

The Study of Brakes and the Regenerative Braking System

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ABSTRACT: In current years, the worries about environmental effects of traditional car Internal Combustions Engine have led to improvement and growth of the electric vehicle (EV). The evolution of the RBS has led to the need to increase overall vehicle performance (RBS) whenever driver applied the brake the energy is completely loss in the form of kinetic energy due to friction loss between wheel of vehicle and road. By the use of regenerative braking this energy store in the form of electrical energy into a battery which increased the efficiency of an engine. This paper focuses on braking system, types of braking system and RBS, types of RBS, need of RBS and application of RBS and how RBS help to increase the efficiency of electric vehicle. They have various car which using RBS and for future there are many company who can use this type of RBS for increased the efficiency of an engine.

KEYWORDS: Brakes, Braking, Electric, RBS, Vehicle.

INTRODUCTION

A 4-wheeled vehicle, commonly known as motor car or automobile, is normally constructed primarily for transport of passengers and is powered by an internal combustion engine which uses a fuel that is volatile. Braking system in cars decelerate in moving vehicles, which implies that brakes can slow or halt their movement, generally by pushing a pedal. Braking distance is the period between the time brakes applied and time stoppages for the vehicle.

Classification of Braking System:

Braking system are defined on following basic:

- On Power Source Basis
- On Frictional Contact Basis
- On Application Basis
- On Brake Force Distribution Basis

1.1.1. Mechanical Brakes:

In this sort of the braking method, brake applied load by driver on the pedal shifted to the final brakes disc or drum rotor via a variety of mechanical links such as cylindrical rod, springs fulcrums, and so on in order to decelerate and stop car[1].

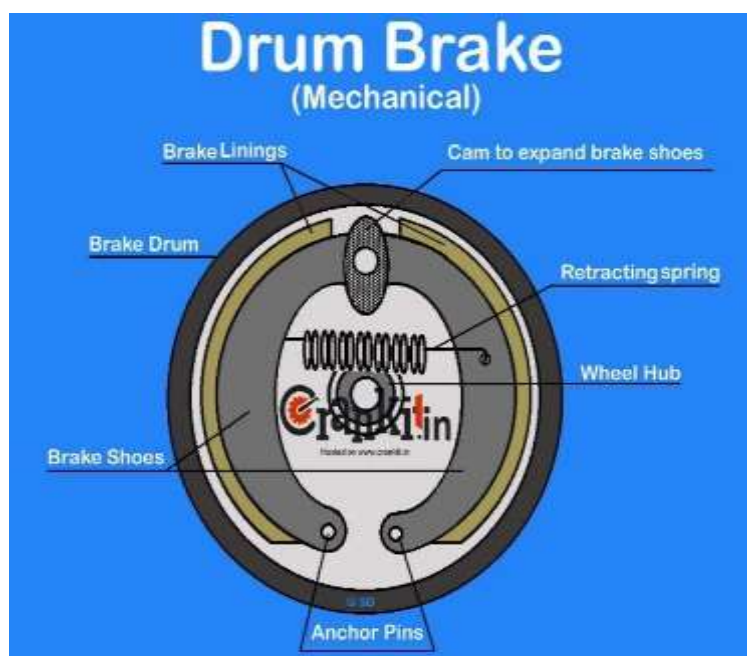


Fig. 1: Mechanical Drum Brake in that Brake Applied Load by Driver on the Pedal Shifted to the Final Brakes Disc or Drum Rotor.

1.1.2. Hydraulic Brakes:

The brake power employed by driver on the pedal is 1st transformed in to hydraulically pressure from the master cylinders, and then that hydraulic pressures are transported from the master cylinders to the final brakes disc or drum rotors via brake lines, as shown in Figure 2[2].

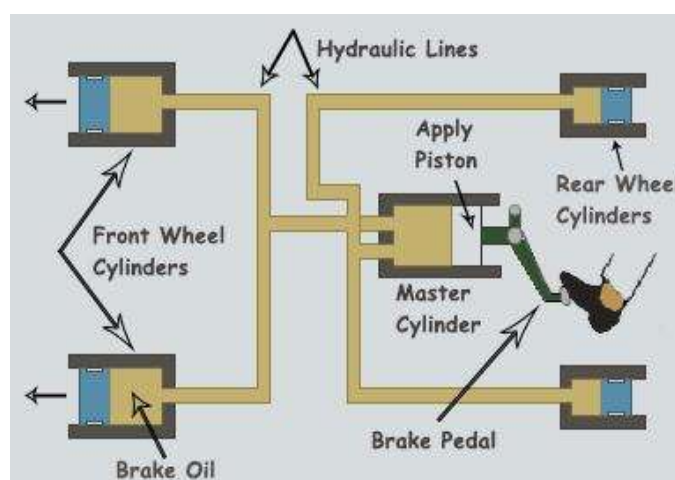


Fig. 2: Hydraulic Brake in that Brake Power Employed by Driver On the Pedal is 1st Transformed in to Hydraulically Pressure From the Master Cylinders .

1.1.3. Air or Pneumatic Brakes:

The brake pedal power is supplied by valves and compressors in this system from the pedal to the final disc or drum rotor. Since high-braking forces cannot be carried over longer distances by hydraulic brakes and pneumatic frequencies that provide more braking force than by hydraulic breaks, air brakes are used in huge vehicles such as buses and trucks[3].

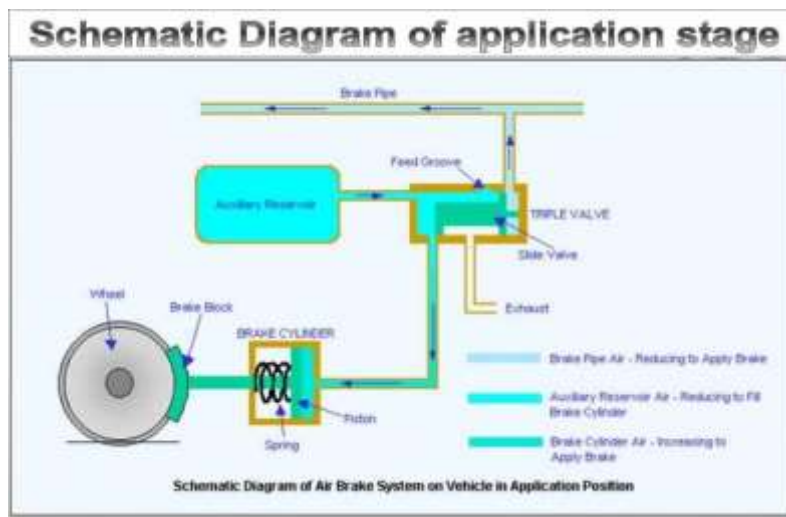


Fig. 3: Air Or Pneumatic Brakes from Pedal to Final Disc or Drum Rotor by Valves and Compressors in that System .

1.1.4. Vacuum Brakes:

The pressure in the brake line leads to a change in the brake pad, which stops or accelerates the automobile in turn. Figure 4 illustrates the primary cylinders, exhaust systems, valves and brake pads, disc or drum and any other important components of a vacuum braking system[4].

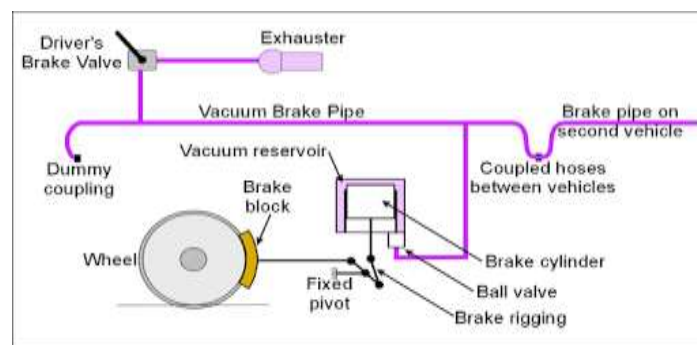


Fig. 4: Vacuum Brakes in which the Vacuum inside the Brake Lines in causes the Brake Pads to Shift, which Ultimately Stops or Accelerates the Vehicle in turn .

1.1.5. Magnetic Brakes:

The magnet field generated by the permanent magnets in this braking system is used in a braking system to create brakes in the vehicle. The idea is that we make eddy current when we drive a magnet through a cogenerate tube and the magnetic field created by eddy currents brakes as seen in Figure 5[5].

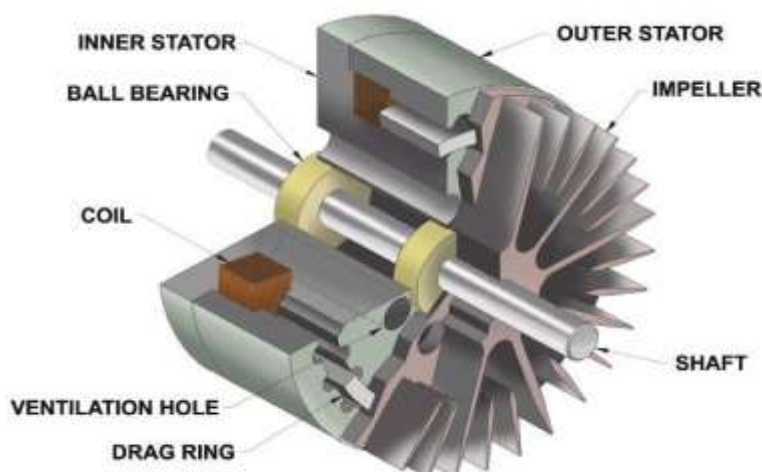


Fig. 5: Magnetic Brake in that Magnetic Field Produced by the Permanent Magnets is Use in Braking System to Cause Vehicle for Brake.

1.1.6. Electrical Brakes:

This is a kind of brake used on electric cars which, as illustrated in Figure 6, produces braking by electric motors and is further characterised by three types[6]:

- 1) Plugging Brakes:
- 2) Regenerative Braking:
- 3) Dynamic or Rheostat Braking

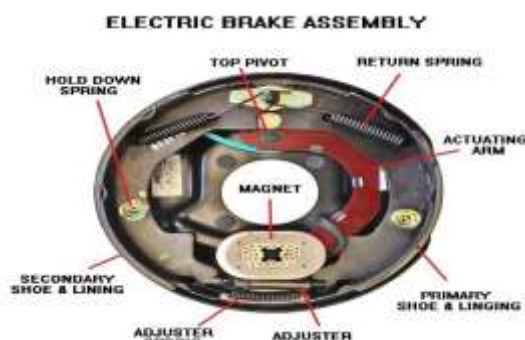


Fig. 6: Electrical Brake In Electric Vehicles that Creates Braking Using Electric Motors [7] .

1.1. On Frictional Contact Basis:

In order to speed up or stop vehicles below, there are two forms of frictional contact:

- (1) The internal expanding brake or drum brake
- 2) Disc Brake or Brake External Agreement

1.2.1. Drum Brakes or the Internal Expand Brake:

These are braking systems, in which the disc rotor is installed on the wheel hub so that it spins with the wheel instead of a drum component and the rotor is a clamping between the calliper permanently fixed upwards and downwards, as seen in Figure 7[8]. Figure 7 shows.



Fig. 7: Drum Brake in which Actuation Mechanism Contracts the attached Brake Shoes when the Brakes are Applied.

1.2.2. Disc Brakes or the External Contract Brake:

They are braking systems where the rotor attached to the wheel hub as an alternative to drums is permanently fixed between the callipers by using car knuckles (or the straight ones), in a way that spins the wheel, as shown in Figure 8. They are braking systems. Box and mechanism of the brake shoes are inserted in the calliper[9].

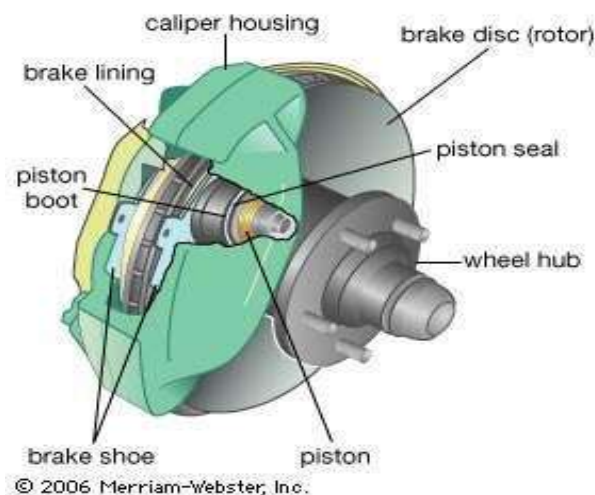


Fig. 8: Disc Brake In Wherein, Alternative of Drum Fabrication, Rotor Attach to wheel Hub is Clamped between Callipers[10].

On Brake Force Distribution Basis:

They have also 2 types of distribution basis brakes are given below:

1.3.1. Single Acting Brakes:

This type of braking is because the braking forces may be sent to any pair of wheels or a single wheel using a single control system, as shown in Figure 9 Braking force is also used to communicate the braking forces.

1.3.2. Dual Acting Brakes:

As seen in Figure 9 this braking mechanism is used by a dual actuators to transmit the brake force to both vehicle wheels. Double working cylinders change the cycle of pressurised liquids both at the piston side, producing extended strength and retracting force for the piston rod which makes more control possible.

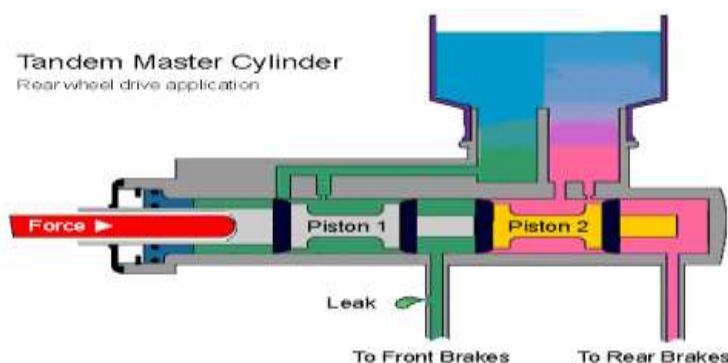


Fig. 9: Dual Acting Brake in which the Brake Force is transmitted via a Dual Actuation System to both Wheels of the Vehicle.

2. Basic Idea of Regenerative Braking System:

A RBS is used for powering pure electric cars. This gadget has an electrically powered motor. The motor functions as a generator and battery charger while the breaks are applied. Thermal frictional energy has been transformed to the useable braking energy.

Electric RBS

The system comprises of an electric motor which works as the generator and the motor in the electric system powered exclusively by an electric motor (Figure 10). This system's key components.

- 1) Generator or Motor
- 2) Engine
- 3) Batteries
- 4) Electronic controls system

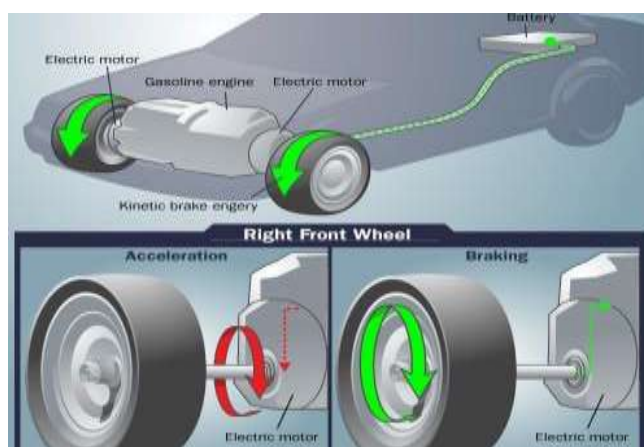


Fig. 10: Electric Regenerative Braking when the System is Cruising the Power is supplied by the Motor.

LITERATURE REVIEW

They have several researchers studying and experimenting the RBS and RBS mechanism, the few analyzers and researchers presented below are: Vishesh Verma investigates several regenerative braking systems with a view to improving vehicle performance and different means of storing regenerated energy. The improvement in fuel saving is evaluated with regenerative braking by several models. It offers scientific expertise with regeneration braking to enhance automotive fuel efficiency and compares the RBS effect on fuel and regenerative cycle performance.

Yogesh Abhale et al. are studying that the kinetic energy of the wheels are turned into electricity and placed in condensers or batteries in the electric vehicle's regenerative brake system. The usage of flywheels, DC DC transformers, ultra-condensers, is intensifying this process.

An EV version from Saharat Chanthanumataporn et al. investigation is modified from an internal ignition engine vehicle. The performance of the regeneration method is evaluated by three regenerative technologies, namely unmodified braking system, altered braking method with competitor ABS signals, and modified braking classification with brake fluids delivered in the master cylinders.

DISCUSSION

They have a great advantage over non-electric vehicles in electric vehicles one of the advantages is the breakage system differentiation. Whenever the driver uses the brake the energy is fully loosened by kinetic energies in the case of non-electric vehicles because of the loss of friction between wheels, but in the electric vehicle, the energy, which is loss, is stored in a battery in the form of electrical energy, using it to charge the battery which is used further for driving the vehicle. On dampo systems, the intended technique is evaluated by i-MiEV and regenerative energy is increased to 18 percent. Thus the efficiency of an engine for the future automobile with a regenerative kind of braking system will also grow by increasing the regenerative energy.

CONCLUSION

The RBS utilised in automobiles is designed to save some of the energy wasted during the braking process. The RBS aims to restore battery charges partially lost. Braking method for the vehicle. Energy is transformed into heat by the friction brakes dispersed in the environment which utilise energy to rotate the rotor and rotate the mechanical energy of wheels into useable battery charges. There is a variety of vehicles that utilise RBS and those vehicles store the fine energy that losses due to the frictional loss between a wheel and a traffic, and enhance an engin's efficiency by storing energy in the form of electricity in a battery.