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Review Paper on Different Defects in Hydraulic Braking System

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ABSTRACT—Today in this modern era the biggest concern of automobile industries is about control systems. This control system consists of two systems. (A) steering & (B) Braking. If these two systems are fine then the vehicle is ready for sale. Now talking about braking systems most modern cars are being installed with a hydraulic braking system that works on foot brakes on all wheels and with that the hand brake is also added for mechanically operated on the rear wheel. But there can be some defects in the hydraulic braking system.

Keywords—Tandom master cylinder, proportioning valve, metering valve, bleeding valve, Lucas- Girling wheel slide protection**.**

INTRODUCTION

WHAT IS HYDRAULIC BRAKING??

The hydraulic type braking system is very important as it's mostly used in modern vehicles. This braking mechanism uses hydraulic fluid to transmit the brake pedal to the drum shoes or for braking purposes and to stop the vehicle

In this braking system, the mechanical force from the foot on the brake pedal is transmitted and converted into pressure with the help of the cylinder known as the master cylinder.

Ease of Use

This brake system works with the principle of pascal's law. The laws state on any surface the pressure of the fluid is applied it travels uniformly in all directions. The same principle is followed by the hydraulic braking system as the fluid from the master cylinder is compressed by pressing the pedal and the fluid is then let to travel to all the four-wheel cylinders which then expands by the fluid which leads to the rotation of brake drum and because of that the brake pad rub against the brake drum and hence the moving vehicle is stopped. now certain defects may occur in this type of braking system.

Defects that may occur in the hydraulic braking system

1. The main component of the hydraulic braking system and which is also known as the heart of the hydraulic braking system is MASTER CYLINDER.

Working: As its name tells us that it is the heart of the hydraulic braking system it is the pumping element in the braking system that takes the effort pressurized on the brake pedal to occur hydraulic pressure in the brake lines.

This master cylinder is also called the brake master cylinder and it consists of 2 sections

2. Reservoir section: This section is to supply the braking fluid to the cylinder through the intake port and it also gets the extra oil through compensating port.

DEFECTS THAT MAY OCCUR IN THE RESERVOIR Section

I) The fluid volume in the reservoir is varied by the temperature and due to this, it may cause damage to the pipelines or the other components where the fluid is flowing or it can be the reason for the leakage of the pipe.

HOW TO OVERCOME THE DEFECT

3. To prevent leakage there are rubber seals present attached at both ends of the cylinder section or compression chamber.
4. Cylinder section: It is a casing airtight inside the piston that travels with the moment of the brake pedal resulting in the change and multiple forces.

DEFECTS THAT MAY OCCUR IN THE CYLINDER SECTION

I) When we apply brakes there is some residual pressure in the brake lines which may again cause the damage to disc brake leading to drag them.

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II) Another assumption is that the quickness of the engagement of the brake will not be that much efficient.

HOW TO OVERCOME THE DEFECT

A rubber boot covering is provided which covers the rod end of the master cylinder that prevents the dirt from entering inside.

BESIDES THE ABOVE TWO COMPONENTS THERE ARE OTHER COMPONENTS ALSO THAT ARE DISCUSSED BELOW :

5. PUSH ROD: It is operated with a foot brake pedal with the help of linkages. As it is pressed the push rod moves to the left which is opposite to the spring force. This leads to the developing pressure in a compression chamber or cylinder section. And by which the fluid enters the wheel cylinder and moves to the pistons by applying the brakes

6. DEFECTS THAT MAY OCCUR BY THE PUSH ROD

I) If the temperature of the fluid is not maintained then it will cause the leaking in the pipes which leads to failure of the braking and also causes damage to the vehicle.

II) Abnormal noises may also occur if there is anything not correct in the push rod mechanism.

III) There will also reduction in the efficiency and performance of the system. As this is the hydraulic system i.e the determination of the flow is accuracy to speed and response. Therefore as there is a speed reduction it will indicate a loss or reduction of flow.

7. Piston assembly: As the pedal is released the pressure of the spring in the cylinder section or compression chamber moves the piston to the extreme right. This spring pressure also keeps the fluid check valve pressed on its seat for some time intervals and thereby delays the incoming fluid from the line in the cylinder section again.

DEFECTS IN THE PISTON ASSEMBLY

I) As the above operation is done there is a delay sometimes caused by the fluid in the line due to inertia. Which causes a vacuum in the cylinder section and this delay can cause the leakage of air in the system. Even a negligible amount of air will render the brakes useless as the air is compressed and can block the system.

HOW TO OVERCOME THIS DEFECT

This can be sorted with the help of the intake port but as there is already the presence of a vacuum the atm pressure in the fluid reservoir forces and the holes in the piston deflect the rubber cup and enter the compression chamber, which destroys the vacuum.

Now as there is no vacuum present the fluid from the lines returns to the reservoir by the upliftment of the fluid check valve off its seat. This fluid which is remain used somehow as a cylinder chamber or compression chamber is full. Now the pressure being exerted in the lines will not be relieved properly and there are again chances of the friction of the brake shoe on the drum and generation of more heat which can cause the shoe to move toward the drum and ultimately the brakes are the jam. Now to overcome this jamming of brakes is prevented by pass-port. By providing this by-pass port the incoming fluid from lines passes to the fluid reservoir, where the atmospheric temperature is maintained by providing an air vent.

NOW as the above mechanism is completed there are chances of worn braking pads.

- BRAKING PADS: These pads transform or convert kinetic energy into thermal energy by creating friction. In a vehicle, there are two brake pads installed in each brake with their surfaces which are in friction already. And which are facing the rotor.

Working: When the brakes are applied hydraulically, the caliper clamps these two pads together onto the spinning rotor to slow down or moreover to stop the vehicle.

HOW TO OVERCOME THE DEFECT

In certain cases, if there a case of braking or worn braking pads or braking linings that there is an excessive clearance that is between the lining and drum or pad and disc, there is a quick release of the brake pedal that will draw extra fluid from the reservoir chamber or section and immediately a quick pressure of pedal will send the extra fluid into the pipeline of brakes, thus this takes up the clearance which is in excessive amount.

Apart from this, the disc brakes should also not have any residual pressure in the pipelines as eventually the pads are not completely separated from the disc as they are released. That is why a special fluid check valve is provided in case of a vehicle has both drum and disc brakes which have a small restrictor hole used in the master cylinder.

8. TANDOM MASTER CYLINDER

9. WORKING: In this different lines are separated and they reach out to the brakes of the front as well as the rear. So in case, there is any damage to the front brake the rear brake is still effective. Almost all vehicles today we see are employed

with a tandom master cylinder that uses a pressure differential switch with warning lights and proportioning valve. The disc brakes are often used at the front with a combination of drum brakes at the rear for this a metering valve is required.

10. HOW TO OVERCOME IF ANY DEFECT IS HAPPEN DUE TO THE TANDOM MASTER CYLINDER
11. PRESSURE DIFFERENTIAL VALVE WITH WARNING LIGHT SWITCH
12. These lights are best for a driver as well as for the vehicle, with the help of this we can get to know which part of the hydraulic braking system is failed.
13. Working: These valves are used to warn the driver whenever there is any failure part in the hydraulic braking system. These valves are simply released whenever there is any fault in the braking system (hydraulic braking) and simply switch ON the lights.
14. Whenever there is let's suppose there is any failure in the rear brake, due to the pressure on the side drops to zero, which results in the plunger moving towards the right, thereby pressing the switch contact. So that the lights are ON
15. BLEEDING VALVE: The only care that must be taken is that the air even a small amount of air does not let into the braking system. As the air is compressible, it gets compressed when we apply pressure on the brake pedal. Because this results that pressure of the fluid pressure is not transmitted to the brakes which results in not actuating the brakes. This process is called bleeding.
16. We also the other defects like 1) leaking of air in the braking system and 2) This braking is only adopted intermittently like for parking purposes which separates the different linkages and they are being used.
17. HOW TO OVERCOME THE ABOVE ISSUES
18. LUCAS- GIRLING WHEEL SLIDE PROTECTION: This system is very much useful for the detection of leakage in the vehicle in normal operation even when the vehicle is not working. But the only problem with this device is that it is 1) bulk space availability and 2) and requires a different power source.

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