

AUTOMATIC BRAKE IN HILL STATION

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ABSTRACT

The aim of the project is to design and construction of a module used for vehicles in the hill stations. Auto breaking system is used when vehicle is moving upward direction . The project was divided into two phases. The First phase is to demonstrate the application of MEMS. The second phase of the project attempts controlling motors.

MEMS sensor is interfaced to micro controller using I2c protocol, microcontroller receives the data from the mems sensor and process it according to the data from the sensor appliances are operated. Applications are like refrigerators, microwave ovens, Theaters hospitals etc. I2C protocol is used for interfacing MEMS sensors with micro controller, Micro controller main functionality is to receive signals for sensors and process information by taking desired decision.

INTRODUCTION

The proposed mechanism is to reverse break using ratchet gear. By reverse locking the differential the differential is disengaged from the axle.

Thus the power is directly transmitted to the axle and hence to the wheels. This will considerably reduce the power loss in some occasions when unwanted loss is happening due to the transmission if power from the shaft to the ratchet gear and then to the axle and hence to the wheels.

So in mechanism the unwanted power loss in the due course of transmission through the gear wheel is reduced.

A ratchet is a device which is used in vehicles over a few decades and when a vehicle is negotiating a turn, the outside wheel travels a greater distance and turns faster than the inside wheel. The ratchet gear is the device transmitting the power to each wheel, allows one wheel to turn faster than the other.

Degrees of automation are of two types, viz.

- Full automation.
- Semi automation.

In semi automation a combination of manual effort and mechanical power is required whereas in full automation human participation is very negligible.

Inertial sensors have been used in aircraft and navigation systems for a long time.

It is not until recently that new technology has caused the price and size of gyroscopes and accelerometers to make them available in consumer electronics. Of particular importance is the MEMS (micro-electro-mechanical-systems) technology that has allowed small, cheap and robust sensors to enter the market, recent advances in micro- electromechanical system (MEMS) technologies have enabled

inertial sensors to become available on the small size and price scales associated with such commonplace devices as consumer appliances.

PROBLEM STATEMENT

Design and develop a prototype model of showing the concept of automatic hill station braking system which will show the working of application of brakes in emergency conditions while driving on slopes in hill stations road conditions.

Also fabricate the model of the same which will show the working desired by emergency braking on slopes in hill station roads.

OBJECTIVE

- To Design and develop a prototype model of showing the concept of automatic hill station braking system while driving on slopes in hill stations road conditions.
- To fabricate the model of the same which will show the working desired by emergency braking on slopes in hill station roads.
- To provide safety options while driving in hill stations.
- To test the model under different conditions of speed and slopes.
- To automate the braking system by means of sensors and actuators.

SCOPE OF THE PROJECT

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METHODOLOGY

In this work, Ratchet and Pawl mechanism is identified to arrest the backward motion to the car. The ratchet is placed in the front drive shaft and the Pawl is fitted with the frame.

When the vehicle is moved in the hill road, the lever has to make the pawl to touch the ratchet. If the vehicle tends to move backward direction, the pawl would stop the ratchet to move Counter Clock-wise direction with respect to front wheel.

As the vehicle is in neutral position, the pawl engaged the ratchet and the vehicle did not move on.

LITERATURE SURVEY

The New In-Depth, At-the-Scene, Accident Investigation Database in India

N. Rameshkrishnan, A. Sathyakumar, S. Balakumar, A. M. Hassan, R. Rajaraman, J. Padmanaban

India's staggering record of traffic fatalities has created an urgent need to understand, and mitigate, the factors involved in these crashes. But understanding relies on having quality, in-depth data available for analysis. To provide such data, a consortium of vehicle manufacturers and researchers, with support from the police, developed a methodology for investigating and recording crash and injury details for road traffic accidents occurring on South Indian highways. This paper describes key features of the India-centric data collection methodology, which uses established techniques to make it compatible with studies in countries such as the USA, UK, and Germany while addressing issues unique to India.

Material Selection Method in Design of Automotive Brake Disc

M.A. Maleque¹, S. Dyuti² and M.M. Rahman (Member, IAENG)³

An automotive brake disc or rotor is a device for slowing or stopping the motion of a wheel while it runs at a certain speed. The widely used brake rotor material is cast iron which consumes much fuel due to its high specific gravity. The aim of this paper is to develop the material selection method and select the optimum material for the application of brake disc system emphasizing on the substitution of this cast iron by any other lightweight material.

SAFETY AUTO BRAKE SYSTEM FOR VEHICLES IN HILL STATION USING MEMS SENSOR

Shankarappagari Girish¹, Chandu Lalith Nandan², K.V.N. Kavitha³

This paper outlines the design and construction of a module suitable for driving the vehicles in hill station. Auto braking system is used for vehicles going in upward direction. This construction includes two phases. In first module, slope of the vehicle is observed using micro-electromechanical system (MEMS) Sensor and in second phase, motor speed is controlled based on the data from sensor. Sensor is interfaced to the microcontroller using I2c Protocol where the controller receives the information from the sensor and processes it according to the desired decisions. This can also be used in applications like Refrigerator, microwave oven, operation theaters etc.

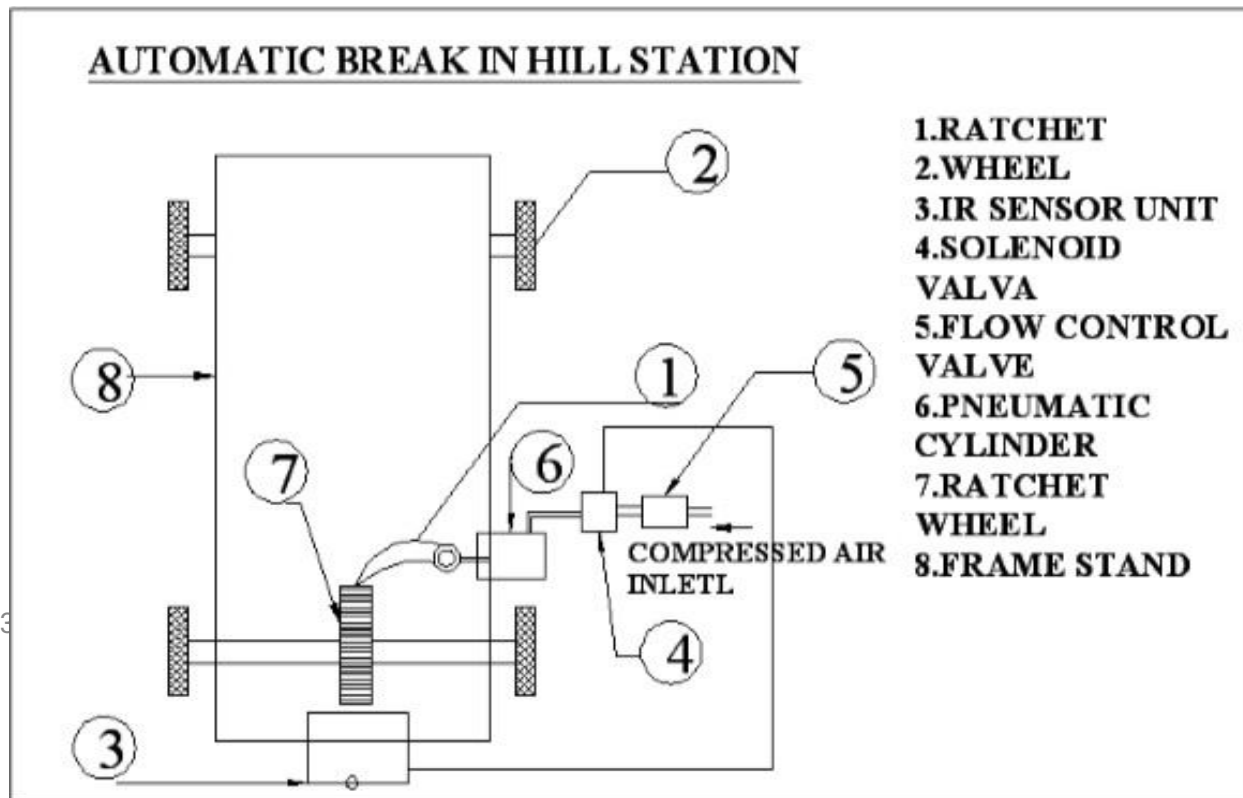
WORKING

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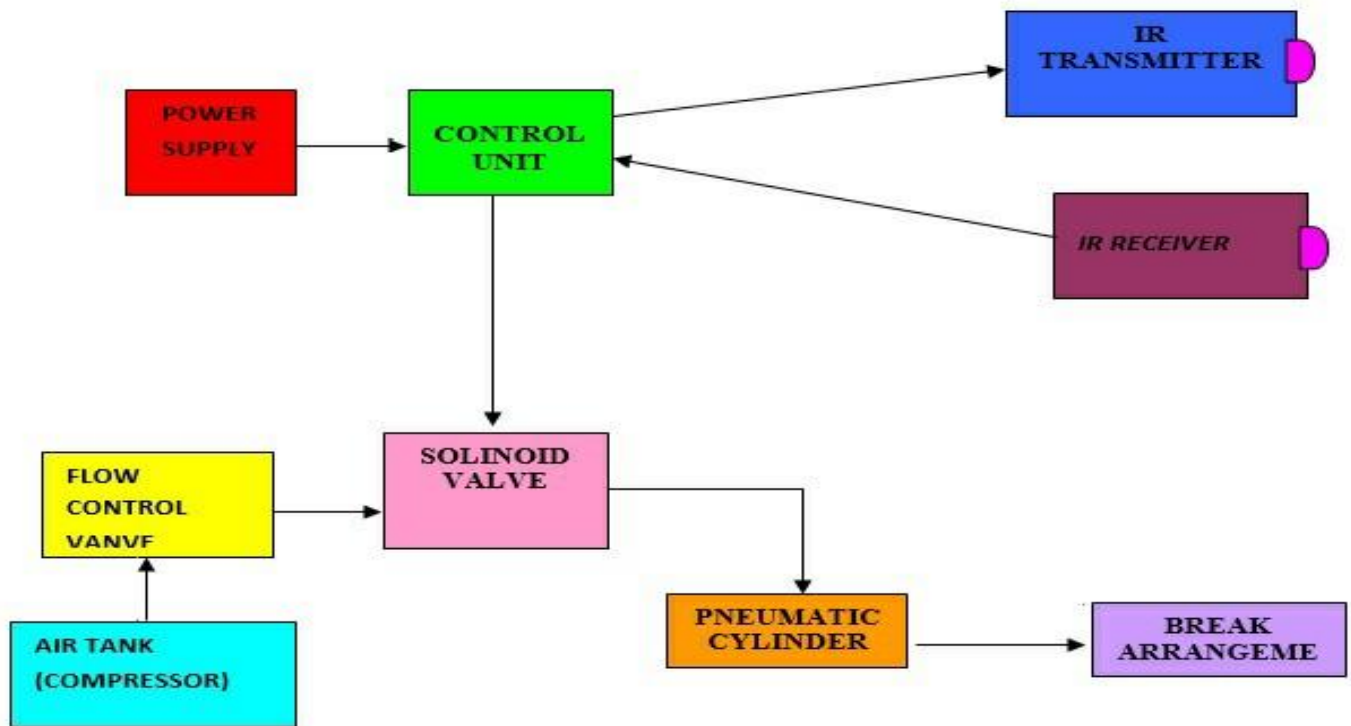
As the vehicle is in neutral position, the pawl engaged the ratchet and the vehicle did not move in backward direction. So the hand brakes need not to be applied. When the vehicle is in moving condition, the engagement between the ratchet and pawl is detached.

If the solenoid valve is activated, the compressed air passes to the Single Acting Pneumatic Cylinder. The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement activated. The breaking arrangement is used to break the wheel gradually or suddenly due to the piston movement. The breaking speed is varied by adjusting the valve is called "FLOW CONTROL VALVE".

BLOCK DIAGRAM



WORKING DIAGRAM:



3/15/2018

SOURCE CODE TECHNOLOGY PUNE
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BLOCK DIAGRAM EXPLANATION

The IR TRANSMITTER circuit is to transmit the Infra-Red rays. If any obstacle is there in a path, the Infra-Red rays are reflected.

This reflected Infra-Red ray is received by the receiver circuit, which is called "IR RECEIVER".

The IR receiver circuit receives the reflected IR rays and gives the control signal to the control circuit. The control circuit is used to activate the solenoid valve.

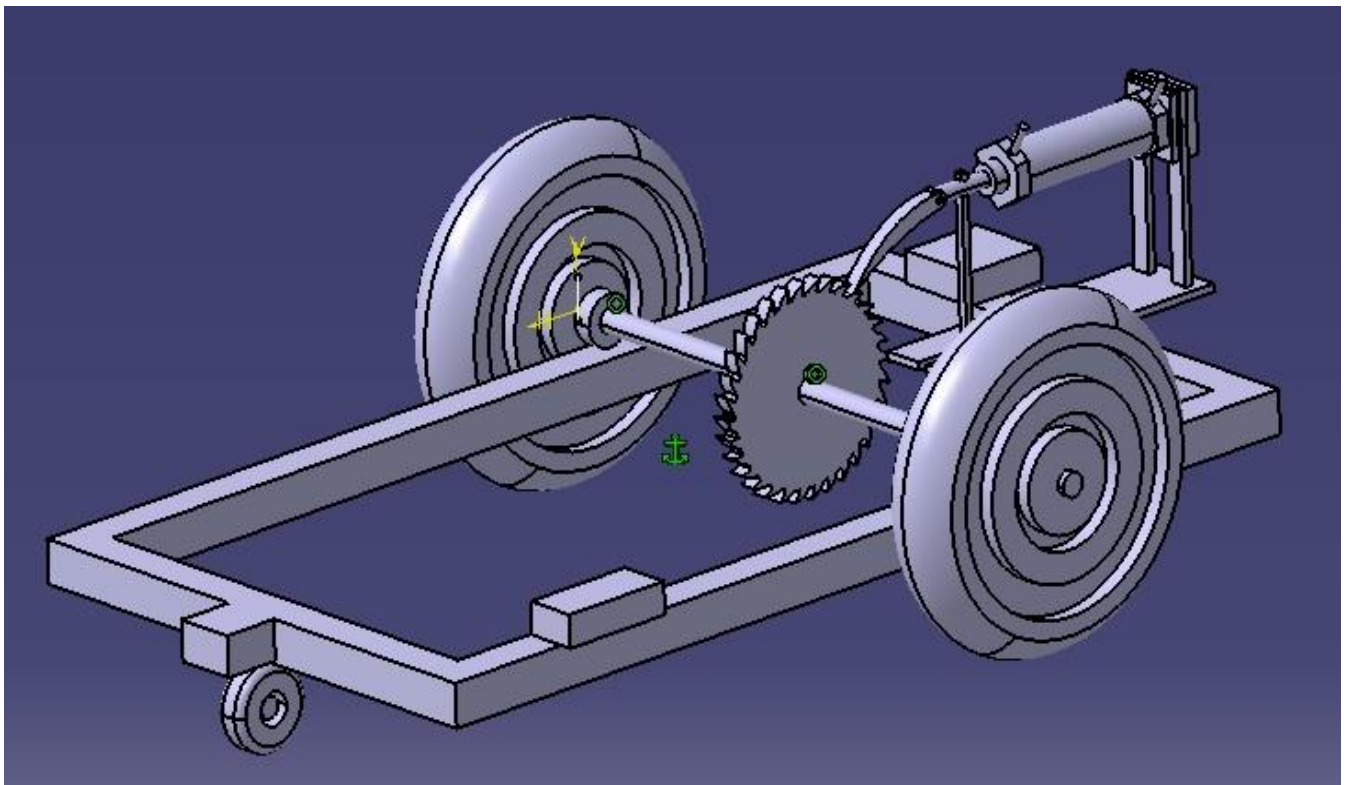
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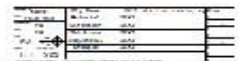
The compressed air activates the pneumatic cylinder and moves the piston rod. If the piston moves forward, then the breaking arrangement is activated.

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PROPOSED MODEL





COMPONENTS

- IR sensor
- Pneumatic actuator
- Solenoid
- Ratchet
- Pawl
- Wheel
- Frame(ms)

CALCULATION

- ROAD SLOPE
- SLOPE OF THE ROAD:
- The steepest road in India is ZOJI PASS in KASHMIR and the angle of inclination of the road is found to be 21.80 degrees.
- WE DESIGN THE PROTOTYPE FOR 40 % SLOPE

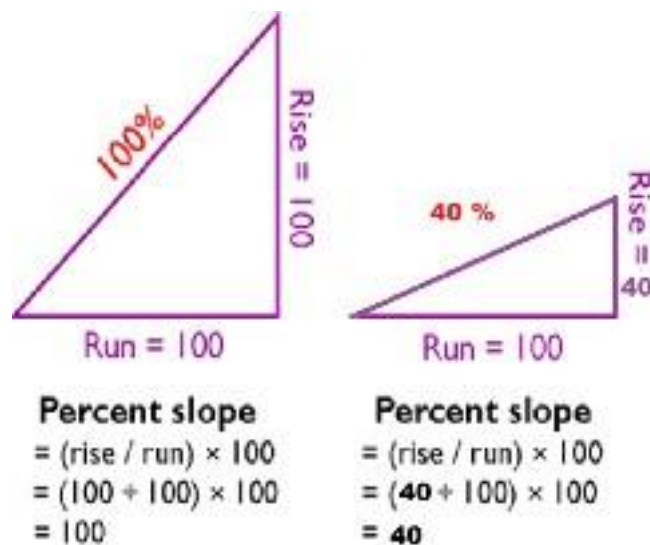


FIG. SLOPE ANGLE DEFINITION

- Brake force calculation
- Suppose maximum prototype mass of 50 kg is traveling on a slope of 40 % height as shown in above figure the various forces acting on vehicle are,
- mg =downwards weight of vehicle.
- N = normal reaction
- Θ = slope angle
- $\tan\Theta = 40/100$ so, $\Theta = \tan^{-1}(0.4) = 21.80 \text{ degree} = 25 \text{ degree}$.
- So as shown in fig. the force on a vehicle while sliding down the slope is $mg\sin\Theta$,
- So the braking force required to stop the vehicle by the brakes is $- mg\sin\Theta$ (-ve sign indicates opposite direction of forces)
- So the braking force is $F_b = mg\sin\Theta, = mg*\sin 25$

$$= 50*9.81*\sin 25 = 207.2 \text{ N}$$

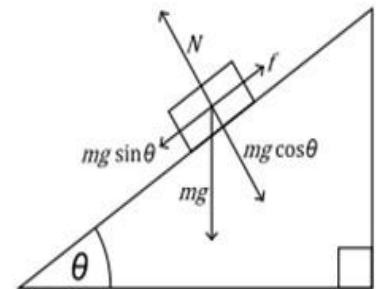


Fig. various forces acting on vehicle traveling on slopes

POWER REQUIRED TO DRIVE THE BRAKES

- Power= work/time
- 1 watt = 1 Newton meter / sec.
- Watt = Newton meter / sec.
- For a time period of 10 seconds and for displacement of 50 mm,
- Watt = $207.2*0.05/10 = 1.036 \text{ watt} = 2 \text{ watt}$
- So the power required to drive the brakes is 2 watt.
- Torque required
- Power $P = 2NT/60$
- Where $p = 1.5 \text{ watt}$,
- N = maximum rotations can be 100 rpm, $2 = 2*3.142*100*T/60$
- So we get torque $T = 0.19 = 0.2 \text{ N.m}$.

COST ESTIMATION

Sr no	contents	cost
1.	Base frame	
2.	Wheels*2	
3.	Front castor wheel	
4.	Ratchet and pawl	
5.	Shaft	
6.	Bearings*2	
7.	Pneumatic actuator	
8.	IR sensor unit	
9.	DC valve	
10.	Flexible hoses(pipes)	
11.	Valve connectors	
12.	Fabrication	
13.	Assembly and labour charges	
14.	Others	
15	Total	

ADVANTAGES

- Brake cost will be less.
- Free from wear adjustment.
- Less power consumption
- Less skill technicians is sufficient to operate.
- It gives simplified very operation.
- Installation is simplified very much.

APPLICATION

- Now-a-days every institution needs automation. As a part of college automation, we have decided to do a project
- For automobile application
- Industrial application

CONCLUSION

A ratchet is a device which is used in vehicles over a few decades and when a vehicle is negotiating a turn, the outside wheel travels a greater distance and turns faster than the inside wheel. The ratchet gear is the device transmitting the power to each wheel, allows one wheel to turn faster than the other.

REFERENCES

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