



## Design and Fabrication of Automatic Side-Stand Retrieval System

\*R.Girimurugan, \*\*M.Mohamedrasik, \*\*S.T.Mukesh, \*\*S.Gowtham,  
\*\*M.Hariprasath

\*Assistant Professor, \*\* UG Scholars-Final Year, Department of Mechanical Engineering, Nandha College of Technology, Erode, Tamilnadu, India-638052.  
[giri2621988@gmail.com](mailto:giri2621988@gmail.com)

### Abstract:

*The paper is explained about side stand releasing automatically by using the mechanical engage. That means the small (external) sprocket is connected over the chain of the two wheelers. While the vehicle is in moving condition the side stand is automatically released. Due to the rotation of the sprocket is lifting the side stand by using clutch cable. The one end of the clutch cable is connected to the side stand, and other end of the cable is connected to the sliding element. If the vehicle is move, the external sprocket is also rotate and strike the sliding rod.at the time the sliding rod is release the side stand by using cable. The engage is De-engaged while the vehicle is in moving condition.*

**Keywords:** Design, fabrication, side stand, automatic retrieval.

### Introduction:

In modern world the living status were developed and developing more equipped. The automobile takes a great part in the development, since it plays one of a major key in daily life. While automobile is concern two-wheeler i.e. (motorcycles and bike) it plays very important role because it saves the time of traveler by reaching the target place very faster. Although it saves the time it does not safe the life of rider if rider is careless, there are some sad facts on them such as accidents. While the two-wheelers is concerned accidents occurs due to riding the vehicle in high speed, ignores to use helmets, does not maintains the speed limit and forgets to lift the side stand while riding the vehicles. These are the major source for accidents. Forgetting to lift the side stand causes huge accidents in rural areas partly in urban areas too, because all the other source of accident has preventive measure, but accident due to side stand do not have proper preventive measure. If you see the accident status 36% of the accidents occur due to this problem. Vishal srivastava, tejasvi kupta, vinay kumar, sathish kumar, in his paper. Automatic side stand gives the anatomy of side stand that is a device on

a bicycle. That allows the bike to be kept upright without leaning against another object or the aid of the person. "A smaller more convenient" kickstand was developed by Joseph Paul. A kick stand is usually a piece of metal that flips down from the frame and makes contact with the ground. It's generally located in middle of the bike. A side stand style kick stand is a single leg that simply flips out to one side, usually the non-drive side, and the bike then leans against it. Side stand can be mounted to the chain stays right behind the bottom bracket and seat stay near the rear hub. Side stand mounted right behind the bottom bracket can be bolted on, either clamping the chain stays in to the place as an integral part of the frame.

### **Problem formulation from literature**

Engaged side stand can create accidental damage. The electric based automatic side stand removal system has its dependencies on the power supply. The electric based automatic system can be risky because the electronic device has its limitation of moisture content.

### **Existing methods**

To prevent accidents occur due this side-stand many ECU and mechanical project had been found.

#### **a. Modern ECU**

In order to reduce accidents due to carelessness in lifting the side-stand, many advance measures have been introduced like ECU; the modern ECU contains a 32 bit and 40 MHz processor. It will be fast as pc's microprocessor. The ECU decides timing and functioning of engine and its parts. This play its role in dashboard, this indicates the gear shifting, side stand, to wear helmet in digital display E.g, Hero Honda's Karizma ZMR. But the people ignore to listen those indicators and safety rules. So for safe guard many mechanical projects have been found to retrieve the side stand automatically.

#### **b. Mechanical Methods**

In existing mechanical project many ideas had been found to lift the side-stand automatically. One small flat rod is kept attached and pivoted between the gear actuator lever and the side stand of the bike. When the gear is actuated the side stand gets lifted automatically. Small stepper motor is connected between the side stand and the engine, when engine is started the stepper motor gains the source of power and retrieve side stand automatically. These are some methods to retrieve side stand automatically when the vehicle moves but it is not implemented in practical use due to its drawback.

#### **c. Drawback of Existing Methods**

ECU methods are implemented only in costlier bikes but it does not implemented in normal domestic bikes due to their cost. When we come across those mechanical projects we could note some drawbacks like wear out of gears, making injuries in legs while actuating gears. Major drawback is it cannot use in all type of two-wheelers. So, in order to solve this we thought and designed "**Automatic-Side Stand Retrieve System**" this system can be attached in all type of two-wheelers (mopeds, geared, non-geared, hand geared bikes).

## Proposed Method

Based on the working principle of two-wheeler (i.e. the power is generated in the engine and it transmits power to the pinion and makes it to rotate. The pinion transmits power to the rear wheel pinion and makes the vehicle to move). This is the basic principle followed in all type of two-wheelers, based on this “Automatic-side stand retrieve system” is designed. Because this system works by getting power from chain drive. This system consists of four components, which is assembled as two set up which would be explained briefly in construction and working part of this paper.

### a. Objective of the proposed method

- ✓ To find the method of fabrication side stand removal system.
- ✓ To fabricate according to selected method.
- ✓ To study the future implementation on the system.

## Design

### a. Axle

Axle is the metallic rod made up of mild steel. It connects the pushing lever and sprocket centrally. The axle is welded centrally to the sprocket. The axle is hold by a holder. The holder is welded with the frame. The holder is used to prevent vibration and to provide support to the axle. The holder has small metallic tube and a rectangular metal plate. The metal plate is welded perpendicular to the tube. The diameter of tube is slightly greater than the axle diameter about 2 to 4mm. This is for allowing the axle to rotate freely without friction with the tube. The other end of the metal plate is welded at the frame. The whole metallic members of holder are of mild steel. The one end of axle is welded with sprocket and other end with pushing lever and thus the power is transmitted from sprocket to pushing lever.

### b. Sprocket pinion

Sprocket is the major component of this system because it is power transmitting device. It gets power from the chain drive and makes this system to work. It is the device which transmits the linear motion of meshing chain drive into rotary motion by means of the tooth found on it. The sprocket with ball bearings is said to be FREE WHEEL. Since it is a free wheel it allows the toothed part to rotate free from central portion in a direction. Hence this type of sprocket is used as the rear power transmission device in by cycle that makes the wheel to rotate and also allows toothed area to rotate in anticlockwise when pedaled anticlockwise direction. This action of sprocket allows attached pushing lever to adjust freely automatically or manually when it does not engages with pushing lever properly. Since the sprocket transmits the power from chain drive, it should have the capability to withstand the heavy loads of engine. So to withstand those impacts on toothed area, it is made of high carbon steel.

### c. Inciter assembly

Inciter assembly consists of axle, sprocket and pushing lever. The Sprocket is mounted on the centre of the axle and the pushing lever is welded at the front side of axle.

#### d. Sliding rod

Sliding rod is a set-up. That is placed near by the sprocket pinion. That is engage with sprocket pinion, during the rest-condition. If the vehicle is moving that engage pull the side stand by using the clutch cable. The sliding rod set-up is disengaging, during the working condition of the vehicle.

#### e. Clutch cable

The clutch cable is stronger than other cables.so that's connecting the sliding rod and side-stand. That connection is done by inner link without disturbance of the vehicle.

#### f. Pushing lever

Pushing lever is the third major component of the system .the Pushing lever is the rectangular rod made of MS-rod, which consists of two Pushing leaves which is mounted with the edge of axle. The Pushing leaves should be parallel to the sprocket pinion. The Pushing lever is composed of two metal rods, where both are welded at either sides of the axle. The free ends of the Pushing leaves are tapered well. The ends are machined well for tapered shape for smooth engaging with pushing sliding setup. This smooth engagement leads proper retrieving of side-stand. This tapered surface makes the pushing lever as capable to withstand engine impact. When stand is moved vertical in position, the sliding lever engages with pushing leaves. This may not possible in all time, since the angle of pushing lever may be any degree. So due to effect of free wheel and tapered surface of the pushing lever can adjust itself.

#### g. Design calculation

- ✓ Wire diameter :0.003m
- ✓ Coil outer diameter (d) :0.027m
- ✓ Coil inner diameter :0.021m
- ✓ Number of coils(n) :17
- ✓ Free length of spring(L) : $\pi dN = 3.14*0.027*17 = 1.44126$  mm
- ✓ Span weight :0.056+0.400kg = 0.456kg
- ✓ Force (F) : $K*X = 1.732*1.215 = 2.105$ N

#### h. Torque analysis

- ✓ Torque (T) :  $F*R = 2.105*0.11 = 0.2315$  N-m
- ✓ Torque due to stand weight  
Stand and spring weight : 400 and 56gm
- ✓ Combined weight of spring and stand : 400+56gm =0.456kg
- ✓ Force due to stand weight : $0.456*9.81*\sin 500 =3.4267$ N
- ✓ Torque due to stand weight : $F*R =3.4267*0.11=0.377$  N-m
- ✓ Total torque (Ta) : $0.2315+0.3769=0.6087$ N-m

## Construction

The whole construction of this system is simple and efficient. The arrangement and position of components makes the system to function. Each and every component has its own property and responsibility. The power obtained from the chain drive is transmitted to the appropriate component without power loss. The systematic design of system is made in order to consume only very low amount of power initially for few seconds to retrieve the stand. Then the power consumption does not occur after retrieving the stand.

### a. Assembly

For the functioning of system the above four components are arranged in two assembly which is described below.



**Fig.1. Sliding set-up**

### b. Inciter assembly

Inciter assembly consists of axle, sprocket and pushing lever. The Sprocket is mounted on the centre of the axle and the pushing lever is welded at the front side of axle. Inciter assembly is main assembly because it receives the power from the chain and incites the retriever assembly to retrieve the side stand because this inciter assembly is kept under the chain as such that the sprocket attached centrally with the axle get engage with chain drive. This set up is arranged in the bike as such that this inciter assembly is hold by the small hollow shaft with rod welded at the center which is welded to the bottom side of the bike. As the inciter assemblies sprocket get engage with chain drive. When sprocket rotates, the axle along with pushing lever rotates.



**Fig.2. Entire assembly model**

**c. Retriever assembly**

Retriever assembly consists of pushing lever and side stand. The pushing lever is centrally pivoted to the side stand.

**d. Power source of inciter assembly**

Inciter assembly gets the power from the linear chain motion i.e. (as engine transmit power to the rear wheel through chain drive since the setup is kept at the bottom and sprocket get engage with chain so, when chain rotates in anti-clockwise direction the sprocket engaged rotates in clockwise direction) as sprocket rotates the axle rotates as the result pushing lever rotates in clockwise direction.

**e. Power source of retriever assembly**

As the retriever assembly's pushing lever get engage with pushing lever. It gets power from the rotation pushing lever and transmits to the clamp and retrieves the side stand automatically. Automatic side stand retrieve system retrieves the side stand automatically if the rider forgets to lift the side stand while moving the bike. It works based on the working principle of the two-wheelers .every bikes transmit power from engine's pinion to the 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 bikes to move. Based on this Automatic side stand retrieve system is designed.



**Fig.3. Inciter assembly**

If Sprocket is kept between the chain drive, it make the sprocket to rotate so, using the sprocket as the major component this system works. It gains the power from the chain and make specially designed component (pushing lever) to rotate. This rotation incites engaged pushing lever to push the side stand to retrieve. When chain rotates anti-clockwise direction the inciter assemblies' sprocket absorbs the power and rotates in clockwise direction. The working of "Automatic-Side Stand Retrieve System is explained below in both (resting & riding condition of two-wheel.

### **Working**

Automatic side-stand retrieve system retrieves the side-stand automatically, if the rider forgets to lift the side-stand while moving the bike. It works based on the working principal of the two-wheelers. Every bike transmits power from engine's pinions to the rear-wheels. (i.e.: Rotary motion of the pinion makes the linear motion of the chain) That linear motion of the chain is observed by rear wheel's sprocket and converted rotary motion. The rotary motion of the rear wheel makes the bikes to move. "Based on this sprocket side stand retrieve system is designed. The sliding set-up and inciter assembly are engaged position in vehicle rest condition. The side stand is connected to the sliding set-up by using the clutch cable. In running condition the inciter assembly rotates and strikes the sliding set-up. So the sliding set-up pulls the side stand by using clutch cable. The side stand retrieved automatically. The sliding set-up and inciter assembly are de-engaged position in vehicle running condition.so the vehicle is move without power loss.



**Fig.4. Engaged position**



**Fig.5 Disengaged position**



### Advantages

- ✓ It's cost wise less than other method.
- ✓ This method is does not affect the engine efficiency.
- ✓ It's does not affect the structure of a vehicle.
- ✓ It's easily fitted in the vehicle than other method.
- ✓ It's a weight less method.
- ✓ Electrical supply not required.

### Applications

This method reduces the side stand accidents in two wheelers. This method also used for with gear and without gear of two wheelers.

### Summary

“Automatic side stand retrieve system” will definitely good retrieve system. Since this setup is compact it does not affect the performance of the vehicle. Because of the power is obtained from chain drive. Definitely this system could be used in all types of two wheelers (TVS-XL, All front, back hand geared) for retrieving the side stand. This system can be implemented in all types of bikes by changing small variation in size and cost of this system also very low and so it will not affect the economic level also, while compare to other system this “Automatic Side-Stand Retrieve System” will be the life saver.

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