Design and Fabrication of Automated Footrest and Side-Stand

Mr. Kartik Ghodkhande [1], Mr. Vivek Uke [2], Mr. Shantanu Joshi [3] Mr. S. J. Deshmukh [4]

Students, Mechanical Engineering Department, Sipna COET, Amravati, Maharashtra, India[1,2,3]

Assistant Professor, Mechanical Engineering Department, Sipna COET, Amravati, Maharashtra, India [4]

Abstract: The current dense traffic on the road leading to increase in road accidents of two wheeler vehicles. The one of the reason which increases the risk of accidents is people forgetting to lift up the side stand of their vehicles. Also it is very common for the pillion rider to forget to unlock the footrest before taking his seat and trying to do that while the vehicle is in motion is a risky affair as it disturbs the balance of the vehicle. The main objective of this project is counter these problems by installing electrically operated servo motor driven mechanisms for lifting and unlocking the side stand and the footrest respectively. The mechanism works on the signals sent to it by a microcontroller circuit, which generates these signals based on the user code feed to it. By integrating this mechanism to the vehicle, the side stand will automatically left off when the vehicle is in motion and the footrest will automatically unlock when an adult passenger is seated on the vehicle's pillion seat.

Keywords: Automated, Side Stand Retrieving, Footrest Retrieving, Arduino.

I. INTRODUCTION

Generally accidents with bikes occurs due to riding the vehicle at high speed, ignorance of using helmets, not maintaining speed limit and forgetting to retract the side stand while riding the vehicle. Following table shows accident percentage with different reasons on Indian roads.

TABLE I PERCENTAGE OF DIFFERENT ROAD ACCIDENT CAUSES

Sr.No	During The Year	Reason For Accident	Percentage
1.	2010-2022	Released Side Stand	36%
2.	2010-2022	Over Speeding	38%
3.	2010-2022	Disobeying traffic rules	22%
4.	2010-2022	Other problem	04%

From above date it is cleared that 36% of accidents occur due to forgetting to retract the side stand while driving. To overcome this warning buzzer is provided in vehicle but due to high noise of traffic on road the buzzer sound is not audible. Hence some alternate solution is needed critically to tackle this problem.

The aim of proposed work is to provide cost efficient automate footrest and the side-stand retrieval system for two wheelers.

II. LITERATURE REVIEW

S Ramanathan et al [1]In this paper the author has studied the existing mechanical automatic side stand retrieving mechanism. He states that the main disadvantage these is that less efficiency, more chances of failure, high maintenance. He conducted detain analysis of the existing system and come up with idea of integration of both mechanical and electric system into an single system , which makes use of spring , Arduino uno, motor for the sliding and both return system.

Pravin Barapatre et al [2] worked on Automatic side stand to avoid such accidents caused due to not retracting the side stand. In this paper, mechanism presented has been used on the gear lever. The system works when the gear lever is pressed, the cable wire attached to the gear lever get stretched due to which the hook catch lock gets de-locked to retract the side stand automatically. Ultimately side stand retrieval mechanism discussed.

Aniket Gulhane et al [3] worked on the automatic side stand system on the basis of gear lever of the bike. It consist of the gear lever cable wire attached to the hook catch lock, when the gear lever is pressed the cable is stretched because of which the lock gets de-locked and the side stand gets retracted.

Shubham Bagul et al [4] developed the automatic side stand lifting mechanism is based on the motor and cable. When the vehicle is start the microcontroller give signal to start the motor. As motor rotates the cable attached to motor get wounded causes the sides stand to retrieve.

Sanjeev N K [5], has worked on Bike Side Stand Lock Link. In this system the side stand lock link is welded to the gear lever. When side stand is in release position the link will resist the gear lever movement thereby indicating the person handling the vehicle about the unreleased side stand when the rider tries to apply the gear in unreleased state of stand and prevent him from being endangered or to have unsafe ride of motorcycle. The bike side stand unfolded side lock link for two wheelers is one of the lifesaving mechanism which prevents the ride from riding the bike in unreleased position of the side stand.

Bharaneedharan Muralidharan et al [6], has design mechanism retrieving side stand. In this author has design sprocket and lever mechanism which get power from chain derives of vehicle. The sprocket is engaged with the chain and when vehicle start moving the sprocket will rotate along with the lever attached to it which in turn lift the side stand of two wheeler. Pintoo Prjapati et al [7] has also worked on Sprocket Side Stand Retrieve System with some modification in mechanism linkages.

III. PROBLEM DEFINATION

As discussed previously, engaged side-stand while driving can lead to life threat due to accident. From literature survey it is observe that many authors propose the mechanical as well as electrical side stand retrieving system but these system has following problem in their implementation in existing two wheelers as mentioned below;
➢ The mechanical based automatic side stand removal system has its dependencies on the gearing and wear and tear.
➢ The mechanical based systems are difficult to install in existing vehicle and needed huge modification in existing designs.
➢ The electric system already propose are effective than mechanical but has installation problem in existing vehicle

IV. OBJECTIVES

➢ To design side stand retrieving system with less mechanical components.
➢ To design cost effective system; which can be implemented in the existing vehicle with minor modifications.

V. CONSTRUCTION & WORKING

For the fabrication of automated footrest and side stand retrieving system the various components required are as mentioned below

TABLE II LIST OF COMPONENTS FOR AUTOMATED FOOTREST AND SIDE STAND RETRIEVING SYSTEM

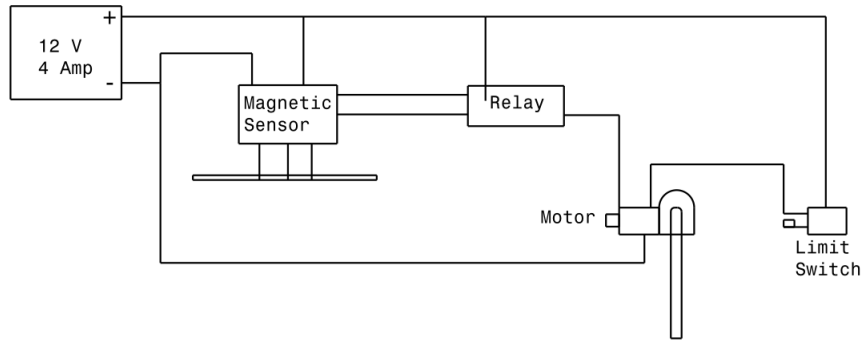| Sr. No.	Detail of Components
1	Battery (12 volts (6 cells in series) with Nominal Capacity 20-hour rate (250mA to 10.50 volts) 5.00 A.H.)
2	DC Motor (12 volt Operating Range – 6-12 VDC Install Current – 1.0 amp at 12 VDC)
3	Arduino
4	Limit Switch
5	Relay
6	Hall effect Sensor
7	Neodymium magnet
8	Siphon Pump
9	Pressure Switch

Fig. 1 Circuited diagram of side stand retrieving system

The circuit diagram for side stand retrieving is as shown above. When the vehicle start moving the Hall Effect sensor installed at front wheel gives command to the relay switch which starts the DC motor. After, the stand is retrieved completely the limit switch turn off the DC motor.
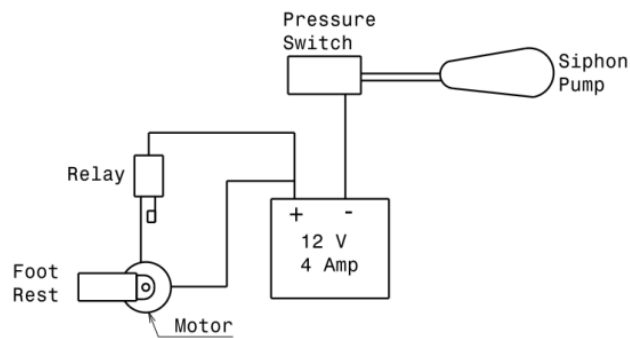

Fig. 2 Circuited diagram of foot rest retrieving system

The circuit diagram for foot rest retrieving system is as shown above. When the second ride sit on vehicle the siphon pump switch on pressure switch which in turn switch on DC motor. This will retrieve the foot rest and then the limit switch will turn of the motor.

Fig. 3 Installation of side stand & foot rest retrieving system

VI. ARDUINO CODING

```
volatile byte half_revolutions;
unsigned int rpm;
unsigned long timeold;
const int seat = 3;
int seatsen = 0;
int a = 0;
void setup()
{
 Serial.begin(115200);
 attachInterrupt(1, magnet_detect, RISING);//Initialize
the intterrupt pin (Arduino digital pin 2)
 half_revolutions = 0;
 rpm = 0;
 timeold = 0;

 pinMode(seat, INPUT);
 pinMode(10, OUTPUT); //EN1 Footrest
 pinMode(11, OUTPUT); //EN2 Footrest
 pinMode(12, OUTPUT); //EN3 Stand
 pinMode(13, OUTPUT); //EN4 Stand
}
void loop()//Measure RPM
{
 /* if (half_revolutions >= 5)
 {
 rpm = 30*1000/(millis() - timeold)*half_revolutions;
 timeold = millis();
 half_revolutions = 0;
 Serial.println(rpm,DEC);
 }*/
/* if(rpm >= 10)
 {
 digitalWrite(10,0);
 digitalWrite(11,1);
 delay(1000);
 digitalWrite(10,0);
 digitalWrite(11,0);
 half_revolutions = 0;
 }*/
 seatsen = digitalRead(seat);
 if(seatsen == 0 && a == 1)
 {
 digitalWrite(12,1);
 digitalWrite(13,0);
 delay(3);
 digitalWrite(12,0);
 digitalWrite(13,0);
 a = 0;
 }
 if(seatsen == 0 && a == 0)
 {
 digitalWrite(12,0);
 digitalWrite(13,1);
 delay(3);
 digitalWrite(12,0);
 digitalWrite(13,0);
 a = 1;
 }
}
 void magnet_detect()//This function is called
whenever a magnet/interrupt is detected by the arduino
{
 half_revolutions++;
 If ( half_revolutions > 5)
 {
 Serial.println("detect");
 digitalWrite(10,0);
 digitalWrite(11,1);
 delay(1000);
 digitalWrite(10,0);
 digitalWrite(11,0);
 half_revolutions = 0;
 }
}
```

VII. CONCLUSION

The designed "Automated Side Stand & Footrest Retrieving System" improves the safety of the rider. This electric based hence it is having fewer chance of mal-function. Also, the system not taking power from of the main engine and transmission system, unlike other system therefore will not affect the engine efficiency.

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