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DESIGN AND DEVELOPMENT OF VERTICALLY MOUNTED MASTERCYLINDER FOR GRAVITY FEED EFFECTIVE BRAKING SYSTEM

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Abstract— According to the first law of motion in the physical universe, energy can only undergo transformations. This procedure results in the release of a massive amount of heat into space. If there was a means to capture this energy that is now being wasted, we could use it when we accelerate again. What we call "regenerative braking" is really a system that lets cars temporarily store their kinetic energy as accumulative energy when they brake, which they may subsequently use to speed up or even run again. Although regenerative braking is just a small step towards a future devoid of fossil fuels, it is a huge improvement over where we are now. Using these brakes, you can convert a vehicle's kinetic energy into something else, which you may then use immediately or store for later. Thus, electric trains may reuse the electricity they generate while braking, while electric vehicles that run on batteries or have a hybrid powertrain can store this energy for later use. Two further possible ways to store energy are by using compressed air or a rotating flywheel [1].
An Energy Regeneration Brake was installed in the 1967 AMC Amitron. A completely electric vehicle, this urban concept automobile ran on batteries that were recharged by regenerative braking.

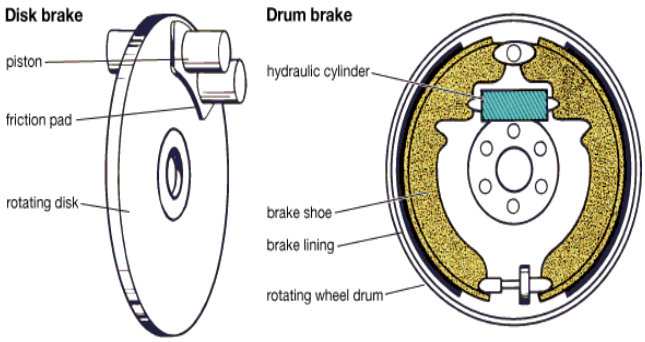
II. TYPES OF BRAKES

III. Long-lasting batteries • Frictional brakes, the most common kind, do not need any form of external charge. These brakes considerably lengthen the time it takes for ZEVs to be recharged. Regenerative braking is one way that electric vehicles may extend their driving range. To further improve their fuel economy, this technology is being used by more and more hybrid vehicles.

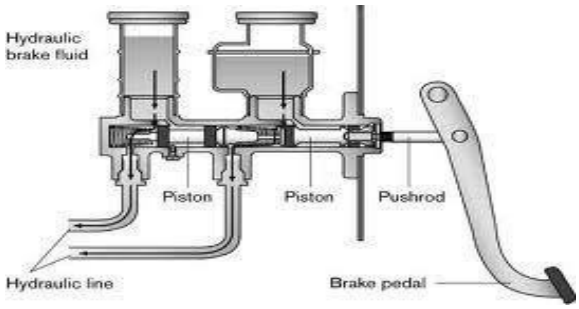
Keywords— Shaft Braking, Electromagnet, Eddy Current, Magnetic Field, Electromechanical, Current, Electromagnet

I. INTRODUCTION

Regenerative brake is an energy recovery

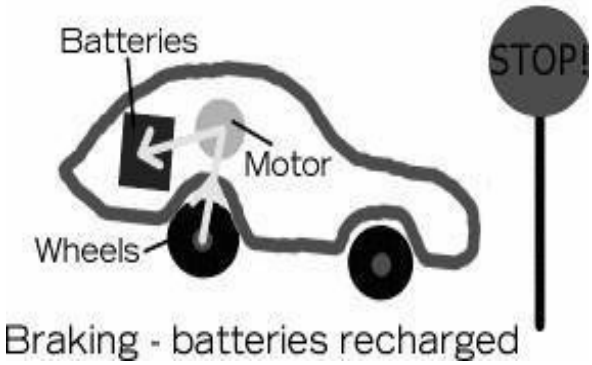


divided into two primary categories: "shoe" or "pad" brakes that use an explicit wear surface, and hydrodynamic brakes, similar to parachutes, that utilise friction in a working fluid. Nevertheless, the term "friction brake" is often reserved for pad/shoe brakes and does not include hydrodynamic brakes.
friction.
Pumping brakes are often used in machines that already have pumps incorporated into them. The braking effect that may be generated by an internal combustion piston engine when the fuel supply is interrupted is a prime example of this. Some engines employ a valve override called a Jake brake to significantly increase pumping losses. Dissipating energy as heat and recharging it are the two primary functions of pumping brakes.



III. BASIC IDEA OF GRAVITYFEED EFFECTIVE BRAKES

Electric motors coupled to batteries are what drive electric trains, automobiles, and other EVs. As we go, kinetic energy is generated by the transfer of energy from the batteries to the motors, which in turn drive the wheels. When we use the brakes, the procedure is reversed: the power to the motors is switched off by electrical circuits. Our forward motion and kinetic energy cause the wheels to rotate the motors, which in turn cause the motors to act as generators and begin generating power in Hydraulic pressure reservoirs have magnetic linings as their outside surfaces.



accumulator.

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electromagnetism operates. The lining is the sole one that the electromagnetic energy is directed at. A magnetic liner made of iron is fastened to the wheel of the vehicle or any piece of equipment that is meant to stop. When the wheel stops moving, it's because the electromagnetic braking force stopped the moving lining or iron plate.

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THE MOTOR AS A GENERATOR

IV. In regenerative braking, an electric vehicle's motor doubles as a generator while the vehicle is in motion; this energy is then transferred to an electrical load, causing the brakes to be applied. A technique to recoup some of the energy lost after stopping is regenerative braking, which is available in hybrid gas/electric cars. While operating in electric mode, the motor of an EV is powered by energy stored in a battery [3][5]. Deceleration is a crucial phase for recharging and maintaining kinetic energy.

While running at low loads, in order to absorb the engine's excess energy

V. METHODOLOGY

Electromagnetism

Among the four basic modes of communication used by nature, electromagnetism is one. The other three are enticing energy, helpless collaboration, and solid communication. The interaction of electrically charged particles is called an electromagnetic field, and the force that causes this interaction is electromagnetism.

Magnetic Effect of Current

By definition, "a current flowing in a wire produces a magnetic field around it" is what a phrase like "magnetic effect of current" means. The theory of the magnetic effect of current was first proposed by Oersted in 1820. Based on what Oersted found, a wire that carries electricity may redirect a magnetic needle.

Electromagnet

Using an electric current is one method to make a magnet, which is referred to as an electromagnet. The ability of an electromagnet to work is due to the magnetic influence of current. The discovery that a soft iron rod, or core, may be placed within a solenoid to generate an extremely strong magnetic field is based on the fact that iron ore is magnetised by induction.

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Eddy Current

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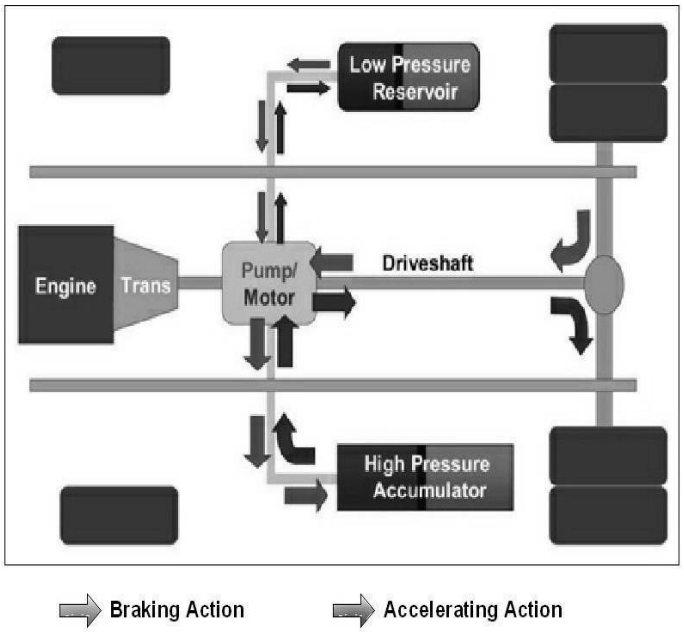
Vol 18, Issue 1, 2024

An eddy current is a phenomena where the current flows in a circular pattern due to a change in the magnetic field within a conductor, as stated by Faraday's law of induction. Closed loops along lines of magnetic field carry eddy currents via conductors. The phenomenon known as an eddy current arises from Lenz's law, which asserts that an eddy current's magnetic field will be of opposite intensity to its source. Using this phenomena, eddy current brakes may quickly stop spinning power equipment when turned off. The energy that is transmitted from the current via the resistance of a conductor is also lost as heat inside the material, according to Faraday's law of induction. Closed loops along lines of magnetic field carry eddy currents via conductors. The phenomenon known as an eddy current arises from Lenz's law, which asserts that an eddy current's magnetic field will be of opposite intensity to its source. Using this phenomena, eddy current brakes may quickly stop spinning power equipment when turned off. Another kind of energy that is lost by the material when a current flows through a conductor but encounters resistance is heat.

Working

Basically, this project was to review and analyze the electromagnetic braking system as a secondary measure for the hydraulic braking system. First, the base for the electromagnet and the stand for fitting the wheel are created. Then, a wheel is made and attached to the spook whereas the spook is attached to the stand by the help of bearings.

An electromagnet is made by winding the copper wire with the cylindrical body and attached to its base. Furthermore, aU shaped metal rod is welded with a L shaped metal bar forming a brake shoe and then its end are rest inside the electromagnet



1. Magnetic force produced (B)=μIN

$=4\pi*10^{-7}*7*4000$

=0.0351 T which is magnetic force produced by one electromagnet as we are using two electromagnets. So our total force will be, Total Magnetic force (B)=2*B

=0.0703 T.

2. Resistance of wire(R)=ρL/A

$=1.7*10^{-8}*10/0.503$

=0.337 Ω

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Vol 18, Issue 1, 2024

VI. MECHANICAL ASPECTS OF GRAVITY FEED BRAKING

The energy of a flywheel can be described by this general energy equation, assuming the flywheel is the system:

- E_{in} is the energy into the flywheel.
- E_{out} is the energy out of the flywheel.
- ΔE_{system} is the change in energy of the flywheel.

Assumptions

The variables I, N, A, G, R, L, ρ, and T stand for current, number of turns, cross-sectional area, resistivity of copper, length of copper wire, and duration in seconds, respectively.

Observations

Time required to stop the rotation of wheel without applying brake= 4.9 seconds

Time required to stop the rotation of wheel with applying brake= 3.1 seconds

VII.Applications

According to researches, the companies that operate long rail

- The model is not in account of load and frictisoynst.em lines are the major customers of the energy market.
- The cross-section of copper wire is uniform Therefore, most of the transportation companies are integrating
  throughout its length.
- The data are taken in room temperature.
- All the types of vibrations are neglected.

Calculation

systems for railway operations that include regenerative braking technology. More efficient use of petrol by road vehicles is another something that has been sought for.
Additionally, Hydraulic Hybrid Vehicle (HHV) technology has been gaining more and more attention. Significant advantages from regenerative braking are made possible by the intrinsic power density of HHV.

reachable in vehicles with a larger mass. [8].

In order to prevent the traditional braking system from overheating and failing, this technology may also be used as an auxiliary braking system.

VIII. CONCLUSION

IX. It's possible that the end of the century will mark the peak sales period for cars driven by internal combustion engines. The use of alternative energy carriers such as compressed air, hydrogen fuel, electric batteries, and others is already gaining traction in the automobile sector. Although regenerative braking is just a small step towards a future devoid of fossil fuels, it is a huge improvement over where we are now. Batteries may be used for extended periods of time without an external charging thanks to these brakes. These brakes considerably lengthen the time it takes for ZEVs to be recharged. It is true that the Tesla Roadster and other totally electric cars could not have been made possible without this invention.[2] These cars can be charged using coal and other fossil fuels, but once they're on the road, they can operate on renewable energy alone, which is a significant increase.

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