

HYDRAULIC PUMP BASED CENTER STAND FOR PARKING MOTORCYCLE

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Abstract: Conventionally two components are used for standing the motorcycle, namely side stand and center stand. Both components undergo static loading. The side stand is easily deployed allowing the scooter to lean to the left side. The scooter must be hoisted up onto the center stand. To operate center stand, rider has to get down from bike and has to pull against the lever which is difficult sometime. Rider has to lift minimum 50% of weight of scooter to engage the center stand. Unless on firm, leveled ground, the side stand on a scooter or any bike cannot be trusted whose wheels cannot be locked in place by setting a parking brake or by leaving it on gear. In this paper an automatic center stand is designed which consists of a hydraulic pump or actuator powered by a battery source and controlled by a key operated switch. The function of the hydraulic pump is to lower the center stand legs and lift the vehicle. This type of automatic center stand reduces the human effort to almost zero.

Key words: center stand, DC motor powered hydraulic pump, key switch, battery, etc.

1. INTRODUCTION

Conventional method of applying a center stand requires lot of human efforts. Applying scooter center stand is a painful task, especially for ladies and old people. Hence they go for side stand; but it consumes more parking space. The automatic center stand reduces human effort.

As a replacement to man power, a 12 Volt DC hydraulic pump operated by a battery is used. The operation is controlled by a key operated switch. The automatic center stand is connected as in the conventional method, under the engine where the ground clearance is minimum.

1.1 Identification of problem.

From the history of motorcycle it is seen that several components are optimized because of improved innovations and technology. Chassis, engine assembly, tyre and suspension system are optimized but still there are several open loop for different components. There are

many unsafe problems associated with the parking assembly, center and side stands
Some problems are listed:

- 1) **Ian Falloon (2003)** has recorded that keeping scooter on side stand for a long time adversely affects life time of tyre .
- 2) **James R. Davis (2011)** discussed about motorcycle safety and dynamics that includes both center and side stand. Both these stands doesn't restricts forward motion completely (in case of inclined surface). In such a case the bike has to be kept in the first gear when parked.
- 3) **D. Kopernic (1984)** in his studies waste content about retraction of side stand. He pointed out that there is a regular problem in retraction of side stand. Side stand is easy to apply but if forgotten to retract it can cause severe accident.
- 4) **Zainul Huda (2009)** found the reasons for failure of side stand. Due to excess loading and corrosion phenomenon, large stresses are generated in the material. Both side stand and main stand are conventionally manufactured by plain carbon steel and there are also severe chances of corrosion on main stand. From this we can conclude that material change is also a research gap for main stand.
- 5) On surveying, it was found that around 72% men and 28% women drive scooters. Among those 72% men, around 20% are old people and remaining are adults. It is found that women and old people find it difficult to apply center stand.

Large efforts are needed to retract the side stand. If the main stand can perform the same work of side stand then there is no need of such a side stand. Hence, we are developing an effort free automatic center stand.

Moreover, on applying side stand,

- 1) Fatigue is developed in the stand.
- 2) Increases chances of accident.
- 3) Requires more parking space.
- 4) On the application of side stand which is in contact

with earth, reduces the battery life time. Because negative terminal of battery is connected to the body of the motorcycle which is in turn connected to the vehicle stand, thus the battery gets grounded through the stand.

Where as applying center stand manually,

- 1) For heavy weight motorcycle, requires more efforts for application.
- 2) May cause back and/or leg injuries.

From the above discussed factors it is found that center stand needs more human effort and is a increased risk for women & old people.

1.2 Solution formation.

The automatic center stand assembly is fixed at the same place as that of conventional stand. It has three main components: (1) a hydraulic pump provides linear motion to legs of the stand which is connected to joint. It is connected in such a way that the load is distribute equally on both the limbs of the stand. (2) guide way supporting structure connectable to chassis which holds the reciprocating legs. (3) the motion of leg is controlled by a key switch which controls the operation of a hydraulic pump (with inbuilt DC motor) powered by a battery.

2. COMPONENTS REQUIRED.

- 1) 12 Volt DC powered hydraulic pump.
- 2) Modified stand.
- 3) Key operated switch.
- 4) Battery.

2.1 Components specifications:

2.1.1 12 Volt DC hydraulic pump.

A linear actuator is an actuator that creates motion in a straight line, in contrast to the circular motion of a conventional electric motor. It can handle incredible amount of static load and will hold position even when the power supply is removed. The fixed limit switches at each end of the actuator will cut off power when tripped to prevent over-run. Linear actuators are used in machine tools and industrial machinery, in computer peripherals such as disk drives and printers, in valves and dampers, and in many other places where linear motion is required.

The operation of 12 Volt DC powered hydraulic pump is as follows.



(1)Initial position.



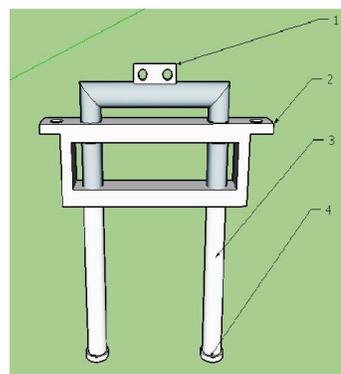
(2) Final position.

2.1.2 Modified center stand.

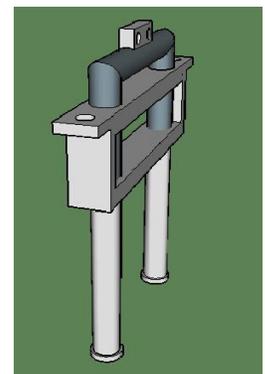
Front view consists of parts as given below,

- 1) Connecting joint for hydraulic pump.
- 2) Guide way and supporting structure connectable to motorcycle chassis.
- 3) Reciprocating legs (up and down).
- 4) Contact pad.

The modified center stand is show in bellow figure.



(3) Front view

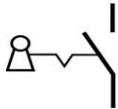


(4) Side view

2.1.3 Key operated switch.

Key operated switch is mainly used for security and safety purpose. It operates as that of a conventional switch with rotary action. It can be activated only by using a key. Different types of key switches are available on the bases of ampere rating.

The main advantage of using key operated switch instead of normal switch is to avoid accidental application of normal switch while riding the vehicle. It also covers child safety and operation by unskilled users.



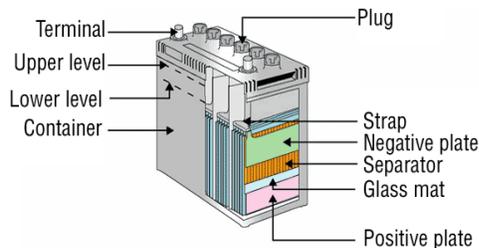
(5) Symbol of key switch



(6) Key operated switch

2.1.4 Battery.

An electric battery is a device consisting of one or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal, or cathode, and a negative terminal, or anode. Electrolytes allow ions to move between the electrodes and terminals, which results in the current to flow out of the battery to perform work. Many types of batteries are available in the market with desired specifications.



(7) Battery Structure.

3. WORKING PRINCIPLE OF CENTER STAND.

When the key switch is enabled using the key, the linear hydraulic pump connected at the center of the stand assembly actuates and pushes the stand downwards. On touching the ground, it is not possible for the stand to move any further and hence the motorcycle gets lifted gradually. On full displacement of the hydraulic pump, the stand is in applied position. The actuator cannot be manually displaced without key which gives an additional benefit with respect to safety. On turning key switch in reverse

direction to off position, the hydraulic pump starts to displace in reverse direction and hence lifting the stand and lowering the motorcycle back onto the wheels.

4. CONCLUSION.

Battery powered hydraulic pump and modified stand are used to make the stand automatically operational. The main advantage of this mechanism is reduction of human efforts and parking space required compared to a vehicle parked on side stand. It also includes safety precautions.

5. LIST OF MERITS.

- 1) Requires no human effort.
- 2) Requires less parking space.
- 3) Easy to handle for women and old people.
- 4) Easy to use for handicaps.
- 5) Easy to install and uninstall.

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