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Nitro Shock Absorber

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Abstract: In the present scenario of automobile industry manufacturers are trying to produce comfortable and safe vehicles which the consumers are looking for. A shock absorber is a damping element of the vehicle suspension, and its performance directly affects the comfortability, dynamic load of the wheel and dynamic stroke of the suspension. The conventional type of shock absorbers has got the main drawback that it causes foaming of the fluid at high speeds of operation. This results in a decrease of the damping forces and a loss of spring control. The gas filled shock absorbers are designed to reduce foaming of the oil and provide a smooth ride for a long period.

Keywords*:* Shock, Suspension, Smooth, Comfortable, ride

I. INTRODUCTION

For a smooth and comfortable ride the disturbing forces should be eliminated or reduced considerably by using some devices. Shock absorbers are such devices which isolate the vibrations by absorbing some disturbing energy themselves. Of the many types telescopic shocks are widely used which has got the draw back that the flow of oil in the cylinder can cause foam of oil and air to form. These limit the optimum throughout of the flow in the valves. Gas shocks represent an advance over traditional shocks. Nitrogen filled gas shock absorbers are the results of years of extensive research and development with top flight shock design engineers. They are designed for both lowered and stock vehicles to provide shock absorbers that would out perform anything on the market today. Nitro shock absorbers are high quality, nitrogen filled shocks designed and gas charged specifically for each vehicle application.

II. WHAT SHOCKS DO

Let's start our discussion of shock absorbers with one of very important point: despite what many people think, conventional shock absorbers do not support vehicle weight. Instead, the primary purpose of the shock absorber is to control spring and suspension movement. This is accomplished by turning the kinetic energy of suspension movement into thermal energy, or heat energy, to be dissipated through the hydraulic fluid. Shock absorbers are basically oil pumps. A piston is attached to the end of the piston rod and works against hydraulic fluid in the pressure tube. As the suspension travels up and down, the hydraulic fluid is forced through tiny holes, called orifices, inside the piston. However, these orifices let only a small amount of fluid through the piston. This slows down the piston, which in turn slows down spring and suspension movement. The amount of resistance a shock absorber develops depends on the speed of the suspension and the number and size of the orifices in the piston. All modern shock absorbers are velocity sensitive hydraulic damping devices - meaning the faster the suspension moves, the more resistance the shock absorber provides. Because of this feature, shock absorbers adjust to road conditions

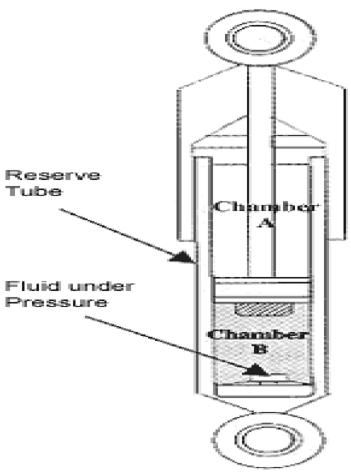

Fig.1.Shock Absorber

III. COMPRESSION CYCLE

During the compression stroke or downward movement, some fluid flows through the piston from chamber B to chamber A and some through the compression valve into the reserve tube. To control the flow, there are three valving stages each in the piston and in the compression valve.

At the piston, oil flows through the oil ports, and at slow piston speeds, the first stage bleeds come into play and restrict the amount of oil flow. This allows a controlled flow of fluid from chamber B to chamber A.

At faster piston speeds, the increase in fluid pressure below the piston in chamber B causes the discs to open up away from the valve seat.

At high speeds, the limit of the second stage discs phases into the third stage orifice restrictions. Compression control, then, is the force that results from a higher pressure present in chamber B, which acts on the bottom of the piston and the piston rod area.

IV. EXTENSION CYCLE

As the piston and rod move upward toward the top of the pressure tube, the volume of chamber A is reduced and thus is at a higher pressure than chamber B. Because of this higher pressure, fluid flows down through the piston's 3-stage extension valve into chamber B.

However, the piston rod volume has been withdrawn from chamber B greatly increasing its volume. Thus the volume of fluid from chamber A is insufficient to fill chamber B. The pressure in the reserve tube is now greater than that in chamber B, forcing the compression intake valve to unseat. Fluid then flows from the reserve tube into chamber B, keeping the pressure tube full.

Extension control is a force present as a result of the higher pressure in chamber A, acting on the topside of the piston area.

V. SHOCK ABSORBER ACTION

Shock absorbers develop control or resistance by forcing fluid through restricted passages. A cross-sectional view of a typical shock absorber is shown below. Its main components and working is also given below.

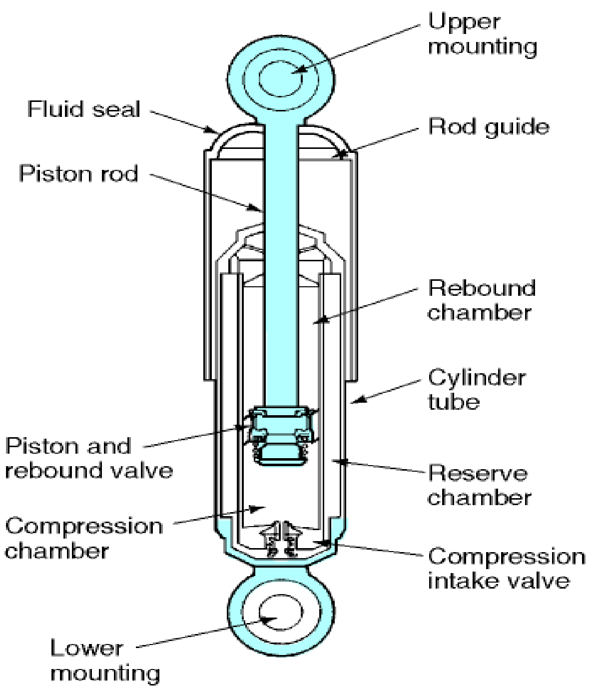

Fig 2.The Inside parts of shock absorber

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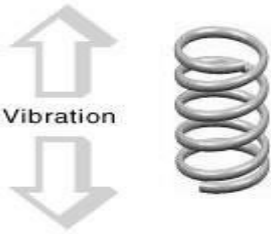
The upper mounting is attached to a piston rod. The piston rod is attached to a piston and rebound valve assembly. A rebound chamber is located above the piston and a compression chamber below the piston. These chambers are full of hydraulic fluid. A compression intake valve is positioned in the bottom of the cylinder and connected hydraulically to a reserve chamber also full of hydraulic fluid. The lower mounting is attached to the cylinder tube in which the piston operates.

During compression, the movement of the shock absorber causes the piston to move downward with respect to the cylinder tube, transferring fluid from the compression chamber to the rebound chamber. This is accomplished by fluid moving through the outer piston hole and unseating the piston intake valve.

During rebound, the pressure in the compression chamber falls below that of the reserve chamber. As a result, the compression valve will unseat and allow fluid to flow from the reserve chamber into the compression chamber. At the same time, fluid in the rebound chamber will be transferred into the compression chamber through the inner piston holes and the rebound valve.



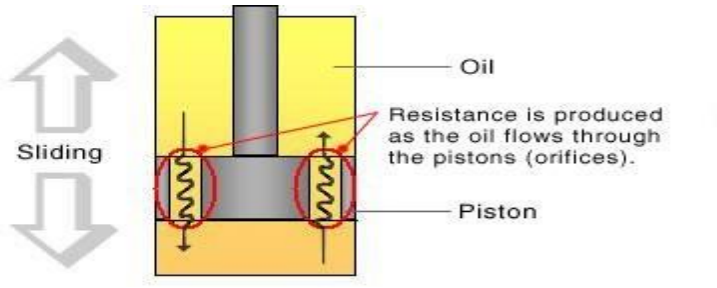


Fig.3.Spring

Fig.4. Schematic Diagram of the Interior of a Shock Absorber

VI. GAS FILLED SHOCK ABSORBER

The gas filed shock absorbers is designed to reduce the foaming of the oil. It uses a piston and oil chamber similar to other shock absorbers. The difference is that instead of a double tube with a reserve chamber, a dividing piston separates the oil chamber from the gas chamber. The oil chamber contains a special hydraulic oil and the gas chamber contains nitrogen at 25 times atmospheric pressure. The schematic diagram showing the inside parts of a gas filled shock absorber is shown below.

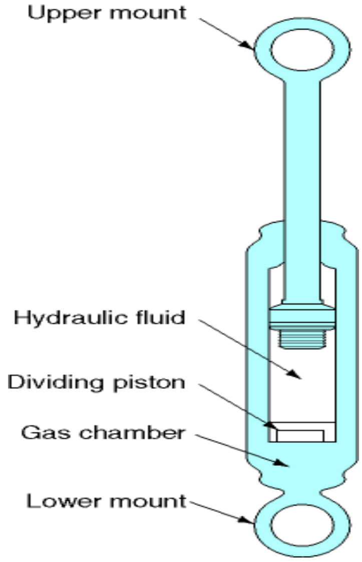


Fig.5. The Inside parts of gas filled shock absorber

When the piston rod is moved into the shock absorber, oil is displaced as in double tube principle. This oil displacement causes the dividing piston to press in the gas chamber, thus reducing it in size. With the return of the piston rod the gas pressure returns the dividing piston to its starting position.

Whenever the oil column is held at a static pressure of approximately 25 times atmospheric pressure, the pressure decreases behind, the working piston cannot be high enough for the gas to exit from the oil column. Consequently, the gas filled shock absorber operates without foaming

There are two types of gas shock absorbers:

- Single tube with high pressure
- Twin-tube with low pressure gas.

1. High pressure single tube shock absorbers.

Gas shock absorbers operate on the same basic principle of movement of the piston in an oil filled tube but they contain, at one end, a small quantity of nitrogen under high pressure (25 bars).

The gas is prevented from mixing with the oil by a floating piston. When the piston rod passes into the body and displaces oil, the oil compresses the nitrogen even further. The volume of gas changes, playing the same role as an equalization tube. The permanent pressure exerted on the oil by the gas guarantees an instantaneous response and quieter piston valve operation. At the same time, this constant pressure eliminates cavitation and foaming which could momentarily degrade the effectiveness of the shock absorber.

2. Low Pressure gas twin-tube shock absorbers

The Monroe Original twin-tube Gas-Technology design retains the classical twin-tube while adding, at the top of the reserve tube, nitrogen under relatively low pressure 2,5-5 bars instead of the 25-30 bars used in high pressure shock absorbers. This pressure is sufficient to to radically improve the efficiency of the shock absorber.

The Monroe Original low-pressure design presents two main innovations:

- In the upper part of the reserve tube, air at atmospheric pressure is replaced by nitrogen (an inert gas) at pressure of 2,5 to 5 bars.This is introduced once and for all during manufacture.
- The oil seal surrounding the piston rod in the upper body of the shock absorber has been especially designed with one lip to prevent the entry of dust and with a further two sealing lips to prevent oil escaping.The base of the seal is in the form of a circular strip which functions as a non-return valve. The flexibility of the strip allows the oil to flow back into the reserve tubes and keeps the gas pressure solely on the oil in the reserve.

The low pressure shock absorber design has enabled Monroe to solve certain problems associated with the MacPerson system.These shock absorbers produce a very comfortable ride and very precise steering.

VII. CONCLUSION

In the current scenario of automobile industry the need for vehicles which provides smooth and comfort ride is growing. Nitro shock absorbers are designed to be ultimate in performance and comfort. In a country like ours whose roads are not up to world standards the need for automotive components like nitro shocks are necessary. It goes without saying that if the right choice is made the improvements in vehicles ride and handling can be shocking.

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