DESIGN AND FABRICATE BRAKING SYSTEM FOR THE ELECTRIC BUGGY CAR

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ABSTRACT

Nowadays, brake system is probably the most important system for vehicle. Most buggy cars have disc brakes on the rear wheels, and some have disc brakes on all four wheels. This is the part of the brake system that does the actual work of stopping the car. The main thing in the braking system is caliper, master cylinder, disc brake or rotor and the hose or piping. Research and comparison are done to make sure the flow of the project run smoothly. To design the suitable breaking system for Electric Buggy Car must depend on the speed the vehicle, maximum weight of baggage and weight driver and body. From the research that we get from the design before, for suitable these Electric Buggy Car breaking system to use is motorcycle RXZ/TZM breaking systems or Go Kart breaking system. The Motorcycle and Go Kart breaking system is simple and efficient for the Electric Buggy Car and easy to maintenance the brake and not complicated system. In this Electric Buggy Car we selected to use the motorcycle Yamaha 125Z Braking system because of the low cost of the part compared with the Go Kart Braking System. The most of the problem in this project is selected of the push rod because of the material cannot withstand the high force when the brake is applied. To overcome the trouble, modification and testing is the process of the recovered. Finally, the Braking System for the Electric Buggy Car can functionally with the best performance.

ABSTRAK

Pada masa sekarang, perkembangan dunia automotif adalah semakin berkembang pesat. Sebagai contoh dalam pembinaan rekabentuk Buggy Car itu sendiri kebanyakkannya telahpun mula menggunakan system brake disc terutama sekali diletakkan di bahagian belakang kenderaan tersebut dan ada juga mempunyai system brake disc di kedua-dua belah bahagian depan dan belakang kereta tersebut. Fungsi utama kegunaan system brake itu sendiri tentunya adalah untuk memberhentikan kenderaan itu sendiri. Komponen utama dalam pembentukan system brake itu mestilah mempunyai Caliper Brake, Master Cylinder, Disc Brake atau Rotor, system piping atau hose dan juga pedal. Didalam pembinaan system brake bagi kenderaan ini adalah semestinya bergantung kepada kelajuan maksima yang boleh dicapai oleh kenderaan tersebut, berat maksima kenderaan tersebut bersama-sama pemandu dan penumpang serta berat maksima muatan yang boleh ditampung dan dibawa. Daripada kajian yang telah dijalankan, system brake yang bersesuaian bagi kenderaan Buggy Car ini adalah menggunakan system brake daripada Yamaha 125Z. Sistem braking motosikal adalah yang terbaik , mudah dan senang dalam melakukan kerja penyelenggaraan , efficient dan system brake tersebut adalah tidak terlalu rumit untuk di rekabentuk kepada keadaan rekabentuk Buggy Car tersebut. Selain daripada itu juga,dari segi aspek kos dalam mendapatkan spare part untuk braking sistem juga adalah rendah dan mudah didapati jika di bandingkan dengan braking sistem yang lain. Dalam pembinaan projek ini masalah utama yang telah dihadapi adalah bar ataupun palang untuk menekan atau mengepam master cylinder yang pada awal penggunaannya adalah tidak tahan kepada daya yang tinggi apabila pedal ditekan. Dalam mengatasi masalah ini,pengubahsuain pada bar ataupun palang sering dibuat mengikut ketahanan dan kesesuian supaya masalah dapat diatasi. Pada akhirnya, keberkesanan dan fungsi system brake tersebut telah dapat mencapai tahap keberkesanannya.

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CHAPTER 1

INTRODUCTION

1.0 Project Background

Nowadays Electric Buggy Car at airport is popular around the world using for carry all the passenger baggage. People use the buggy car is using for caring something that the people can handle or bring uses their hand.

The brake system is probably the most important system for vehicle. Most buggy cars have disc brakes on the rear wheels, and some have disc brakes on all four wheels. This is the part of the brake system that does the actual work of stopping the car.

There are two design of break disc is solid disc and ventilated disc. Brake disc make from cast iron, with a ground surface on each side against which the pads are applied. The disc is shaped to fit over the wheel hub and has a drilled hole to fit the wheel studs. To design the suitable breaking system for Electric Buggy Car must depend on the speed the vehicle, maximum weight of baggage and weight driver and body.

For suitable these Electric Buggy Car breaking system to use is motorcycle RXZ/TZM breaking systems or Go Kart breaking system. The motorcycle and Go Kart breaking system is simple and efficient for the Electric Buggy Car and easy to maintenance the break and not complicated system. The break disc system use hydraulic oil to transmit force and also increase the force. The breaking system

operated with fluid (oil). Hydraulics is part of the more general discipline of fluid power to function the breaking system.

1.2 Project Objective

- To design the breaking system for Electric Buggy Car

To fabricate the breaking system

1.3 Scopes Of Project

- Research on Hydraulic Break Disc System conducted to collect information as required in literature review.
- Use motorcycle breaking system (YAMAHA 125Z) or Go Kart Breaking System to appropriate for the design of Buggy Car.
- Analyze the efficiency / function the Breaking System from the ETEK motor 24-48 Volt D.C.
- Develop the suitable breaking system for Buggy Car using motorcycle or go kart braking system.
- Design and fabricate the breaking system from pedal to break disc depend on the frame structure.
- Low cost for the design of the Braking System.

CHAPTER 2

LITERATURE REVIEW

2.1 HISTORY OF DISC BRAKE

As the level of technology of transportation has increased, the mechanical devices used to slow down and stop vehicles has also become more complex . The history of vehicular braking technology and possible future developments.

Before there was a "horse-less carriage," wagons, and other animal drawn vehicles relied on the animal's power to both accelerate and decelerate the vehicle. Eventually there was the development of supplemental braking systems consisting of a hand lever to push a wooden friction pad directly against the metal tread of the wheels. In wet conditions these crude brakes would lose any effectiveness.

In this chaotic era is the first record of the disk brake. Dr. F.W. Lanchester patented a design for a disk brake in 1902 in England. It was incorporated into the Lanchester car produced between 1906 through 1914. These early disk brakes were not as effective at stopping as the contemporary drum brakes of that time and were soon forgotten. Another important development occurred in the 1920's when drum brakes were used at all four wheels instead of a single brake to halt only the back axle and wheels such as on the Ford model T. The disk brake was again utilized during World War II in the landing gear of aircraft. The aircraft disk brake system was adapted for use in automotive applications, first in racing in 1952, then in production automobiles in 1956. United States auto manufacturers did not start to

incorporate disk brakes in lower priced non-high-performance cars until the late 1960's.

Early disk brake systems required an outside mechanical brake booster such as a vacuum assist or hydraulic pump to generate the pressure for primitive friction materials to apply the necessary braking force.

A recent Ducati concept show bike uses brake disks of silesium, developed by the Russian aerospace industry(3), which claim to have the friction coefficient of cast iron with the light weight of carbon fiber.

2.2 Introduction of Breaking System

The breaking system provides the means to stop or slow the vehicle. To control for the vehicle, we need to be able to start it moving, make it turn, accelerate and decelerate and of the major importance to stop it. A vehicle with a breaking system that is not working properly is a candidate for the wreaking yard and may be cause injury to the driver and passenger as well as to others.

The breaking system is considered by many people to be the most important system involved in the operation of the vehicle. We do not normally use brakes at their maximum capability, but we want the system to work flawlessly in emergency much like parachute. Most of user find hard breaking unpleasant and avoid hard stops. The breaking system of most vehicle are rarely tested ensure that they are working at minimum efficiency.

The ideal breaking system is one of that will allow the driver to bring a vehicle to a stop in the shortest possible distance. To be able to do this, it should have an enough power to lock up and skid all tires while stopping on clean, dry pavement. Also, stopping should occur with a moderate amount of pedal pressure so that even weaker drivers can achieve tire lockup.

No legislation specifies exactly what to do, and there are no commonly used test devices or instruments to access exactly how good or bad a brake system is.

2.3 Basic Brake System

The parts are as follow:-

1. Brake Pedal - Operated by the driver.
2. Brake booster - Provides the brake easier to apply
3. Master cylinder - Provides hydraulic pressure
4. Caliper and Disc - Slow or stop the wheels when the brake calipers at the wheel.
5. Brake lines and Hoses - Connect the master cylinder to the caliper at the wheels
6. Brake Fluid - Transmits force from the master cylinder to the calipers at the wheels.
7. Connector Rod - Connected from brake pedal until master cylinder to transmit the pressure when pedal is apply.

2.4 The Basic Operation of the System

When the driver pushes the brake pedal fro the figure 2.1, force will be transmitted to the piston in the master cylinder. The pistons will apply the pressure to the fluid in the cylinder and the brake lines transfer the pressure to the caliper. The pistons in the hydraulic cylinder in the caliper are move to apply the brakes.

When disc brake is applied, brake pad is clamped against the disc. A moving vehicle has energy, which must be absorbed by the brakes when they are applied. The energy is converted into heat as a result of the friction between the breaking surfaces. The heat is then dissipated into the brake parts and into the surrounding atmosphere. Therefore, the brake pad and disc or the brake lining, the material must be withstood high temperature as well as high pressure.

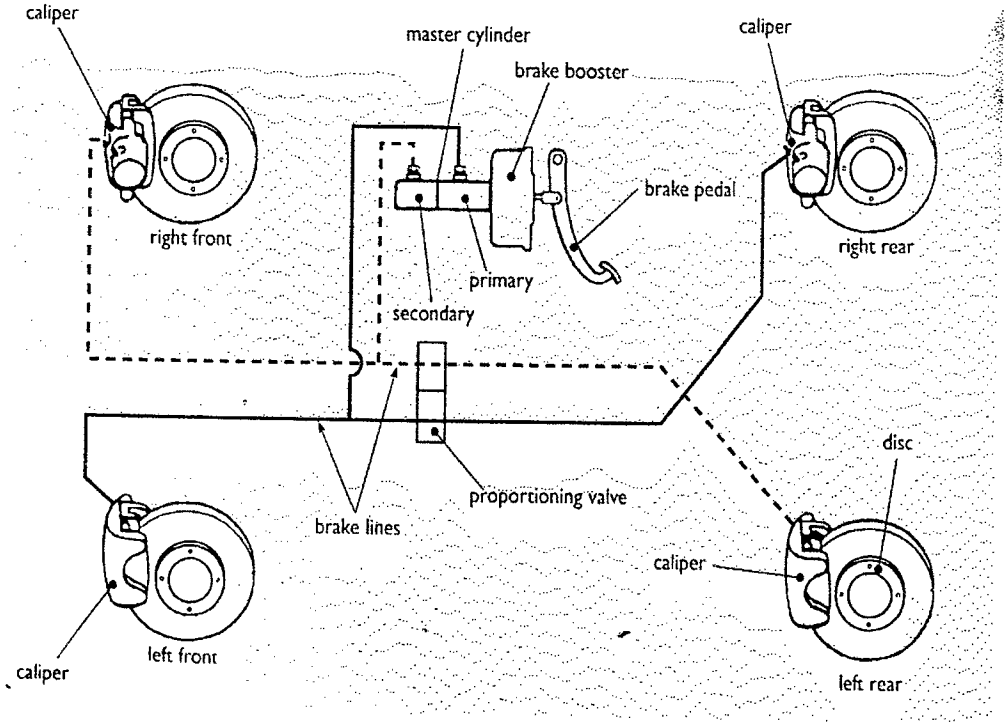

Figure 2.1 Basic operation of breaking system

2.5 Hydraulic Principle

The hydraulic system (Fluid Power) is a method of transmitting the motion or force. It does this by having a cylinder and piston in a different sizes. Hydraulic is based on the fact that liquid can flow easily through complicated path, yet cannot be compressed. Another important feature is that when liquid transmit pressure, that pressure will be transmitted equally in all direction. This is known as Pascal's Principle. The figure 2.2 had shown the basic of Pascal's Principle.

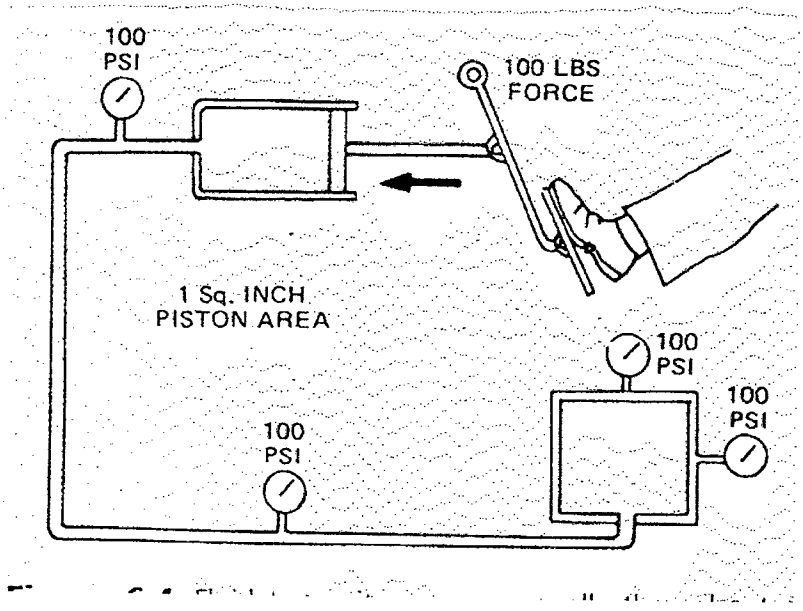

Figure 2.2 Fluid transmit pressure equally throughout a hydraulic circuit and act with an equal force on each surface of the same size.

2.5.1 Liquid will not compress

For all practical purpose, liquids are not compressible and so hydraulic pressure represents a pressure applied to the liquid. It does not mean that the liquid is reduced in volume, as is the case with a gas. Refer to cylinder in figure 2.3 which contains liquid and a piston. As a result of the force on the piston, the liquid applies pressure to the walls and the bottom of the cylinder. From the figure 2.3 the piston does not move because there is nowhere for the liquid to go.

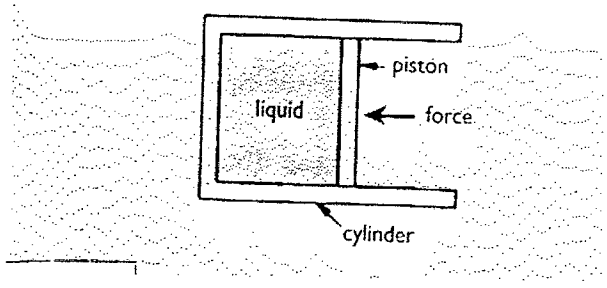

Figure 2.3 Force applied to a liquid transmit the pressure

2.5.2 Air will compress

If the cylinder contains both air and liquid, a force applied to the piston will compress the air and reduced its volume and the piston will move down the cylinder (Figure 2.4). When the force is removed, the piston will return to its original position.

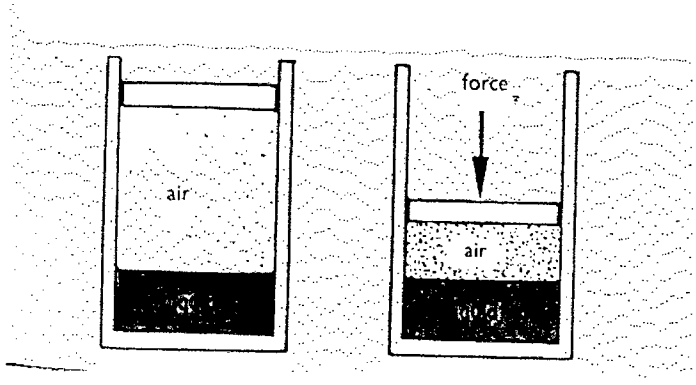

Figure 2.4 Force applied to the piston compressed the air not liquid

2.5.3 Force and Pressure

Figure 2.5 shows the 2 cylinder of the same size (diameter). Forced applied to one piston is being transfer hydraulically to the other. Because the cylinder and the piston are the same size, the force applied to one piston will be the same as the forced delivered by the other. However, by having cylinders of different size, force can be increased or reduced.

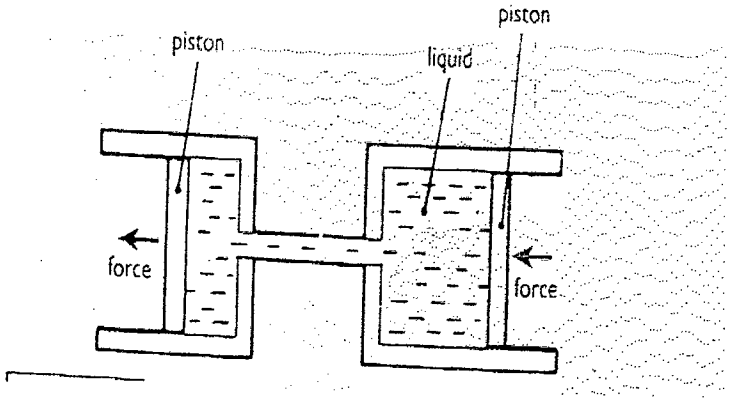

Figure 2.5 Force transmitted by hydraulic means from one cylinder to another.

2.6 Basic principle of a hydraulic brake system

Figure 2.6 is a simple hydraulic brake system with three cylinders of different size. The diagram can be used to explain force and pressure.

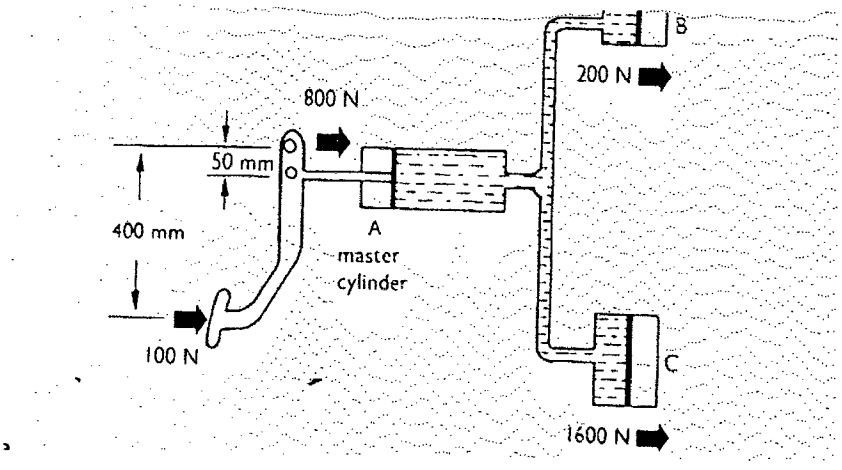

Figure 2.6 Basic principle of a hydraulic brake system

When the pedal is pressed, the force against the piston in the master cylinder (A) will apply pressure to the fluid. The pressure will be the same in all part of the system, but will have a different effect on the piston in the other cylinder. There will be different forces from the piston as follows:

1. Cylinder (B) is smaller than (A), so the force from (B) will be less than the force applied to (A).
2. Cylinder (C) is larger than (A), so the force from its piston will be greater than the force applied to (A).

In an actual hydraulic brake system, the master cylinder is smaller than the wheel cylinder, so the force all the wheel cylinder is increased. The force can be varied by the use of different sized cylinder and it can be varied from front to rear to provide better breaking. This can be done even though the pressure is same in all part of the system.

2.7 Master Cylinder

The figure 2.7 is shown the basic operational of master cylinder. The master cylinder is the input piston for the vehicle break system. It is connected to the break pedal so the movement of the break pedal is transmitted to the master cylinder piston by a pushrod. The first master cylinder used a single piston and cylinder bore with one outlet at the end of the bore. From this outlet, tubing branched out to each of the wheel cylinder.

The master cylinder body has two major areas, the piston and the cylinder bore and the reservoir. These two areas are connected by two passages, a small compensating port and a larger bypass port (intake or replenishing port).

2.7.1 The Operation of Master Cylinder

1. When the break applied, the primary piston is moved in its bore and fluid is displaced by the piston.
2. Because of its larger bore, there will be more fluid displaced by the rear part of the primary piston than by the front.
3. This is can be produced a high volume of fluid, which quickly moves the brake pad to take up the clearance between them and the disc.
4. With continued movement of the piston, pressure builds up in the system ahead of the piston to apply the breaks.
5. This is also some pressure created in the large bore behind of the head of piston. This pressure opens the ball in the fast fill valve so that fluid can flow from the large bore back into the reservoir.
6. Once the fast fill valve has opened, the cylinder acts in the same way as a conventional master cylinder, with all the pressure being created in the small bore section of the master cylinder.

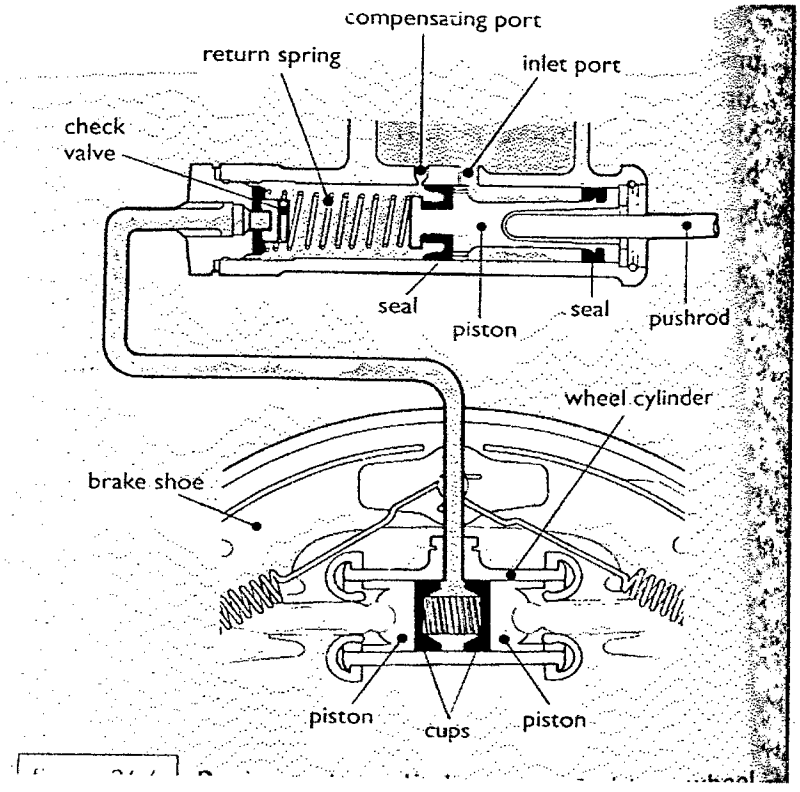

Figure 2.7 Basic master cylinders

2.8 Caliper

The two major style of caliper are used on vehicle:-

1. Fixed Caliper
2. Floating Caliper

Most caliper use a cup shaped bore in a cast iron caliper body. Each bore will include a piston with a seal and boot, and a bleeder screw. A few pistons include an insulator to block heat flow from the lining to the piston. Disc brake experienced higher brake fluid operating temperature because the fluid in the caliper body is fairly close to the friction material, and the caliper body and piston conduct quite a bit of heat to the fluid.

2.8.1 Fixed Caliper

A fixed caliper assembly and a solid disc are illustrated in figure 2.8. Two piece calipers are used, with two parts being bolted together. The caliper has two cylinders, one on each side of the disc, and so each piston operates its own brake pad. When the brakes applied, hydraulic pressure is applied to the piston and the piston and they move the pads against the disc equal force.

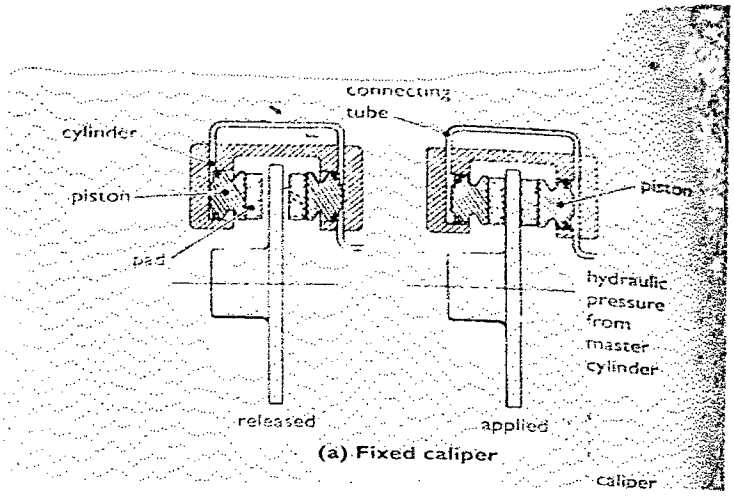

Figure 2.8 Fixed Calipers

2.8.2 Floating Calipers.

The dismantled part of the floating caliper assembly is shown in figure 2.9. The main parts of the assembly are the caliper housing, the anchor plate, the piston and the pads. This type of the caliper is made as single part and has only one cylinder, which is built into the inner side of caliper.