STUDY & FABRICATION OF HYDRAULIC BREAKING SYSTEM

[1]Mr. Y. A. Phopale, [2] Mr.S. J. Nadaf, [3]Mr. S. H. Hawaldar, [4]Mr. S. R. Munoli, [5]Mr. S. B. Mane, [6]Mr. R.R. Potdar

Lecturer in Department of Mechanical Engineering, SVSMD's KKI Polytechnic, Akkalkot, Solapur, Maharashtra, India[1], Student, Department of Mechanical Engineering SVSMD's KKI Polytechnic, Akkalkot, Solapur, Maharashtra, India[2,3,4,5]

Abstract

Hydraulic brakes work on the principle of Pascal Law. According to this whenever pressure is applied on a fluid it travels a uniformly in all the directions. Therefore, when we apply a force on a small piston pressure gets created which is transmitted through the fluid to larger piston and vehicle stopped. This project is to design and develop a low cost hydraulic braking system model which is used to know the working of its. The purpose of the project was to demonstrate the flow of energy from mechanical to fluid back to mechanical the goal of the project was to create a working classroom model that will last up to 10 year the mechanical force comes from the operates and squeezing the brake lever which compress hydraulic fluid that hydraulic fluid in the line becomes pressurized and the pushes on a piston. That squeezes the brake pads on to brake disc. The model will be able to show different braking scenarios by applying differing amounts of force to the handle. For example the motor can be run with minimal braking and the wheel will spin at a slower speed than without braking. Another extreme is stopping the wheel instantaneously by applying rapid firm pressure to the brake handle.

INTRODUCTION

Brakes play a very important role in every industry and vehicle. A brake is a mechanical device which inhibits motion and use friction energy to convert kinetic energy into heat. Brakes are usually used on rotating axles or tires, although may also take other styles such as the exterior of your going substance (flaps deployed into mineral water or air). Many motor vehicles employ a mix of **braking mechanisms**, for example lug race cars and trucks together with both equally wheel brakes and a parachute, or Aero planes together with both equally wheel brakes and lug flaps elevated in the air flow throughout landing.

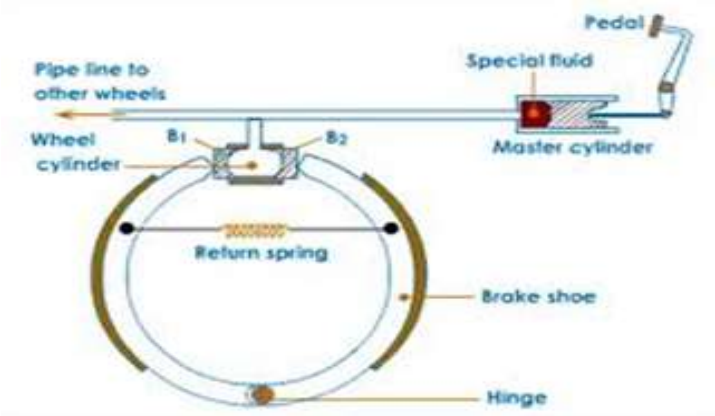

Fig.1: Braking system of a vehicle

Hydraulic brakes are those brakes which are actuated by the hydraulic pressure or pressure of a fluid and are commonly and widely used in the automobiles. 'Pascal's law is the main principle behind working of hydraulics brakes system which states that "pressure at a point in a fluid is equal in all directions in space". According to this law when pressure is applied on a fluid it travels equally in all directions so that uniform braking action is applied on all wheels.

This paper contains study about construction, working, component and application of hydraulics braking system.

LITERATURE SURVEY:

During 1904, Frederick George Heath (Heath Hydraulic Brake Co., Ltd.), Redditch, England devised and fitted a hydraulic (water/glycerin) brake system to a cycle using a handlebar lever and piston. He obtained patent GB190403651A for “Improvements in hydraulic actuated brakes for cycles and motors”, as well as subsequently for improved flexible rubber hydraulic pipes. In 1908, Ernest Walter Weight of Bristol, England devised and fitted a four-wheel hydraulic (oil) braking system to a motor car. He patented it in Great Britain in December 1908, later in Europe and the USA and then exhibited it at the 1909 London Motor Show. His brother, William Herbert Weight improved the patent and both were assigned to the Weight Patent Automobile Brake Ltd. of 23 Bridge Street, Bristol when it was established in 1909/10. The company, which had a factory at Luckwell Lane, Bristol, installed a four-wheel hydraulic braking system on a Metallurgique chassis, fitted with a Hill and Boll body, which was exhibited at the November 1910 London Motor Show. Although more cars had the brake system installed and the company advertised heavily, it disappeared without achieving the success it deserved.

In 1918, Malcolm Loughead (who later changed his name to Lockheed in 1926) proposed a concept of a four-wheel brake system using hydraulics. Using cylinders and tubes, Lockheed used fluids to transfer force to the brake shoe when a pedal was pressed. It required much less effort for the driver to apply brakes. The hydraulic brake system was first fitted into all four wheels of a Model A Duesenberg car in 1921.

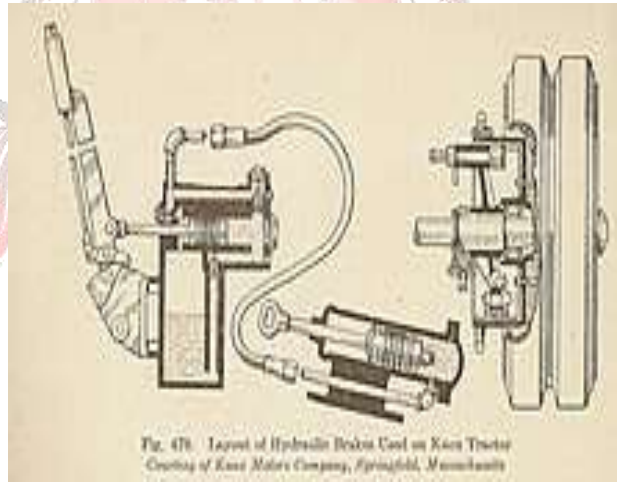

Fig. no. 2: Layout of Hydraulic Brake

CONSTRUCTION:

The construction of hydraulic braking systems involves the following part arrangement. Brake pedal or level, a wreath, also known as an actuating rod, a master cylinder assembly is carrying a piston assembly. It is composed of one or two pistons, a return spring, a series of gasket or O-rings, and a fluid reservoir. The construction of hydraulic braking systems consists of reinforced hydraulic lines, & the brake caliper assembly consists of one or two hollows aluminum or chrome-plated steels piston. This is known as the caliper piston. It consists of following parts;

1. Master Cylinder
2. Brake Pedal and Mechanical Linkage
3. Hydraulic/Brake Fluid Reservoir

4. Hydraulic Lines
5. Brake Calipers
6. Drum Cylinder

WORKING:

We all know that pushing down on the brake pedal slows a vehicle to a stop. But we do not how doesn't this happen, how does vehicle transmit the force from our leg to its wheels and how does it multiply the force so that it is enough to stop something as big as a car. A brake system is designed to slow and halt the motion of vehicle. To do this, various components within the brake system must convert vehicles moving energy into heat. This is done by using friction. Friction is the resistance to movement exerted by two objects on each other. Two forms of friction play a part in controlling a vehicle Kinetic or moving, and static or stationary. The amount of friction or resistance to movement depends upon the type of material in contact, the smoothness of their rubbing surfaces and the pressure holding them together.

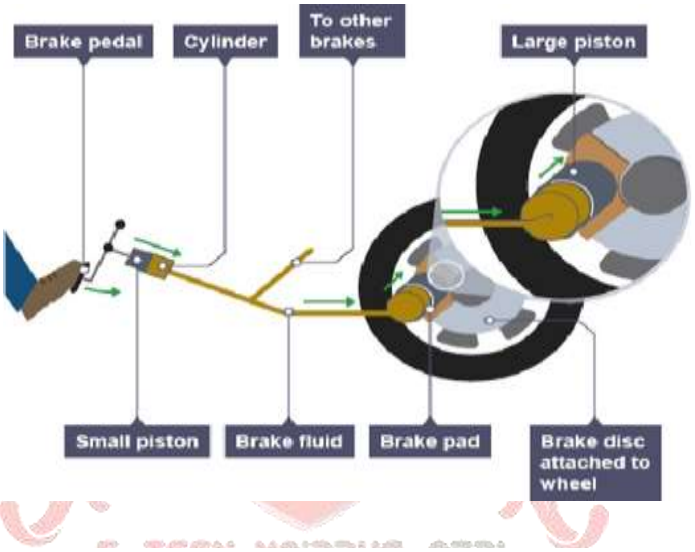

Fig.no. 3: Breaking fundamentals

As the brakes on a moving automobile are put into motion, rough-textures brake pads or brake shoes are pressed against the rotating parts of vehicle, be it disc or drum. The kinetic energy or momentum of the vehicle is then converted into heat energy by kinetic friction of the rubbing surfaces and the car or truck slows down. When vehicle comes to stop, it is held in place by static friction. The friction between surfaces of brakes as well as the friction between tires and roads resists any movement. To overcome the static friction that holds the car motionless, brakes are released. The heat energy of combustion of in engine is converted into kinetic energy by transmission and drive train, and the vehicle moves.

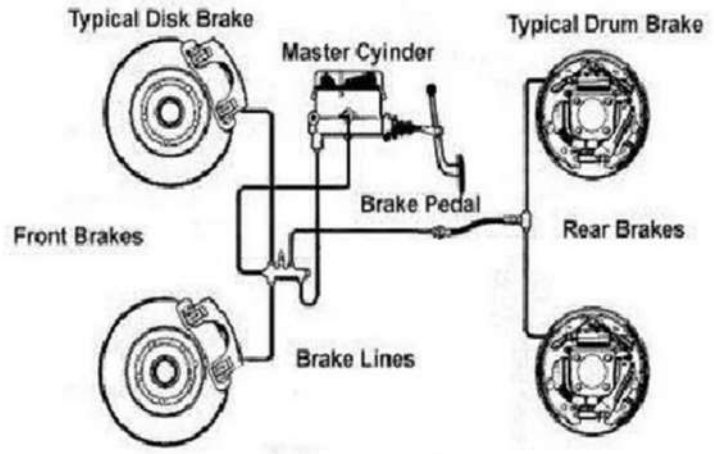

Fig. No. 4: Typical breaking system

ADVANTAGES:

A hydraulic system is an efficient transmitter of power for many reasons. Firstly, its simple levers and push buttons make it easy to start, stop, accelerate and decelerate. This also allows for control accuracy. **Here is a list of some most important advantages of hydraulic brakes**.

- They transmit uniform pressure. (Due to hydrostatic pressure being equal in all directions. Pascal law).
- They help in multiplying the driver's effort more times than that of Mechanical Brakes. (Hydraulic leverage ratio, hydraulic advantage) higher mechanical advantage.
- The brake fluid also acts as a lubricant and reduces the frictional losses at high-speed braking.
- They are simpler in construction and lighter in weight.
- Thermal stresses generated are much lower in hydraulic brakes than Mechanical Brakes.
- However, they are more wear resistant. Hence, improving the advantages of hydraulic brakes.

DIS-ADVANTAGES:

- Hydraulic systems are more complex and expensive than systems operated by air.
- Because many hydraulic fluids are oil based, hydraulic systems can pose a fire hazard whenthey leak, according to Scribd.
- You must filter oils in hydraulic systems on a regular basis to ensure that the hydraulic fluidcontains no broken particles, as well as to eliminate harmful damaging air pockets, according toScribd.
- Hydraulic systems that do not have the necessary hydraulic fluids will not function, whichbecomes a problem when a leak occurs. You must repair the leak so the hydraulic fluids cancontinue to produce flow; otherwise, the hydraulic system will begin to slow down.

CONCLUSION:

The conventional braking system has ability to developed maximum <80% of the braking effort that required to stop the vehicle in desired distance. While, the braking system is designed to develop 100% braking effort to stop the car in desired distance corresponding to the speed. The lacking of the braking effort development due to the slow response of the driver Chances of brake failure are reduced in the hydraulic braking system compared to the mechanical types, because of the direct connection between the actuator (brake pedal or lever) and the brake disc

or drum. The hydraulic braking system is very easy to fix due to its less complexity compared to mechanical brakes. The Hydraulic Brake System is being more popular due to its advantages and easy to use. The modern automobiles like bikes, cars, and heavy vehicles are adapting this technology. The fluids used in this system can vary according to its application because the heavy vehicles require more effort or pressure to push the brakes and stop the rotary wheel. Few of its applications can be seen in mopeds now days.

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