

SUSPENSION SYSTEM

What is suspension system?

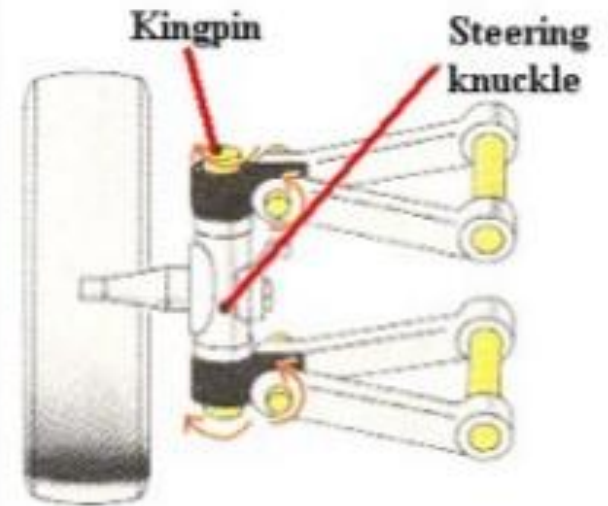
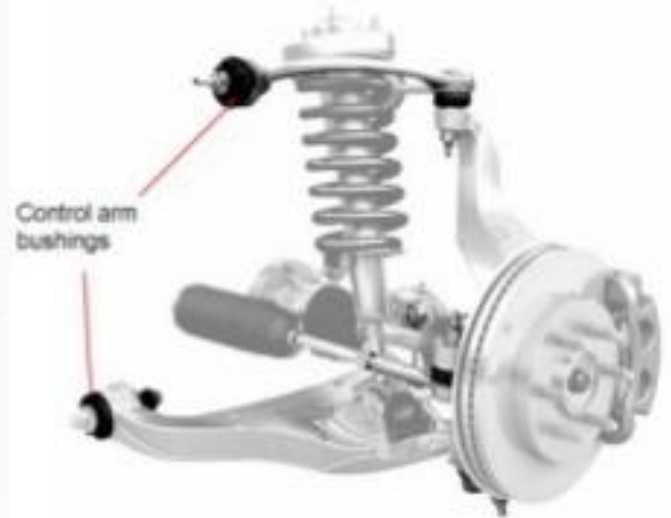
- Suspension is the term given to the system of springs, shock absorbers and linkages that connects a vehicle to its wheels
- Serve a dual purpose – contributing to the car's handling and braking.
- Protects the vehicle itself and any cargo or luggage from damage and wear

Suspension System

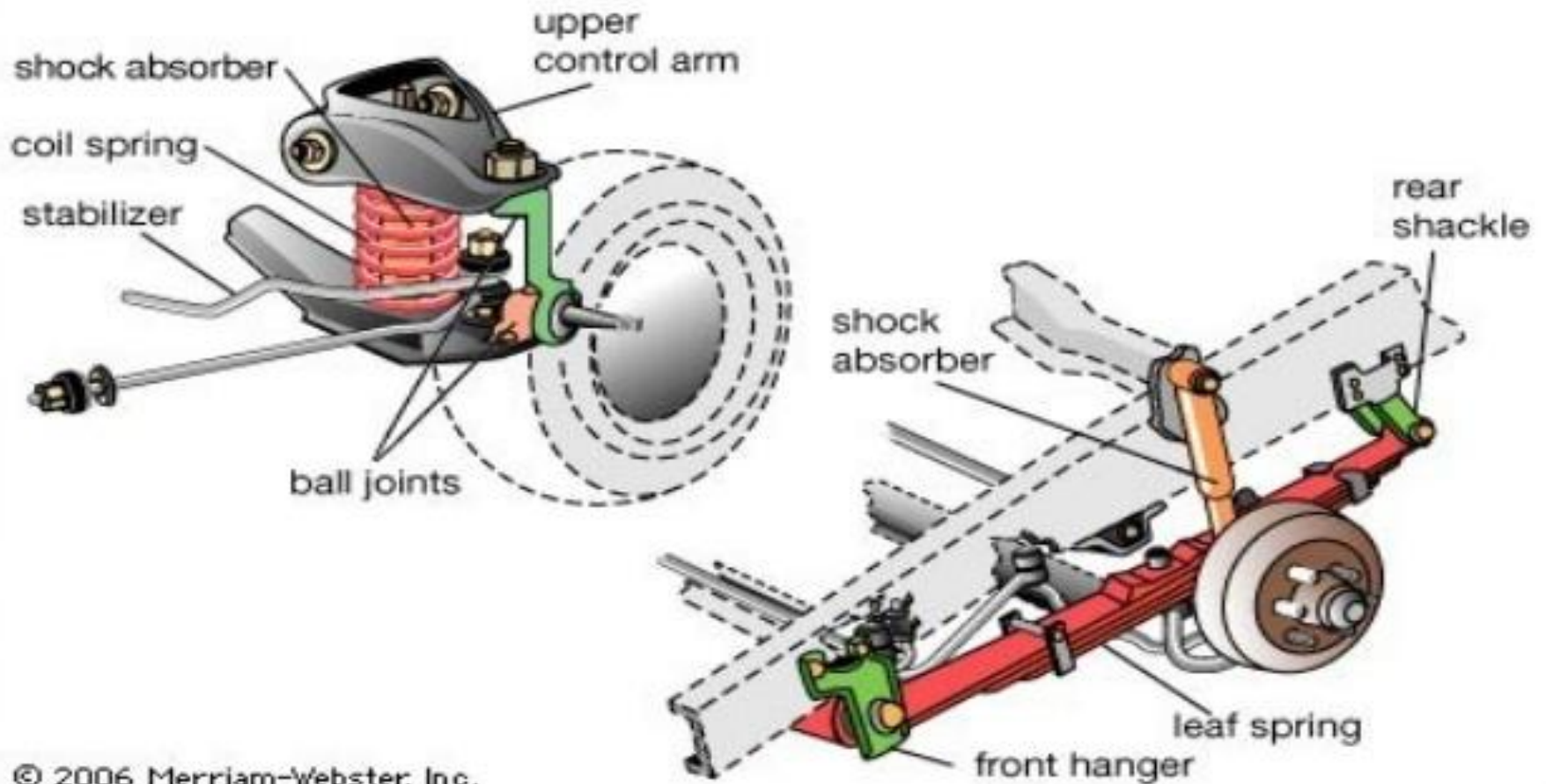
Basic Parts:

Control Arm:- movable lever that fastens the steering knuckle to the vehicle's body or frame.

Steering Knuckle:- provides a spindle or bearing support for the wheel hub, bearings and wheel assembly.



Suspension System

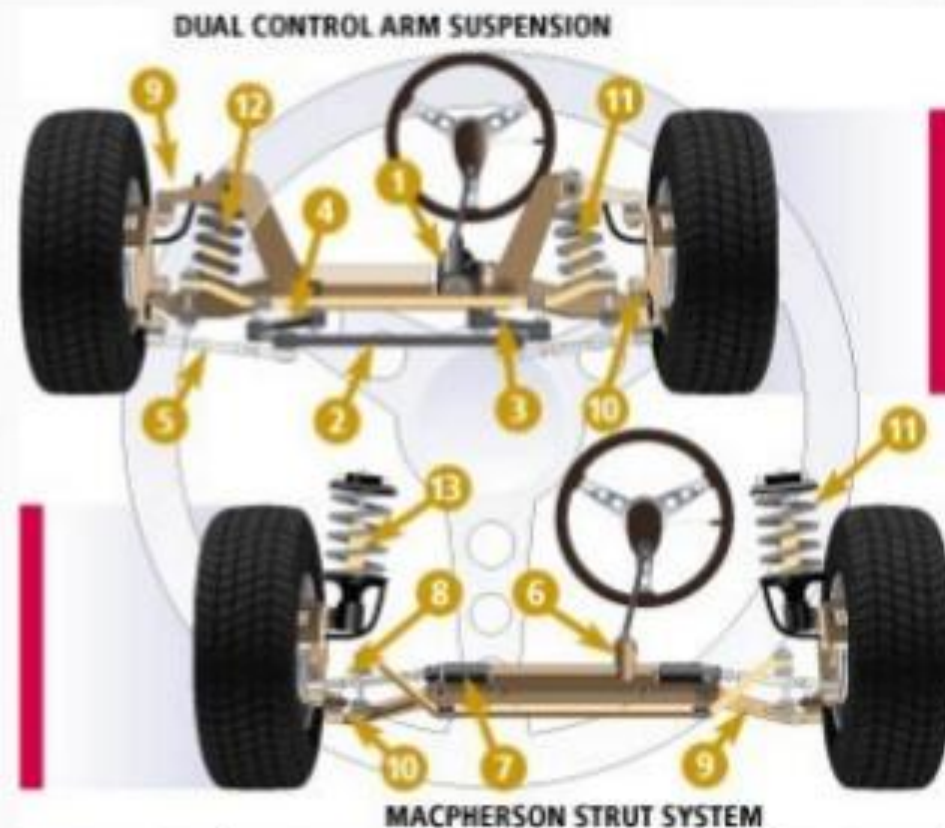


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COIL SPRING AND LEAF SPRING

PURPOSE OF SUSPENSION SYSTEM

- Supports the weight.
- Provides a smooth ride.
- Allows rapid cornering without extreme body roll.
- Keeps tires in firm contact with the road.
- Allows front wheels to turn side-to-side for steering.
- Works with the steering system to keep the wheels in correct alignment.
- Isolate passenger and cargo from vibration and shock



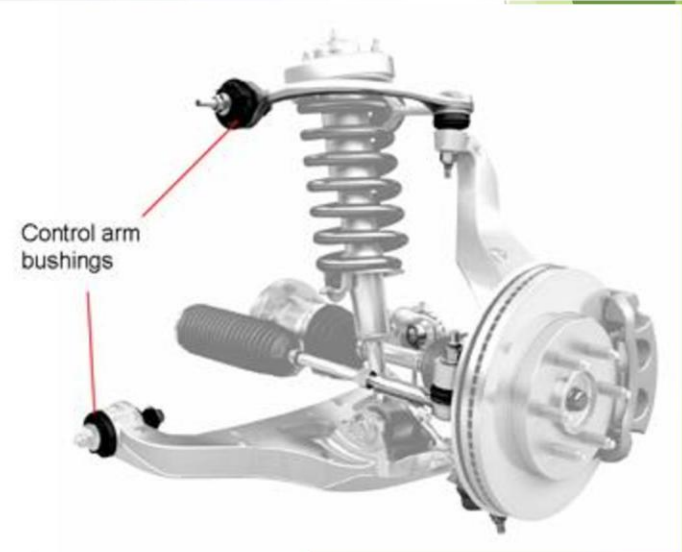
Suspension System

Basic Parts

Shock absorbers or dampeners – keeps the suspension from continuing to bounce after spring compression and extension.



Control arm bushing – sleeves that allows the control arm to swing up and down on the frame.



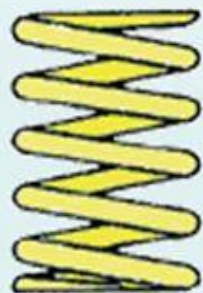
Suspension Systems

- Coil

- Spring wire heated and wound into coil
- Insulator pads used between frame and spring
- Ends of coils are shaped to fit application



COIL SPRING ENDS



TAPERED
END



TANGENTIAL
END

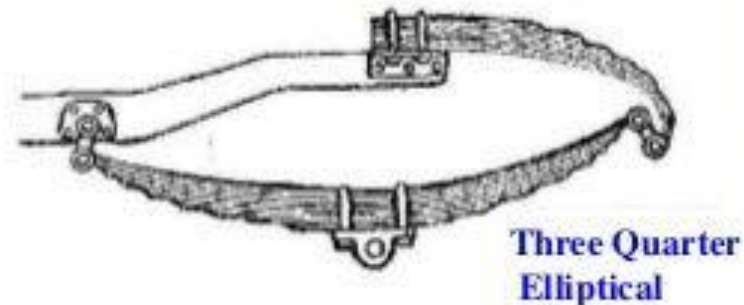
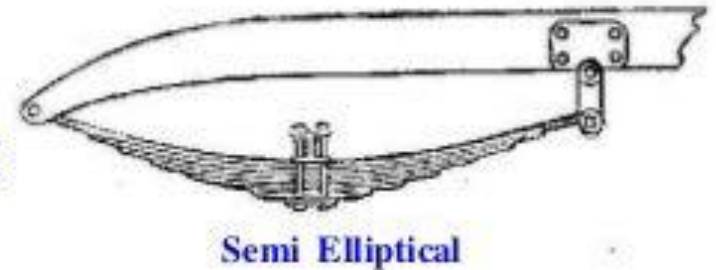


PIG-
TAIL

LEAF SPRING :

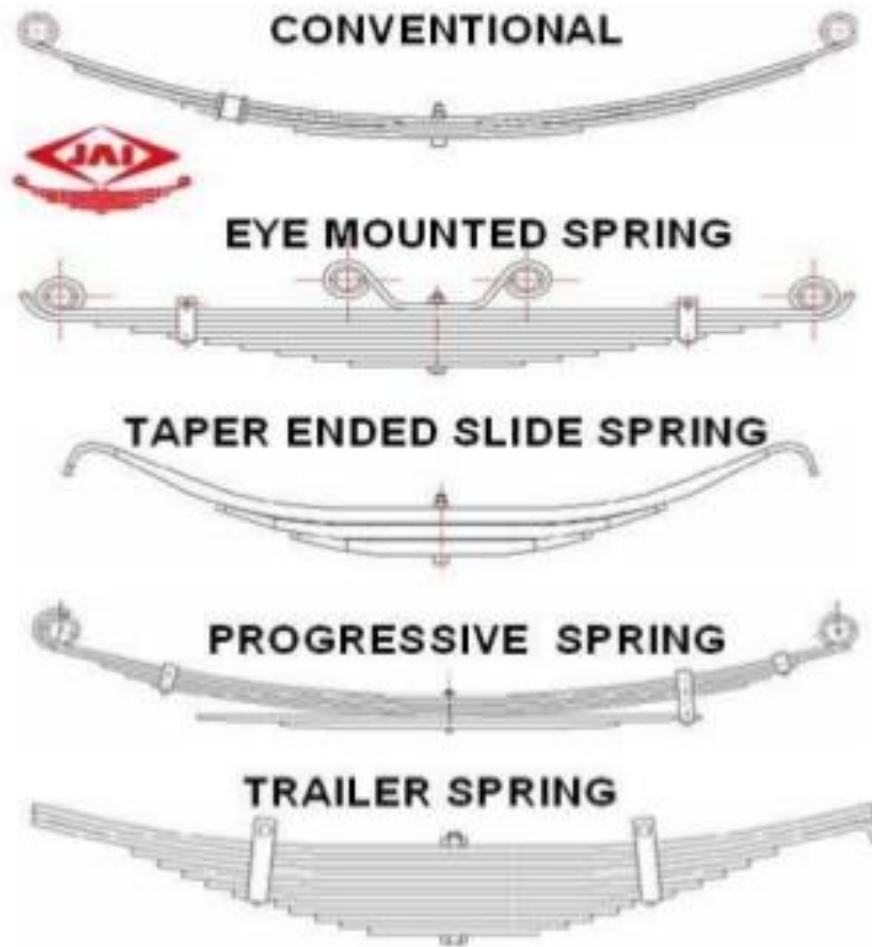
Leaf springs are of the following types

- 1) Semi-elliptical spring
- 2) Quarter elliptical spring
- 3) Three quarter elliptical spring
- 4) Transverse spring
- 5) Full elliptical spring
- 6) Platform type spring



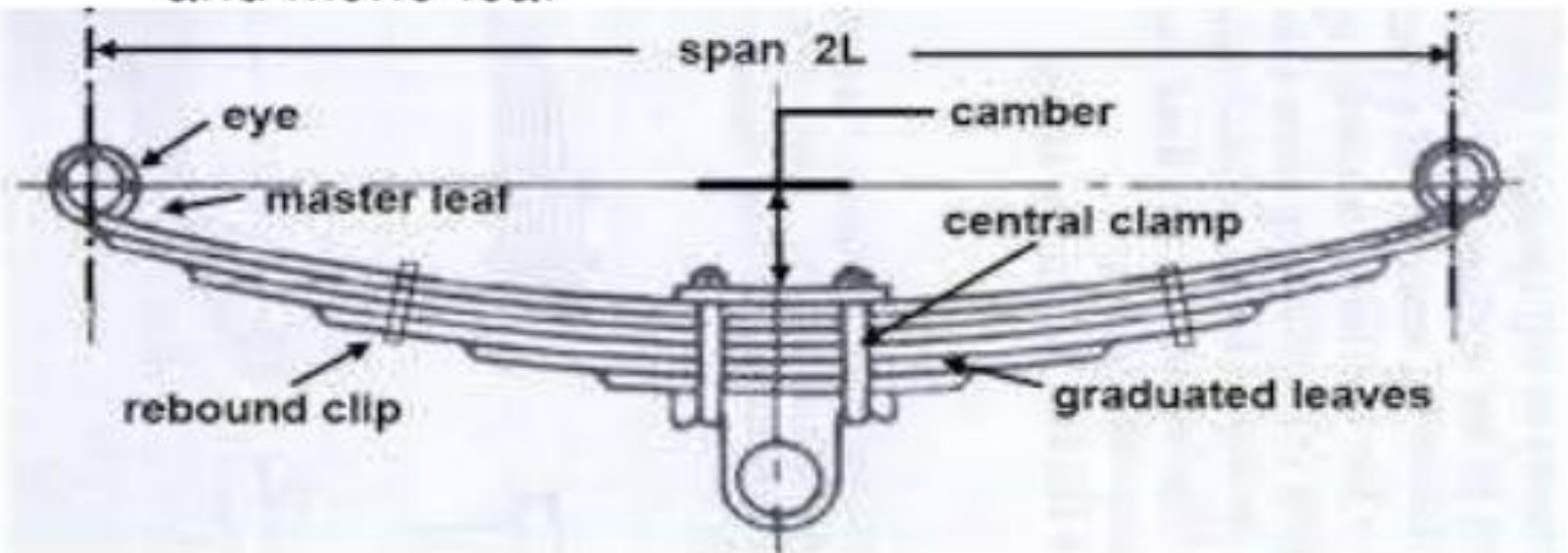
Semi-elliptical spring are usually used in all the vehicles.

Another Types of Leaf Spring



LEAF SPRING:

- A leaf spring is a simple type of suspension spring commonly used in heavy duty vehicles.
- Leaf springs also known as flat spring are made out of flat plates.
- Leaf springs are designed two ways: multi-leaf and mono-leaf



COIL SPRING

- Little to no internal damping
- Low cost
- Compact Size
- Used in many Suspension types
- Coil spring is the most common type of spring found on modern vehicles

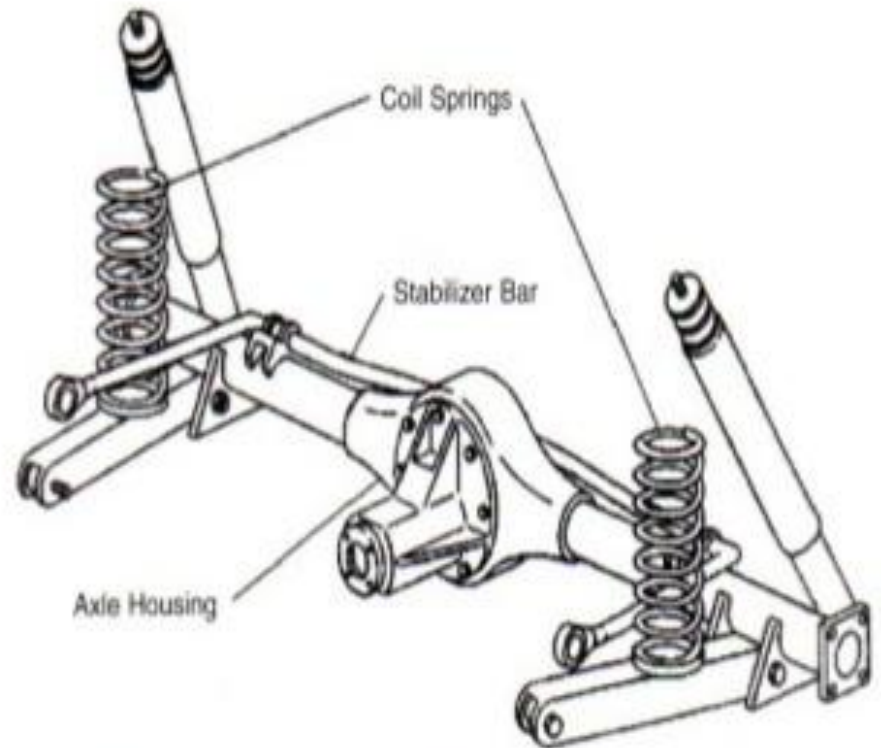


Figure 8.19. A coil spring suspension. Adapted from TM 9-8000 (1985).

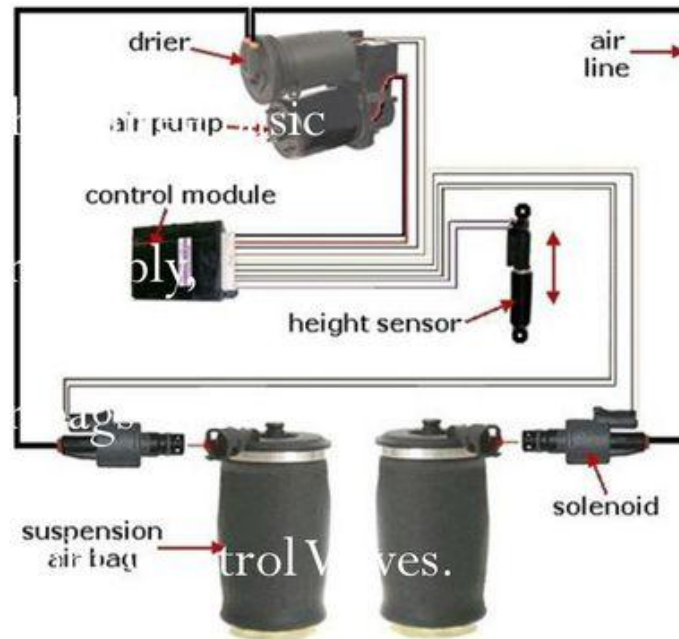
Leaf Spring

- Leaf spring is spring in which number of spring in which number of strips with same width and different length clamped together.
- The leaf spring is capable to carry lateral loads, driving torque and braking torque in addition to shock.
- Leaf springs are widely used in automobile vehicles, earth moving machineries, railway wagons and passenger train carriage.
- The suitable material for leaf spring is highly hardened plain carbon steels, vanadium steels and silicon manganese steels.

Types of Leaf Springs

- There are six types of leaf springs
 - 1.Full – elliptic type
 - 2.Semi – elliptic type
 - 3.Quarter – elliptic type
 - 4.Three Quarter – elliptic type
 - 5.Transverse Spring type
 - 6.Helper Spring type

Component Of the Air Suspension



AIR SUSPENSION SYSTEM

Air bags are simply a rubber bladder that holds air. Air bags are also referred to as air springs or bellows.

- The air bags are located between the frame of the vehicle and the vehicle axles.
- Air bags are rated for weight and pressure capacities.
- At the very least, there will be one air bag for each side of each axle in the vehicle.

Shock absorber

- A **shock absorber** or damper is a mechanical or hydraulic device designed to absorb and damp **shock** impulses. It does this by converting the kinetic energy of the **shock** into another form of energy (typically heat) which is then dissipated.

Shock Absorber

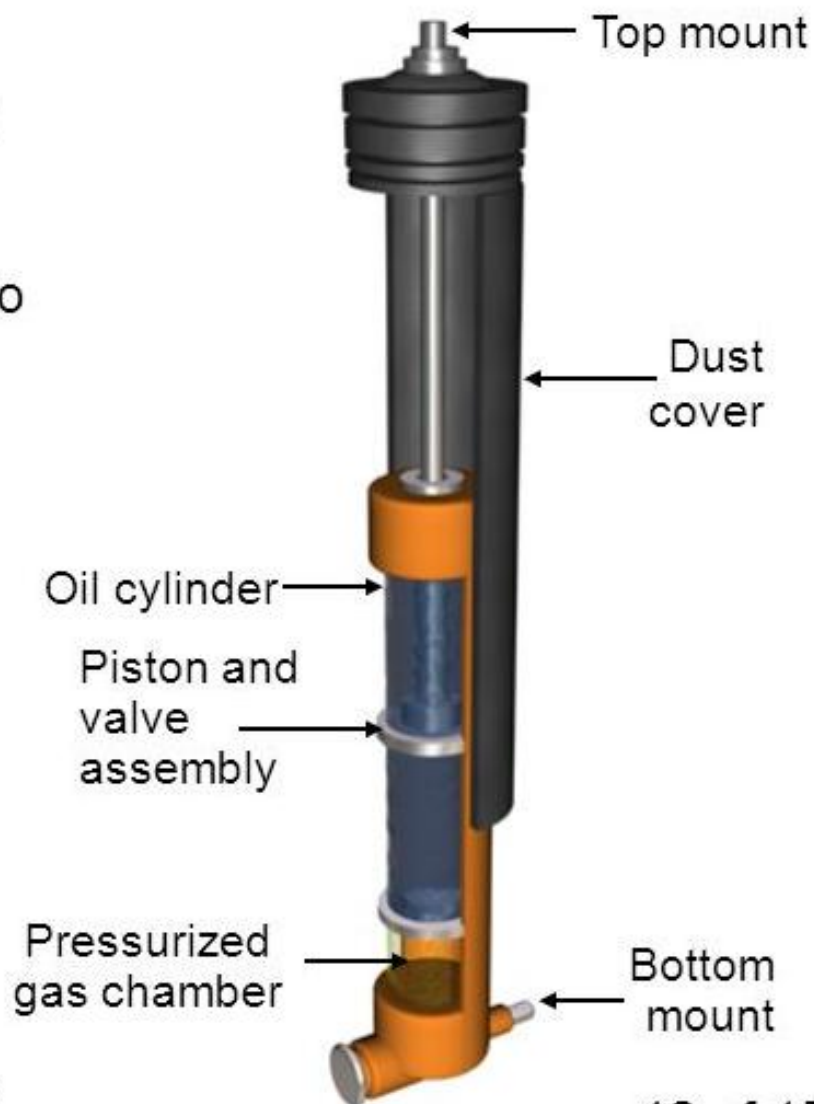
The function of a shock absorber is to reduce spring oscillations (up and down movements) following a road shock.

The upper end (top mount) is attached to the frame and the lower end (bottom mount) to the suspension unit.

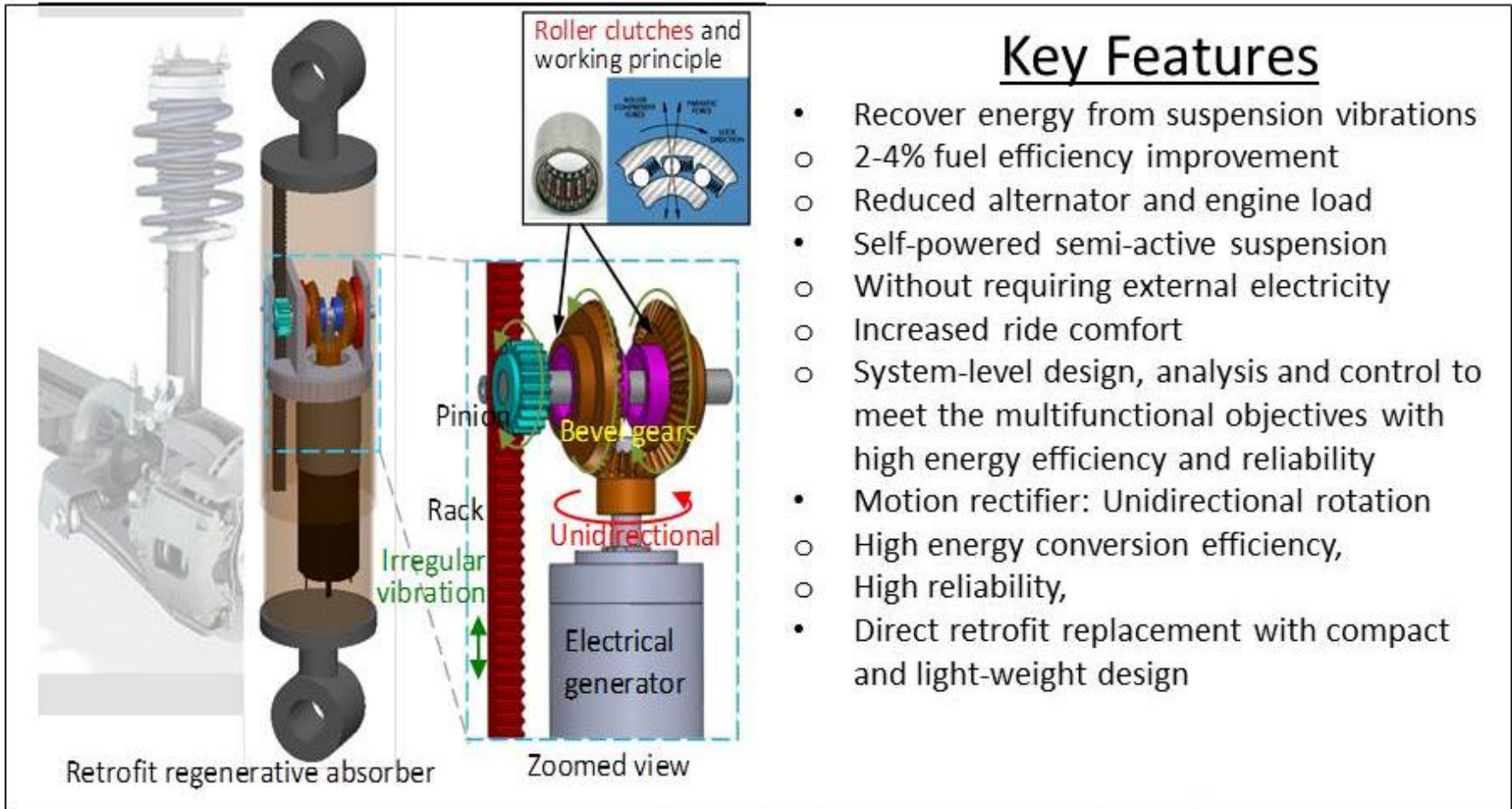
A piston and valve assembly moves in an oil-filled cylinder. Movement is controlled by the valve, rate-of-flow, restriction.

A pressurized gas chamber is sometimes added to prevent air bubbles in the oil causing foaming.

The cylinder is enclosed in a dust cover.



Working Principle and Features



Key Features

- Recover energy from suspension vibrations
 - 2-4% fuel efficiency improvement
 - Reduced alternator and engine load
- Self-powered semi-active suspension
 - Without requiring external electricity
 - Increased ride comfort
 - System-level design, analysis and control to meet the multifunctional objectives with high energy efficiency and reliability
- Motion rectifier: Unidirectional rotation
 - High energy conversion efficiency,
 - High reliability,
- Direct retrofit replacement with compact and light-weight design

Telescopic shock absorber

