

Auto Retreat Side Stand

Harshal Butle¹, Mohit Waghade², Shubham Govindwar³, Prof. Shailendra Zaveri⁴

^{1,2,3}Student, Department of Mechanical Engineering, Rajiv Gandhi College Of Engineering Research and Technology, Chandrapur, Maharashtra, India

⁴Associate Professor, Department of Mechanical Engineering, Rajiv Gandhi College Of Engineering Research and Technology, Chandrapur, Maharashtra, India

Abstract - The side stand is used for supporting a parked motorcycle. Side stand in two wheeler's function the entire weight of the vehicle when it is parked. They are perfect on quick stop when one need to leave the vehicle for short while. If the rider forget to retract the side stand before riding, then the chance of stand hitting the ground and affecting the riders control during the turn increases. In this paper the system of Auto Retreat Side Stand is designed to reduce the possibility of accident. The presented mechanism consists of 12 V geared motor powered by motorcycles battery. The system is comprised of spring loaded piston cylinder mechanism with the cam and follower mechanism. The motor is actuated by the pulse signal from reed switch sensor and magnet which is assembled to either sprocket or wheel.

Key Words: Side stand, Automatic stand, Sensor, Safety, Two wheeler side stand

1. INTRODUCTION

In modern developing world, automobile plays important role in passenger transport on land. Especially two wheeler's play a major role on road. Even though they are helpful there are some events of accidents due to careless nature of motorcyclists. A substantial number of motorcyclists suffer injuries in crashes each year for the reason of forgetting the side stand left deployed while driving on the road. However, there is no simple way to identify what percentage of motorcyclists get into accidents. This is due to the fact that many accidents go unreported. Motorcycles are generally provided with side stand for supporting them when they are not in use. Its standard form usually comprises a bar or rod which is pivoted to the lower portion of the motorcycle frame and is movable to a laterally downward extending position so that the motorcycle can be tilted against and rest upon the bar. When the motorcycle is in use, the bar is swung upward and along the frame so that it will not interfere with the running of the motorcycle. Often the motorcyclists neglect to move the stand to its raised position and when a bike is tilted left while riding, the stand strikes the ground and causes the motorcycle to be thrown to the ground, generally with serious

consequences to both motorcyclists and his companion. Now a day's sensors are used for ensure that the stand is in retracted condition but often due to some mistakes of a person sometimes stand is deployed without knowledge of rider and the engine is suddenly stops in mid of the road and in mid of the traffic, this again put the driver in a panic situation. To avoid such risks we have designed Auto Retreat Side Stand.

1.1 Aim

- 1) To reduce the accidents of motorcycle rider from side stand in two wheeler's.
- 2) To study the method of fabrication of side stand lifting system.
- 3) To fabricate according to selected method.
- 4) To study the future implementation on the system.

1.2 Objective

- 1) Auto lifting the side stand.
- 2) Minimizing the risk.
- 3) Minimum moving components.
- 4) Minimum battery power use.
- 5) The system should not interfere with manual use of side stand by the rider

1.3 Need of Project

The side stand should lift automatically when driver forgets to lift it. Minimizing the risk of accidents by side stand while cornering and obstacles.

2. METHODOLOGY

Following chart shows the methodology used to design and fabricate auto retreat side stand.

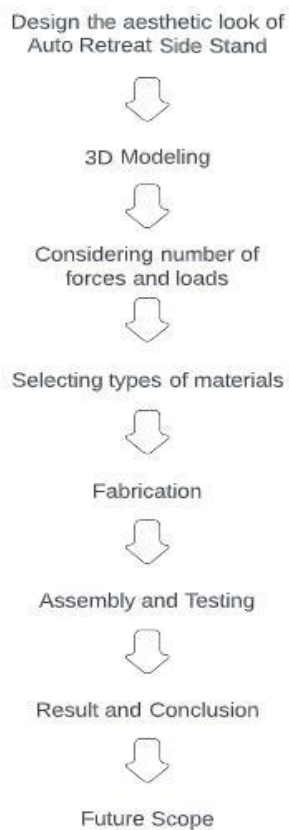


Fig - 1 : Flow Chart

2.1 3D Modeling

The virtual model is created by using 3D Modeling software to analyze the model. The dimensions are considered as per the physical model and a rough diagram of the Auto Retreat Side Stand is drawn.

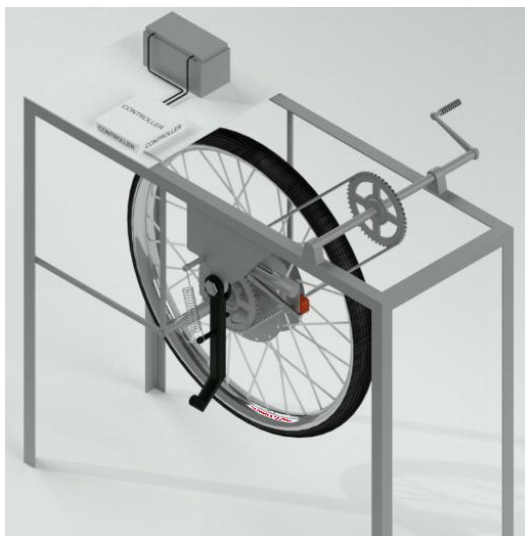


Fig - 2 : 3D Modeling (Isometric View Stand Down)

2.2 Material Selection

After doing research on the several material properties, the most feasible material is selected for the spring loaded piston, cylinder and other working components. We investigated for the characteristics which are taken into account, which including machinability, durability, strength, weight, availability, and material cost. A material with sufficient strength is chosen to ensure that the fabricated frame of the side stand lifter mechanism does not fail under the strain exerted. We have used cylindrical shape for frame cylinder for this project.

2.3 Components

2.3.1 Electric Gear Motor



Fig - 3 : Electric Gear Motor

A DC gear motor is a electrical motor coupled to the gear box with output of low speed high torque arrangement. A small motor is one kind of electric motor, and the main function of this is to change the energy from electrical to mechanical. The uses of small/mini motors involve in several many applications like designing sample mini motor projects, CD/DVD players, hard drives, fans, pumps, coffee machines, robotic vacuum cleaners, hairdryers, mixers, bread cutters & spindle drives within modifiable or changeable speed applications.

2.3.2 Wheel and Tyre



Fig - 4 : Wheel rim with tire

The rim is the outer edge of a wheel holding the tire on it. It makes up the outer circular design of the wheel on which the inside edge of the tire is mounted on vehicles such as automobiles. In cross-section, the rim is deep in the center and shallow at the outer edges, thus forming a "U" shape that supports the bead of the tire casing. Wheels are used which are connected with help of axle and bearings. Spokes of wheels are made of stainless steel or high-carbon steel.

2.3.3 Controller Circuit

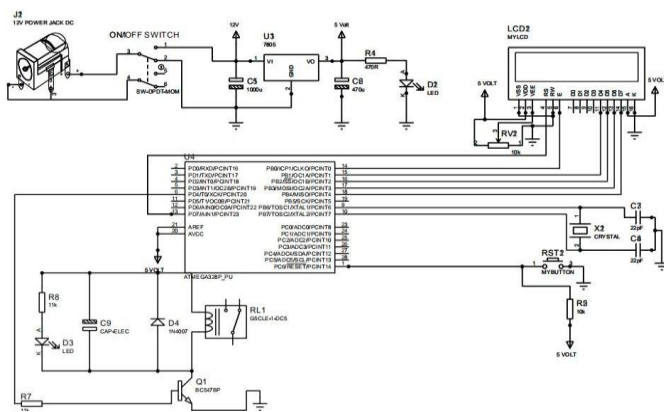


Fig - 5 : Control Unit Circuit

A controller circuit is used to connect all electrical and electronic components including sensors and actuators together. The controller basically acts as the "heart" for the system.

2.3.4 Frame Angles



Fig - 6 : Frame Angle

This is a L section angle frame used for fabrication of frame structure on which components are mounted. Steel angle (also known as angle iron), is one of the most commonly used steel structural shapes due to its 90° L-

shape and useful mechanical properties. Angle iron can be manufactured in different steel and metal alloys, in both smaller bar sizes and larger L-shape sizes. Ideal for high-strength applications, L-shaped angle iron is available in equal or unequal angle steel.

2.3.5 Lithium-Ion Battery



Fig - 7 : Lithium-Ion Battery

Lithium-ion (Li-ion) batteries are used in many products such as electronics, toys, wireless headphones, handheld power tools, small and large appliances, electric vehicles and electrical energy storage systems. Lithium batteries can be smaller and lighter than other types of batteries while holding the same amount of energy

2.3.6 Reed Sensor and Magnet

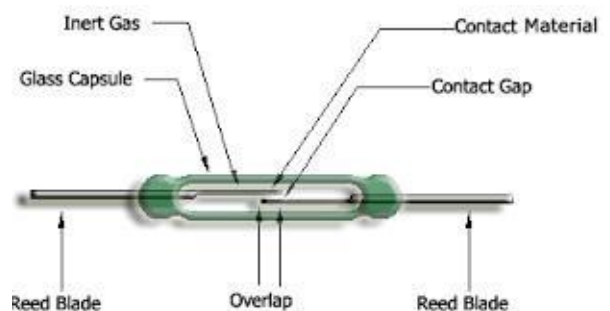


Fig - 8 : Reed Sensor

Reed sensors use a magnet or electromagnet to create a magnetic field that opens or closes a reed switch within the sensor. This deceptively simple device reliably controls circuits in a wide range of industrial and commercial goods.

A reed switch is a pair of electrical contacts that create a closed circuit when they touch and an open circuit when separated. Reed switches form the basis for a reed sensor. Reed sensors have a switch and a magnet that power the opening and closing of the contacts. This system is contained within a hermetically sealed container.

2.3.7 Chain, Sprocket, Bearing



Fig - 9 : Chain, Sprocket, Bearing

Sprocket teeth or cogs that mesh with a chain. These transmit rotary motion between two shafts or impart linear motion to a track, tape etc. Widely used in bicycles, motorcycles, cars, tracked vehicles and machinery. It is made up of Stainless steel. Ball bearing is a machine element which constrains relative motion to only desired motion and reduces friction between moving parts.

3.2.8 Spring

There are two types of springs used in this project.

- 1) Compression spring - It is placed inside the cylinder. It is the key component to lift the stand up when piston is released. It stores the energy in, when rider lowers the side stand.
- 2) Tension spring - It hold stable the side stand in both the positions.

2.3.9 Other Components in Mechanism



Fig - 10 : Components in the mechanism

A cylindrical housing with key way slot is provided with piston having single degree of freedom and spring. A lever is pivoted on the cylinder to catch lock the piston. A vertical strip with circular hole is welded towards the rear side of the cylinder where geared motor is attached.

2.3.10 Modified Side Stand

A Side 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 stand is usually a piece of metal that flips down from the frame and makes contact with the ground. It is generally located in the middle of the bike or towards the rear.



Fig - 11 : Modified Side Stand

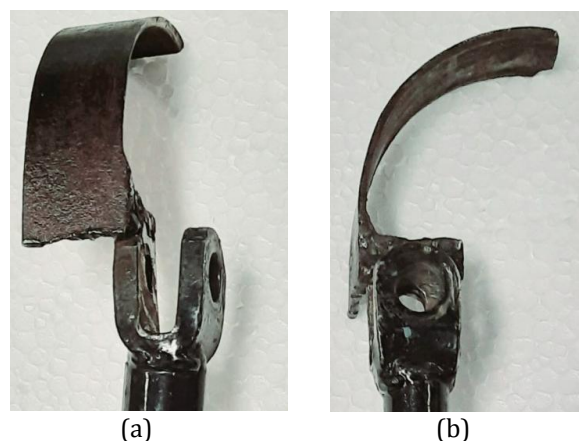


Fig - 12 : Modified Part Views

In this system the side stand is modified as to be in partially contact with the piston head. A curved strip is attached to the stand. When the stand is in downward

position the curved strip makes contact with the piston head. When the stand is in upward position the stand will not be in contact with piston. This curved strip also helps to lock the piston in cylinder.

3. ASSEMBLY VIEWS

The following figures shows the assembly views of the Auto Retreat Side Stand.

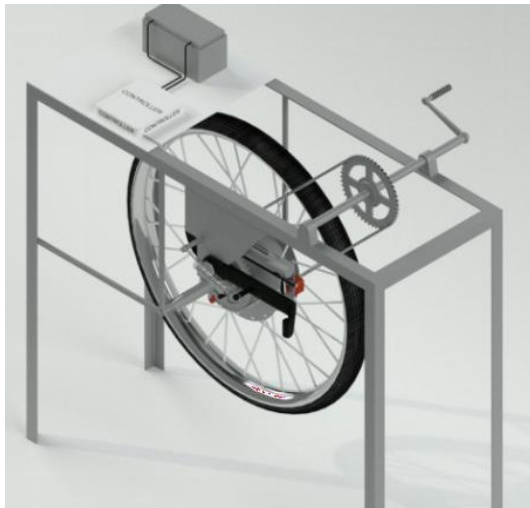


Fig - 13 : Isometric View (Stand Up)

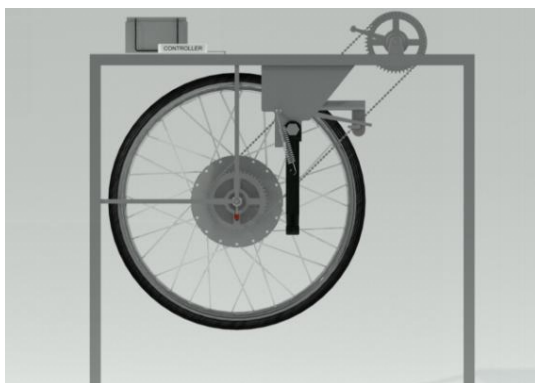


Fig - 14 : Front View (Stand Down)

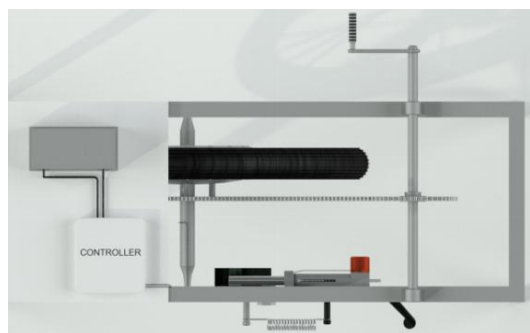


Fig - 15 : Top View (Stand UP)

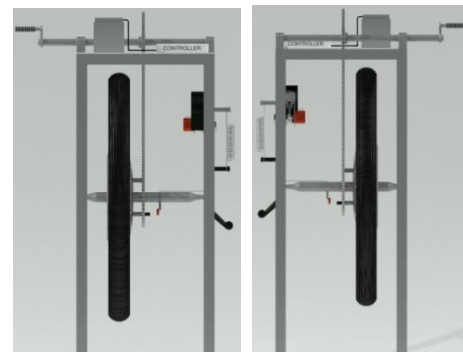


Fig - 16 : LHSV and RHSV (Stand Down)

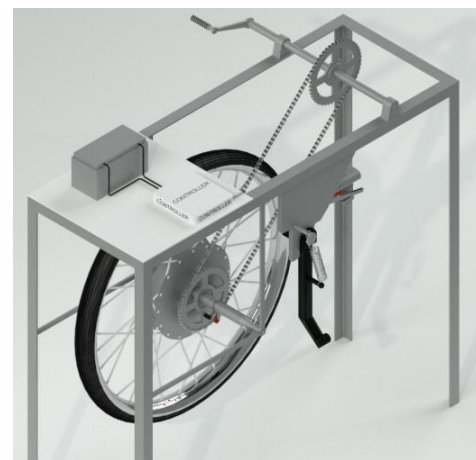


Fig - 17 : Isometric View (Stand Down)

4. CONSTRUCTION AND WORKING

The project is using sensors, microcontroller and an actuator as a 12V DC geared motor to control the mechanisms of automatic retreat of the side stand system. The sensor will constantly monitor the rotation of wheel. The main control unit is connected with the sensor to receive signal. The control unit is also connected to the actuator which is connected to side stand assembly. Initially when the wheel is in the rest position, the side stand is in the deployed downward position. At this time the reed switch will not generate any pulses. The pulse generation of reed switch is dependent on rotation of wheel as magnet is attached with the wheel arrangement. When the wheel starts to rotate the magnet also rotate along with it. As the magnetic field passes near the sensor it generate a pulse and sends it to the control unit. The control unit receives the signal from sensor. The controller will send the signal to relay based on the pulses received from sensor. The relay closes the circuit for the DC geared motor. The cam attached to the shaft of motor lifts the follower which is pivoted to the cylinder by a pin. The follower also acts as a locking arrangement to the piston. Initially the piston is in locked position and the spring inside the cylinder is in the compressed position. As the

follower rotates, it unlocks the piston. The spring forces the piston and piston further forces the metal strip attached to the modified stand. This action will result in the lifting of the stand upward. The tension spring will hold the side stand in its up position.

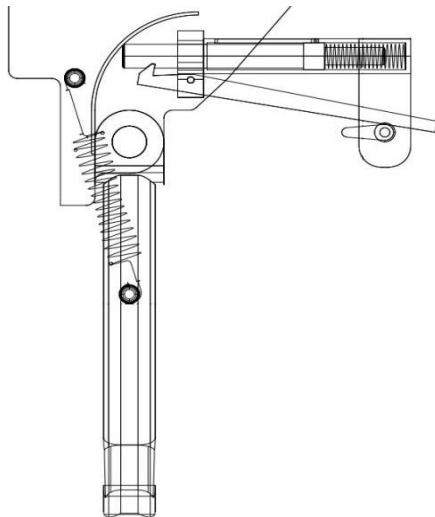


Fig - 18 : Wireframe Assembly of Mechanism (Stand Down)

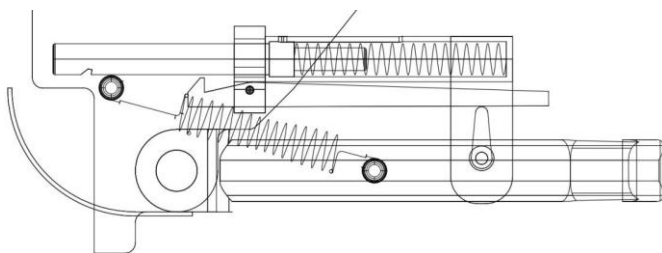


Fig - 19 : Wireframe Assembly of Mechanism (Stand Up)

5. ASSEMBLED PROJECT MODEL



Fig - 18 : Auto Retreat Side Stand

6. ADVANTAGES

- 1) Provides safety to the rider.
- 2) Automatic operation.
- 3) Minimum power required for working.
- 4) Stand can operated manually as well as automatically.
- 5) When battery runs out of charge it can be operated manually.
- 6) It does not change original working setup for side stand.
- 7) Cost effective as compared to other methods.
- 8) Shorter response time.
- 9) Simple in design.
- 10) Easy for maintenance.
- 11) Cheap in cost.
- 12) User friendly.
- 13) Low maintenance cost required

7. DISADVANTAGES

- 1) To operate automatically it needs charging when battery runs out.
- 2) Need periodic maintenance.
- 3) The system may fail when sensor failed to sense the rotation of the wheel.
- 4) Need extra attachment to implement in non battery two wheeler's.

8. APPLICATIONS

- 1) It can be implemented in two wheeler vehicles.
- 2) The two wheeler vehicle segment includes geared and non geared bikes.
- 3) EV bikes are also great to implement this system.
- 4) It can also be implemented in bicycle with the addition of some electronic components and battery

9. FUTURE SCOPE

- 1) The system can implemented in both the vehicle by making some changes in arrangements.
- 2) Space can be minimized with the help of using small solenoid instant of mechanical plunger.
- 3) The system can be more effective and efficient, if the all electrical components are designed in single unit of system.
- 4) The system can be implemented in another sector where the more responsive system is needed.

3. CONCLUSION

As the setup is compact it takes less space than side stand itself. In future further modification can be done. When the rider forgets to lift the side stand this system will definitely help save his life. The possibilities of the accidents will definitely be reduced. This system requires

low maintenance due to lesser moving parts which can be done with the periodic maintenance of the vehicle.

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BIOGRAPHIES



Harshal B. Butle
B-Tech student, Final year
Mechanical Engineering.
Rajiv Gandhi College of Engineering
Research and Technology,
Chandrapur, Maharashtra.



Mohit P. Waghade
B-Tech student, Final year
Mechanical Engineering.
Rajiv Gandhi College of Engineering
Research and Technology,
Chandrapur, Maharashtra.



Shubham S. Govindwar
B-Tech student, Final year
Mechanical Engineering.
Rajiv Gandhi College of Engineering
Research and Technology,
Chandrapur, Maharashtra.



Prof. Shailendra R. Zaveri
Associate Professor, Department of
Mechanical Engineering,
Rajiv Gandhi College of Engineering
Research and Technology,
Chandrapur, Maharashtra.