fig 4. Input/output Gears

IV. WORKING

The gearbox consists of two idler gears which are mounted on the central dog shaft and one input and one output gear. The central shaft of the AWS system is been cut into two parts, the part which is connected to the front steering rack will be connected to the input gear, the part which is coupled with the rear rack is connected with the output gear.

The input and output gears are meshed with the idler gear in order to keep the direction same and to attain the required ratio for proper working of the system.

The two idler gears are free to rotate on the central dog shaft, which can be connected with each other with the help of connecting pin. This connecting pin is mounted over the moving part of the dog shaft. This moving part of the dog shaft is connected to the gear shifter which controls the engagement and disengagement of the steering system. The gear shifter is operates with the help of a lever which is actuated by the driver for changing the mode of steering system

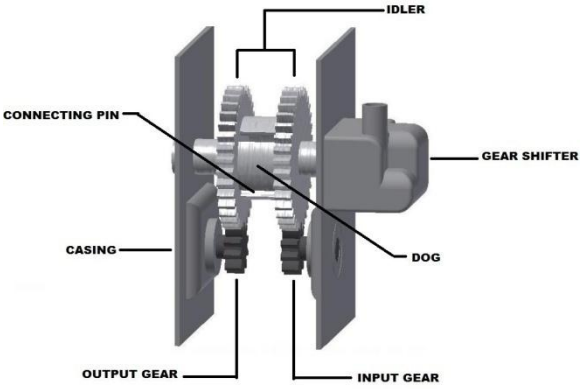

Fig 5. General layout of the selectable steering gearbox

V. CONCLUSIONS

The experimental setup designed is capable of working properly. The setup will prove to be cost effective and would be much lesser than the other electronic systems and mechanisms available in market. The whole system is mechanically operated which makes it easy to operate and offers easy servicing.

- The arrangement i.e. the SAWS gearbox can be mounted on the existing all wheel steer system and works as desired.
- The whole system is mechanically operated
- The gearbox is small and compact in size.

REFERENCES

[1]. Auto Suspension and Steering; Book by Chris Johanson and Martin T Stockel
[2]. Trucks About: 4 Wheel Steer. http://trucks.about.com/cs/4ws/a/4wheel_steering.htm
[3]. Dr. N. K. Giri, "Automotive Mechanics", Khanna Publishers, 2-B, Nath Market, NaiSarak, New Delhi – 111006. (1996) , 7th Edition.
[4]. Thomas. D. Gillespie, "Fundamentals of Vehicle Dynamics", Society of Automotive Engineers, Warrendale. (2000) Online Edition