WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

"Automatic Hand Brake System"

Akhilesh Vishwakarma, Ashutosh Kumar Sharma, Muslim Alam, Saurav Kumar, Ashish Shah, Dr. Jitendra Pandey

Department of Mechanical Engineering Oriental Institute of Science & Technology, Bhopal

ABSTRACT

Automobiles are synonyms for mobility and freedom. An amazing increase in the growth of population in this world leads to the rapid increase in the number of vehicle being used. With the growing number of vehicles and the consequent shortage of parking space, there is haphazard and totally unregulated parking of vehicles all over. In densely populated areas they are real challenge for city planners, architects and developers. The need to offer sufficient parking spaces is a task for specialists. This situation calls for the need of an automated parking system that not only makes parking process easy but also allows parking more cars in the available space. Automatic car parking systems is the sole solution to park as many cars as possible in as little space as possible. Our demonstration facility presents a miniature model of an automated car parking system that regulates the number of cars that can be parked in a given space at any given time based on the parking space availability. It is more cost-effective and allows more cars to be parked in less space. The automation technology is used to typically double to triple the capacity of conventional parking spaces.

So we were keen to develop a system for parking of cars which would be suitable and practical for Indian society. As we know that there are already some systems which are using technology like multi floor parking system and automated parking area system. But these systems are little bit impractical in context to Indian society as these systems result in extra consumptions of money and power. So "Smart parking system for cars" would be a cheap and less expensive system for parking and simple construction as well.

Introduction

- Automatic Hand Brake System" is an industrial project which meets the above requirements efficiently.
- A motor with breaking system is used for the operation of automatic brake mechanism.
- By taking an inventory of all the essential mechanical components and doing a basic mechanical component evaluation, you can get a good idea how much the brake work efficiently.

Brake System for Cars

- ***What is Brake?***

"A brake is a mechanical device which inhibits motion "

Types of Brakes

a) **Frictional brakes-** are most common and can be divided broadly into "shoe" or "pad" brakes, using an explicit wear surface, and hydrodynamic brakes, such as parachutes, which use friction in a working fluid and do not explicitly wear. Typically the term "friction brake" is used to mean pad/shoe brakes and excludes hydrodynamic brakes, even though hydrodynamic brakes use friction

b) **Pumping brakes-** are often used where a pump is already part of the machinery. For example, an internal-combustion piston motor can use a valve override called a Jake brake to greatly increase pumping losses. Pumping brakes can dump energy as heat, or can be regenerative brakes that recharge a pressure reservoir called a hydraulic accumulator.

c) **Electromagnetic brakes-**are likewise often used where an electric motor is already part of the machinery. For example, many hybrid gasoline/electric vehicles use the electric motor as a generator to charge electric batteries and also as a regenerative brake. Some diesel/electric railroad locomotives use the electric motors to generate electricity which is then sent to a resistor bank and dumped as heat. Some vehicles, such as some transit buses, do not already have an electric motor but use a secondary "retarder" brake that is effectively a generator with an internal short-circuit. Related types of such a brake are eddy current brakes, and electro- mechanical brakes (which actually are magnetically

driven friction brakes, but nowadays are often just called “electromagnetic brakes” as well).

Why It Was Needed?

- In the modern lifestyle braking of cars is itself a tedious and important process.
- Places like Metro station, Supermarket, Local market and sometimes on streets do not have enough space for free ride so we need brake at that time.
- So we require a system which can make braking easy, less time taking and also using less area to stop the car.
- The system should also be less expensive as people will not like to spend much extra money for such accessories.

Vision of The Project

- There are also some technologies regarding braking of cars like Hand braking and Disc braking .
- We believe that in a country like us where we do not have as much efficient equipment that we use in car, so we require a accurate and reliable system.
- So we are keen to develop a system which is simple in operation and cheap.

What is “Automatic Handbrake System”?

- As we know that hand braking is not occur automatically.
- But by implementing two motors on brake with 200rpm each and one motor of 500 rpm for running front wheel, and brake will apply as the ignition off.
- That is why this system is named “Automatic Handbrake System”.
- It is often used in parking lots, shopping centers and sometimes along street curbs.
- With a little practice, braking at minimum distance is possible so easily .

Key Elements of The Project

- MOTOR(200RPM)
- MOTOR(200RPM)
- SHAFT
- CAPACITOR
- WHEELS
- DIODE
- SPRINGS

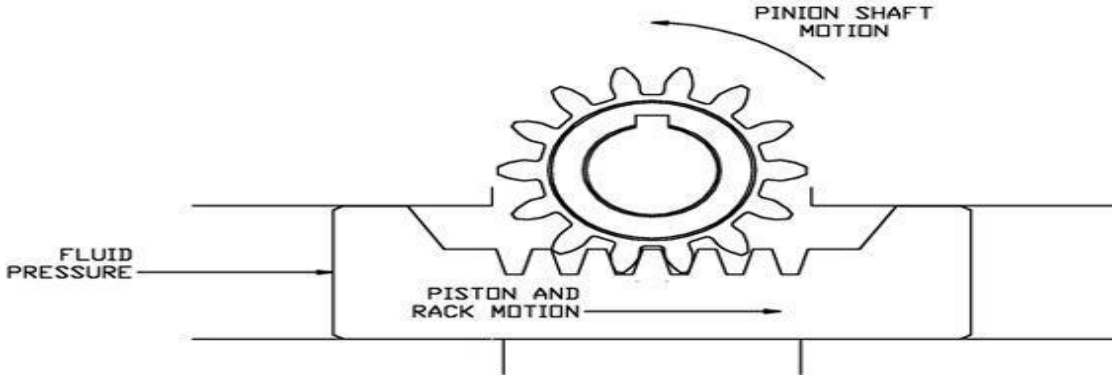
Detailed Description of Various Components

1. ***Motor***

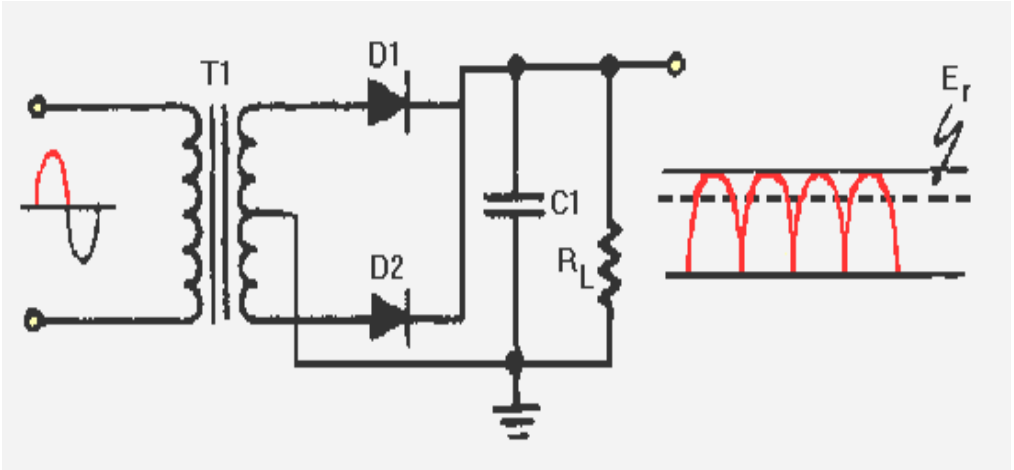
- A simple D.C motor of speed 200 rpm.
- For the rotation of pinion in the Rack and pinion arrangement and two motor for braking system.

1. Rack and pinion arrangement

- Rack and pinion arrangement is used for converting rotational motion of motor spindle into translational motion the connecting shaft (Wooden shaft).
- Rack length is 70 mm and breadth is 5 mm.
- Pinion diameter is 6 mm thickness is 5mm .
- Rack and pinion assembly cover made of aluminum of 18x25 mm dimension is used.
- Moving centre tube and outer casing tube are other parts of the assembly.
- A **rack and pinion** is a pair of gears which convert rotational motion into linear motion. The circular pinion engages teeth on a flat bar - the rack. Rotational motion applied to the pinion will cause the rack to move to the side, up to the limit of its travel. For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and pulls a train along a steep slope.



2. Rectifier



- Full wave rectifier circuit is used for supply current only in one direction.
- For that a capacitor of 1000μF and 6.3 Volt supply is used in switch control board.
- Dp-Dc switches are used for rotating the motors in clockwise and anticlockwise directions

3. Wheels and Motors

- In the model 4 no. of D.C motors of 60 rpm each is employed in all the four wheels.
- Parallel connection of motors in a single axle is made so that movement in all four directions can be smooth.
- A wheel is a circular device that is capable of rotating on its axis, facilitating movement or transportation or performing labour in machines. A wheel together with an axle overcomes friction by facilitating motion by rolling. In order for wheels to rotate a moment needs to be applied to the wheel about its axis, either by way of gravity or by application of another external force. Common examples are found in transport applications. More generally the term is also used for other circular objects that rotate or turn, such as a Ship's wheel and flywheel.

Three wheels on an antique tricycle.

- ***Etymology***

The English word wheel comes from the Proto-Indo- European *kwekwlo-,[1] which was an extended form of the root *kwel- meaning "to revolve, move around". This is also the root of the Greek κυκλος kuklos, the Sanskrit chakra, and Persian charkh, all meaning "circle" or "wheel",[2] and also in Lithuanian, sukti means "to rotate". The Latin word rota is from the Proto-Indo- European *rotā-, the extended o-grade form of the root *ret- meaning "to roll, revolve".

- ***Mechanics and function***

The wheel is a device that enables efficient movement of an object across a surface where there is a force pressing the object to the surface. Common examples are a cart drawn by a horse, and the rollers on an aircraft flap mechanism.

The wheel is not a machine, and should not be confused with the wheel and axle, one of the simple machines. A driven wheel is a special case, that is a wheel and axle. Note that wheels predate driven wheels by about 6000 years.

Wheels are used in conjunction with axles, either the wheel turns on the axle or the axle turns in the object body. The mechanics are the same in either case.

- The low resistance to motion (compared to dragging) is explained as follows (refer to friction):
  - the normal force at the sliding interface is the same.
  - the sliding distance is reduced for a given distance of travel.
  - the coefficient of friction at the interface is usually lower.
- Bearings are used to reduce friction at the interface.
- Example:
- If dragging a 100 kg object for 10 m along a surface with $\mu = 0.5$, the normal force is 981 N and the work done (required energy) is (work=force x distance) $981 \times 0.5 \times 10 = 4905$ joules.
- Now give the object 4 wheels. The normal force between the 4 wheels and axles is the same (in total) 981 N, assume $\mu = 0.1$, and say the wheel diameter is 1000 mm and axle diameter is 50 mm. So while the object still moves 10 m the sliding frictional surfaces only slide over each other a distance of 0.5 m. The work done is 981 x 0.1 x 0.5 = 49 joules.

Additional energy is lost at the wheel to road interface. This is termed rolling resistance which is predominantly a deformation loss.

WIRES

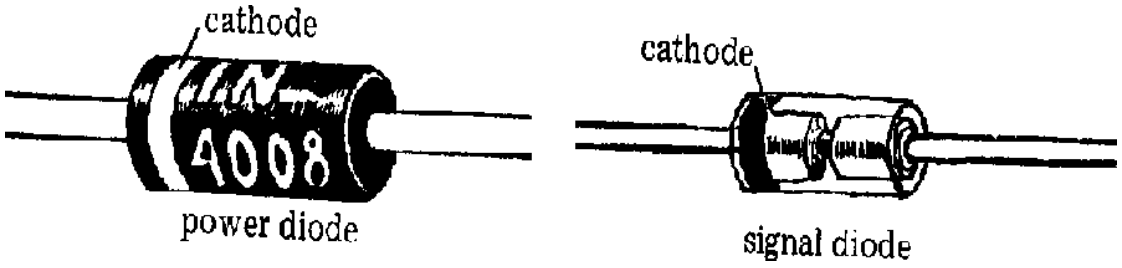
Wires are used to make connection between various mechanical components used in automatic hand brake system, which provide mechanical action to the system.

DIODE

The simplest semiconductor device is made up of a sandwich of P- type semiconducting material, with contacts provided to connect the p- and n-type layers to an external circuit. This is a junction Diode. If the positive terminal of the battery is connected to the p-type material (cathode) and the negative terminal to the N-type material (Anode), a large current will flow. This is called forward current or forward biased.

If the connections are reversed, a very little current will flow. This is because under this condition, the p-type material will accept the electrons from the negative terminal of the battery and the N-type material will give up its free electrons to the battery, resulting in the state of electrical equilibrium since the N-type material has no more electrons. Thus there will be a small current to flow and the diode is called Reverse biased.

Thus the Diode allows direct current to pass only in one direction while blocking it in the other direction. Power diodes are used in concerting AC into DC. In this, current will flow freely during the first half cycle (forward biased) and practically not at all during the other half cycle (reverse biased). This makes the diode an effective rectifier, which convert ac into pulsating dc. Signal diodes are used in radio circuits for detection. Zener diodes are used in the circuit to control the voltage.



Some common diodes are:-

1. Zener diode.
2. Photo diode.
3. Light Emitting diode

1. Zener Diode:-

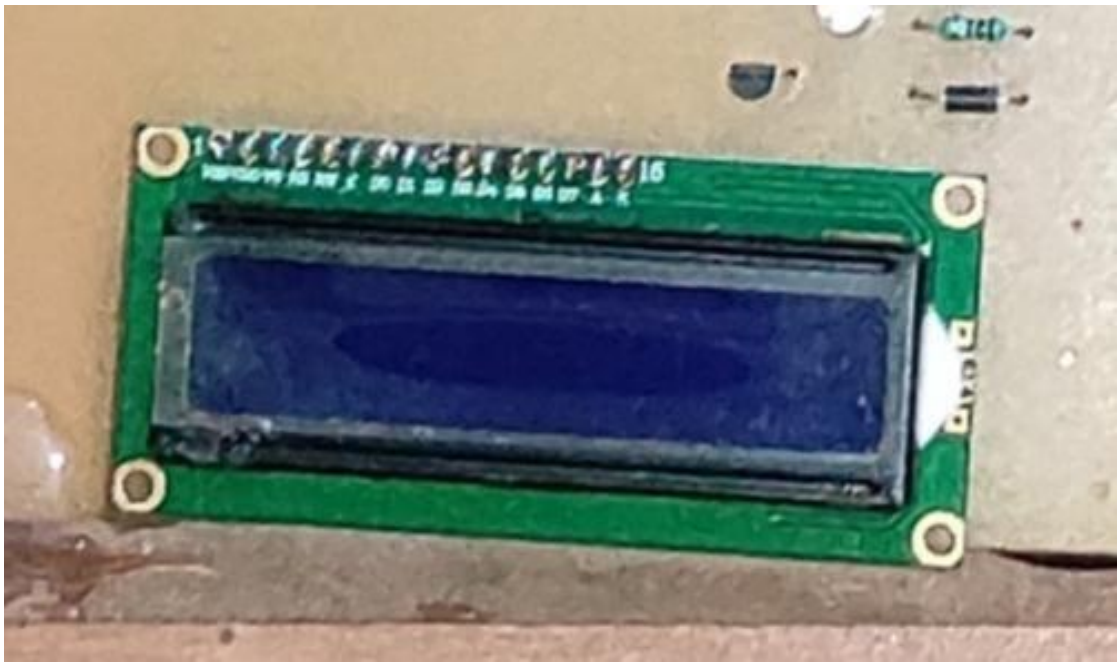
A zener diode is specially designed junction diode, which can operate continuously without being damaged in the region of reverse break down voltage. One of the most important applications of zener diode is the design of constant voltage power supply. The zener diode is joined in reverse bias to D.C. through a resistance R of suitable value.

2. Photo Diode:-

A photo diode is a junction diode made from photo- sensitive semiconductor or material. In such a diode, there is a provision to allow the light of suitable frequency to fall on the p-n junction. It is reverse biased, but the voltage applied is less than the break down voltage. As the intensity of incident light is increased, current goes on increasing till it becomes maximum. The maximum current is called saturation current.

3. Light Emitting Diode (Led):-

When a junction diode is forward biased, energy is released at the junction diode is forward biased, energy is released at the junction due to recombination of electrons and holes. In case of silicon and germanium diodes, the energy released is in infrared region. In the junction diode made of gallium arsenate or indium phosphide, the energy is released in visible region. Such a junction diode is called a light emitting diode or LED.



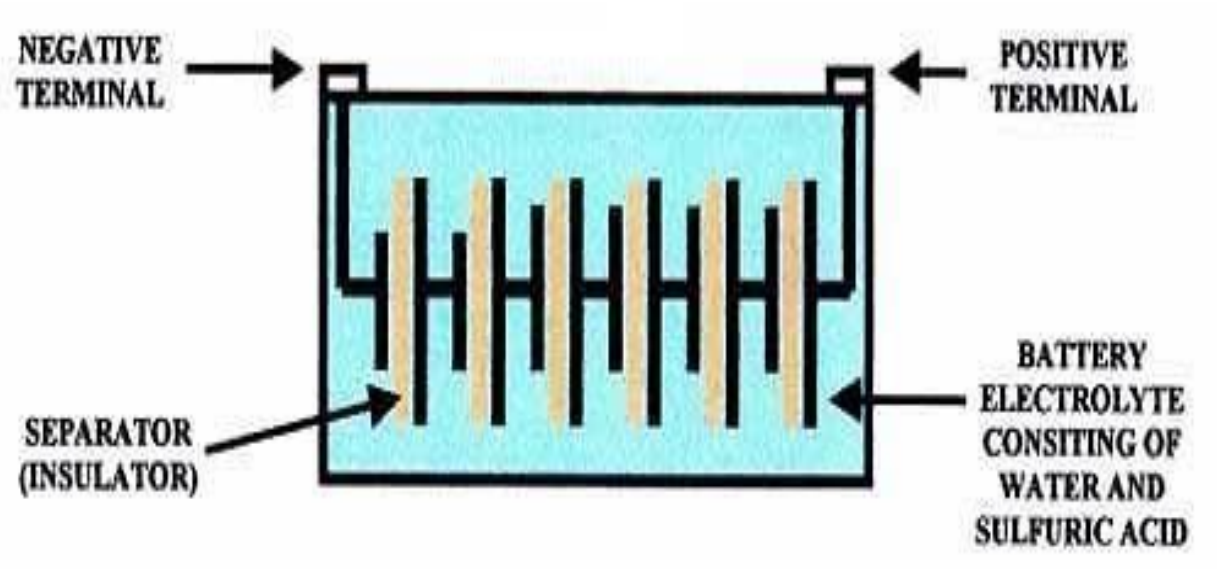
Batteries

Lead Acid batteries have changed little since the 1880's although improvements in materials and manufacturing methods continue to bring improvements in energy density, life and reliability. All lead acid batteries consist of flat lead plates immersed in a pool of electrolyte. Regular water addition is required for most types of lead acid batteries although low-maintenance types come with excess electrolyte calculated to compensate for water loss during a normal lifetime.

Battery Construction

Lead acid batteries used in the RV and Marine Industries usually consist of two 6-volt batteries in series, or a single 12-volt battery. These batteries are constructed of several single cells connected in series each cell produces approximately 2.1 volts. A six-volt battery has three single cells, which when fully charged produce an output voltage of 6.3 volts. A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts.

A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between. The plates are enclosed in a plastic battery case and then submersed in an electrolyte consisting of water and sulfuric acid. Each cell is capable of storing 2.1 volts.



Front vs. Rear Brake

The relative effect of the front vs. rear brakes was not understood for many decades, and cautionary messages to avoid use of the front brake were common. It is now realized that the front brake does almost all the work; at least 75% and as much as 90% depending on wheelbase, weight distribution, tire size, speed &c. Original rear drum brakes are frequently sufficient in type, size and mechanical advantage for competition purposes, although a change in lining material may prove helpful, and additional cooling for sustained use.

Under braking weight transfers forward, which relieves the rear wheel of most weight and reduces rear wheel traction. This is not due entirely to front suspension compression, &c. (although this a contributing factor) and takes place even in rigid frames with no suspension travel. Shorter wheelbase machines with high centers of gravity have greater weight transfer. The front wheel now has increased traction, and can accept much more braking force before its traction limit is reached. All but the most advanced front drum brakes are inadequate for performance use, and even these can be improved to some extent.

Where to be implemented?

- Smart parking system will be implemented with four wheel drive system.
- Driver feel less stress in using this system when the braking will be automatically done.
- So that it can be easily operated in less time3
- The power for central motor will be supplied from battery of the car.
- Two separate motors is used to apply the brake automatically.

Brake Fluid

Brake fluid is a type of hydraulic fluid used in brake applications in motorcycles, automobiles, light trucks and some advanced bicycles. It is used to transfer force under pressure from where it is created through hydraulic lines to the braking mechanism near the wheels. It works because liquids are not appreciably compressible. Braking applications produce a lot of heat so brake fluid must have a high boiling point to remain effective and must also not freeze under normal temperatures. These requirements eliminate most water-based solutions.

In the USA brake fluid comes in a number of forms, standardized under by the United States Department of Transportation (DOT). DOT 2 is essentially castor oil; DOT 3, DOT 4, and DOT 5.1 are composed of various mineral oils, glycol esters and ethers; some are synthetic oil based, and DOT 5 is silicone-based. As of 2006, most cars produced in the U.S. use DOT 3.

Glycol based fluids are two times less compressible than silicone type fluids, even when heated. Less compressibility of brake fluid will increase pedal feel (firmness), but in either case this effect is minimal. The U.S. Army has used silicone brake fluid exclusively since 1982 successfully. Glycols are hygroscopic and will absorb water from the atmosphere, reducing the boiling point of the fluid and degrading hydraulic efficiency. Changing fluid on a regular basis will greatly increase the performance of the brake system, but this is often not a concern in passenger cars. On the other hand, changing fluid at least every several years will preserve the life of brake system components (by removing accumulated water and other contaminants) and increase the overall reliability of the brake system.

Polyethylene glycol and other brake fluid ingredients may be corrosive to paint and finished surfaces such as chrome and thus care should be taken when working with the fluid. Additionally, polyethylene glycol, in the concentrations found in DOT brake fluids, reacts violently, producing a large fireball, with some household chemicals, notably pool care products.

Hotwheelscollectors.com cites that hobby modellers use brake fluid as a safe (if somewhat slow) paint stripper. It is less likely to harm skin and will not harm plastics.

Working

As the ignition start, the front wheels start rotating and with the help of rotating motor attach with the rotating shaft. the wheels move in both direction clockwise as well as in anticlock wise direction. a power suppy is attach with motor to provide continious electricity to motor. as ignition stops, with in one or half second the brake will apply automatically with the help of braking motor attach with the brake. the application of brake is so quick due to which this mechanical system is so efficient.power supply is provided by the transformer, when excess amount is enegry deliver than capacitor is used to store the extra amount of enegry.

Key Features

- It can be a solution for car braking problem at congested place.
- Easy braking
- Cheap
- Simple mechanism
- Less time consuming

Advantages

- Improved company faith over customer.
- Reduces accident chances.
- Ensures safety of car driver.
- Improve industry goodwill in the market.
- Improves company's profit.

Disadvantages

- Very costly due to automation.
- Should not be adopt in every vehicle. Some time if brake should not work at necessity time it is so dangerous.

Conclusion

- In roads it saves human life due to their optimum technique develop by the industry and provide maximum faith to the customer by the company.
- It is used in various industries such as automobile, aerospace and heavy machinery plants.
- It is costly in nature , hence cannot be adopted by all the plants of automobile to installed in the cars.

Biblography

1) https://www.google.com
2) 2.https://www.vickypedia.com
3) www.final-yearproject.com

Books

a) S.chand(TOM)
b) P.K. Neg(Automobile engg)