

Design and Fabrication of Trailer Disc Braking System

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ABSTRACT

This journal states the component which is absolutely subject to the braking mechanism, where the main contrast is that the regular trailer axle is been changed with the new hub and the front part of the trailer, as pole of the trailer and farm truck is been given an extra part of slowing down control. This part is the single chamber which is the principal part to work the brakes. At the point when the driver applies a critical brake because of latency, it comes over on the working vehicle. As the cylinder pushes the oil forward from the pipe it applies the brakes and the trailer stops with the working vehicle. The accidents can be prevented by implementing it. The semi-truck is a separable trailer hauling loads around 6-7 tons. It is found that because of an extreme burden on the trailer in India there are questionable jerks on the tractor trailer. The farm vehicle and the trailer have the likelihood to break down or fall. This might hurt the driver, the street, and the existence of individuals who are around the farm vehicle while the mishap happens.

Keywords : Cylinder Pushes, Trailer Disc Braking System, Aluminum Brakes

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I. INTRODUCTION

The first documented case of brakes in use turned into in historic Rome. These easy brakes had been composed of a lever that after pulled, pressed a timber block onto the outdoor of a metallic covered wheel. The number one pressure for braking with this tool turned into friction. This approach turned into powerful because of the sluggish speeds at which the carts travelled; however, it turned into an insufficient shape of slowing runaway carts. This approach of

braking turned into used for hundreds of years with little layout improvement [1].

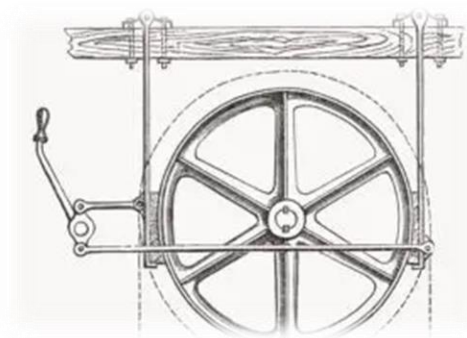


Fig 1: Lever Brake Example

When the rubber-covered wheels were created by the Michelin brothers' wooden blocks were replaced with drum brakes. Louis Renault invented drum brakes in 1902. Instead of applying a block to the outside of the wheel, drum brakes were mounted inside of the wheel hubs. This helped minimize debris blockage and reduce the loss in braking friction. Drum brakes are still in use in cars as handbrakes due to the large amount of force needed in order to overcome the brake force while at rest. With the introduction of the assembly line, cars became heavier and faster, which created a need for a more powerful braking system. Malcolm Longhead [2] created a four-wheeled hydraulic braking system. The hydraulic system uses lines filled with hydraulic fluid rather than cable driven braking systems. The main advantage to hydraulic braking systems is that they can apply a greater braking force than cable systems. Cable brakes fatigue faster than hydraulic brakes due to a constant tension that the cable is under. Hydraulic brakes allowed the driver to apply less force onto the brake pedal while still stopping in a same short distance.

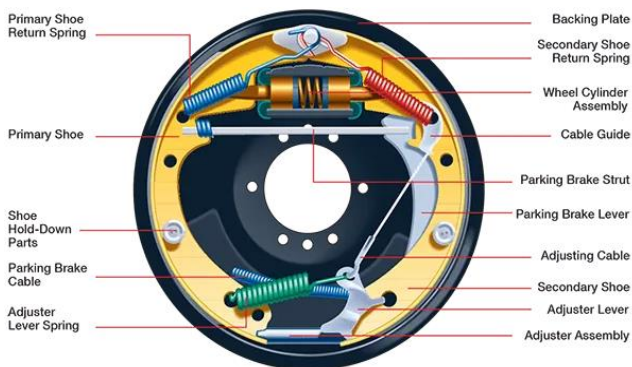


Fig 2: Drum Brake Example

Throughout braking history, the issue of overheating has been a constant problem. Heat happens when the brake pads interact with the slowing down surface. The main factor in scattering heat is having a bigger surface region for the brake to chill off. Disc brakes have a huge surface region presented to the air, which assists it with staying cooler. There are openings and notches cut into the rotor of the stopping mechanism to permit water and garbage to be moved off the

slowing down surface and limit impedance, which causes loss of slowing down force.



Fig 3: Disk Brake Example

Disk brakes started becoming popular in vehicles during the 1950's even though they were invented around 1902 [3]. Disk brakes are attached inside the rim of the vehicle and spin in unison with the wheel. When driver applies the force to brake pedal by foot the brake fluid travels through hydraulic cables and becomes amplified by the power braking system attached to the engine; this in turn pushes the brake fluid against the caliper which which uses frictional force to slow the vehicle. Faster vehicles need brake pads and calipers to be made of different materials to replicate the same braking distance needed to stop slower less advanced vehicles, due to the greater amount of inertia that is trying to be stopped. Most commonly found in brake rotors are spheroidal graphite iron, steel, aluminum, and carbon tool steel. Production cars use cast iron brakes due to the amount of abuse that they can handle without cracking or failing. Steel brakes have a lighter weight and heat capacity, but lack durability in repeated uses. Heat can disperse faster with layered steel brakes because adding layers to simple steel brakes allows for a stronger material that can withstand a more rigorous workload. Aluminum brakes have the lowest weight of all vehicle rotors.



Fig 4: Brake Rotors Example

Brake pads have been made with different materials throughout the years depending on the intended use. Asbestos [4] was the most popular material due to its ability to absorb and disperse heat. After scientific studies, asbestos has been found to be a highly toxic material and has been banned from use in vehicles in the United States. With asbestos illegal to use, brake manufacturers were forced to create safer brakes from a material that will not harm the general public. Organic brakes are made from materials that can withstand heat, for example; glass and varieties of rubber are mixed with a heat resilient resin to produce safer brakes.



Fig 5: Brake Pads

The advantages of using organic brake pads are that they are usually quieter and are easier to dispose. Even

so, organic brakes are not typically used because they wear easily and dust particles collect between the pad and wheel, which decreases the braking surface. With a lighter weight to slow down, motorcycles use organic and ceramic brake pads. They are the most effective type of brake pads but are the costliest. The most common type of brake pad is made with a mixture of several types of metals. These metallic brakes are durable while still being cost efficient. The negative factors for using metallic brakes are that they work best when warm and it may take longer to slow down at first when driving in cold weather. With advances in material science, brakes will continue to improve to match the advances in car technology. A hydraulic brake is an arrangement of braking mechanism which uses brake fluid, which has glycol ethers or diethylene glycol, to transfer pressure from the controlling mechanism to the braking mechanism[5].

Why we need to have Hydraulic braking system

- Preceding the pressure driven stopping mechanism the kind of slowing mechanism utilized was mechanical slowing mechanism, so presently the inquiry emerges on the off chance that we as of now have mechanical slowing mechanism so why water powered slowing mechanism? [6] Let's simply find out.
- The brake force created by pressure driven slowing mechanism is created by the hydraulic hose pipe and system of control is applied to series of vehicles.
- Frictional need amount in the event of mechanical stopping system was extremely high because of the contribution of many complex components, which is all around lesson to the ideal level with the presentation of the pressure driven stopping mechanism which has exceptionally fewer moving parts when contrasted with the mechanical one.
- Brake disappointment chances on account of water driven stopping mechanism are exceptionally less when contrasted with the

mechanical framework because of the immediate association between the actuator (brake pedal or switch) and the brake plate or drum.

- Plan intricacy on account of mechanical slowing down was extremely high which is diminished with the presentation of the pressure driven stopping mechanism which has a straightforward and effortlessly gathered plan.
- The support on account of mechanical stopping mechanism was high because of the contribution of perplexing and a greater number of individuals which isn't an issue with the pressure driven slowing mechanism as it has a straightforward plan with less moving parts.

II. OBJECTIVE

- In order to lesser the accident due to lack of braking system in the tractor trolley
- As hydraulic braking system is used quick result may be obtained
- Used as life saver project as 80% of the accident are stop from happening
- Mostly applicable in agricultural field but can also be applicable in another field
- Efficient in travelling while carrying load

III. METHOD

Methodology is a process of project planning wherein all the major and minor steps of the project whether it may be logical creative fabrication application steps are neatly explained. Methodology is one of the prime components in project planning where all the possible factors and their aftermath effects are relatively considered for the optimum and effective project management. In the present work, collections of methods or practices done are as follows:

A. Literature review

Journal papers are reviewed in order to study and understand the recent updates in the field of electric power tillers. Surveying of literature review helps in simple understanding of the overall activities in our

topic. It also helps us to implement further up gradation of work in our research.

B. Characteristics

Brakes are frequently defined in line with numerous traits including:

Peak pressure – The top pressure is the most decelerating impact that may be obtained. The top pressure is frequently extra than the traction restricts of the tires, wherein case the brake can purpose a wheel skid.

Continuous energy dissipation – Brakes normally get warm in use, and fail while the temperature receives too excessive. The finest quantity of energy (strength in line with unit time) that may be dissipated thru the brake without failure is the non-stop energy dissipation. Continuous energy dissipation frequently relies upon on e.g., the temperature and velocity of ambient cooling air.

Fade – As a brake heats, it is able to end up much less powerful, known as brake fade. Some designs are inherently vulnerable to fade, whilst different designs are rather immune. Further, use considerations, including cooling, frequently have a huge impact on fade.

Smoothness – A brake this is grabby, pulses, has chatter, or in any other case exerts various brake pressure might also additionally result in skids. For example, railroad wheels have little traction, and friction brakes without an anti-skid mechanism frequently result in skids, which will increase renovation charges and ends in a "thump thump" feeling for riders internal.

Power – Brakes are frequently defined as "effective" while a small human software pressure ends in a braking pressure this is better than standard for different brakes within side the equal class. This belief of "effective" does now no longer relate to non-stop energydissipation, and can be puzzling in that a

brake can be "effective" and brake strongly with a mild brake software, but have lower (worse) top pressure than a much less "effective" brake.

Pedal experience – Brake pedal experience encompasses subjective notion of brake energy output as a feature of pedal tour. Pedal tour is stimulated through the fluid displacement of the brake and different elements.

Drag – Brakes have numerous quantities of drag within side the off-brake situation relying on layout of the device to house general device compliance and deformation that exists beneath neath braking with capacity to retract friction fabric from the rubbing floor withinside the off-brake situation.

Durability – Friction brakes have put on surfaces that have to be renewed periodically. Wear surfaces consist of the brake footwear or pads, and additionally the brake disc or drum. There can be tradeoffs, for instance a put-on floor that generates excessive top pressure might also put on quickly.

C. Components of water driven brake

Now that we grasp water power, we ought to research the different parts which make up the strain driven brake. The entire easing back instrument can be isolated into the going with chief parts:

1. Expert chamber (Lever)
2. Lines
3. Fluid
4. Slave chamber (Calliper)
5. Cushions
6. Rotor

D. Fabrication

Fabrication is a sequence of events which is done to create something from its root rather than just assembling it. In this research fabrication work is the building of trailer disc braking system. Building each

part individually and assembling or welding it together is main goal of our project.

E. Designing and fabrication

As we have designed our project based on braking installation on trailer, as the step of designing we have done on solid edge with a dimension and calculation based on trailer.

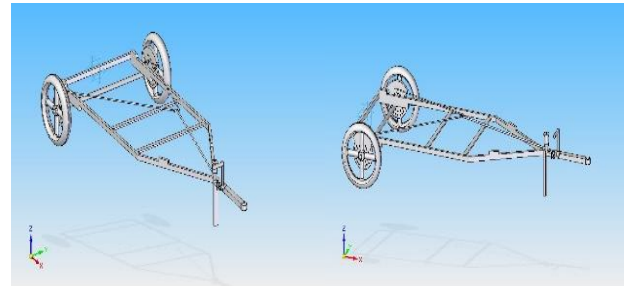


Fig 6: Di-metric and Tri-metric View

Fabrication of trainer disc brake system consist of many joints with welding operation done on MS steel and disc brake system added as a design created which is connected to single cylinder with the perfect dimension and process the fabrication have been created and successfully, we find our output.



Fig 7: Trailer Disc Braking System

F. Final result

Final goal of this research is to complete a fabrication of a trailer disc braking system effectively for the optimum market conditions.

G. Advantages

- It requires less effort to stop the vehicle.
- Disc brakes generates less heat
- Installation and service is easy in disc brakes
- They are easy to control
- Disk brake cannot get self-locked.
- Comparatively disc brakes have high toque transmitting capacity in small volume
- The braking torque is proportional to the actuating force in disc brakes
- For both directions of rotation of the disc, the disk brake is equally effective
- Disc brake doesn't wear down the rims.
- In wet condition it will skid less.
- Aesthetic value of your bike will increase with Disc brakes

H. Disadvantages

- Timely service is required as the disc brakes are more prone to noise
- The rotor covers the brake easier than the drum brake system.
- Power booster is needed for higher clamping force as disk brakes are not self-energizing
- Comparatively more expensive than drum brake.
- Components used in this brake are too many thus increase weight.

IV. CONCLUSION

This project has been successfully designed and fabricated. This hydraulic disc brake will fulfil the task of installing the effective braking system to the tractor trailer. Hence it will help the people who risk's their life while driving a tractor with trailer. Also, this will help the transportation to the hill and congested area with ease. This simple hydraulic brake system is cheaper and easier to install compared to drum brake system, as trailer tire disc does not have any hub space to fix the drum brakes. This hydraulic brake system could find a great scope in future for all trailers.

V. REFERENCES

- [1]. Automobile Engineering R.B.Gupta. 'Brakes, classification and its introduction. Page no 9.1-9.6
- [2]. Kamaraju Ramakrishna. 'Types of Braking system'. Page no 190-200
- [3]. <http://www.ignou.ac.in/upload/Unit-6-61.pdf> Calculation of hydraulic forces.
- [4]. www.mdpi.com/journal/energies Hydraulic Braking Design
- [5]. E. Ajay Kumar¹, B. Praveen Kumar Analysis of Master Cylinder of Hydraulic Braking System Using ANSYS
- [6]. Ramamurti V.1, Sukumar T.2, Mithun S.2, Prabhakar N.2 & Hudson P. V Design analysis of Hub, Rim and Drum in Brake assembly

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