

# Design And Fabrication of Automatic Main Stand for Two-Wheeler

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## Abstract-

A center stand is a device on a bicycle or motorcycle that allows the bike to be kept upright without leaning against another object or the aid of a person. A center stand is usually a made of metal that comes down from the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear. Some touring bicycles have two: one at the rear, and a second in the front. Most modern bikes come with both a side stand and a centre stand. A new standing device which replaces center stand using external power which reduces human effort is being proposed. An existing center stand is modified by using electrical and mechanical components at optimum cost. The different mechanical parameters of stand are analyzed using Computational software and the best model is selected for fabrication.

**Keywords:** *Centre Stand, Gear Mechanism , High torque DC Motor, Battery powered , etc.*

## 1. Introduction

A center stand support means adapted to position vehicle on a ground surface in an operative vertical position. Displacement means adapted to displace support from an inoperative folded, retracted configuration to an inoperative unfolded, retracted configuration and further to an operative unfolded, extended configuration and vice versa in one continuous movement. Guided locking means adapted to lock support in operative configuration. Fitting means adapted to fit stand to frame of a two wheeled vehicle. As the problems identified by studying the existing system it is decided to design an alternative. Here hydraulic power is used to assist human effort. A double acting hydraulic cylinder takes power from motor to place and displace the stand. The entire system is housed just below the engine on the frame. From the history of motorcycle, it is seen that several components are optimized from time to time. Chassis, engine assembly and suspension system is optimized but still there are several open loop for different components. There are several problems associated with center and side stand

It's been our aim to make an attempt to eliminate efforts that are required to be made in day to day life. Two wheelers are used by most of the people around the globe. We observed that it is quite difficult and cumbersome to park it on main stand. It becomes necessary to park the vehicle on its main stand. Applying the best possible method we would try to make an automatic main stand Conventionally two-

wheeler stands on two parts, aspect stand and center stand, each bears static loading. The aspect stand is definitely deployed permitting the scooter to lean to the left aspect. while The use of center stand needs lots of human effort and rider

has to pull 50% of vehicles weight so it's difficult to apply. So they go for side stand, but the use of side stand affects the life of tyre and battery since it the electrolyte remains in constant touch with the electrode. During this project an automatic center stand is intended that consists of a Electrical gear hopped-up by a mechanical device and controlled by a key operated switch. The purpose of the gear driving mechanism is to lower the center stand legs. This sort of automatic center stand will not only increase the life of components but will also reduce the human effort to virtually zero. It can be used as an anti-theft mechanism.

## 2. Problem Definition

Two wheelers are in use since a long time now and it's not attending to reduce any time in future. It's determined that for a few folks mounting the vehicle on the middle stand is difficult and needs a lot of strength.

A lot this just in case of significant two wheelers just like the cruise kind, that has a higher engine capability creating the vehicle heavier and bulky.

Thus the proposed system aims at providing a user friendly approach by minimizing the human effort needed for the task. Since mounting a two-wheeler on its main stand is quite a cumbersome process, it is an effort to make new automatic stand which is more advantageous and technically sound than the conventional two wheeler stands.

The present project relates to two wheeler stands, and relates more particularly to an automatic two wheeler stand which uses collapsible mechanical linkages and actuating force (hydraulic/pneumatic/electric) which will push open the legs of stand and help in mounting the vehicle for parking and repairing.

A center stand is a device on a bicycle or motorcycle that allows the bike to be kept upright without leaning against

another object or the aid of a person. A center stand is usually made of metal that comes down from the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear. Some touring bicycles have two: one at the rear, and a second in the front.

Modification in our project of automated center stand is use of mechanical actuator for operating center stand by connecting battery and switches. Now a day's placing a center stand while parking on the uneven road is difficult and risky, to overcome this problem we are using some mechanical arrangement using rack arrangement which can adjust automatically according to the road surface and the whole system is actuated by mechanical actuator operating through switches

### 3. Objectives

1. Minimizing human efforts to lift the heavy vehicles.
2. For easy handling of old peoples.
3. To increase the life of vehicle components.
4. To provide a centre stand for a two wheeler that is operable by an unskilled person.

The main objective of our project is to provide a safety measure in bikes to avoid unwanted accidents and damage caused by not lifting off the Main stand by providing automated Main stand lifting system. Here we propose an idea for automatic Main stand which is completely mechanical and electronic circuit and without using any external power.

### 4. Literature Review

A centre stand side stand is a pair of legs or a bracket that flips straight down and lifts the rear wheel off the ground when in use. Centre stands can be mounted to the chain stays right behind the bottom bracket or to the rear dropouts. Many motorcycles feature centre stands in addition to side stands. The centre stand is advantageous because it takes most of the motorcycle's weight off its tires for long term parking, and it allows the user to perform maintenance such as chain adjustments without the need for a motorcycle, but are omitted on most high performance sport bikes to save weight and increase ground clearance

The modification in side stand in our project is that we use a servo motor which is attached with the stand and that motor is controlled with the centre lock of the. Due to which when we switch on the bike the stand is removed with the help of servomotor without use of manual work to remove the side stand. In this project we use some different types of parts just like gas sensor, temperature, etc that are the modifications of the or projects.

Vishal Srivastava, Tejasvi Gupta, Sourabh Kumar, Vinay Kumar, Javed Rafiq, Satish Kumar Dwivedi, has worked

on Automatic Side Stand. If the rider may forget to retract the side stand before riding, then undistracted stand hitting the ground and affected the rider control during the turn and this will cause unwanted troubles. In this paper the presented mechanism consists of D.C. motor powered by motorcycle battery which is connected to the worm and worm gear mechanism for reduction of speed of motor and multiply the torque. Then the motor is actuated by rotation sensor which is mounted on the front of the wheel. We observe that from the design and analysis D.C. motor and other components like as Micro-controller and speed sensor, switch occupies less space and this space is easily available into the mechanical frame of the motorcycle. After analysis of torque the required torque to raise the side stand is 6076 N-m and the power required to raise the side stand which is 19.078 Watt.[1]

Pintoo Prjapati, Vipul kr. Srivastava, Rahul kr. Yadav, Ramapukar Gon, Pintu Singh, Mr. Sandeep has worked on Sprocket Side stand Retrieve System. It is based on the Working Principle of Two Wheelers. In Motor Bike power is transmitted from engine's pinion to rear wheel (i.e. Rotary motion of the pinion makes the linear motion of the chain). That linear motion of the chain is absorbed by rear wheel's sprocket and converted into rotary motion. That rotary motion of the rear wheel makes the bike to move. This system could be used in all type of two wheeler (TVs-XL, all front, back and geared) for retrieving side stand and to control accident due to side stand problem and protect the careless rider.[2]

Mr. V.V.R. Murthy, Mr. T. Seetharam, Mr. V. Prudhvi Raj, has worked on Fabrication and Analysis of Sprocket Side Stand Retrieve System. It is based on working principle of two wheeler (i.e. the power is generated in the engine's and it transmits power to the pinion and make it to rotate the pinion transmits power to the rear wheel pinion and makes the vehicle to move. This system could be used in all type of two wheeler (TVs-XL, all front, back and geared) for retrieving side stand and to control accident due to side stand problem and protect the careless rider [4].

Ritu Raj, Rupesh Kr. Verma, Yashveer Yadav, Nilesh Singh, has worked in the advancement of the automatic side stand to make it fully automatic with some additional feature which is not yet implemented in any of the above type of project. In this system, stand is fully automatic which is controlled by an Arduino microcontroller. It also has some special type of sensor like temperature sensor and emission sensor.[7]

Kiran Mukund et. al. 2018, A center stand is a device on a bicycle or motorcycle that allows the bike to be kept upright without leaning against another object or the aid of a person. A center stand is usually made of metal that comes down from

the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear. Some touring bicycles have two: one at the rear, and a second in the front. A new standing device which replaces center stand using external power which reduces human effort is being proposed. An existing center stand is modified by using electrical and mechanical components at optimum cost. The different mechanical parameters of stand are analyzed using Computational software and the best model is selected for fabrication.

**Ashish jyoti et. al. 2017** , Most modern bikes come with both a side stand and a centre stand. The side stand is easily deployed allowing the bikes to lean to the left side. The bikes must be hoisted up onto the center stand. The difficulties faces with these stands need to be stepped upon and the vehicle needs to be lifted manually. Unless on firm, leveled ground, the side stand on a bikes or any bike cannot be trusted whose wheels cannot be locked in place by setting a brake leaving it in gear. In this paper, an automated centre stand is design and development which uses a linear actuator powered by a battery to lower the stand and lift the vehicle and parks it on the stand. This stand minimizes human efforts to almost zero. In addition, the self-balancing mechanism was firmly established which lifts the bikes upright on uneven surfaces. As a result, it has become possible to install this automated centre stand in mass production bikes.

**Nirmal Kumar Kushwaha et. al. 2015** , two-wheeler on its main stand is quite a cumbersome process, it is an effort to make new automatic stand which is more advantageous and technically sound than the conventional two wheeler stands. The present project relates to two wheeler stands, and relates more particularly to an automatic two wheeler stand which uses collapsible mechanical linkages and actuating force (hydraulic/pneumatic/electric) which will push open the legs of stand and help in mounting the vehicle for parking and repairing. It will be controlled and operated using solenoid valves and control valves. It mainly aims at convenient parking and reducing manual effort which is a major discomfort for ladies and aged people. It's been our aim to make an attempt to eliminate efforts that are required to be made in day to day life. Two wheelers are used by most of the people around the globe. We observed that it is quite difficult and cumbersome to park it on main stand. It becomes necessary to park the vehicle on its main stand. Applying the best possible method we would try to make an automatic main stand.

**R. Selvendran et. al. 2019** , In modern developing world, automobile plays important role especially two-wheeler i.e. (motorcycles & bikes) plays a major role. Even though they are helpful there are some sad events like accidents due to careless of rider. Some accidents occur due to forgetting of

lifting side stand. To avoid such accidents, cause due to uplift the side stand, we may be produce the new advance in bike that as we press the gear lever to lift the side stand. So, we have made the project of "Automatic Side-Stand Lifter for Two-Wheeler" is to be designed based on the working principle of bikes. This mechanism is operated manually means on the feet power of rider. After starting the bike immediately when the rider puts the first gear, the side stand lifts automatically.

**Jamal Uddin Ahamed et. al. 2021**, This paper aims to enhance the efficiency of manual actuation and automation for sliding of side-stand to increase the safety of the rider. In the modern developing world, automobile plays an important role especially two-wheeler i.e. (motorcycles& bikes) plays a major role. Even though they are helpful there are some accidents due to the carelessness of the rider. To rectify this problem many advanced measures have been taken, but they are least helpful. To overcome the limitations of the existing methods a new model of "Automated side stand retrieving device", an electromechanical system, is introduced by using electric circuits and gear mechanism. The automatic side stand retrieval system is powered by the same source as every other electrical component on the vehicle, namely the battery. Due to the gear mechanism, increased torque will help the motor to lift the side stand easily.

**Ravi Pratap Singh et. al. 2020**, Life in twenty first century is very fast and sometimes unknowingly the rider starts the bike and move forward without pulling off the side stand because of urgency which may cause unavoidable accidents. To avoid such accidents cause due to the carelessness of rider, we may produce the new advancement in bike that as we press the gear lever, the cable wire get stretched due to the hook catch lock get delocked to lift the side stand automatically. There is a need of prevent the rider in this type of condition, which arises many times, hence, it is important to create one mechanism, which prevents the rider from the accidents caused due to ungifted side stand. The mechanism should be such that it should neither affect the original mechanism nor create make the side stand more bulky. In additional it should not increase the price of the bike. It is just a small mechanism, which operate the stand and operation will be easy. Therefore, it is necessary to have a separate attachment in a bike to lift up the side stand automatically.

**Piyush Choudhary et. al. 2020** , Conventionally two-wheeler stands on two parts, aspect stand and center stand, each bears static loading. The aspect stand is definitely deployed permitting the scooter to lean to the left aspect.while The use of center stand needs lots of human effort and rider has to pull 50% of vehicles weight so it's difficult to apply. So they go for side stand, but the use of side stand affects the life of tyre and battery since it the electrolyte remains in constant touch with

the electrode. During this project an automatic center stand is intended that consists of a pneumatic cylinder hopped-up by a mechanical device and controlled by a key operated switch. The purpose of the pneumatic cylinder is to lower the center stand legs and raise the vehicle. This sort of automatic center stand will not only increase the life of components but will also reduce the human effort to virtually zero. It can be used as an anti-theft mechanism.

**Aniket Gulhane et. al. 2017**, In a current world two wheelers plays main role of transport or travelling. They are useful but also responsible for some sad events like accident by mistake of drivers. The need of prevention of the rider on this type of condition, which is happened many times, which avoid by using such mechanism in bike. Major accident obtained due to forget lifting the side stand. To avoid this problem we do the project practically for "Automatic Side Stand Lifting Mechanism System". This project is based on simple mechanism. This mechanism operated by the total manually means on the feet power of rider. So it is not required any external power and it is more economical also easily installable in bike. In our India 20- 22% accident happened due side stand which is not removed by the rider after starting a bike. For preventing that problem we installed this mechanism

#### 4. Block Diagram

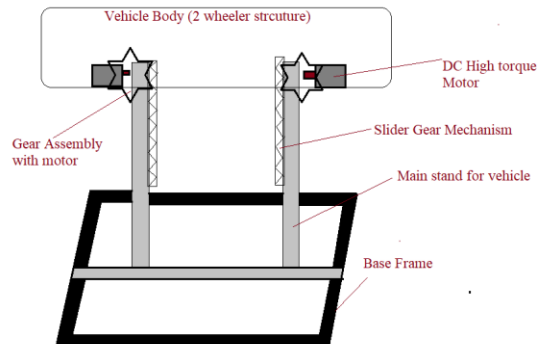


Fig.1. Block Diagram of system

#### 5. Working

To make bike stand with two contact points the Rack and pinion mechanism is fitted at the center of two supporting stand. When the DC Motor with gear mechanism slides the rack structure with main stand will pushes down towards ground vice versa. , slider pushes out, it pulls the stand away with it and pushing the bike up. When the bike is pushed up, the stand comes in its engaged to floor. Bottom of the chassis in an angled position and in this way the process of pushing the bike off the stand is complicated. The idea proposed in this project is to pull the stand by the use of a Scissors mechanism. This will provide enough force to pull the stand and also be able to lift the two- wheeler off the ground. The supporting stand be arranged in a Scissors manner and can be easily

bolted to the chassis or the leg guard on the fixed end and to the stand from its moving side. The whole process will be powered by a DC battery.

#### Components Required

DC High torque Motor 60 RPM  
Rack & Pinion mechanism  
Frame  
Battery  
DPDT Switch  
Others

#### 6. Calculation

##### Calculation for Pressure

Pressure Required:

$F$  = Weight of the two wheeler

$D$  = Bore diameter of cylinder

Here,

$$F = 100 \text{ kg} = 100 \times 9.81 = 981 \text{ N}$$

$$A = \pi r^2 = \pi (25)^2 = 1963.495 \text{ mm}^2 = 1.96 \text{ m}^2$$

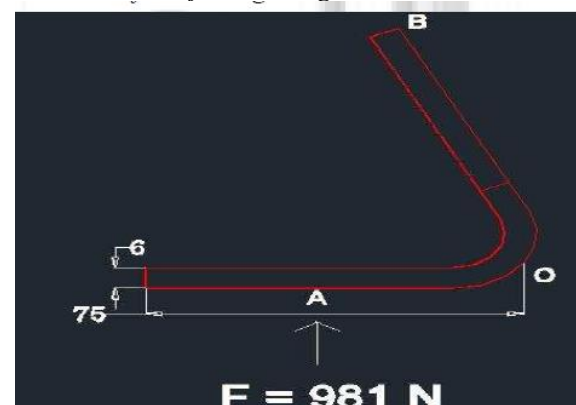
Now,

$$F = P \times A$$

So,

$$F/A = 981/1.98 \times 10^{-3} = 499745 \text{ N/m}^2 = 4.99 \text{ bar} = 5 \text{ bar}$$

##### B. Calculation for Bending Stress



Bending stress calculation

$$\frac{M}{I} = \frac{\sigma}{y}$$

Where,  $M$  = Bending moment

$$= F \times OA = 981 \times 37.5$$

$$= 36787.5 \text{ Nmm}$$

$I$  = moment of inertia

$$= \frac{bd^3}{12} = \frac{75 \cdot 6^3}{12}$$

$$= 1350 \text{ mm}^4$$

$\sigma_b$  = maximum bending stress for Mild steel.

$$= 248 \text{ MPa}$$

y = maximum distance from neutral axis = 3mm.

$$\sigma = \frac{M}{I} y$$

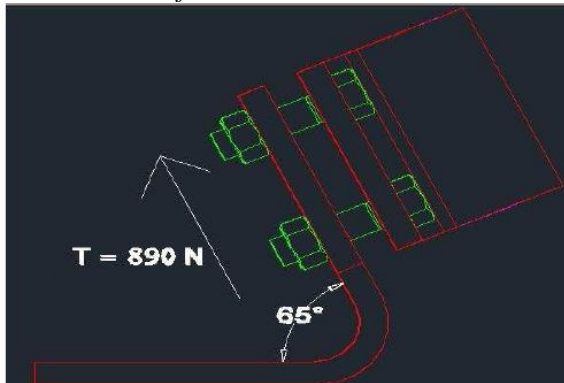
$$= \frac{36757.5 \cdot 3}{1350}$$

$$= 81.75 \text{ MPa}$$

$$< 248 \text{ MPa}$$

Hence, design of mounting is safe.

### C. Calculation for Tensile Stress on Bolt



Fastener design

Resolving into tangential and normal forces w.r.t. chassis,

$$\text{Tangential force, } T = F \sin \theta$$

$$= 981 \cdot \sin 65$$

$$= 889.09 \text{ N}$$

$$T = 890 \text{ N}$$

$$D_c = \text{core diameter of bolt} = 6.466 \text{ mm}$$

$$T = \mu \cdot N$$

So,

$$N = 988.88 \text{ N} = 989 \text{ N}$$

$$A = \pi r^2 = \pi (3.233)^2 = 32.837 \text{ mm}^2$$

Here we use four bolts

$$\text{So, total area of bolt} = 4 \cdot A = 131.347 \text{ mm}^2$$

Stress on four bolt

$$= \frac{N}{4A} = \frac{989}{131.347} = 7.52 \text{ N/mm}^2$$

### Calculation For Number Of Repetition Of Operation

Using the formula,

$$PV = \text{Constant}$$

So,

$$N \cdot P_1 V_1 = P_2 V_2$$

Pressure required in pneumatic cylinder,  $P_1 = 5 \text{ bar}$ ,

Volume of air consumed in one cycle,  $V_1$

Pressure in air tank,  $P_2 = 140 \text{ bar}$

Where, pressure is continuously reduced. so, we take average

pressure 70 bar

Volume of air tank,  $V_2 = 4 \cdot 106 \text{ mm}^3$

$$\text{For forward stroke, } V_f = \frac{\pi}{4} D^2 L$$

$$\text{For forward stroke, } V_f = \frac{\pi}{4} D^2 L$$

$$V_f = 173180.295 \text{ mm}^3$$

For backward stroke,

$$V_b = \frac{\pi}{4} (D^2 - d^2) L$$

$$V_b = 206167.02 \text{ mm}^3$$

Now sum of forward and backward

$$V_1 = V_f + V_b$$

$$V_1 = 173180.295 + 206167.02 \text{ mm}^3 = 379347.315 \text{ mm}^3$$

So,

$$N \cdot 5 \cdot (379347.315) = 70 \cdot 4 \cdot 106$$

$$N = 148$$

Pressure Required:

F = Weight of the two wheeler

D = Bore diameter of cylinder

Here,

$$F = 100 \text{ kg} = 100 \cdot 9.81 = 981 \text{ N}$$

$$A = \pi r^2 = \pi (25)^2 = 1963.495 \text{ mm}^2 = 1.96 \cdot 10^{-3}$$

Now,

$$F = P \cdot A$$

So,

$$P = \frac{F}{A} = \frac{981}{1.96 \cdot 10^{-3}} = 499745 \text{ N/m}^2 = 4.99 \text{ bar} = 5$$

### 7. Advantages

- It is easily installed.
- It is rigid versatile.
- It is low cost application.
- Near about less maintenance.
- It is light in weight.
- Electrical supply not required.
- It does not affect the structure of a vehicle

## 8.Application

It can be used in all type of bikes and motorcycle which have gears, this same gear can be used to operate lift the side stand.

Many people while driving the vehicles forget to lift stand and hence accident takes place with the help of these application road accident can be avoided.

## 9. Discussion

It is by an observation that the side stand removal by electronic based circuit is better than removing by mechanical method The system can be maintained by a little maintenance It can reduce the risk of accident caused by un-removal of stand. Definitely this system could be used in all type of two wheeler. this project could be a revolution in automobile industry because it provides a solution for the problem we are facing in our daily life but repeating it carelessly or unknowingly. The fabricated model safety analysis proves that the model will fail if the extension from the crossbar fails. Although the safety value shows a difference in obtained safety factor of both the fabricated model and model-4, the fabricated model only has a single failure point while the model-4 has multiple failure points that is the model-4 has failure points at the joining area of the center stand and the bike frame, there is also failure points at the legs of the center stand. On the first look of the results obtained it would be noted that the model-4 should be preferred to the fabricated model, but in operating case the model-4 shows multiple failure points with show higher risk to operation. The failure of fabricated model is a single point so by taking adequate measure the failure of the extension can be avoided.

As we know that the centre stand is the integral part of two wheeler vehicle. To make the vehicle in a stable position. That is in a well balanced position we generally apply the centre stand but it is very difficult for old women and handicap person. To use the present centre stand so by considering all the design parameter & above condition. We notified the existing design & make the centre stand automated. Thus it is concluded that the use of this modified centre stand makes the human effortless and make the vehicle in were at optimum cost balanced condition rough surfaces (uneven surfaces) at optimum cost.

The center stand of the motorbike will be lifted up if both the conditions - turning the key on and rider sit on the seat are fulfilled. In the similar way the stand is going to be retrieved, if both the conditions key off and weight is taken off the seat are fulfilled. The required conditions for the working of the center stand are given below in table 1. The system won't work if any of the condition is missed. And

also if any resistance is detected while the motor is working, the system automatically switches off. Usage of sprocket, gear system or speed sensor with DPDT switch to attain the automated functioning of center stand isn't recommended during this research work. The observations are mentioned in the table below:

| Conditions    | Output                          |
|---------------|---------------------------------|
| Switch Up     | Centre stand is lifted upward   |
| Switch Down   | Centre stand is lifted Downward |
| Switch Stable | Centre stand is lifted Stable   |

## Project Image

## 10. Conclusions

During the time of riding a bike with side stand in its uplift may create problems and accident but with the help of our accessories we solve this problem. The objective of this project is to provide the rigid and safety mechanism without changing in any standard design of bike. It does not disturb the performance of the vehicle. And it is different than other mechanism. Other system requires battery power or chain power but it is not required any external power. Moreover, it should be economical for every class of society. it is new product it will promote employment and vast field development for new engineer in day period. By using this system, we avoid the accident which happened due to the side stand. Also, it's easy to installed in any gear bike and economical.

This project helps in reducing the painful task of applying the center stand (especially for ladies and old person) and also reduces the parking constraint. The equipment would provide best result just by actuating the center stand using linear actuator operated by compressor. Design and Analysis of standing device on the basis of ease of actuation point of view is successively done.

## 11. Future Scope

The present project can be alternated by using speed sensor. The is magneto resistive sensor modules with an integrated signal conditioning electronics to provide a simple and cost effective solution for rotational speed measurement .Due to their compact design-in and therefore time to market dis-significantly reduced. The KMI sensor modules consist of the magneto resistive sensor element, a permanent magnet fixed to his sensor and the integrated signal conditioning circuit

designed in bipolar technology. It is applicable to all type of two-wheeler whether it is costly or cheaper motorbike. In future there is a possibility for some advanced modifications basis of the sensors and more. In this project, we dealt with the mechanism of lifting off the stand in the very smooth way. Possibly within the future, to stop deaths and injuries caused by motor bike accidents, airbag system could be installed as like in other vehicles.

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