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# Anti Roll Back System

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## ABSTRACT

An automobile is defined as a vehicle designed for operation on roads and usually has four wheels and a diesel or gasoline internal combustion engine. While driving on a hill road most of the drivers face the problem of rolling of a vehicle, it may be rolling backward or rolling forward which is termed as roll back system. The aim of the research is to arrest the motion of axle by using pawl and ratchet mechanism which will be operated electronically without utilizing the brakes. The objective of this is to design and fabricate a mechanism so that vehicle will not roll due to the slope of the hill and gravitational pull. The "Automobile Reverse Locking Differential Mechanism" is a preferred embodiment provides systems and methods for preventing a vehicle from reverse movement on a slope. This system consists of ratchet and pawl device connected to at least one wheel of the vehicle and actuator which will control the movement of the pawl while engaging or disengaging the mechanism where in the system may be engaged using an engaging mechanism when reverse motion is undesirable or to be restricted, and may be disengaged when the reverse motion is desirable. A push button will be provided on gear of the vehicle which will be operated by the driver on choice. In this work the mechanism will be developed to stop the vehicle from rolling backwards when the vehicle is moving on the hill roads.

Keywords: Ratchet and Pawl Mechanism, Actuator, Antiroll Back Effect, Switch.

#### I. INTRODUCTION

Road transport safety is an important issue in the land transport sector. Driving mistakes made by heavy goods vehicle drivers may be more serious because of the weight, size, shape, braking abilities, etc., of the vehicle. Fatal accidents occurs due to loss of control or improper handling of equipment.

An anti- roll back system, which effectively and easily supports driver while driving up on steep gradient in forward or reverse direction. The system is capable of being fitted on any vehicle having fluid (gas or liquid) operated braking system. Further, the system is capable of being retrofitted on existing vehicles with minor vehicle modifications. Furthermore, the system operates without affecting basic braking system performance of the vehicle.

### **II. BACKGROUND OF THE INVENTION**

The present invention in its various embodiments, aims to address the above drawbacks and requirements, and provide effective systems and methods to prevent a vehicle from reverse movement in a slope.



Figure 1. Actual diagram of traffic in Ghats

In the hill station, the most common problem to the drivers is to park their vehicle in the slope and to start up the car. While waiting in the traffic the cars have to move on step by step very slowly, this situation is a difficult one for the drivers to make their car not to roll back in the slope. So the mechanism has to be developed to stop the vehicle from rolling back and it should not stop the vehicle in accelerating forwards. This function can be achieved by using the ratchet and pawl mechanism.

#### **III. OBJECTIVES**

- The major objective of our project is to prevent of accidents with some simple and economical means.
- To overcome problem of sliding in reverse direction of a vehicle on hill or any inclined surface.
- To replace the electrical components in design of hill assist braking system by ratchet and pawl for cost optimization.

#### **IV. LITERATURE REVIEW**

[1]A.Arunkumar- "Design and Fabrication of Anti-Roll Back System in Vehicles using Ratchet and Pawl Mechanism" in January 2015.It has investigated, Ratchet and Pawl mechanism is identified to arrest the backward motion to the car.

[2] Rajeshkanna - "Locking Reverse Wheel Using Anti Roll Back Mechanism" in April 2017. It has discussed, a ratchet and pawl mechanism that has advantages for mechanical safety mechanisms, particularly when the design envelop is too small to allow for traditional mechanical components.

[3] HarshalAhire-"Automobile reverse locking differential mechanism" in March 2016.It has discussed, a differential is a device which is used in vehicles over a few decades and when vehicle is negotiating a turn, the outside wheel travels a greater distance and turns faster than the inside wheel.

[4] PrateekChaturvedi-"Anti-Roll Back Mechanisms: a Review" in May 2015. It has invention relates to an automobile locking mechanism for preventing a vehicle such as an automobile, from moving backward at such times when reverse movements is not desired. It is among the objects of his invention to provide a reverse lock of the character described which permits free forward movement of the vehicle.

[5] BhavanarayanaKotteat- "Development and Fabrication of MAC Technology for a Vehicle to Control Roll Back Effect".It has discussed, Manual Actuated Control (MAC) mechanism operates by taking manual input according to the requirement.

### V. COMPONENTS

#### Actuator

Hydraulic or pneumatic cylinders inherently produce linear motion. Many other mechanisms are used to generate linear motion from a rotating motor. It is operated by a source of energy, typically electric current, hydraulic fluid pressure, or pneumatic pressure, and converts that energy into motion.



#### Axle

A drive shaft, driveshaft, driving shaft, propeller shaft (prop shaft), or Cardan shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them.

#### Ratchet and Pawl

A ratchet is a mechanical device that allows continuous linear or rotary motion in only one direction while preventing motion in the opposite direction. Ratchets are widely used in machinery and tools. Though something of a misnomer, "ratchet" is also often used to refer to ratcheting socket wrenches, a common tool with a ratcheting handle. The ratchet and pawl, a very simple device which allows a shaft



Figure 3. Ratchet & Pawl Mechanism.

### Wheels

A wheel is a circular component that is intended to rotate on an axial bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing in machines. Wheels are also used for other purposes, such as a ship's wheel ship's wheel, steering wheel, potter's wheel and flywheel.



Figure 4. Wheel

## VI. WORKING

The working principal of the mechanism is very simple. It can be easily understood from the above Cad diagram. Mechanism consists of Ratchet and Pawl arrangement which will engage with each other as per the choice of the driver. As seen above the ratchet is simply a gear which has got one side teeth due to which is can transfer the power in unidirectional only. Just above it pawls are mounted which will engage with the ratchet to lock its rotation in any one direction. Ratchet and Pawl will be collectively mounted on the rear axle in such a way that the ratchet will have the drive along with the rear axle. Due to this the pawl will be able to engage with the ratchet when it will be in motion along with the wheels.



Figure 5. cad Diagram for Experimental Setup

## VII. ADVANTAGES AND DISADVANTAGES

#### Advantages

- Less manual work.
- Fewer problems in traffic.
- Comfortable and panic free ride.
- Less risk of accidents.

#### Disadvantages

- Wear between Ratchet and Pawl.
- Failure of the actuator will stop the working of the mechanism.
- Complicated to implement due to space limitation.
- Needs to be operated manually.

## VIII. FUTURE SCOPE

1. The engagement and disengagement of the Ratchet and Pawl can be made by using PLC control instead of using linear actuator which will result in fewer backlashes from the ratchet to the pawl.

- 2. Instead of using two ratchets and two pawls we can use four ratchets and four pawls which will take more heavy loads.
- 3. The engagement and disengagement of the Ratchet and Pawl will be done by using high grade sensors which will automatically disengaged the ratchet and pawl when driver is willing to take vehicle in reverse direction.
- 4. This design can be modified with axel carrying differential so that it can easily implement on actual vehicle.

## IX. CONCLUSION

It will make the new driver feel comfortable during driving on gradient surfaces. Also undesirable reverse motion of the vehicle will be prevented which will result in less chances of road accidents. This will propose a perfect mechanism to Indian market at low cost. Due to this most of the manufacturers will be in a race to provide such mechanism which will be the first reference of the customer while buying a vehicle.

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