

A REVIEW PAPER ON VEHICLE LIFTING AND ROTATION MECHANISMS

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Abstract –The paper focuses on review of various innovative mechanism's capable of lifting and rotating the domestic vehicles, aimed at facilitating maintenance, U-turn, repair and inspection procedure. This mechanism comprises a lifting system capable of elevating the vehicle to a specified height and a rotation system enabling controlled rotation around its longitudinal axis.

Key Words: Mechanism, Lifting and Rotation, Maintenance, Inspection, U-turn.

1. INTRODUCTION

In today's world, necessity for living for human being is food, clothes, shelter and Vehicle. In vehicle, Cars are of much importance for humans. Previously car were very expensive to buy and also to maintain. So only few people used to have cars. But now a days cars have moved away from convenience and become an important part of daily life. Almost every family has at least one car, which becomes an important means of transportation.

There is no limit for the travelling of car, it goes from city to countryside also in rural area. Driving a car in city is generally a simple task because in city we have wide roads with well-marked road signs and signals, so probability of going on wrong roads is less. Even if the driver goes on wrong path then he can easily take a U-turn because of wide roads. In contrast to that, the roads of rural areas or countryside are very much narrow when compared to the city roads.

Narrow roads are often not guided by road signs, also the direction are not accurate which sometimes results in dead-end streets. Due to these reasons, sometimes driver gets on wrong roads. Due to narrow roads, making U-turns are logistically challenging.

The topography of the rural landscape presents additional complexity, due to its slopes and large areas of land on both sides of the road which can create obstacles that affect the U-turn or reversing process.

Recognizing these challenges, there is an urgent need for Professional navigation systems suited to the unique needs of urban and rural travel. So a system is needed to be designed to solve the uncertainty of driving on narrow, unmarked roads, which can overcome the restrictions caused by these reasons.

Also a Mechanical system can be helpful which can turn the car on that narrow roads on which taking a normal U-turn is difficult. When taking a normal U-turn the vehicle needs some turning radius, which makes it difficult to turn on these narrow roads. So a Mechanical system can be attached to the vehicle which can turn the vehicle with zero degree turning radius which can be operated from within the car without more driver effort. This type of system can reduce danger of turning a car through the narrow roads in rural areas, farms, hilly areas, narrow bridges, etc.

2. LITERATURE SURVEY

2.1 LIFTING MECHANISMS

Mechanism of Inbuilt Automatic Hydraulic Jack used for Light and Heavy Vehicles

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This paper is about lifting the vehicle for changing the tire is punctured. This mechanism helps to reduce human efforts as the system is operated by hydraulic actuators. The system is combination of Mechanical, Hydraulic and Electric components. The hydraulic actuator is mounted on both side of vehicle each side is operated by different button. If left side of vehicle needs to be lifted, then left button is pressed and so for the right side.

Fabrication of Inbuilt Electrohydraulic Jack for Four Wheelers

1 R.Sureshkumar, 2 V.Vijaykumar, 3 R.Vinoth, 4 M.Yogeshwaran, 5 R.Moses Samuel 1 Assistant Professor, 2,3,4,5UG Students, Department of Mechanical Engineering, Gnanamani College of Technology, Namakkal, Tamilnadu

This paper is about lifting a vehicle using Electrohydraulic jack. This mechanism helps to reduce efforts that are required to lift the vehicle using a manual hydraulic jack or a normal screw jack. As this mechanism is operated using an electric motor, the time required is less for lifting, so much of the time is saved. The electrohydraulic jack is indirectly used to apply force on the link which is in contact with the ground.

Design and Fabrication of Inbuilt Hydraulic Jack for Four Wheelers

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This paper is about lifting mechanism which is operated using hydraulic system. In this vane pump is used to pressurize fluid. The hydraulic actuators are attached to the vehicle – 2 in front and 2 at back. These front and back side actuators are operated using different electrical switches so that by pressing one switch front will lift and another switch will lift the back side. This mechanism is used for breakdown of car or for servicing of car or tire puncture.

Mechanism for Transverse Car Parking

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This paper is about lifting a car using hydraulic system. This mechanism is designed primarily for parking purpose. This is used to park the vehicle on the roadside parking. As parking on roadside has less space and for that professional drivers are required, so to overcome this the mechanism lifts the vehicle using hydraulic system and then the car moves in transverse direction with the help of small wheels that are attached to the mechanism. Also this mechanism can also be used in case of vehicle breakdown or tire puncture. This system operates using a battery.

Design and fabrication of automotive hydraulic jack system for vehicles.

* Dr. Ramachandra C G, Krishna Pavana, Shivraj Shet and Venugopal Reddy ** Virupaxappa B * Department of Mechanical Engineering Srinivas Institute of Technology Mangaluru,

This paper is about vehicle lifting using brake fluid from master cylinder. This system is having a 5-way valve that is manually operated using ball valve. So, when the brake is pressed if the valve for brake is open then brakes will be applied and when the valve for the brake is closed and for the actuator is open then it will operate the actuator when we press the brake pedal.

Inbuilt lifting and safety arrangements for a Four-wheeler

[3] Rajmohan G ¹ , Jazim Haris² , Mohamed Shafin K ² , Sabah Salam K ² , Santhosh Kumar S

In Built- in lifting and safety features are available for four-wheelers.

Hydraulic bottle jack systems are mounted on the front and rear of the vehicle chassis. During punctures or some repairs that do not require handling, the hydraulic bottle can be lowered outside the ball carriage. Hydraulic jacks are made of a cam that operates on a slider crank chain mechanism. The arm is connected to the return spring. The force of the piston is 10 times less than the lifting weight.

2.2. COMPONENTS OF LIFTING MECHANISM

- 1) Motor: It is an electric device which converts electrical energy into mechanical work. The Motor comprises of a stator and rotor and is driven by current. It is used to run the pump.
- 2) Vane Pump: This is a positive displacement high pressure pump with vanes mounted on a rotor rotating within a cavity. The large diameter spool is mounted on the pump shaft. It has a circular rotor that rotates in a larger circle.
- 3) Master Cylinder: A single-acting spring return cylinder is used. Single-acting cylinders even have a spring inside the cylinder. It works with the assistance of packed gas to incite the piston single-way and utilizes spring force to come back to the base position. As soon as the air supply is stopped, the connecting rod retracts by spring force.
- 4) Storage Tank: It is facilitated in the hydraulic jack in order to store the hydraulic oil. The supply of the hydraulic oil takes place from the storage tank.
- 5) Pipes: These are used for the transferring of the hydraulic oil from one part to the other in the hydraulic jack starting from the reservoir.
- 6) Oil: A hydraulic liquid or hydraulic fluid is the medium that moves power in hydraulic machines. Mineral oil or water is the most commonly used fluid. Transmissions, hydraulic brakes, excavators, power steering systems, aircraft flight control systems, lifts and industrial machinery are the examples where we use the hydraulic liquids.

2.3 ROTATION MECHANISMS

Design and Development of AKEA: A 360-degree rotating vehicle

Adedeji. A. Kasali ^{1, *}, Yussuoff A. Abiodun ², Emola. W. Shola ¹, Olajide. S. Anthony ¹ and Ogundele A. Gbolahan

This paper is about turning vehicle in 360°. This mechanism can turn the vehicle with zero degree turning radius. The wheels are turned to required angle using servo motors that are attached to all wheels. The wheels are driven using gears motors. The rotation of the servo motors are controlled using Arduino, Motor drivers, etc. This mechanism is useful for turning cars in narrow roads, in city as it can turn the vehicle with zero degree turning radius. Also, the tire wear is reduced.

Study and Design of turntable using gears

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This paper is about designing of a turntable using gears. In this mechanism spur gears are used to rotate the table using motor. The gear is mounted on shaft which is fixed using a bearing to the chassis and at the end of the shaft there is a table top fitted. When the motor turns driver gear then the driver gear turns driven gear which is mounted on the shaft which turns the shaft which is fixed using bearing and when the shaft rotates then the table top also rotates. This mechanism can save the efforts required to turn the table and also conducts the operation smoothly.

Design and Development of 360 Degree Welding Turn Table with Scissor Height Adjuster

Bhushan Nandre^{1, a)}, Neha Salunkhe^{1, b)}, Swaraj Bhure^{1, c)}, Amit Patil^{1,}

This paper is about design and development of a turntable. This turntable also is used as a jack. This is used for lifting a object to the height we want using hydraulic actuators and rotating to the direction we want, manually using worm and worm wheel. It is used in Welding shops also can be used in garage for lifting and rotating a vehicle for servicing.

360° Rotating Vehicle to Overcome the Problem of Parking Space

1Jaishnu Moudgil, 2Shubhankar Mengi, 3Mudit Chopra, 4Dr. Jaswinder Singh

In this mechanism the turning radius of this car is zero, which means that the car turns on the axis passing through the center of gravity. The car does not need additional space for turning. The car must turn in an area equal to the length of the car. In this demonstration, the concept of 360-degree wheel rotation of the car is given, There are flat areas that enable the truck to rotate its wheel 360 degrees. vehicle, enterprises, hospitals, railway platforms, etc. It can be used in many places like this.

2.4. COMPONENTS OF ROTATION MECHANISM

- 1) Motor :- Motor is used to covert Electrical energy into Mechanical work, it is used to drive pinion.
- 2) Gear Pair :- Gear pair consist of a Gear and Pinion. the pair acts to reduce speed and to amplify torque; if the pinion is on the driven shaft the pair acts as a speed increaser and a torque reducer.
- 3) Bearings: - turntable bearings provide fixation to a structure. Mounted to the end of each shaft in an equipment piece that supplies rotary motion,

turntable bearings can handle thrust or radial loads, clockwise rotation or continuous, low-speed rotation.

3. MY APPROACH

In the wake of analyzing past works. We found where all of these systems are missing and what their limitations are. In past works there were two separate systems for Lifting and Rotation. The lifting system was majorly used for maintenance purpose like, changing tires in the case punctures or in case of an emergency breakdown. Rotation system is used in vehicles for 360-degree wheel rotation. But if we integrate lifting and rotation system, then we can perform various operations, which include: -

Lifting of vehicle and rotating it along its zero turning radius. This mechanism can be used in case of turning of vehicles on narrow roads.

4. CONCLUSION

As we live in India, we have different topography at different places. So, a normal 4-wheel car used in other countries for travelling, may not fulfil our requirement. We need more different types of additional mechanism which will help us to travel through the country without any complexity in driving. Also, this type of mechanism can help a driver to travel through narrow roads of hilly areas, rural areas, farms, etc. Also, these mechanisms are not much costlier but can be mounted to various types of vehicles and due to user-friendly operation they can be used by everyone.

5. REFERENCES

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