Automatic Side Stand Retrieval System Using Kinematic Links

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Abstract: Automobilesare playing a vital role in human's day to day life. Two wheelers number is increasing exponentially day by day in developing countries like India because those are available at affordable cost, easy for short distance commute. Someriders either in urgency or hurry they forget to lift the side stand before starting the ride. This is a reason for a significant number of accidents for two wheelers today. So, there is a necessity to study this issue and rectify by incorporating a certain mechanism to lift the side stand automatically before the ride starts. We started to design a mechanism which is feasible for both industry and users which is cost effective and easy to install. We design it in a way that, when the rider shifts the gear from neutral to first to start the ride, the side stand automatically gets lifted off from the grounded position. A model was built to test this design and found the mechanism is working fine on the model and it has to be tested on the original application.

Index Terms : Automobiles, Accidents, Two wheelers, Side Stand, Mechanism

1. INTRODUCTION

Road accidents have become a very common thing which we hear about everyday. In those, bike accidents have a huge share. There might be many causes for bike accidents. Eventhough it is not greatly reported or talked about, riding the bike without lifting the side stand is also a culprit which is causing accidents. As a responsible pedestrian walking on road, if we see some one riding bike without a lifted side stand, we warn them to lift the side stand up. With that a pedestrian's responsibility completes. But we as persons with some technical background thought to find a solution for it and the work we did to find a solution which is effective, feasible, compact for both manufacturers and users is reported in this paper.Accidents report[1] reported that bike accidents has a share of 33% of total number of accidents. The report[1] also listed some of the driver responsibilities which caused accidents in which "other improper actions" of the driver has a share of 12.6%. If the accidents caused because of not lifting the side stand were reported, it would have been reported under the list of "other improper actions" and might have contributed a good number in those 12.6%.Very less two wheeler models warning or alarm systems to let the rider know that the side stand is not lifted. This type of system is not seen in vehicles which is used most. So, there is a need for a mechanism which automatically lifts the side stand when vehicle moves.In literature, people used two methods for lifting the side stand. One is using the power from the engine or an external motor and the other is by using kinematic links and mechanisms.Akhil Ramesh et.al.[2] used the first type i.e they used the power from the engine to lift the side stand. Side stand is welded with a pinion gear and the pinion gear is placed at the chain drive of the two wheeler. The pinion is in contact with the chain in rested position and the contact would not be there when it is lifted. When the vehicle is started, the gear is shifted and when the vehicle starts moving i.e. the power from engine is transmitted to rear wheel by the chain drive. The pinion which is in contact with the chain drive also rotates and lifts the side stand up.A similar mechanism is used by Devendranath et.al.[3] where a link is connected to the pinion gear and the other end of the link is hooked to the side stand. When the pinion rotates because of the power transmission from engine to rear wheel the pinion rotates and the link lifts off the side stand and the pinion loosens from the chain drive while the vehicle is in motion.Pravin Barapatre et.al.[4] used a mechanism that lifts of the side stand on pressing the gear shift rod. They used a cable wire for doing this job. As the gear shift rod is pressed the wire get stretched due to the hook catch lock and it gets released from the hook to lift the side stand.

1) COMPONENTS USED FOR DESIGNING THE MECHANISM

1) L-Link:

It is named by us like that because it is in the shape of Letter 'L.' It can be fixed at a point and made to oscillate about that point. The spring in the link helps to bring back the arm to its original position, if the arm gets deviated from its position by any action on it. This is usually found as gear shifting link which can be found in almost all types of two wheeler gear boxes.

Figure 1. *Gear shift rod*

2) Gear shift rod:

This is used to shift the gears in sequential gearbox system which is commonly used in two wheelers. This shift rod converts up and down motion to rotary motion which internally changes the gears.

Figure 2. *Gear Shift Rod*

3) 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 kickstand usually a piece of metal that flips down from the frame and makes contact withtheground.ltisgenerallylocatedinthemiddleofthe bikeor towardtherear.

Figure 3. *Side Stand*

2) DESIGN PROCESS

The mechanism is fully mechanical, comprising of kinematic links and springs. The model was made using an L- Link, gear shifting rod, Spring, Eyebolts, a flat square plate of 1'' side. Having a rough idea about the mechanism i.e., how to retract the side stand from the grounded position, no clear understanding was there about the behaviour of the mechanism because no mathematics was involved in selecting the positions for placing the links. In this process, a lot of trials was done to find a position for the eye bolt on the side stand and rigid support for the spring on the bike(on wooden plank in the model). After many trials for the placement of bolts, a position was found where the mechanism works perfectly. Eye bolts were welded to the side side stand as shown in the sketch one is to interlock the side stand with the L-link when the side stand is in ON position and the other is for fixing the spring. The link should be fixed such that it is free to rotate about a point(only one degree of freedom) when it is pressed and it should come back to its normal position by the action of the spring. The L-link has a hook at the other end to get interlocked with the eye bolt welded to the side stand when the side stand is in ON position otherwise it will be hanging in the air when the stand is in OFF position.

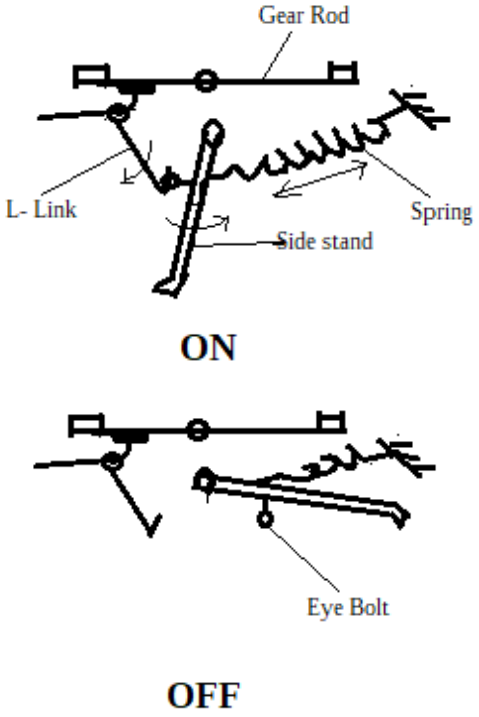

Figure 4. *Sketch showing the lifting mechanism. ON- Grounded position, OFF – Lifted position*

1) Mechanism

When the gear is shifted from neutral to the first by therider, the flat plat welded to the gear shift rod will hit the head of the L-link. L-link has a mechanism such that, it can rotate over a point in clockwise direction when a force is applied on its head and it can come back to its original position by the action of spring in that L-link. When the side stand is in ON position, the hook of the L-link is interlocked in the head of the eye bolt. Whenever a force is applied on the L-link, it rotates clockwise and the hook which is interlocked in the eye bolt gets released from its position. Because the spring has a great tension and no support is there to keep the side stand in grounded position, the side stand gets retracted to OFF position. The placement of the eye bolt and the L-link should make it possible that the hook will rest in the eye bolt again when it is brought back by the rider to rest the bike on the side stand.

Figure 5. *Model prepared*

2) FUTURE WORK

1. Implementing the same for back geared vehicles
2. By involving mathematics, making the design more fool proof such that it should not cause any damage to the rider or the bike.
3. Adjusting the model without changing the mechanism to suit the original application
4. Incorporating damper at the other end of the spring, because the stand hits the bike (wooden plank in the model) very hard and makes a lot of noise, also it may cause damage to the rider if his/her leg falls in between unfortunately.
5. Stress analysis on the side stand to know about the load it can bear.

3. ADVANTAGES

- Low cost
- Easy to install to a bike
- No sharp parts that can cause a bruise to the rider or make him feel uncomfortable.

4. CONCLUSION

The model made based on the mechanism reported in the previous sections is working satisfactorily. It can be easily installed to a bike by making some slight changes in the positions of fixing the links without making any changes to the mechanism.Involving mathematics and physics in deciding the positions will make the job easier as trial and error is cumbersome.

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