Locking Reverse Wheel Using Anti Roll Back Mechanism


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ABSTRACT
This Paper consists of locking the reverse wheel such that it constraint the reverse motion of the vehicle with the help of ratchet and pawl mechanism. The movement of the pawls will be controlled with the help of the linear actuators. 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 has been developed to stop the vehicle from rolling backwards when the vehicle is moving in the hill roads. Ratchet and Pawl mechanism has been identified to arrest the motion to the rear axle. Automobiles are now becoming the most essential part of our day-to-day life. This is the golden age for automobile companies, since they are attaining their peak selling rates in this 21st century. With increased parking difficulties and heavy traffic problems, equipping the reverse system with more facilities is their major objective. In this project, we made a simple and economical solution to the above mentioned problem. We used Ratchet and Pawl mechanism as our major capital and fabricated equipment which can be attached to any automobile that it prevents unwanted reverse motion when it is at rest or in motion.

KEYWORDS: Ratchet and pawl mechanism, Lever mechanism, Actuators.

INTRODUCTION

Ratchet and pawl mechanism is used in many applications effectively where the one side power transmission is required for example in Giant wheel- It is the large wheel used in the amusement parks to rotate along the horizontal axis to rotate in one direction while carrying the number of passengers. Clocks- where the hands rotate in clockwise directions only baffle gates- in the entrances of many buildings which rotate about vertical axis in one direction.In the hill station, the most common problem to the drivers is to park their cars 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.

These mechanisms give a solution for the general issue of descending or rolling back of the vehicle, while starting motion uphill in forward or reverse direction in various ways. The issue is encountered by employing the devices like freewheel, roller clutch or ratchet-pawl mechanism in different-different manners and locations within the gearbox. The issue is discussed here considering uphill motion in forward direction. Uphill motion in the reverse direction also has the similar issue.The land transport sector encompasses the commercial use of many different vehicles including lorry, light vans, taxis, buses, cars construction and agricultural machinery,
emergency service vehicles, motorcycles, mopeds and bicycles. 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, maneuvering abilities, braking abilities, etc., of the vehicle.

The main types of transport accidents are Vehicle crashes People being struck or run over by moving vehicles (e.g. during REVERSING or coupling). People falling from vehicles People struck by objects falling from vehicles, or vehicles overturning. The analysis of European Statistics on Accidents at Work (ESAW) data reveals that 29% of fatal accidents at work are due to loss of control of means of transport or handling equipment. Thus, improper handling and loss of control over vehicles may cause a severe threat to both the driver and the pedestrians. Unexpected reverse motion of vehicles in gradients and mountain roads is one of that problem which may cause disastrous accidents. Even though a modern vehicle has modern equipment’s like parking assistance system, hand brake, etc., drivers aprosclerosis will cause serious damages.

The major objective of our project is to prevent these types of accidents with some simple and economical means. It has Ratchet and pawl as its major component. A ratchet is nothing but 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. With this equipment we can prevent the unwanted reverse motion of a vehicle during all situations. A ratchet wheel is to be welded with the wheel rim of the automobile and the pawl arrangement is connected to the chassis.

The driver has no control over this arrangement that it automatically got engaged with the ratchet while the vehicle is driving below certain speeds. When the reverse gear is actuated, the pawl gets released from the ratchet thus allowing the reverse motion. This is our project description and due to cost considerations a small prototyped scribing this principle was done for this purpose. To prevent the unexpected reverse motion of an automobile under gradients and mountain roads. To protect the heavy load vehicle drivers and fellow pedestrians from disastrous accidents occurring due to loss of control and improper handling of equipment.

![Fig. 1: Anti-rollback mechanism frame design](image)

In this work, Ratchet and Pawl mechanism is identified to arrest the backward motion to the car. The ratchet is placed in the rear drive shaft and the Pawl is fitted with the frame. When the vehicle is moved in the hill road, the lever has to make the pawl to touch the ratchet. If the vehicle tends to move backward direction, the pawl would stop the ratchet to move Counter Clock-wise direction with respect to rear wheel.

As the vehicle is in neutral position, the pawl engaged the ratchet and the vehicle did not move in backward direction. So the hand brakes need not to be applied. When the vehicle is in moving condition, the engagement between the ratchet and pawl is detached.

Mechanism consists of Ratchet and Pawl arrangement which will be mounted on the rear axle of the vehicles or any other location which will have the drive along with the motion of the wheel. One push button will be mounted on steering wheel or dashboard which will be operated by the driver on choice. On pushing the button the pawl will come in engage position with the ratchet and will constraint the reverse motion of the vehicle. The ratchet is mounted on the rim whereas the pawl is fabricated on the chassis of the vehicle.

The pawl is pivoted in such a way that when the first gear of the vehicle is implied it engages with the ratchet. Thus a driver can leave the brake pedal free while resting at a gradient or at a mountain road. So the driver could just place the foot on the clutch and accelerator pedals and could move the vehicle with ease. Thus accidental uncontrolled reversal of vehicle is also avoided. This is the overall working principle of our project.

2. Literature Survey:

[1] Roh J, Woojin Chung (2010) Reversing control of a car with a trailer using a Driver Assistance System: A passive trailer system can be used efficiently for transportation tasks. However, backward motion control of a trailer system is difficult because it is an open loop unstable system. In our previous researches, we have shown that passive trailers can be successfully controlled by an omni-directional or a two-wheel-differential mobile robot. However, a passive trailer system pulled by a car is widely used in practical environments. Unlike mobile robots, a car-like mobile robot has non holonomic constraints and limitation of the steering angle. In this paper,
we tried to solve the backward motion control problem of the trailer system with a car by proposing two strategies.

[2] First, we proposed Driver Assistance System (DAS). By using the DAS, a driver can control the trailer system as a forward motion control instead of a backward motion control directly. A driver only secure the rear handlin- ing of the equipment. ‘Employees who drive more than 25,000 miles a year have at least a one in 8,000 chance of dying behind the wheel of their company vehicle’ (RoSPA, taken from UK Transport Research Laboratory 2008). We are eager to provide a simple and economical solution for the above mentioned problem and we had done it as a small prototype for our mini project. Ratchet and pawl mechanism is one of the most interesting inventions in the field of mechanical engineering found applications in various sectors. Here we make use of this mechanism to arrest the unexpected reverse motion of a vehicle by fabricating it with the wheel control device or a braking assistance servo motor system.

[3] Anti-creep and hill holder brake system. Cook George suggested a hill holder mechanism holds the vehicle in slope for 2 seconds by using the brake pressure. A device operable in a transmission of a vehicle for substantially preventing vehicular rollback on an incline, comprising: a shaft rotatable which is supported in transmission housing; a gear selectively connected for common rotation with the shaft, wherein the gear is rotatable in a first rotary direction and a second rotary direction.

[4] Improved release mechanism for a hill holder device. William kent utilized a load sensor connected with a wheel brake to sense a change in wheel braking torque and communicate responsively with a mechanical brake control device. If a car is stopped on an incline while the motor is still running, there's a good chance that some kind of hill-start control will be needed. A sensor that detects an incline of more than a certain amount, three degrees or more, can send a signal to the hill-start control indicating that the vehicle has the potential to start rolling. The disadvantage of incline detection is that sometimes a car maybe on an incline without needing the hill-start control - for instance, when a tire slips into a pothole.

[5] Improved release mechanism for a hill holder device. Grzegorz Janiszewski stated that the use of piston cylinder device, controlled by an electronic unit which is coupled to a hydraulic pressure system and acts on the brake pedal for two seconds.

[6] Release mechanism for a hill holder device. William K. Messer smith used the load cell with electrical control for braking system. But it requires continuous electric energy for the production and display of signals. It also requires an amplification circuit for the generation of output display because the signals produced by the gauge itself are of very much low voltage almost in milli-volts. In a vehicle having a clutch pedal and a brake pedal, a hill holder device is utilized to maintain the brake pedal in the applied position so that the vehicle operator's foot is free to operate the accelerator pedal. A mechanical brake control device may be disposed between the clutch and brake pedals, with the clutch pedal connected by a linkage to the brake control device so that release of the clutch pedal will cause deactivation of the brake control device and result in release of the brake pedal from the applied position. The release mechanism should be usable with either a mechanical brake control device or a braking assistance servo-motor system.

[7] Vehicle transmission hill holder. Alvin H. Berger used a one-way clutch when engaged it prevents rolling of the vehicle. A device operable in a transmission for substantially preventing vehicular rollback on an incline includes a shaft, a gear, a one-way clutch, and a pawl member. The gear is selectively connected for common rotation with the shaft. The gear is rotatable in a first rotary direction and a second rotary direction. The one-way clutch has an inner race and an outer race, where the inner race is connected to the gear and the outer race has an outer surface having a plurality of engaging teeth. The pawl member has a first end and a second end, where the first end is pivotal mounted to transmission housing. The second end of the pawl has a first angled portion configured to release and engage at least one of the pluralities of engaging teeth of the outer race as the outer race rotates in the second rotary direction.

3. Problem Identification:

A ratchet and pawl mechanism comprising in combination, a ratchet wheel, an oscillating arm having a pawl thereon adapted to engage and rotate the ratchet wheel, an intermediate pawl member on the arm, an extension on the intermediate pawl member, and adjustable means engaging said extension and causing said intermediate pawl to be oscillated and oscillating the pawl out of driving engagement with the ratchet wheel at any predetermined point in the stroke of the oscillating arm.

The problem which we taken under consideration in this project was unexpected reverse motion an automobile in gradients and mountain roads. This problem may occur due to driver’s carelessness or improper handling of the equipment. ‘Employees who drive more than 25,000 miles a year have at least a one in 8,000 chance of dying behind the wheel of their company vehicle’ (RoSPA, taken from UK Transport Research Laboratory 2008). We are eager to provide a simple and economical solution for the above mentioned problem and we had done it as a small prototype for our mini project. Ratchet and pawl mechanism is one of the most interesting inventions in the field of mechanical engineering found applications in various sectors. Here we make use of this mechanism to arrest the unexpected reverse motion of a vehicle by fabricating it with the wheel.
rim and attaching the pawl to the frame. The engagement and disengagement of the pawl can be done with the help of an electromagnetic switch or a lever mechanism.

Brake is the indispensable part of automobile vehicle without which the automobile vehicle is incomplete. It also acts as safety device to the vehicle to control its unwanted motion but when the brakes are apply all the wheels of the vehicle gets locked i.e. the vehicle will not be able to move in forward as well as in the reverse direction. This is considerable only when our intention is to stop the vehicle but when moving on gradient roads such as Ghats that time the reverse motion is to constraint to provide safe ride to driver as well as to other vehicles on the roads. So to overcome the problem associated with the brake i.e. It locks all the four wheels of the vehicle, we have design such a concept that it will allow the motion in forward direction only thereby constraining the reverse motion of the vehicle. The concept consists of Ratchet and Pawl mechanism. This mechanism will be mounted on rear side of the vehicle such that the ratchet will have the drive with the rear wheels of the vehicle.

4. Methodology:

![Diagram](image)

Conclusion:

Thus the mechanism can stop the vehicle from rolling back in hill roads. This would be more helpful for the drivers to drive their cars comfortably in hilly roads and he can take off the car in the uphill without rolling back the car. In this Paper, we made a simple and economical solution to the above mentioned problem.

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