Shock Absorber

1.Dual Shock Absorbers

https://drive.google.com/drive/folders/1MapI31p1sPKdNkeMyu8v199IcHY0XwqH?usp=sharing

2.Electronically Adjusted Shock Absorbers

https://drive.google.com/drive/folders/12RW3uWw3IOWCuMGtS6hvC06rxfaJrkpx?usp=sharing

3.Gas Charged Shock Absorbers

https://drive.google.com/drive/folders/1zNjoWqopPUnaixrAg3rxPhGbCeDnX08W?usp=sharing

4.Hydraulic Shock Absorbers

https://drive.google.com/drive/folders/1qoDYQWaDpJ1ZUxS4V7QfeiqR-Jq3nevR?usp=sharing

5.Manually Adjusted Shock Absorbers

https://drive.google.com/drive/folders/1jhOenGe1o_cl-_hT0489Uw3OOq-3IL68?usp=sharing

6.Mono Shock Absorbers

https://drive.google.com/drive/folders/1I9-OfGAwFTVzKS_cbMWsw2kQRqzN5aeZ?usp=sharing

7.Shock Absorbers Inspection

https://drive.google.com/drive/folders/1jEzFrvJyzK1pnmAAy5MW6xKd46s6OnIO?usp=sharing

8.Single Acting Shock Absorbers

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Function and location of shock absorber

When the vehicle is running on a rough road, or a stone gets below the wheels falls into a pit, heavy shocks are experienced.

A bouncing wheel makes it difficult to control the vehicle and it is to avoid such bouncing of the wheels, a suspension system is provided in the vehicles.

Vibration of higher amplitude and lower frequency are absorbed by suspension spring. Vibration of low amplitude and high frequency are absorbed by the shock absorber.

The shock absorber is connected between the chassis cross-member and the spring axle or suspension control arm.

You tube video

https://www.youtube.com/watch?v=j0vhTg82Pz0

Different types of shock absorbers

Shock absorbers are mainly classified into two types.

Mechanical type

This is called a dry or friction type. It absorbs shocks with the help of friction discs and spring.The friction type shock absorbers have almost become obsolete due to their non-predictable damping characteristics.

Construction of Mechanical type shock absorbers

It consists of two discs with a small clutch, spring and centre bolt. One disc is fixed to the chassis and the other to the axle. A friction disc works between these two discs. All discs are assembled with the spring and centre bolt.When the axle is lifted up the friction produced in between the discs due to the spring pressure, absorbs the vibration.

Hydraulic type

These shock absorbers absorb shock by the resistance of a fluid. There are three types.

Vane type

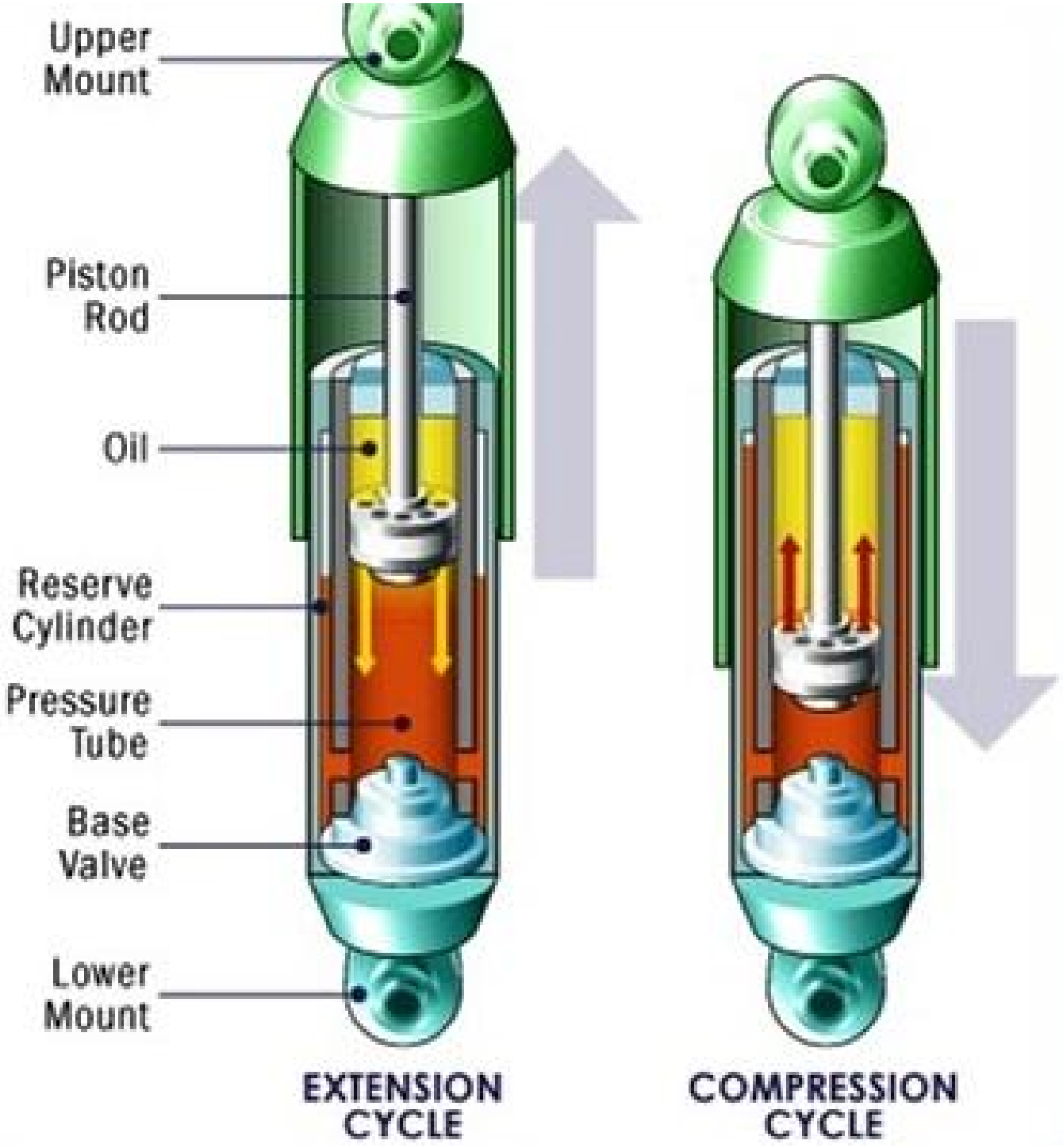
Piston type

Telescopic type

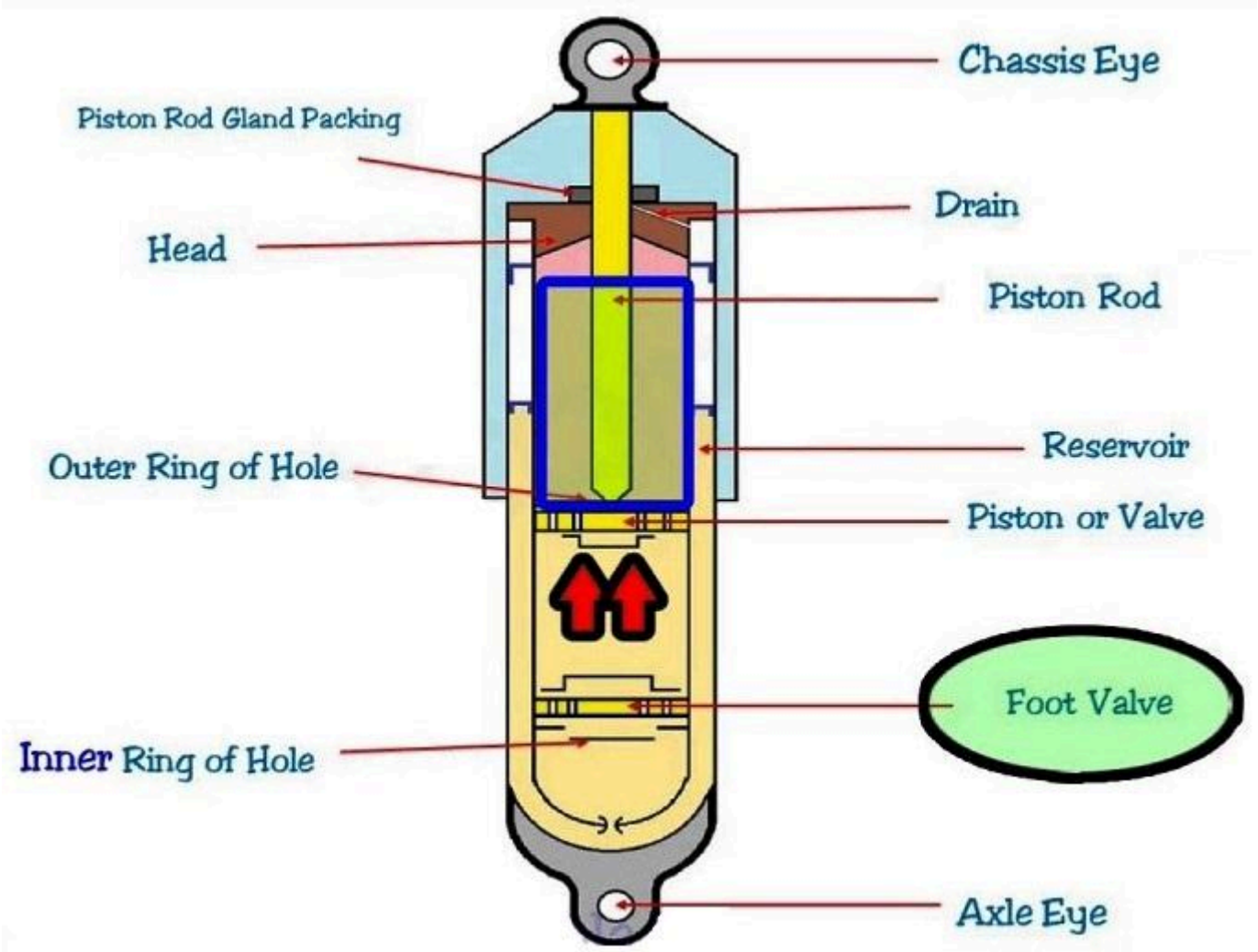
Now a days,the telescopic shock absorber is most popular and is in use because of easy replacement and handling.It is widely used in vehicles.

Construction

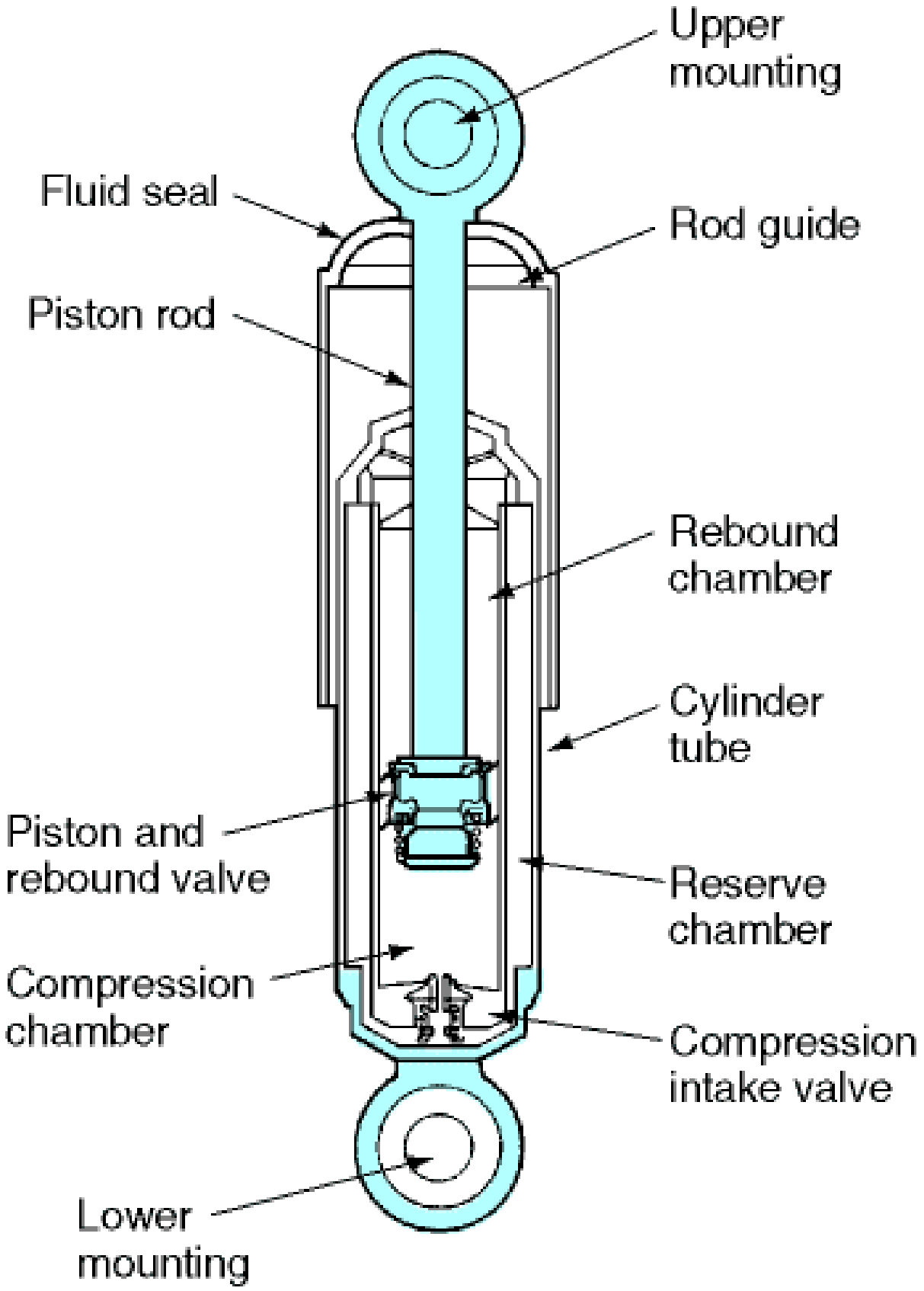
The telescopic shock absorber is made of two thin steel tubes, the inner forms the cylinder and the outer forms the reservoir. It is called telescopic because the tubes are concentric. The outer tube is connected to the axle or suspension member by an eye.



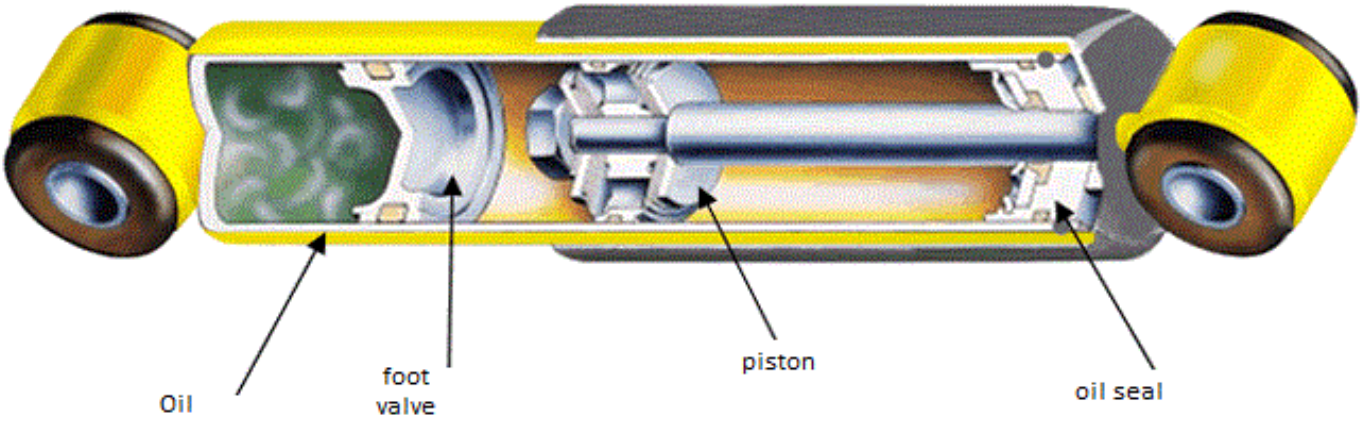
A block is welded in the bottom of the inner tube. The block has two non-return valves. One valve allows oil from the reservoir to the lower cylinder and the other from the lower cylinder to the reservoir. At the upper end of the shock absorber a dust excluder is provided.



The piston has a rebound valve and bump valve. The piston rod's upper end is welded to an eye. This eye is attached to the frame. The cylinder is fully filled with hydraulic fluid and the reservoir is partly filled.



During the rebound/functioning of shock absorber stroke the eye moves away from each other. The piston moves upward. The rebound valve opens and the fluid passes to lower the portion of the cylinder from the upper portion. Since the upper portion does not have enough fluid to fill the lower portion completely, a vacuum is created in the lower portion. Now the extra fluid flows into the lower portion from the reservoir through the foot valve. This passage of fluid provides necessary damping during rebounding.



This way, the shock absorber controls the quick bouncing of the wheels on the road. This provides stability to the vehicle. It also controls the slow balancing of the body to provide comfort to the passenger and avoid damage of other parts.

You tube video

https://www.youtube.com/watch?v=VyJjkCo6PPE

https://www.youtube.com/watch?v=RvSOXX44Ym8

Factors affecting suspension

The following factors affect suspension in any vehicle.

Irregularities of road surface

Bumps and holes

Heavy load or unequal weight distribution

Tyre traction and pressure

Side forces while negotiating corners.

Effects of weak suspension

Directional instability of the vehicle

Excessive/abnormal tyre wear

Damaging of chassis frame and other parts

More shocks and uncomfortable riding

Gas pressurized shock absorbers

Shock absorber 'dissolve' can be reduced by pressurizing the fluid with nitrogen.

In a hydraulic shock absorber, the oil heats up as the energy of motion of the suspension is dampened. The rapid piston movement as the vehicle moves over the road causes the hydraulic fluid to aerate. This reduces the damping effect, and the shock absorber's performance very quickly deteriorates. This condition is called shock absorber dissolve. It can be reduced substantially by pressurizing the fluid with gas, usually Nitrogen.

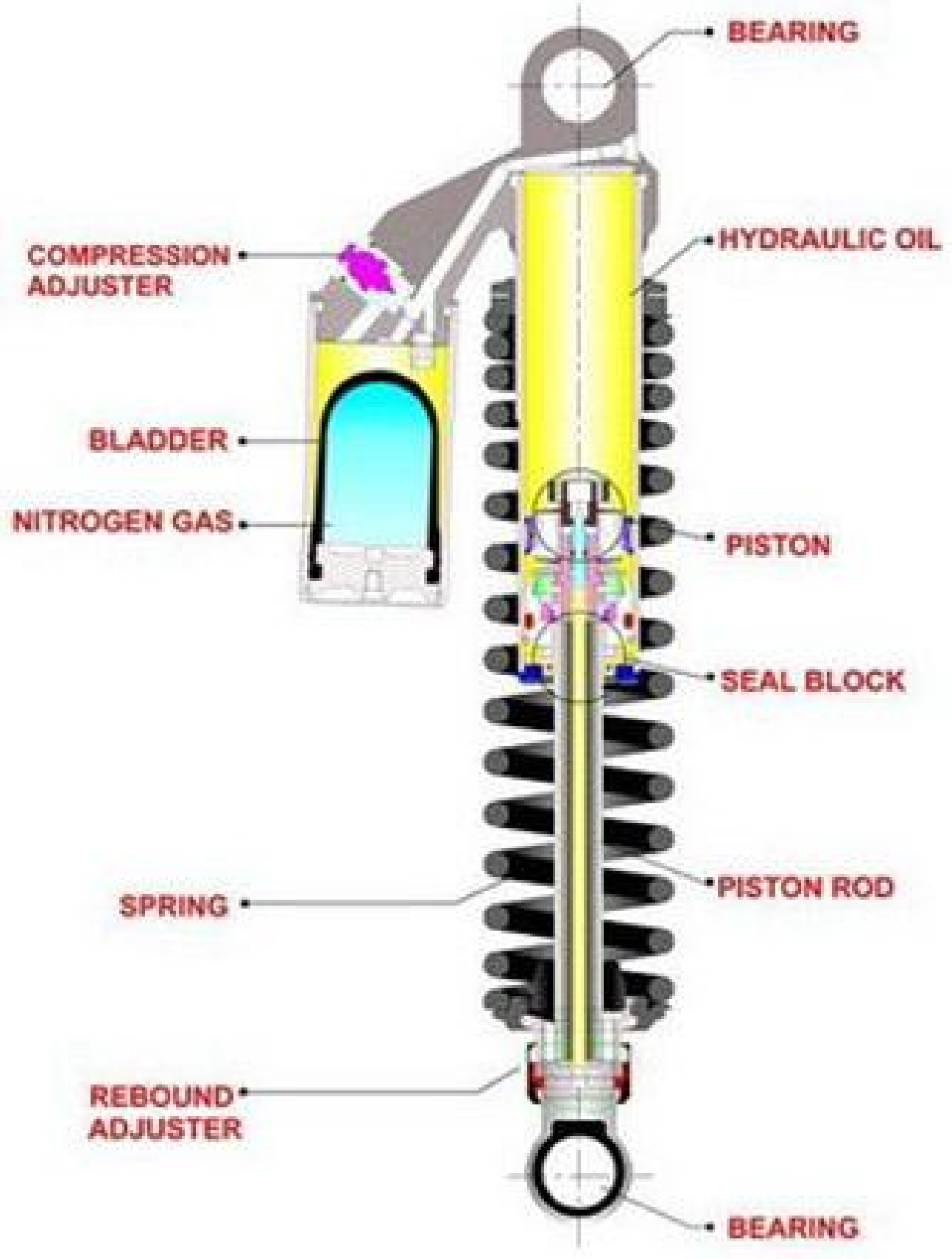
In this mono-tube design, fluid fills the chambers above and below the piston.As the piston moves in the cylinder, valves control the movement of oil from one chamber to the other.

Pressure on the oil is provided by Nitrogen gas at the base of the cylinder, acting on a free floating separation piston which separates the gas from the oil.On bump, the piston moves downwards, and the penetration of the piston rod displaces a quantity of oil equal to its volume. The separation piston is displaced accordingly, and gas pressure increases.

On rebound, the piston and rod move upwards, and gas pressure reduces as the separation piston follows the movement.

You tube Video

https://www.youtube.com/watch?v=EiCb0AhCKVg



Pressure on the oil is maintained, even when the piston and rod are at the top of their stroke.

Load-adjustable shock absorbers

The rubber air cylinder in the load-adjustable shock absorber can be pressurized to assist suspension springs that are under load. Changing the pressure in the cylinder can alter ride height, and the stiffness of the suspension.

When vehicles carry heavy loads, their suspension is compressed, causing the rear of the vehicle to be lower than normal.As a result, steering becomes lighter, the alignment of the headlights becomes too high, and the compression length of travel of the suspension over bumps is reduced, causing discomfort to passengers .

To reduce these effects, a manually adjustable air spring can be incorporated into each rear shock absorber. The air spring consists of a flexible rubber cylinder which seals the outside of the upper and lower halves of the shock absorber.The shock absorber is a standard hydraulic type, providing normal dampening action, but when a heavy load is placed on the rear of the vehicle, the rubber air cylinder can be pressurized to assist the suspension springs.

By changing the air pressure in the cylinder, the ride height can be adjusted, as well as the stiffness of the suspension.Compressed air in the pneumatic cylinder can absorb smaller road shocks, and provide better ride characteristics than just stiff springs alone.

The rubber air cylinder is connected to a filling valve by a flexible plastic hose.Air from a tire pump or a hand unit forces more air into the rubber cylinder, allowing the suspension to support more weight.The maximum air pressure setting must not be exceeded as this can damage the shock absorber .and its mounting points on the vehicle frame .

When the load is removed, the extra air is released through a filling valve, which allows the suspension to return to its original settings.A minimum air pressure must be maintained in the cylinder to prevent tearing of the rubber as it collapses internally with shock absorber action.

Video

https://www.dailymotion.com/video/xyqedq

Electronic adjustable-rate shock absorbers

The electronic adjustable - rate shock absorber has a rotary solenoid that can alter damping rate by changing the number of restrictions the oil must pass through, and varying the force needed to open the valves.

Adjustable rate shock absorbers provide a means of changing their rate of dampening of the spring oscillations, to suit road conditions. Electronic controls let the changes occur either automatically, or as the driver prefers.

Each shock absorber has a rotary solenoid that can alter the dampening rate by changing the number of restrictions the oil must pass through.

In this position, all orifices are open. Oil can flow more easily through the passageways in the piston. Only a small dampening effect is applied to the oil.

This provides a damping force that emphasizes ride comfort when traveling at low speeds.

Closing some orifices makes it harder for fluid to flow through the piston. This increases the dampening effect of the shock absorber, providing a firmer ride, more suitable for higher speeds, and faster cornering.

The solenoid is operated by an electrical signal from the electronic control unit or ECU.

The ECU allows different modes of operation, according to a selector switch on the dash-board. In the Auto position, the dampening effect at the front wheels is increased at road speeds above 80 kilometers per hour.

This improves vehicle stability at high speeds. The rear shock absorbers stay at their normal setting.

The manual position has two settings - normal or sport. In normal settings, all shock absorbers remain at a rate suited to ride comfort.There is no change to the settings at high speeds.

The sport setting increases the damping rate of all the shock absorbers. This is more suited to brisk driving, with heavy acceleration and cornering.

Automatic load-adjustable shock absorbers

Automatic load-adjustable shock absorbers maintain vehicle ride at a pre-set level, according to the load placed over the rear axle.

The section examines automatic load -adjustable shock absorbers. They are also called self-leveling.

When vehicles carry heavy loads, their suspension is compressed, causing the rear of the vehicle to be lower than normal.

As a result, steering becomes lighter, the alignment of the headlights becomes too high, and the compression length of travel of the suspension over bumps is reduced, causing discomfort to passengers.

A lower vehicle handles better on smooth roads, but on a rough road, reduced suspension travel can let harsh road shocks be transmitted to the passenger compartment, and cause discomfort.

An automatic load adjustable suspension system controls the vehicle ride height automatically, according to the load placed over the rear axle.

It consists of air-adjustable shock absorbers fitted to the rear suspension, an electrically driven compressor and air-dryer assembly, and an electronic control unit, and associated wiring and tubing.

The ECU is mounted to the cross-member over the rear axle and a moveable link connects it to a rear suspension member.

As the vehicle is loaded, the normal suspension springs are compressed, which lowers the height of the vehicle .

When · 1e ignition is switched on, the ECU senses the lowered ride height and switches on the air compressor. Air is directed to the shock absorbers, causing the airbag around them to expand and raise the suspension to the normal trim height.

If the load is removed, the suspension springs expand, raising the height of the vehicle .The ECU senses the raised ride height, and air is exhausted from the shock absorbers, causing the airbag to deflate, and lower the suspension to the normal trim height.

During normal suspension operation, continual adjustment of vehicle ride height is prevented by a time delay, in the ECU.

This allows the trim height to be adjusted only when the ECU reads an out-of-trim signal for 5 to 15 seconds . The compressor run-time or exhaust-time is limited to 2 minutes. This prevents it continuing to operate, if the system develops an air leak, or if an exhaust vent remains open.