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DESIGNING ALTERNATIVE TYPES OF SUSPENSION

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Анотація

Стаття присвячена розвитку нових типів автомобільної альтернативної підвіски, які базуються на нових технологіях.

Ключові слова: розвиток автомобілів, нові технології, підвіска, альтернативна підвіска, автомобілі.

Abstract

The article is devoted to the development of new types of automobile alternative suspension on the basis of new technologies.

Keywords: development of automobiles, new technologies, suspension, alternative suspension, automobiles.

Introduction

Nowadays the cars usually use conventional suspension system consisting of two main elements: springs and dampers.

Several manufacturers were trying to overcome the problems that can happen when the car goes over a bump. Such manufacturers as BL and Citroen have come up with some unusual systems for their automobiles.

They tried to overcome the problem of pitching – the fore and – aft rocking movement, that can set up very unpleasant sensations for the driver and passengers and can cause travel sickness, this problem was overcome by replacing the spring and damper system with a different system that could link the front and rear wheels together. This design is known as linked suspension - when the front wheel of the car encounters a bump it rises as normal. But as this happens, the interior linking forces the rear wheel downwards which effectively raises the rear of the car. So the front and rear rise more or less in on and the car stays reasonably level.

This research is devoted to considering linked suspension as an alternative suspension in automobiles.

The Results of the Research

The simplest linked suspension is that used by Citroen on their long running 2CV model. It is a mechanical link consisting of a rod and spring running underneath the car on each side from the front wheel to the back wheel. When the front wheel goes over a bump, it rises and pulls on the spring. The spring transmits this pull to the rear suspension which forces the rear of the car also to rise slightly and levels it.

BL have a more complex system. Each front and rear wheel has a displacer which acts as both spring and damper. This is mounted on the car body or sub-frame and inside it at one end, is a conical rubber spring bonded to the displacer casing. The other end of the displacer is enclosed by a flexible diaphragm, in the middle of which is a rod connected to the suspension arm which is in turn attached to the wheel. The chamber between the spring and diaphragm is divided by a metal separator plate containing a two-way rubber valve

The corresponding front and rear displacers are connected by a pipe and the whole system is filled with a water/alcohol mixture pumped in under pressure. The weight of the car is supported by the pressurized displacer units.

When a front wheel rises its suspension arm forces the piston up inside the displacer. This forces the fluid through the two-way valve, out of the displacer chamber and along the pipe to the rear displacer. The fluid is forced into the chamber of the rear displacer causing the rubber diaphragm to expand, thus pushing the rear suspension down.

Hydragas is a further development of the Hydrolastic system in which the rubber spring is replaced by a gas spring. The gas is contained at high pressure in a domed housing separated from the fluid by a thick rubber diaphragm. The damping action and fluid displacement are similar to the Hydrolastic system.

The Hydrolastic displacer on BL cars acts as both spring and damper. Hydragas works in a similar way except it uses compressed gas as the springing medium instead of rubber. Hydrolastic suspension is found on a range of BL cars, including Minis, Maxis, 1100s, 1300s, 1800s and 2200s.

Hydragas is fitted to Allegros, Princesses, Ambassadors and later Maxis.

In the Hydragas unit, the springing effect comes from the gas contained in the domed housing at the end of the displacer unit. The gas is separated from the suspension fluid by a rubber diaphragm.

Citroen use a mechanical system to link the suspension on their 2CV model. In this the front and rear wheel on each side of the car ride on radius arms which are linked together by a coil spring. When the car is stationary on the flat, the car is level. When driving, the front wheel rises when it bump, meets and pulls on the spring. The spring extends and simultaneously imparts a pull to the rear radius arm. This pull causes the body of the car to rise, effectively levelling it.

Linked suspension has its problems, one of which is caused by the linking. When you put a weight in the boot of a car with linked suspension, it automatically causes the nose of the car to rise as though the rear of the car had encountered a bump. This tail-drooping was a common sight on Leyland cars fitted with linked suspension. Apart from affecting the handling of the car in the wet, it also had the unfortunate effect of upsetting the headlight aim, dazzling oncoming drivers. One Leyland car to overcome this problem was the Austin 3-litre which had an engine-driven pump to self- level the rear suspension.

As for the work of the hydrolastic system, when one of the front wheels rides over a bump, fluid from the front displacer is forced back through the linking pipe to the rear displacer. This causes the rear displacer to expand and raise the rear of the car, thus keeping the car more or less level. Once the wheel has ridden over the bump, the fluid returns from the rear displacer to the front one. But the presence of a two-way valve in each displacer slows the flow of fluid, so the valves act effectively as dampers. Without them, the fluid would continually flow back and forth between the displacers and the car would bounce uncontrollably.

As well as a two-way valve, each a displacer also contains a piston, diaphragm, a separator plate and a rubber spring.

Fluid is forced out of the displacer by the piston rising and pushing against the diaphragm. As the fluid is forced out it compresses the rubber spring. This spring absorbs some of the impact of the wheel riding over a bump and so performs the same role as a coil spring does in a conventional suspension system.

Conclusion

Summing it up the alternative springing as linked suspension overcomes the problem of pitching and improves stability of the car.

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