

DESIGN AND FABRICATION OF REGENERATIVE BRAKING SYSTEM

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ABSTRACT

Now a day's electric vehicle plays main role of alternate fuel. Here battery is used as an alternative fuel. In our project we use the electric motors to the vehicle to propel the vehicle. The input power of the motor given by battery. But main disadvantage is battery store the electric charge. So we introduce the method of regenerative of electricity from the motor or wheel. The power produced from the wheel or motor is stored into battery then again used to run the motor

KEYWORDS: Regenerative Braking System, Braking System, Brake modification

I. INTRODUCTION:

A. Conventional Braking System in Automobiles:

The term 'Braking' in a moving vehicle means the application of the brakes to reduce its speed or stop its movement, usually by depressing a pedal. The braking distance is the distance between the time the brakes are applied and the time the vehicle comes to a complete stop.

friction is used to counteract the forward momentum of a moving vehicle. As the brake pads rub against the wheels or a disc that is connected to the axles, excessive heat energy is created. This heat energy dissipates into the air, wasting as much as 30 percent of the vehicle's generated power. Over time, this cycle of friction and wasted heat energy reduces the vehicle's fuel efficiency. More energy from the engine is required to replace the energy that was lost by braking

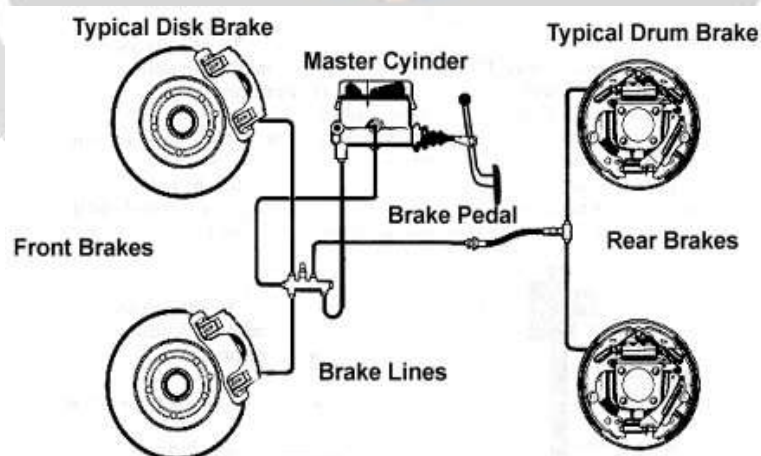


Fig.1: Conventional Braking System in Four Wheeler.

B. Regenerative Braking System in Automobiles:

Most of us only think about brakes when a panic stop occurs ahead in traffic and all we see are brake lights and the undersides of cars. These near emergencies illustrate how important brakes are to our safety. Brakes are also a vital part of high performance, as any racer can tell you. Because everyone wants higher performance

and safety, brakes deserve a great deal of attention, we not only want our car to go fast, but it should also stop quickly and safely.

Regenerative braking refers to a process in which a portion of the kinetic energy of the vehicle is stored by a short term storage system. Energy normally dissipated in the brakes is directed by a power transmission system to the energy store during deceleration. That energy is held until required again by the vehicle, whereby it is converted back into kinetic energy and used to accelerate the vehicle.

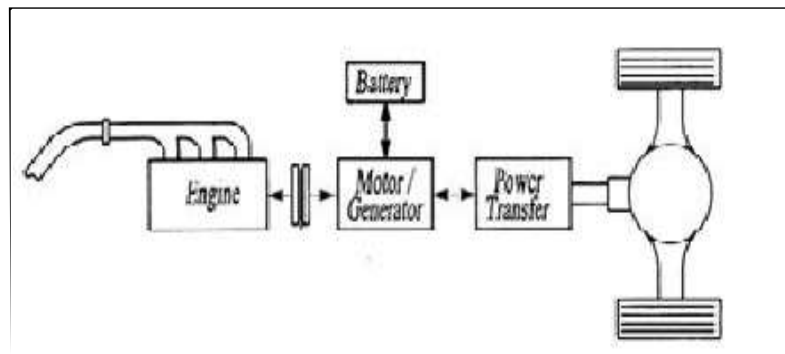


Fig.2: Simple Regenerative Braking System.

II. LITERATURE REVIEW:

[1] Anchal Kumar, Pulkit Gupta, Sandeepan Deb & Shay Pohjujy (Regenerative Braking system (RBS) future Braking system) (May 2014) Vol.2, Issue 5: Regenerative braking systems (RBS). When driving an automobile, a great amount of kinetic energy is wasted when brakes are applied, which then makes the start up fairly energy consuming. The main aim of this project was to develop a product that stores the energy which is normally lost during braking, and reuses it. The use of regenerative braking system in automobiles provides us the means to balance the kinetic energy of the vehicle to some extent which is lost during the process of braking. Also, Electric Motor is used to convert Kinetic Energy into electrical energy.

[2] Siddharth K. Patil (Regenerative Braking System in Automobiles) (May-Oct 2012) Vol. 2, Issue 2: Regenerative braking system can convert the kinetic energy into electrical energy with help of electric motor. And it can also convert the kinetic energy into mechanical energy, which is supplied to the vehicle whenever it is needed, with the help of a flywheel.

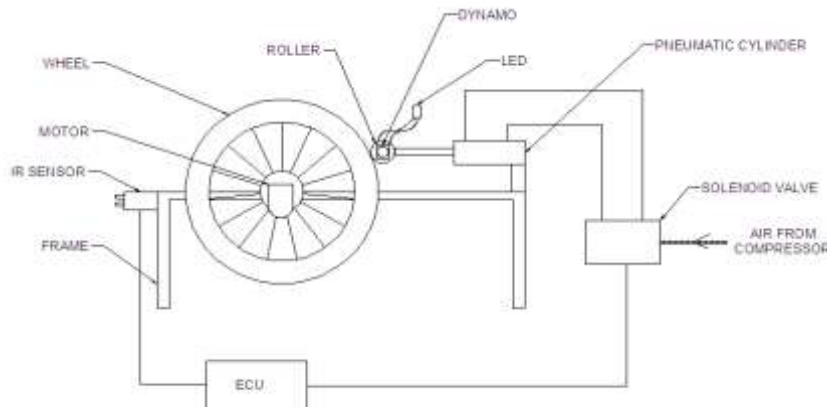
[3] Tribhuwan Singh & Shahzad Ali, (See saw based regenerative power system) (February 2016): The research has shown that the proposed regenerative braking system is significantly better in recovering energy and slowing the vehicle compared to a commercially available regenerative braking system. Regenerative Braking System (RBS) is an efficient system to reduce vehicle emission and fuel consumption. RBS is a system which converts mechanical energy to electrical energy during braking action.

[4] Yogesh Abhale & Prateek Nigam (Review on Regenerative Braking Methodology in Electric Vehicle) (July 2015) Vol. 4, Issue 7: Conventional braking techniques have lot of wastage of energy during the braking in form of heat. Thus regenerative braking is the prime method to be focus as it is energy saving method. It increases efficiency of electric vehicle by saving of waste energy. In regenerative braking mode of electric vehicle, the kinetic energy of wheels is converted into electricity and stored in batteries

III. WORKING OF REGENERATIVE BRAKING SYSTEM:

[1] The construction diagram is shown in the blow diagram. The working of the regenerative braking system depends upon the working principle of an electric motor, which is the important component of the system. [2] Initially the IR sensor is to sense the object then send signal to ECU which is the brain of our project. This control unit is send command to solenoid valve which is supply pneumatic to the cylinder. [3] The pneumatic cylinder is connected with small wheel which has a dynamo and LED. When object is presenting in front of the vehicle the pneumatic cylinder makes forward direction to makes contact with the wheel by small roller wheel.

[4] This small wheel is to rotate to stop the vehicle wheel using friction force The mechanical rotary motion is converted in to electrical energy by using dynamo which can be visible by LED.



IV. WORKING DIAGRAM:

Fig.3: Working of regenerative braking system.

V. CONVERSION OF KINETIC ENERGY TO ELECTRICAL ENERGY BY USING ELECTRIC MOTOR:

Electric motor gets activated when some electric current is passed through it. But, when some external force is applied to activate the motor, then it behaves as a generator and generates electricity.

This means that whenever motor runs in one direction, the electric energy gets converted into mechanical energy, which is then used to accelerate the vehicle and whenever the motor runs in opposite direction, it performs functions of a generator.

which then converts mechanical energy into electrical energy, which makes it possible to utilize the rotational force of the driving axle to turn the electric motors,

which results in regenerating electric energy for storage in the battery and simultaneously reducing the speed of the car with the regenerative resistance of the electric motors. This electricity is then used for recharging the battery.

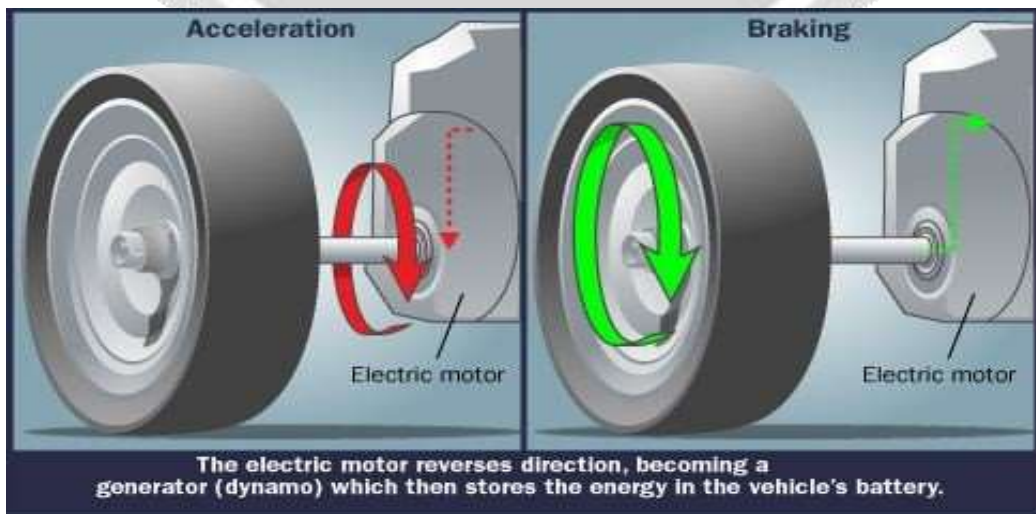


Fig.6: Operation of an Electric Motor.

VI. APPLICATIONS OF REGENERATIVE BRAKING SYSTEMS:

- [1] Regenerative braking is used in some elevator and crane hoist motors.
- [2] Regenerative Braking Systems are also used in electric railway vehicle (London Underground & Virgin Trains).
- [3] Recovering Kinetic energy of vehicle lost during braking process.

VII. ADVANTAGES OF REGENERATIVE BRAKING SYSTEMS:

- [1] Better fuel economy
- [2] Reduced CO2 emissions
- [3] Reduction in Brake Wear- Reducing cost of replacement brake linings, cost of labour to install them, and vehicle down time
- [4] Reduction in Engine wears
- [5] Improved Fuel Economy

VIII. LIMITATIONS OF REGENERATIVE BRAKING SYSTEMS:

- [1] Regenerative braking is necessarily limited when the batteries are fully charged
- [2] Increases the total weight of vehicle by around 25- 30 Kilograms.

IX. FUTURE SCOPER:

Regenerative braking systems require further research to develop a better system that captures more energy and stops faster. As the time passes, designers and engineers will perfect regenerative braking systems, so these systems will become more and more common. All vehicles in motion can benefit from these systems by recapturing energy that would have been lost during braking process. Future technologies in regenerative brakes will include new types of motors which will be more efficient as generators, new drive train designs which will be built with regenerative braking in mind, and electric systems which will be less prone to energy losses. Future technologies in regenerative brakes will include new types of motors which will be more efficient as generators, new drive train designs which will be built with regenerative braking in mind, and electric systems which will be less prone to energy losses.

X. CONCLUSION:

The regenerative braking system used in the vehicles satisfies the purpose of saving a part of the energy lost during braking. Also it can be operated at high temperature range and are efficient as compared to conventional braking system. Regenerative braking systems require further research to develop a better system that captures more energy and stops faster. All vehicles in motion can benefit from these systems by recapturing energy that would have been lost during braking process. The use of more efficient systems could lead to huge savings in the economy of any country.

REFERENCES:

- [1] Anchal Kumar, Pulkit Gupta, Sandeepan Deb & Shay Pohjuy (Regenerative Braking system (RBS) future Braking system) (May 2014) Vol.2, Issue 5.
- [2] Siddharth K. Patil (Regenerative Braking System in Automobiles) (May-Oct 2012) Vol. 2, Issue 2.
- [3] S.J. Clegg, "A Review of Regenerative Braking System", Institute of Transport Studies, University of Leeds, Working paper of 471, 1996

[4] Tribhuwan Singh&Shahzad Ali, (See saw based regenerative power system) (February 2016).

[5] Yogesh Abhale & Prateek Nigam (Review on Regenerative Braking Methodology in Electric Vehicle) (July 2015) Vol. 4, Issue 7

