

Design and Fabrication of Electromagnetic Braking System: A Critical Review

Mr. Vishwjeet V. Ambade ^a, Mr. Saurabh Kawale ^b, Mr. Pradeep Harinkhede ^c, Mr. Nilesh Thakre ^d, Mr. Saroj Patle ^e Mr. Manish Dolas ^f,
Asst. Professor, Mechanical Engineering Department, Tulshiramji Gaikwad Patil College of Engineering and Technology, Nagpur, Maharashtra, India.
Student Mechanical Engineering Department, Tulshiramji Gaikwad Patil College of Engineering and Technology, Nagpur, Maharashtra, India.

ABSTRACT

In transportation engineering, several values are denied by impossibility, submission; inaccuracy over ambiguity. The electromagnetic braking brake system uses magnetic force to reduce or stop the speed of rotation of the wheels. The concept of electromagnetic braking comes with the blessings and barriers of caliper pressure and heat dissipation. The electromagnetic braking system relies on magnetic electricity to transport parts of the brake gadget. The device introduces the command that if the magnetic field is initiated inside the rotating disk, then the opposite side produces a modern eddy motion or rotation of the disc brake. Highlights of the electromagnetic braking machine are braking discs, solenoid, circuit board, sloping converter, and battery power. In other words, human operators, senders, drivers, and passengers, measure the context of a news situation using idiosyncratic information or linguistic evidence in common decisions. The braking device is an ancient example of speeding up the braking system at the same time and minimizing losses. In this paper, the focus is on comparisons between Electromagnetic brake machines and traditional exhaust braking gadgets. The focus of the Electromagnetic machine to improve the safety of the tool is currently to keep the loss to a minimum. The only purpose of the research is to look at the benefits of both structures in addition to exposing their ambiguity.

KEYWORDS: Electromagnetic braking, exhaust braking, eddy contemporary, Magnetic Force

I. INTRODUCTION:

This section introduces us to the tested subjects. It contains research history, research significance, research basis, scope, questions, ideas, purpose, and objectives.

A. Research Center:

The automotive business is a continuously evolving business with the rapid development of technical and operational features. With the advent of the latest and most powerful gadgets, the need to block these devices arises. Now it does not stop yet to increasing performance to the end to keep the power loss to a minimum. Typically, friction braking or exhaust braking is used in automobiles, a compact or exhaust system incorporates a collision mechanism to convert Kinetic friction forces into thermal forces that cause movement to be delayed. The stopping power generated with the help of a braking device is higher than the actual power generated by the engines. Today more engine power and greater demand for protection have led to the development of the Report: Electromagnetic 12345 (1) Report was generated on Monday, Apr 11, 2022, 06:29 PM Page 5 of 23 device to reduce accidents. The development of vehicle safety is one of the areas in the automotive industry that has been increasingly emphasized over time. The balance of pedestrian traf c on the road can be very good depending on the continued development of brake technology. Currently, to

improve the performance of the brakes and to have a minimal impact In the environment, car manufacturers are investing in the development of EMB (Electromechanical braking systems). Electromagnetic brakes that work bring about a reversal through electromagnetic induction inside the disc brake course opposite the rotation of the actual disc i.e. If the car is moving then the rotation of the disk may coincide with the movement of the clock (the reference frame comes from the left side of the car) then the magnetic eld may be opposite the clock. In this way, the brake movement is reduced by the brakes but there is no physical contact anyway. That is a modern concept. For this reason, electrical energy comes from the best energy used for a reason. As with any type of brake, thermal energy is produced in the brakes which must be applied to the surrounding areas but must be replaced or reduced. The brakes are essential for any car, and even the most versatile vehicle uses grid brakes and Electromagnetic brakes. This project typically focuses on the construction of a slow-moving machine, which can be a piece of fabric on a bicycle at a fast and easy adjustment. This device uses an electric motor that is directly connected to the car battery. Electromagnetic brakes are also known as electromechanical brakes or EM brakes and for small or steady movements that use electromagnetic compression to apply mechanical resistance

B. Importance of Research:

Electric brakes are a brand new concept. It is found that the electric brakes produce twice as much energy as the power produced by the engines, and 3 times more often than not. Types of brake systems Exhaust braking gadgets.

Drum brakes: For drum brakes, movement is delayed by the use of a brake pad connected to the inside of the wheel. Which brakes are applied and then the pad-lined pad is removed from the drum and a delay is considered.

Disc brakes: Disc brakes are a hydraulic type of braking machine. In this brake gauge where the brakes are driven fluid from the main cylinder produces pressure and this pressure is skipped by fluid strains. This fluid works hard on the slave cylinders, causing them to rub against the disc. Slave cylinder heads are also covered with a contrasting fabric to improve efficiency.

While braking action is enhanced by the use of electromagnetic induction rotation Electric brakes bring about the same action as the above-mentioned brakes for greater efficiency and efficiency. In this file, we look at studies conducted on a specific topic and various developments in the field of braking and the use of force with caution.

The development of vehicle safety is one of the areas in the automotive industry that has been increasingly emphasized over time. The stability of racing vehicles depends largely on the progressive development of brake technology. Currently, to improve brakes performance and have a less environmental impact, automotive manufacturers are investing in the development of EMB (Electromechanical braking systems). These braking systems are different in concept (Electromechanical braking systems). High torque is required to produce enough thrust that can be cut off when using these actuators. For this reason, in order to produce a lightweight, compact and efficient electromechanical braking system, the engine must be compact and thus need to be added to the compressor. Another factor to consider is the large vibration that the braking system receives due to its position. Too much torque causes a large attractive couple to produce enough pushes that may need to be broken when applying these brakes.

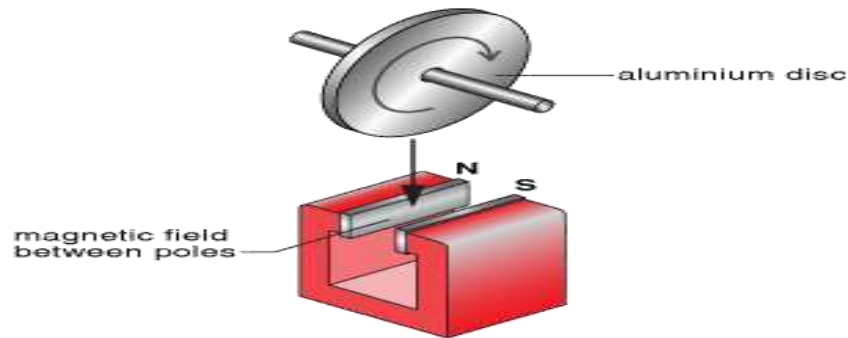


Fig 1. A disc between magnetic poles



Fig .2 Model brake setup

C. Research Rationale:

The layout of electromagnetic braking structures is a critical manner hobby. As a result, electronic automation is required to include braking structures. A survey of the literature on current developments and techniques for braking systems is obtainable. A number of the drawbacks of present methodologies are also tested, and the new study's emphasis areas are investigated. A meeting or a thing holds an element that ought to be machined. This meeting or issue is precise similarly. It must be certainly constructed to fit the contour of the product whilst additionally being well suited to the machining technique. This evaluation might cross over the basics and procedures, in addition to making plans, layout verification, and the way all of this could be related to the primary process.

D. Scope of research:

Electromagnetic braking machine has proven to be more reliable than braking systems, and even a small leak in the oil or air braking device may cause the brakes to fail completely. Because the side plates, coils, and shooting circuits are independently connected to each wheel in the brake machine, or it can be said that one coil fails, the brakes fail, failing completely due to the remaining three coils working properly. And this process requires a little bit of clear conservation. In addition, it has been noted that electric brakes make up about 80% of the total electricity produced by the brakes. Electric brakes, in addition to standard brakes, have been used as backing systems for large trucks. Frictions Brake is used sparingly and almost never reaches high temperatures. Brake linings will last a long time before you wish to be replaced, and a possible "brake fade" problem can be avoided. This improved braking system is now more effective at holding strong brakes but also in stopping injuries and reducing the risk of injury to a bit node. In addition electromagnetic brakes eliminate the

potential danger posed by the long-term use of excess heat to dissipate heat. Proper use of tools reduces production costs, a significant time for product development, and the time required for system development. The benefits outlined above are less effective, but the simulation techniques used in braking systems are also helpful. In addition, it becomes easier to provide value estimates for the production of business-related bids to customers and to set parameters as definitions of technical objectives, given that all of these are important within the business world processes (Huang, 2005).

Research issues:

The subsequent issues could be addressed utilizing the research:

Do electromagnetic braking systems improve usability to improve the person's level in?

Is developing EMB (Electromechanical braking systems) motivated by the need to improve braking capability even as having the least environmental impact?

Is the project's number one consciousness on growing a slowing mechanism that can be materialized in the bike at a Reasonable cost of maintenance?

E. Research assumption:

EBS (Electromagnetic braking system) improves customer experience and satisfaction.

F. Purpose and objective of the research:

The purpose of this study is to study electronic braking systems for the purpose of advising on the development and highlighting the benefits of high-quality buildings.

Objectives:

Exploring the tools and techniques used by developers in creating, building, and testing computer systems that are ubiquitous. Develop sensible solutions that deal with the effectiveness of those programs. This test takes into account many important stages of formation. It also highlights important studies conducted worldwide, in addition to the requirements for brake systems that have emerged over the years. In addition, they have a special focus on the most critical and related research that has been done on the subject, which has used the clever methods and ideas associated with this type of drawing. The CBR method is also introduced within the whole view (the story is mainly based on imagination). It is considered the most effective method. The introduction of this method uses statistics for multiple applications, in addition to many categories of system-based systems. It also describes the levels of work and methods provided. In addition, the shortcomings of current processes are emphasized (Heidar Hashemi, 2016).

II. RESEARCH METHOD:

This section focuses on the method and techniques used in this study, as well as the idea of a sample being of the highest acceptable quality in this look. It contains the purpose of the study, the order of the tests, the ethical issues, and the issues encountered at a particular time in the research program.

A. Purpose of the Study:

That theoretical view has the best purpose of presenting emphatic interpretations of a few incurable events and situations that may be associated with real situations, people, or real events. These studies aim to generally act on the findings from the research side. In addition, descriptive and theoretical studies are often conducted with a view of sufficient mathematical statistics with theories based primarily on the questions and that there is no choice to look at the categories between contexts and real-life scenarios. Advanced research annexures are based entirely on applied study-based studies and secondary materials. As evidence or evidence, testing and assertion are performed.

Learning Design:

The research structure is a mixture of knowledgeable and theoretical research strategies. Theater data is based on a mathematical model, while empirical information is obtained using the available text of the text to validate the statements. The advantages of this system are that it is reasonably priced, takes less time, and allows statistical comparisons to achieve accurate results.

Challenges Encountered:

Many problems have been encountered throughout this study. Because that is a mixed study, the literature test results will not be consistent with theater modeling conclusions due to the fact that one is a theory and the other is a real record. It has been difficult to find sufficient peer-reviewed guidelines in this difficulty because the field is under research due to its rapid development. Due to time constraints and budget constraints, low prices and very limited time have the appearance of selected designs in the study.

Principles:

Before learning about electromagnetic braking systems, it is vital to comprehend the following ideas.

Electromagnetism: Considered one of nature's four fundamental interactions is electromagnetism. The other 3 are gravity, sturdy interaction, and weak interaction. Electromagnetism is the pressure that reasons electrically charged debris to have interaction; the regions wherein this takes place are known as electromagnetic fields.

Magnetic impact of modern-day: The term "magnetic effect of modern-day" refers to the fact that "cutting-edge running on twine creates a magnetic field around it. Oersted discovered magnetic field in 1820. Oersted found that modern sports cable may and cut off the magnetic needle.

Electromagnetic current: When a transmitter conductor is exposed to magnetic training, a current is generated within the conductor; this condition is called Eddy current.



Fig.3 Roller coasters with an electromagnet

II. RESULT:

They look at the findings provided in this section. It provides research findings about having more information on the research problem, representing a summary of practical literature. Includes evidence collected from everything about the mathematical modeling feature to make accurate and accurate statements. Empirical data findings and statistical modeling are examined for the purpose of obtaining accurate conclusions.

Findings From Solid Evidence Reviewed:

Sumit Patel investigated the effectiveness of many types of braking systems and found that the Eddy cut-edge braking device is more effective than a standard braking machine. Sumit Patel and his colleagues also conducted a test to determine the timing of wheel blocking in various RPMs. This test has shown the easy use of an electric brake gadget. Ensure that the electromagnetic Braking gadget can overcome all common brake gadget rules, Sevel P. Nirmal Kannan V, and Mars Mukesh S have proposed the use of an electric brake gadget in large vehicles to reduce "Brake Fading. Normal cars. Select Anti-Lock Braking structures to save your brakes from slipping and causing slipping, but with Electromagnetic braking, there will be no direct contact between brakes and discs. Eliminate braking problem. , and Alessandra Manzin, who conducted comparative studies of electrical brake structures? Electromagnetic diffusion and electromechanical phenomena. of composition research. Impact of electrical and magnetic properties, geometric features, and conditions for providing flexible behavior and energy dissipation are evaluated using a translation problem. Akshay Kumar S. Putter. Nagnath U. Kakde, Huzaifa A. Fidvi, and Bhushan Nandeshwar have shown that electric brake systems are more magnetic than other braking systems. They confirmed that 80 percent of the power provided by the electromagnetic brake machine was obtained by Examination. The results were obtained by testing using a low-cost prototype. As a result, the choice applies Economically. Additional separate studies on locomotive braking made in the manner of eastern engineers. That using an electromagnetic braking system works very well. Engineers are proposing to use electric brakes as additional brakes on trains. The impact of the train slide is reduced, as well as the risk of twisting the end. It's too low. Bedford, Ohio's Stephen Z. Oldakowski. The everlasting magnet and the bipolar solenoid are part of the center of the non-rotating housing located near the shaft. To keep the shaft in rotation, the magnetic armature near the center can extend to the main housing joint and play with the brake disk. The armature is driven away from the central housing assembly and connected to the brake disc in the spring. The brake now does not require any electrical power to hold it inside the fixed mode when the rotating shaft is locked or the launch mode with a fully rotating shaft. Introduced. The permanent magnet is strong enough to hold arms despite the spring pull until the solenoid material has the opposite polarity.

Holzhausen's Karl Erny Brake device for lifting power uses pressure springs to make brake levers and brake linings on the brake drum to provide braking power. In order to beat the tappet movement of the brake armature magnetic armature, a sensor is required. At one stop, the bracket is attached to a brake tappet, and on the other hand, a piece containing a sensor housing is built. An index of high-quality equipment is included in the recovery bag. Display checks the sensor signal and, when hazardous operating conditions are detected, closes the cash drive with a safety circuit. Time allows tracking of braking tool status. In addition to the abrasion of the brake linings, the distance between the armature and the brake magnet housing is reduced. When the armature comes in contact with the brake magnet housing, the brake linings are deemed in vain and are not valid. 958-2 Chung Shan Rd., Tao-Yuan, Taiwan, Hung-Chi Wu This invention is about an adjustable magnet brake, in addition to an aluminum fan, a magnetic ring that includes an aluminum fan, a permanent magnet. discarded aluminum die, permanent magnetic repair seat, sliding seat mounted and bearing. Houses, bolts are provided in one seat for the resolution and extension of housing.

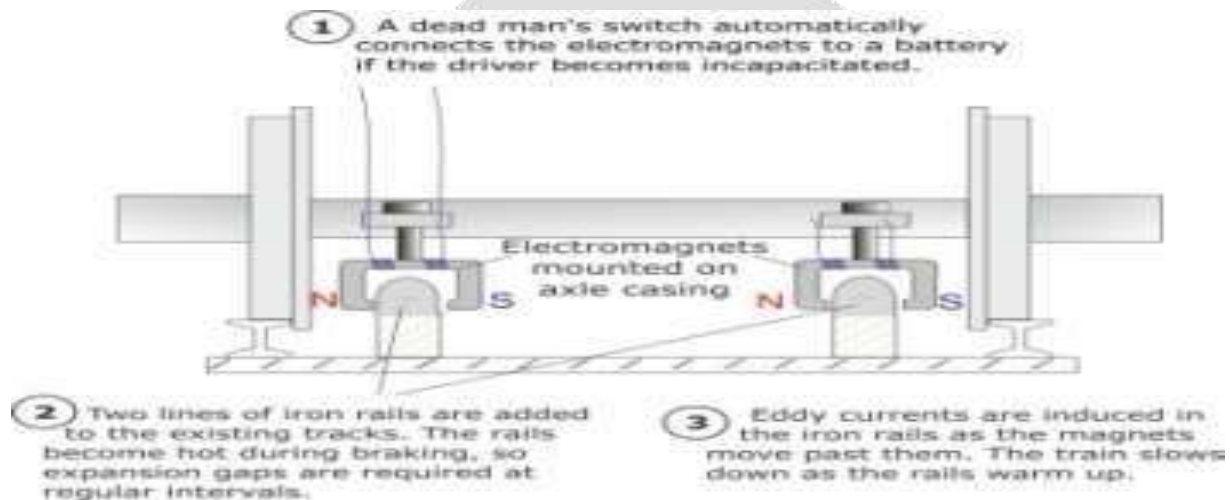


Fig.4 Brakes of Electromagnets in locomotives

A mounting plate attached to bolts, and a cord attached to a mounting plate, so that when the cord is pulled out, the permanent magnet goes out. Seoul, Republic of Korea Jae-Woong Lee The magnetic braking device of a car is disclosed here. Includes: some bake disc solenoid magnetic output, the number of solenoid brake pad generating magnet, brake sensor to detect whether the brake pedal is used or not; tire speed sensor wheel speed sensor: magnetic polarity sensor to detect polarity magnetic brake disc solenoids; and a control unit to control the brake pad solenoids the use of warnings from the brake sensor Magnetic sensor polarity and wheel speed sensor.

EXPERIMENTAL SETUP:

A. Apparatus:

- Metallic Frame
- Disc Electromagnet (Aluminum)
- DC motor
- Controller
- Wheel
- Chain
- Wheel sprocket
- Motor sprocket

- switch
- Electromagnet
- Battery



Fig.5 Setup of Experiment

RPM measuring Sensor:

Working:

The eddy current brake was invented in France during the nineteenth century using a Frenchman named Jean-Bernard Foucault who decided that strong pressure was needed to rotate the copper disc between two magnetic poles or magnetic poles and that of copper. the disc is heated to the same type. The mechanism of action of electric brakes is based entirely on producing eddy currents within the metal discs that rotate between the electromagnetic magnets, making the force resistant to the rotation of the disk. Although the brakes do not work, the circuit is considered incomplete, and electromagnetic is not always strong. Under normal circumstances, the disc attached to the shaft rotates loosely.

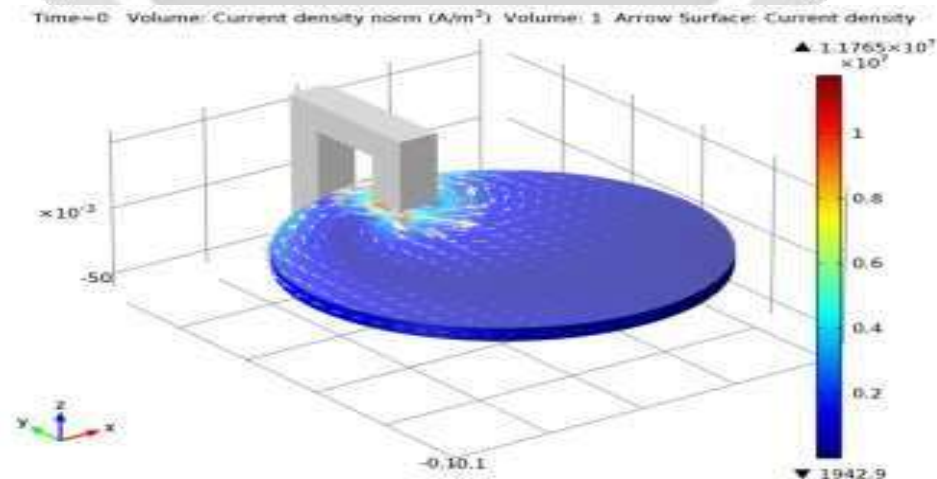


Fig. 6 Distribution of stress on the disc

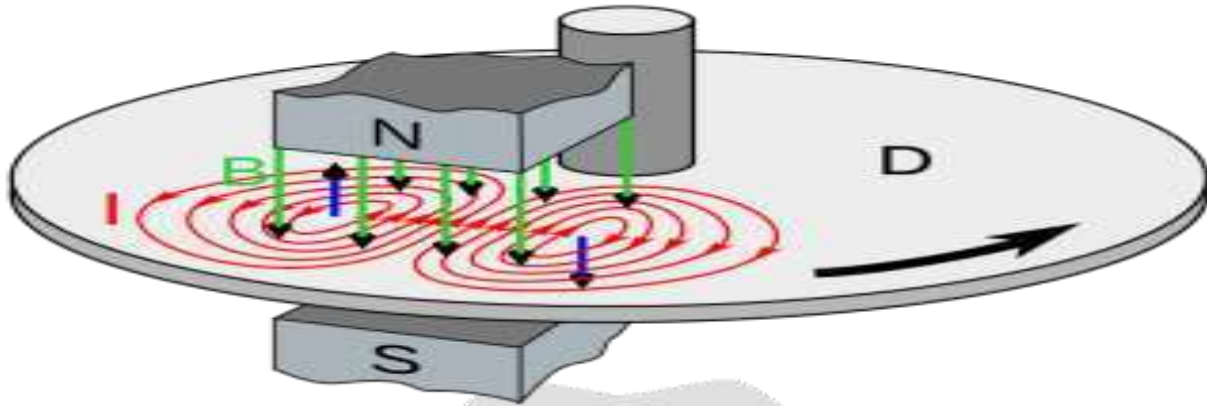


Fig.7 Magnetic Induction

while the brakes are applied, the rotation is complete, the notes are combined, and the eddy currents are formed within the rotating disc, the course of applied force is exactly the opposite of the rotation method. Forcing the brakes to stop the way the magnet brakes work while the modern value introduced is not always monitored. When exercising, rheostats are used along with RPM sensors to test electrical needs. Braking power is equivalent to the modern value in a skewed manner. The French business affiliated with Raoul Sarazin has created and sold many versions of the electric brakes, which initiated the development of the electric brakes. The standard tractor is made of a stator and rotor. Imported coils made of aluminum cables are installed inside the stator. That is attached to the frames and acts as a non-rotating part or stator. The rotor is made of two disc brakes that provide braking motion while the electromagnets in the stators are activated. To cool, the heat dissipation arrangement is provided. The complete disc can also operate independently, and the device is controlled by a microcontroller. The microcontroller can also distribute the brake pressure easily, preventing deception in this type of situation. Within the case of a normal braking system, failure of a single-wheel brake can cause uneven pressure, resulting in loss of control and pushing the driver and car into danger as opposed to protection.

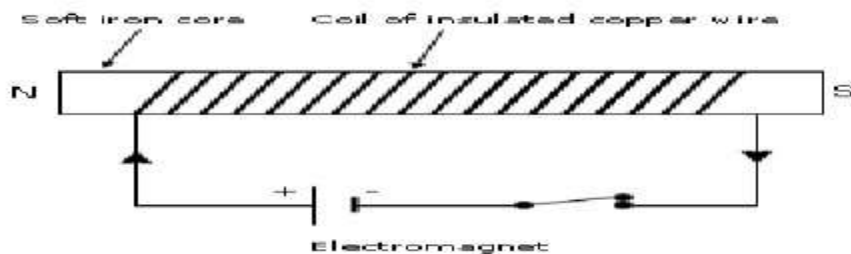


Fig. 8 Base level of Representation

When a current is carried by a conductor, the conductor produces a magnetic field, which converts the conductor into electric magnets.

ADVANTAGES:

- The operation of EM brakes is equal in all temperatures; consequently, there may be no need for added Adjustments in warm or bloodless regions, as with disc brakes.
- The potential chance of tier burst as a result of excessive temperatures is removed.
- Separate wheel braking is feasible.
- Due to the fact warmness output is decreased because of the blended moves of both brakes; break's continue to be cooler.
- The operation of EM brakes is equal in all temperatures; consequently, there may be no need for added Adjustments in warm or bloodless regions, as with disc brakes.
- The price of preservation is definitely low.
- Put on and tear problems are minor.
- The quantity of components that want to be replaced due to being put on and cracking is decreased.
- Easy integration with anti-lock braking and traction systems.
- Because the effect of "brake fade" is low, it may be utilized for lengthy hauls in trucks and different big Cars.

III. DISADVANTAGES:

- The electromagnetic braking mechanism does not paint properly at low RPMs because the eddy present-day generated is minimal in electricity.
- Because immoderate braking requires a large amount of power, battery existence is compromised.
- Because of the low-velocity constraint, EM braking cannot be hired as a standby device.
- On the occasion of vehicles requiring extra braking force, the device can be cumbersome

IV. APPLICATION:

- Coaches
- Roller coasters
- lifts
- Industrial trucks
- Motors
- It may be carried out with aeronautic software
- Aircraft and Ship

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