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D.C. Operated Portable Vehicle Lifting Jack

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***Abstract*-Car jack is a device used to lift up the cars while changing the tires during an emergency. Car jacks are available at the market has some disadvantages such as requiring more energy to operate, are not suitable for women and cannot be used on the uneven surface. The purpose of this project is to modify the design of the existing car jack in terms of its functionality and also human factors considerations. In this project, the scopes of research were on the designing 1.5 to 3 Ton maximum lifting capacity of car jack by using optimization concept.**

***Keywords*- Hydraulic jack, Automobile, Design, slotter leaver mechanism.**

I.INTRODUCTION

Vehicles are lifted for various purposes like for downside inspection or repair, replacement of tyres etc. Till date, the application of manually operated devices also known as lifting gears such as block and tackles, hoists. This study is focused on the design of remotely controlled hydraulic jack for lifting or jacking up of vehicles for basic maintenance and servicing.

The application of a jack in automobile is generally for lifting up vehicles so that auto mechanics/technicians can have more work space or easy access to perform various tasks underneath the vehicle. Jacks are commonly applicable to cars but are also used in several mechanical applications including industrial machineries.

There are two major types of jacks namely, Hydraulic jack and Mechanical jack. In a typical hydraulic jack which usually contains a cylinder and piston mechanism, the upward or downward movement of the connecting rod is especially for to raise or lower the load, whereas, Mechanical jacks can either be hand operated or power. More powerful jacks use hydraulic power to supply more lift over greater distances.

Mechanical jacks are usually rated for max lifting capacity. However, hydraulic jacks are typically used for shop work, instead of as an emergency jack to be kept within the trunk of a vehicle.

II. LITERATURE REVIEW

In research paper **[1] byMartin Raymond Beebe,** the hand operated vehicle lifting apparatus preferably lifts a vehicle by engaging with the wheels of the vehicle. Preferably, the hand operated vehicle lifting apparatus comprises a wheel engagement portion and a hinge for storage.

As in research paper **[2] by Kurt E. Polins**, A preferred embodiment of a system includes a lifting device for lifting a motor vehicle, a support structure for mounting the lifting device in a pit, and a carriage for supporting the lifting device from the support structure and being movable within the support structure. The system also includes a cover coupled to opposite sides of the carriage so that the cover extends away from the carriage and continuously between the opposite sides of the carriage.

As in research paper **[3] by Kelvin Andrews,**In general, an electrically operated car jack is described. A typical embodiment includes a base frame or housing that is adapted to be placed on the ground underneath the automobile to be lifted. The housing includes motors connected to drive arms connected to a load bridge and plate. The bridge is typically mounted within the drive arms by rods located within slots on the arms enabling the bridge to move upward and downward while being retained within the drive arms.

Typically, the motors are operated by the car's battery. The drive arms typically include drive wheels that rotate oppositely and are coupled together by a coupler in an X-configuration that assures the coupler moves uniformly. The motors drive the arms, lifting and lowering the load bridge which lifts and lowers the automobile. The jack can be operated by remote control.

In another paper **[4] by Robinian,** The hydraulic jack comprises a vertical bearing device, a bracket and a hydraulic device, wherein the vertical bearing device is communicated with the hydraulic device through a hydraulic pipeline, and is fixed on the bracket; the hydraulic jack further comprises a horizontal push-and-pull device communicated with the hydraulic device through a hydraulic pipeline; the vertical bearing device comprises four vertical oil cylinders; a jack-up block is connected to each vertical oil cylinder; a supporting plate is coated on the four jack-up blocks; the horizontal push-

and-pull device is placed on the supporting plate, and comprises four horizontal oil cylinders; and a push block is connected to each horizontal oil cylinder, and connected with the supporting plate in a sliding manner.

III. METHODOLOGY

The power source was tapped from 12V battery in each of the cars the remotely controlled hydraulic jack was tested on. The gear system (driver and driven gear) was introduced for the purposes of transmitting rotary motion of the prime mover to the crank link.

Crank mechanism was installed in between the DC gear motor and the hydraulic cylinder to convert the rotary motion of the gear to linear motion required for the upward and downward movement of the jack plunger. So we can use this system to lift up the cars while changing the tires during an emergency.

IV. DESIGN

Fig 1. Design.

1. Specification of Hydraulic Jack:
- Rated capacity: 3 Ton
- Min height: 168 mm
- Hoisting height: 90 mm
- Adjustable height:50 mm
- Max. height: 365 mm
- Net weight: 2.3 kg
- Base area: 142mm * 95mm

2. Specification of Slotter Lever:
- Length: 270 mm
- Height: 50 mm
- Width: 3 mm

3. Specification of Base:
- Base area: 210 mm * 80 mm
- Width: 18 mm

4. Specification of D.C Motor:
- Voltage :12 V
- Breaking torque: 100 N.m
- Working torque : 19 N.m
- No-load speed: 25 rpm(Min.) to 35 rpm(Max.)
- No-load current : 3.5 A(Min.) to 4.5 A(Max.)
- Working speed : 22 rpm (Min) to 28 rpm (Max)
- Working current : 11 A (Min) to 14 A (max)
- Noise : 50 db (Max) 55 db (Max.)

V. RESULT AND DISCUSSION

Here we are going to fabricate a hydraulic jack which is operated using a DC wiper motor which gets dc supply from the battery of the vehicle without application of man force.The hydraulic jack is operated by battery so it can also be used when the vehicle engine is not started. It will also reduce the man power and large load can be lifted.

1. Simpler Design:
In most cases, a few pre-engine components will replace complicated mechanical linkages.

2. Flexibility:
Hydraulic components can be located with considerable flexibility. Pipes and hoses in place of mechanical elements virtually eliminate location problems.

3. Smoothness:
Hydraulic systems are smooth and quiet in operation. Vibration is kept to a minimum.

4. Control:
Control of a wide range of speed and forces is easily possible.

5. Cost:
High efficiency with minimum friction loss keeps the cost of a power transmission at a minimum.

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