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"An Experimental Analysis of Automatic Side Stand"

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Abstract **- Side stand in two wheelers function the entire weight of the vehicle when it is parked. They are perfect on quick stops when one needs to leave the vehicle for a short while. They are provided with a spring that pulls it back into position to ensure extra safety.**

Sometimes the person who drives the two wheeler may forget to release the side stand. This will tend to unwanted danger and lack of concentration while driving.

Now a day's sensors are used for ensure that the stand is in released condition or not by indicating it using small lights in stash board. There is also a possibility to forget to see the light.

This research paper focuses on to completely reduce the possibility of driving two wheelers without releasing the side stand. This may appropriate for all kind of two wheelers which are driven in gear system with low cost.
In this research paper we are proposing an idea to overcome one of those accidents which take place due to the non-folding of the bike stand.

In the case of the classical bikes, the kick stand should be folded manually.

Unfortunately, it will not work at the urgent times. We are just human beings. We often use to forget to fold the kick stand at the hurry-burry times. While taking a deep curve or any obstacles coming on the way, sure there is a maximum feasibility to meet with an accident. So to avoid this accident, we find a new way to fold the kick stand automatically.

I. INTRODUCTION

Today, Motor cycles are used everywhere in all over the world. Designer should design each and every component in the two wheelers with very at most safe and the product should be economical. In motor cycles, the side stand plays major roll while the vehicle is in rest condition. While the driver starting the motor cycle, there may be a possibility of forget to release the side stand. This will tend to unwanted troubles. To avoid the driver has to ensure that the side stand is released.

Side stand in two wheelers function the entire weight of the vehicle when it is parked. They are perfect on quick stops when one needs to leave the vehicle for a

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short while. They are provided with a spring that pulls it back into position to ensure extra safety.

A side stand style kickstand is a single leg that simply flips out to one side, usually the non-drive side, and the bike then leans against it. Side stands can be mounted to the chain stays right behind the bottom bracket or to a chain and seat stay near the rear hub. Side stands mounted right behind the bottom bracket can be bolted on, either clamping the chain stays, or to the bracket between them, or welded into place as an integral part of the frame.

A center stand kickstand is a pair of legs or a bracket that flips straight down and lifts the rear wheel off the ground when in use. Center stands can be mounted to the chain stays right behind the bottom bracket or to the rear dropouts. Many motorcycles feature center stands in addition to side stands. The center stand is advantageous because it takes most of the motorcycle's weight off its tires for long-term parking, and it allows the user to perform maintenance such as chain adjustments without the need for an external stand. Center stands are found on most "standard" and "touring" motorcycles, but are omitted on most high-performance sport bikes to save weight and increase ground clearance.

II. COMPONENTS OF AUTOMATIC SIDE STAND SYSTEM

1. Battery
2. Slow speed dc motor
3. Limit switch
4. Push button
5. Stopper
6. Side stand
7. Relay

III. WORKING PRINCIPLE

When the starter button was pressed electric circuit closed and the electric gets power. Then the electric motor rotates and gives pushing force to the stand, which lifts the stand.

When it touch or press the limit switch the power supply for the forward direction of the motor is cut. At the same time reverse direction power will supply when we pressed the push button.

If the push button was pressed the electric motors turns in opposite direction which pulls the side stand and keep in original position.

POWER SUPPLY

Relay Theory

Relay, is an electrically controlled switch. If a switch contact mechanism is built so that it can be actuated (opened and closed) by the application of a magnetic field, and an electromagnet coil is placed in the near vicinity to produce that requisite field, it will be possible to open and close the switch by the application of a current through the coil. In effect, this gives us a device that enables electricity to control electricity:

Fig. 3.1 – Circuit Diagram of Relay

Relays can be constructed to actuate multiple switch contacts, or operate them in "reverse" (energizing the coil will *open* the switch contact and empowering the coil will allow it to spring closed again).

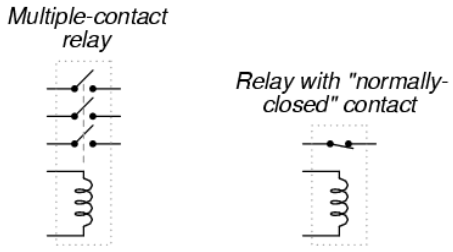

Fig 3.2 – Relay With Normally Closed Contact

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Relay (constructed for the purpose of creating a physical force via its magnetic field when energized), the effect of inductive "kickback" serves no useful purpose at all. In fact, it is quite detrimental to the switch, as it will cause excessive arcing at the contacts, greatly reducing their service life. There are several practical methods of mitigating the high voltage transient created when the switch is opened, but none so simple as the so-called *commutating diode*.

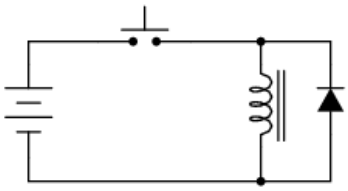

Fig. 3.3 – Commutating Diode

In this circuit, the diode is placed in parallel with the coil, in such a way that it will be reverse-biased when DC voltage is applied to the coil through the switch. Thus, when the coil is energized, the diode conducts no current.

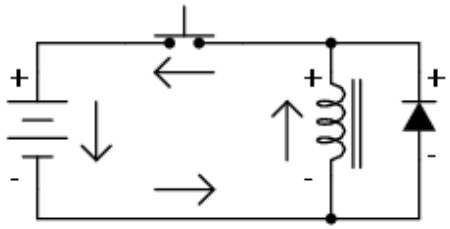

Fig. 3.4 – Circuit Diagram with Switch Closed Condition

However, when the switch is opened, the coil's inductance responds to the decrease in current by inducing a voltage of reverse polarity, in an effort to maintain current at the same magnitude and in the same direction. This sudden reversal of voltage polarity across the coil forward-biases the diode, and the diode provides a current path for the inductor's current, so that its stored energy is dissipated slowly rather than suddenly.

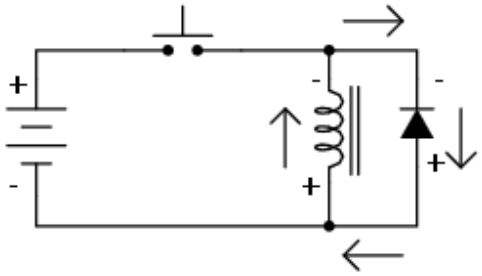

Fig. 3.5 - *Circuit Diagram with Switch Open Condition*

As a result, the voltage induced in the coil by its collapsing magnetic field is quite low: merely the forward voltage drops of the diode, rather than hundreds of volts as before. Thus, the switch contacts experience a voltage drop equal to the battery voltage plus about 0.7 volts (if the diode is silicon) during this discharge time.

Fig. 3.6 - Automatic Side Stand At Rest Position

Fig. 3.7 – Position of Automatic Side Stand When Applied

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PARTICULARS	EXISTING SIDE STANDS	INVENTED SIDE STAND
MANUAL	YES	AUTOMATIC
AUTOMATIC RETRACTION	NO	YES
HUMAN ERROR	HIGH	ELIMINATED
MAINTENANCE	LOW	LOW
STURDINESS	STABLE	STABLE
COST	AVERAGE	BELOW AVERAGE
CUSTOMER SATISFACTION	AVERAGE	GURANTEED
RISK FACTOR	HIGH	ELIMINATED
ERROR ELIMINATION	NOT CONSIDERED	TAKEN UNDER CONSIDERATION
MANUFACTURING OF SPARES	WITH EASE	WITH EASE
MARKET CAPTIVITY	-	IMPROVED SALES
TECHNOLOGY	CUSTOMARY	REVOLUTIONARY / UNIQUE
COMFORT IN USUAGE	COMFORTABLE	HIGHLY COMFORTABLE

Table 3.1 – Specifications of Conventional and Contemporary Side Stands

IV. CALCULATIONS

WORK ENVELOPE

The total area over which the arm can traverse to carry the specified work.
Horizontal area traversed:

$$A=\pi/4D^2$$

Where D = distance from the end point of arm to the center axis of the column

$$A=22/7 \times 23.2 \times 23.2$$

$$=1691.61cm^2$$

CALCULATIONS FOR MOTORS

FOR THE STEPPER MOTOR CONNECTED BENEATH THE BASE

STEP ANGLE (θ)

The angle through which the shaft of the motor turns when given a single electrical pulse.

The step angle of the stepper motor is given by the formula-

$$\theta=360/m\ p$$

Where, m = no. of phase windings of the rotor
= 30

p = no. of rotor teeth over the poles=15

$$\theta = 360/30 \times 15$$
$$= 0.8°$$

Thus, step angle of our stepper motor is 0.8°

TORQUE

The torque of the stepper motor is given by the formula:

$$T=1/2I^2\ dL/d\theta$$

Where,

I = current flowing through the rotor at any particular instant of time (amp)

L = inductance (Henry)
dθ = step angle

$$V=I \times R$$

(I = 2A,V = 12V)
$12 = 2 \times R$

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R = 6Ω

XL = 2πfL
⇒ 6 = 2π × 50 × L
⇒ L = 0.0105 N cm.

FOR D.C. (GEARED MOTOR)

Rated power=100W

Maximum operating speed=2400r.p.m

Geared motor (speed reduction)

Operating speed=15r.p.m

Consider a load of ½ kg to be W=1/2 kg

Continuous torque = m g l sinθ
= 1/2 × 9.8 × 23.2 × sin30°
= 56.84 N cm.

Peak torque = m g l = 1/2 × 9.8 × 23.2
= 113.68 N cm.

Current at continuous torque:

P = 2πNT/6
= 2π × 15 × 56.84/7 × 60 × 100
= 8.932

P = V × I
⇒ 8.932 = 12 × I
⇒ I = 0.744A

CURRENT AT PEAK TORQUE

We know that,
P = 2π × 15 × 113.68/100 × 60
=17.864 W
Also,
P = V × I
⇒ 17.684 = 12 × I
⇒ I = 1.488

Maximum terminal voltage = 100V

GRIPPING FORCE

Force, this is required to hold the object without slippage.

F = mg sinθ/μ

Where, m = mass of the load
G = acceleration due to gravity
θ = Angle subtended by the gripping force to the horizontal line passing through the center of the gravity
μ = Co-efficient of friction between the gripping force and the load
F=0.5 × sin36° × 10/0.3 = 9.66

WRIST (GRIPPER) PITCH AND WRIST ROLL

D.C. Geared motor:
N = 15r.p.m

Maximum operating speed = 2400 r.p.m

Rated torque:
P = 2πNT/60
⇒ T = 60 ×100 × 7/2 × 22 × 15
= 63.63 N cm.

PITCH

The maximum upward and downward displacement of the wrist in a vertical plane is termed as pitch.

Its limit positions are at -90°and 50°
Pitch angle = range = 90 + 50 =140°

YAW

The maximum space for which the grippers of the wrist considering one of the grippers as the reference plane. Its limit positions are -45° and 30°.

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Yaw angle = range = 75°

DESIGN OF FRAME

Column-the column is made up of aluminum. Its cross section is boxed shaped. We have used box shaped cross section because it has good bending stiffness. We have taken a from side frames of window.

It bears the load of motor and arm is bolted to it.

The weight of arm hanged on bolt is 200gms.

And weight of motor is 175gms.

DESIGN OF SCREW CONNECTING COLUMN AND ARM

Torsion shear stress of screw which is subjected to twisting moment is given by-

$$\tau = 16T/\pi(D_C)^3$$

Where,

dc = Core diameter screw = 0.2 cm.
τ = Shear stress
T = Torque

$$\tau = 113.68 \times 16/\pi \times (0.2)^3 = 72407 N/cm^2$$

V. SYSTEM PERFORMANCE

END- ARM SPEED

This measurement identifies the speed at which the manipulator can move an object. It depends upon several factors, including weight carried and path taken and should be used only when comparing characteristics of different robots

ACCURACY

Accuracy identifies the manipulator to go to a pre-programmed point in space or its home position. Its usefulness as an indicator of robot capability is limited to robots, which are programmed off-line programming, commands it to go.

Repeatability-Repeatability is the most important characteristics in determining the robot ability to accurately perform a required task. It measures the ability of the manipulator to continuously return to the same point within the work envelope.

Degree of freedom- degree of freedom of a pair is defined as the numbers of independent relative motions, both transnational and rotational, a pair can have.

Degree of freedom=6-Numbers of restraints
Our robotic arm has two degree of freedom

VI. MATERIAL USED:

We have used Aluminum And High Density Plastic {HDP} for making our robotic arm.

1. The reason for using aluminum is:
2. It is lightweight and has good strength.
3. It can be easily blanked, formed, drawn, turned etc.
4. It has good electrical conductivity, corrosion resistance and non-toxic.
5. We have used high-density plastic because of its low weight and high gripping property.

VII. ADVANTAGES & DISADVANTAGES

ADVANTAGES

1. Customer safety
2. Can form as a ‘Standard Feature’

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3. Marginal increase in cost
4. Improved sales: To face competition.
5. Ergonomic friendly
6. Low maintenance : Can be repaired locally
7. Revolutionary product

DISADVANTAGES

1. Will not done manually.
2. Decrease Battery life
3. Need high fluid pressure in case of hydraulic side stand system.

VIII. APPLICATIONS

1. A BMW R1100RS sport-touring motorcycle
2. The Ducati Monster 696 naked bike
3. BMW R1200GS dual-sport motorcycle.
4. A KTM dirt bike with a paddle tire.
5. Trials bikes have no seat.
6. Police motorcycles are job-related motorcycles

IX. CONCLUSION

From the above study over the topic that automatic side stand is very useful and advantageous application for two wheelers.

It will help over the for two-wheelers for safe riding and prevents accidents
The automatic side stand is a very complicated setup and requires expert knowledge to install. When fitted from local shops. The operation is dependent upon battery so a powerful battery is must.

It doesn't not affect the overall running cost and weight of the two wheelers .hence it can be inferred that the automatic side stands is a very flexible system to operate, remarkably support the better stability.

X. REFERENCES

1. http://www.automobileindustryindia.com/
2. http://www.w6rec.com/duane/bmw/bmwlinks.htm
3. http://www.slideshare.net/greatsiva/automatic-sidestand
4. http://www.docstoc.com/docs/131577866/Automatic-Side-Stand-Retrival-System
5. http://en.wikipedia.org/wiki/Kickstand