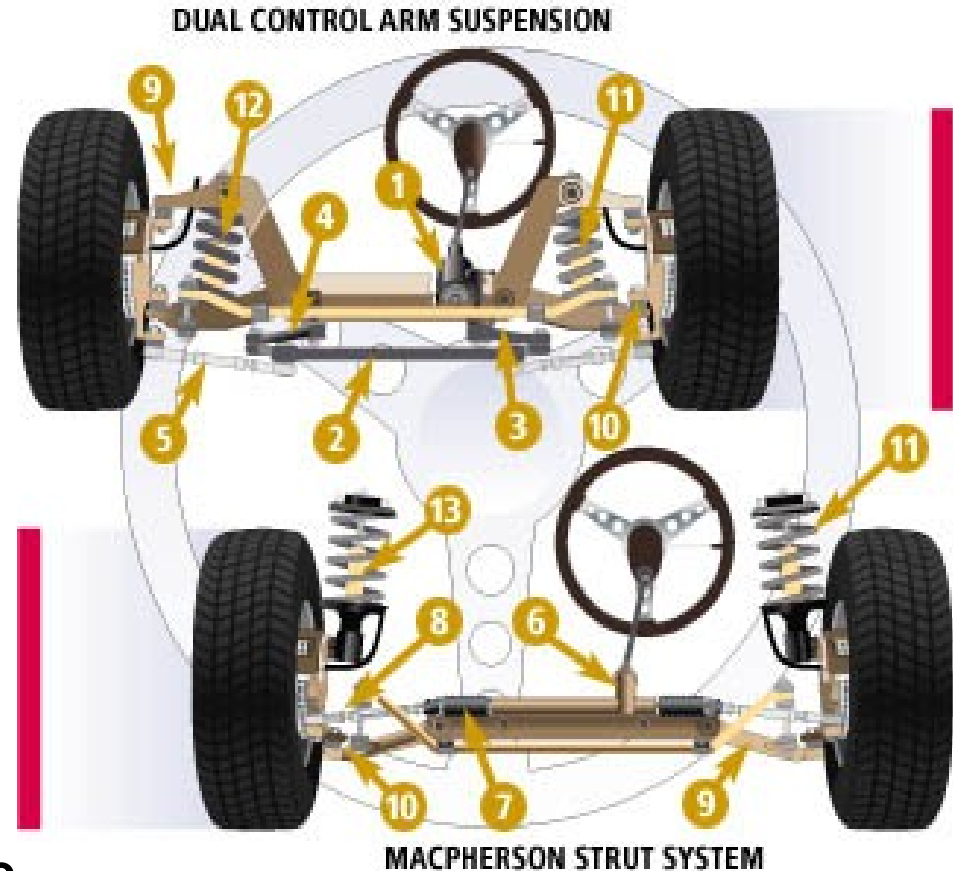


Automobile Suspension System



Function 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
 - Prevents excessive **body squat**.
-
- Prevents excessive **body dive**
 - Allows front wheels to turn side-to-side for steering
 - Works with the steering system to keep the wheels in correct alignment.



Classification

Types of Suspension System

Rigid suspension System

Independent Suspension System

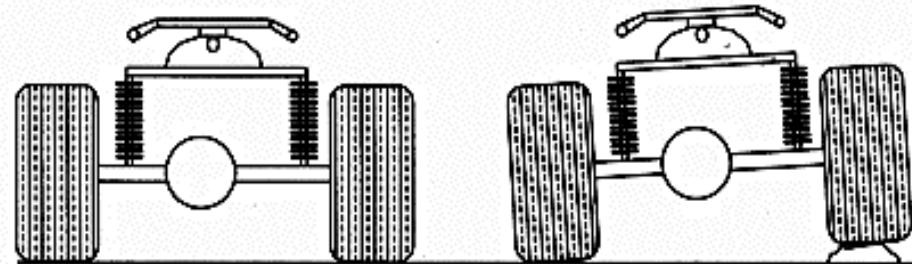


Types of Suspension System

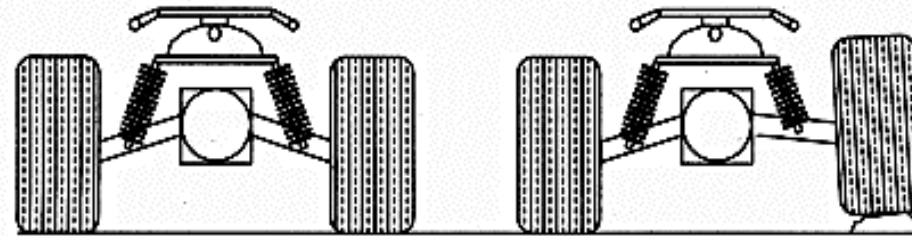
1.Non-independent/Rigid suspension has both right and left wheel attached to the same solid axle. When one wheel hits a bump in the road, its upward movement causes a slight tilt of the other wheel.

2.Independent suspension allows one wheel to move up and down with minimal effect to the other.

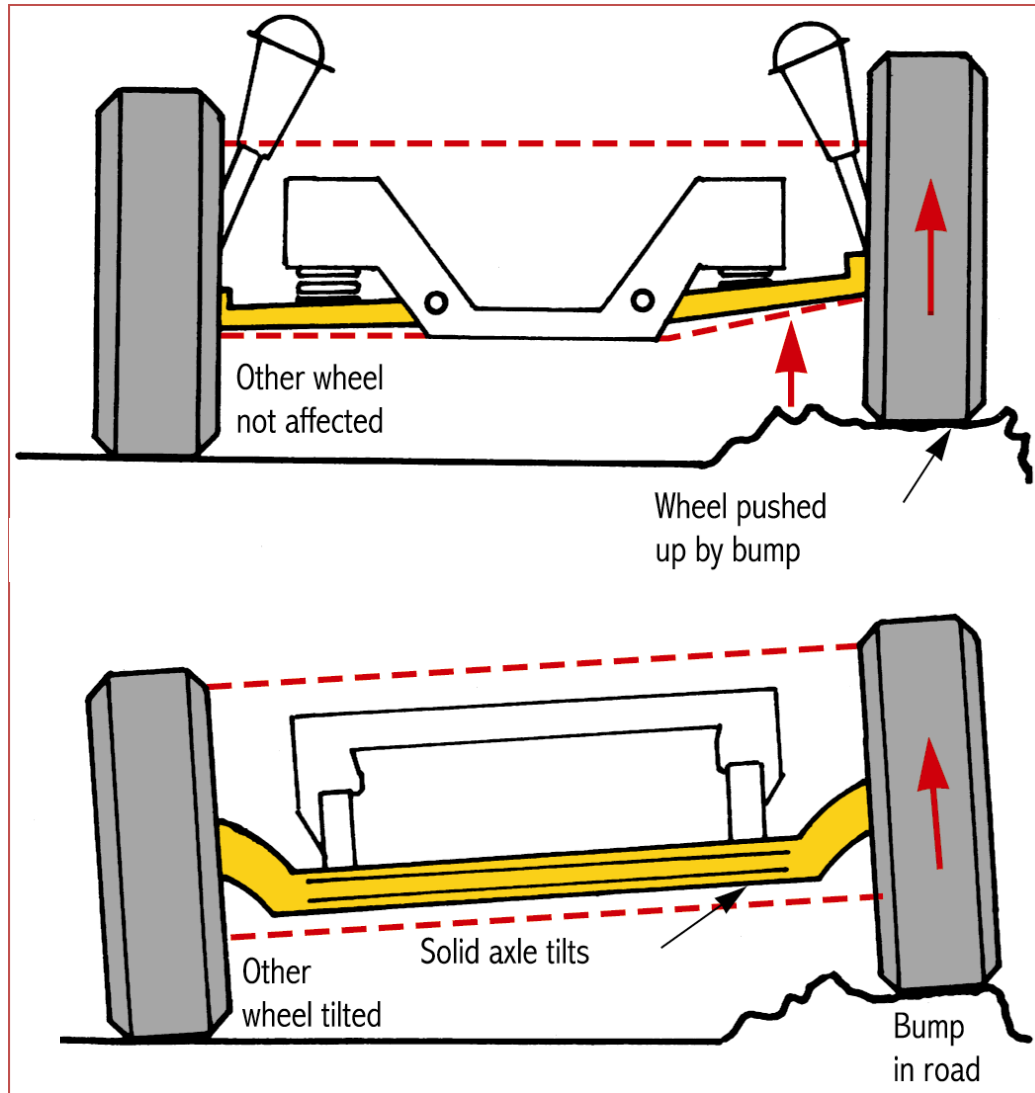
LOW SPEED BUMP WITH THE PATENTED LEHMAN "NO LEAN SUSPENSION"



LOW SPEED BUMP WITH INDEPENDENT SUSPENSION



Suspensions

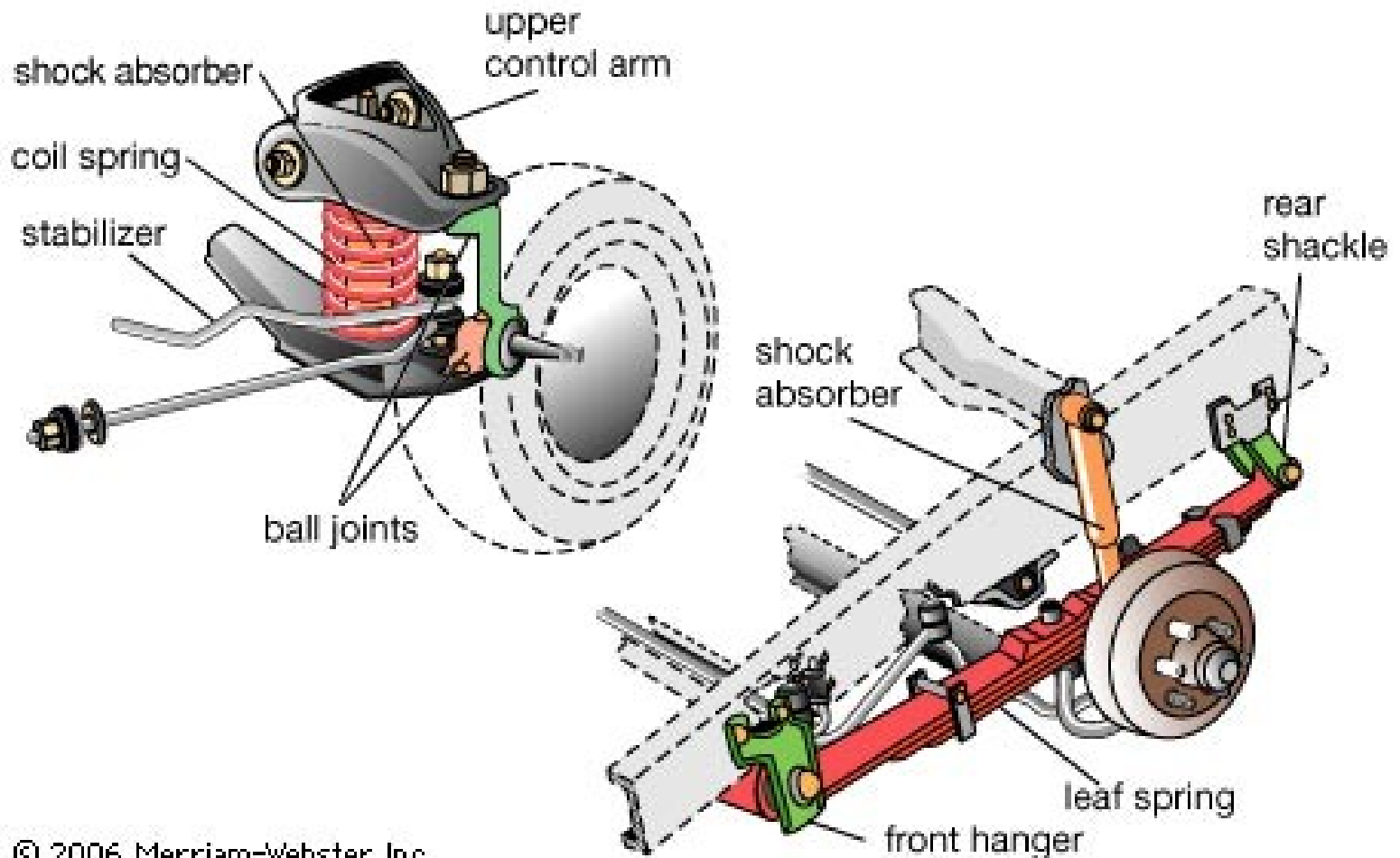


Independent Type

Rigid Type



Suspension System



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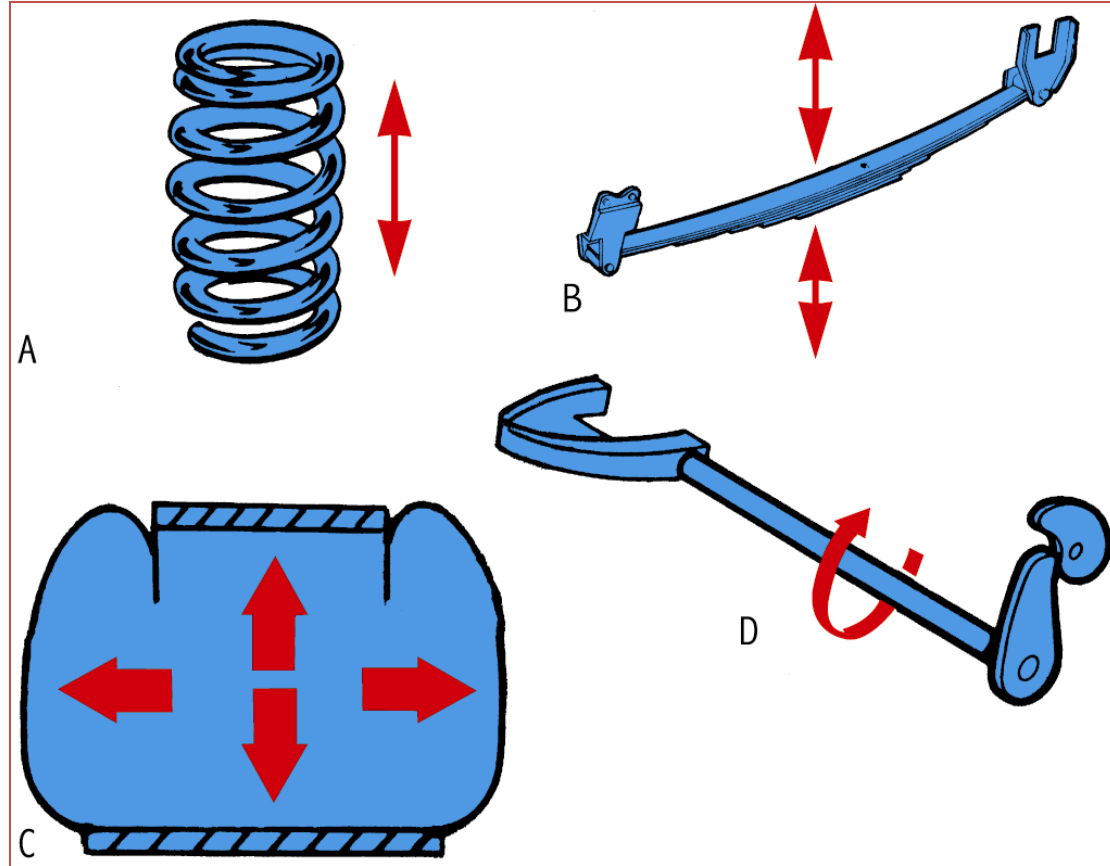
Coil spring is the most common type of spring found on modern vehicles.

Leaf springs are now limited to the rear of some cars.



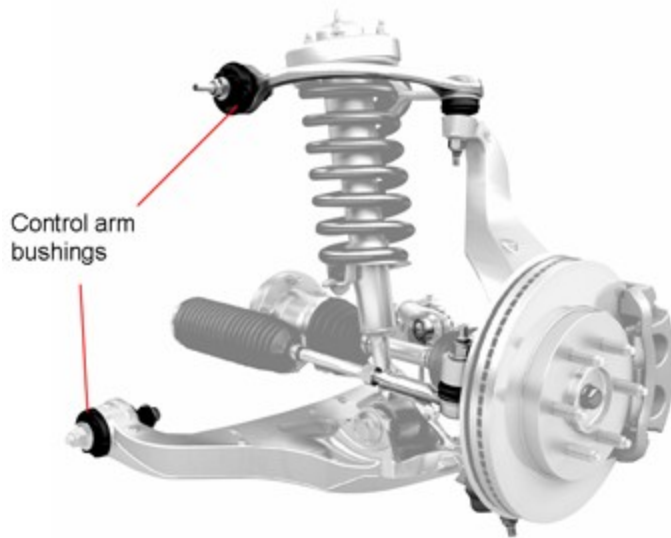
Types of Springs

- A. Coil spring
- B. Leaf spring
- C. Air spring
- D. Torsion bar



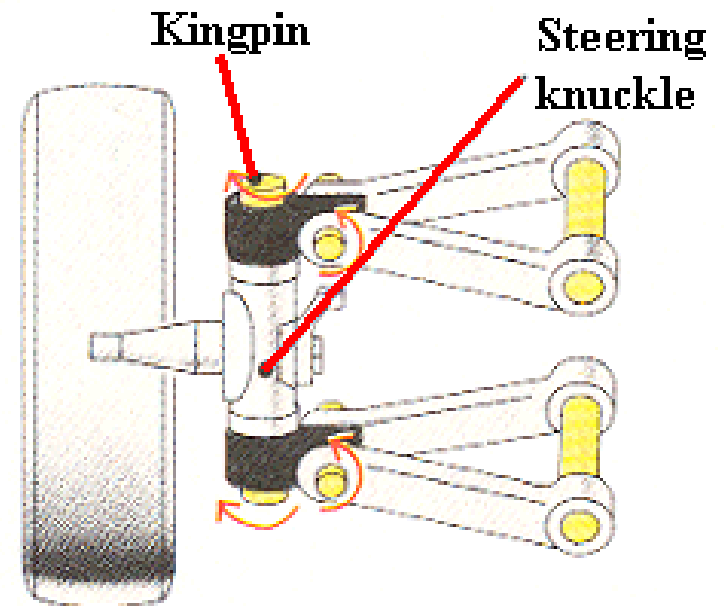
Suspension System

Basic Parts



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

Control arm – movable lever that fastens the steering knuckle to the vehicle's body or frame.



Types of independent Suspension System

MacPherson Strut

Wish bone Type

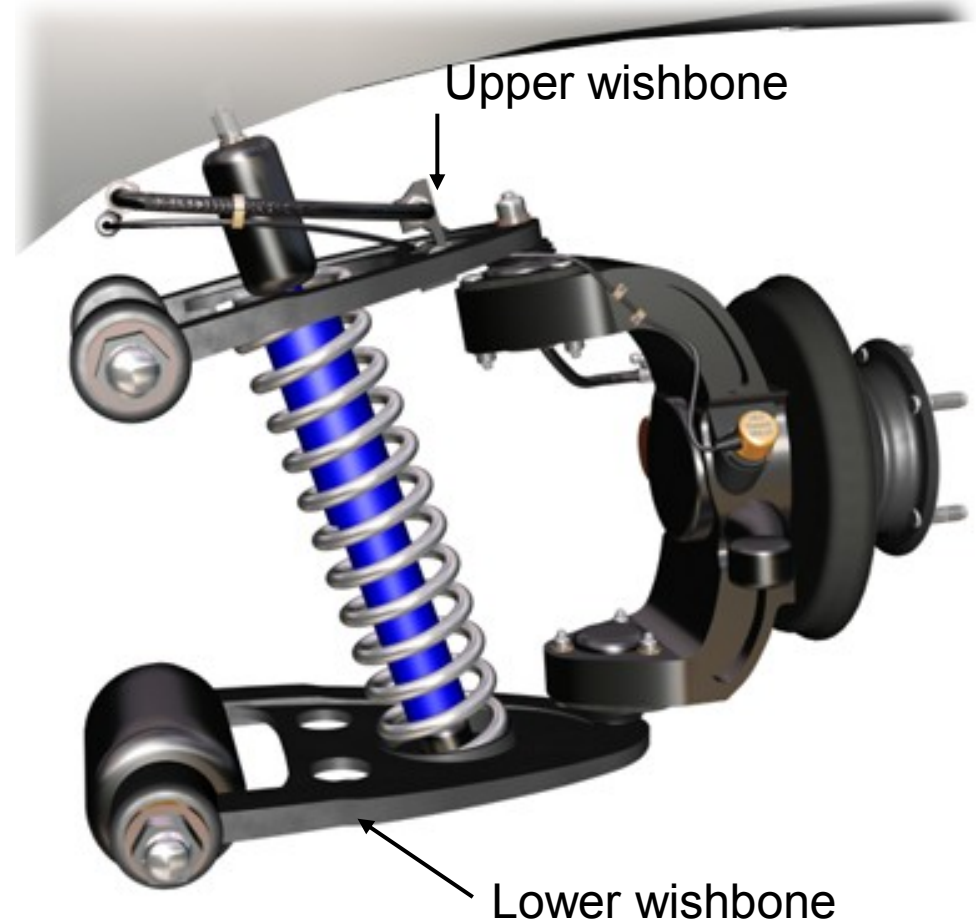


1 Wishbone Suspension

The suspension must be designed in such a way as to keep the wheel upright for maximum tyre contact (vehicle control) and to minimize tyre wear.

The upper wishbone is short and the lower wishbone is longer.

Both wishbones pivot points and lengths are calculated to provide the best operating angle for a given suspension movement.



Advantages & Disadvantages of Wishbone type independent suspension

Advantages

- Ride quality is good.
- Improve the steering preciseness since the wheel movement are not link
- Ground clearance increase

Disadvantages

- Initial cost is more
- Maintenance cost is more.
- Required frequent wheel alignment otherwise increase tyre wear.

Applications:-SUV,CARS

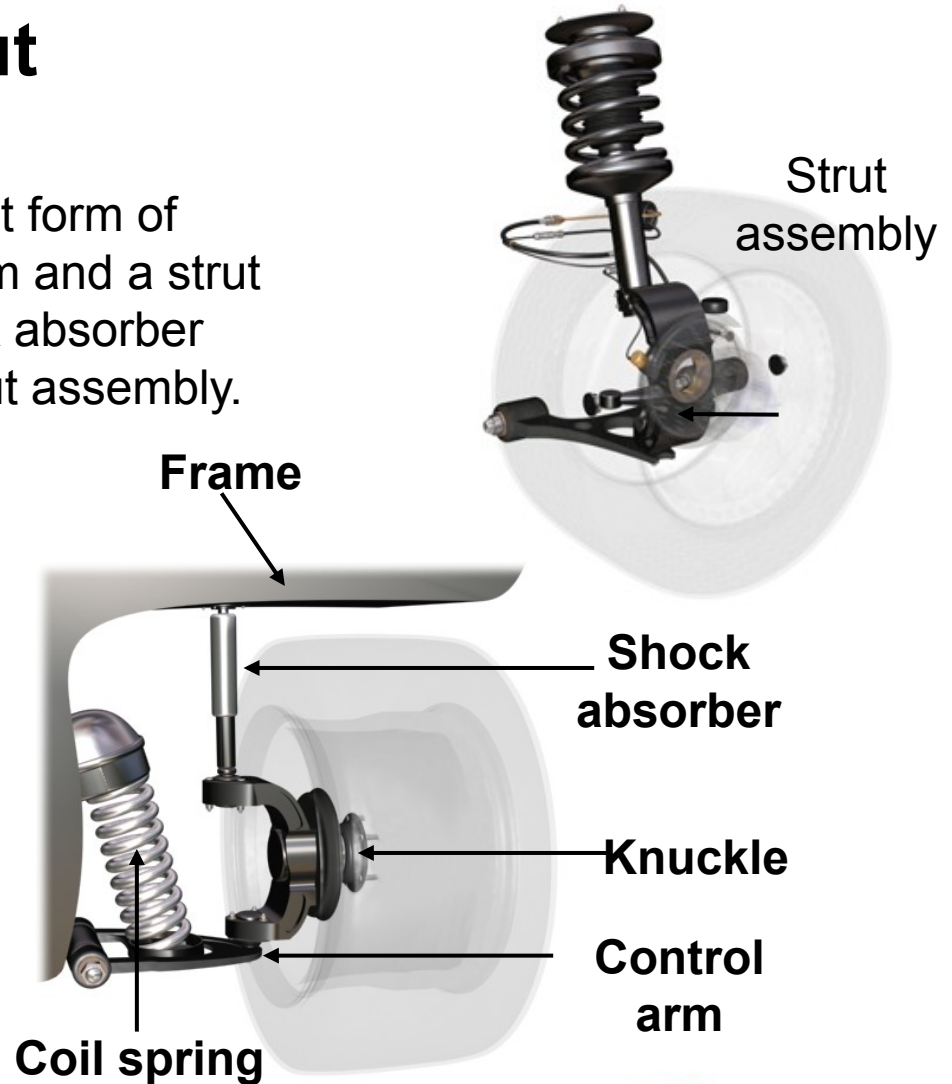


2 MacPherson Strut

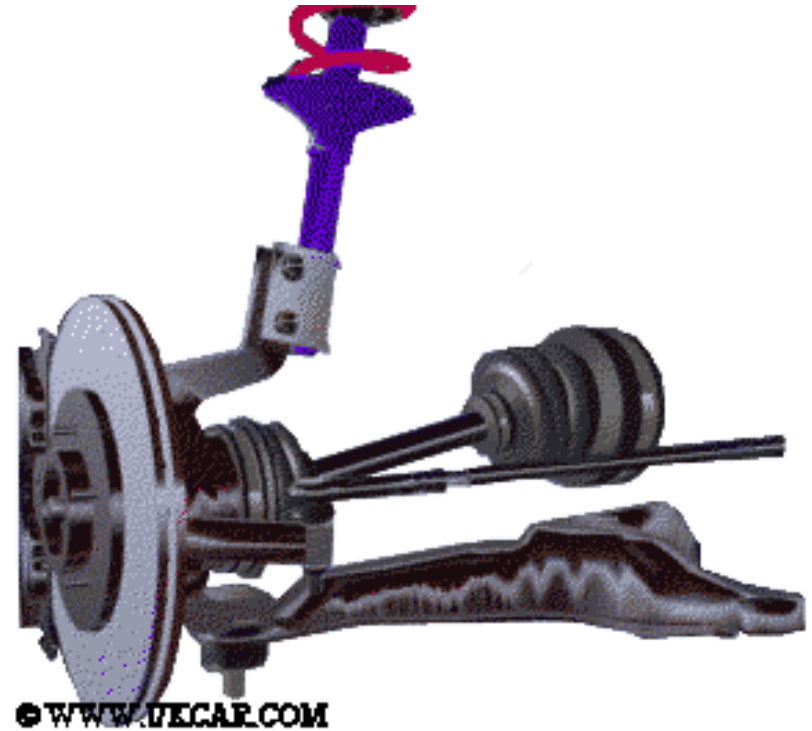
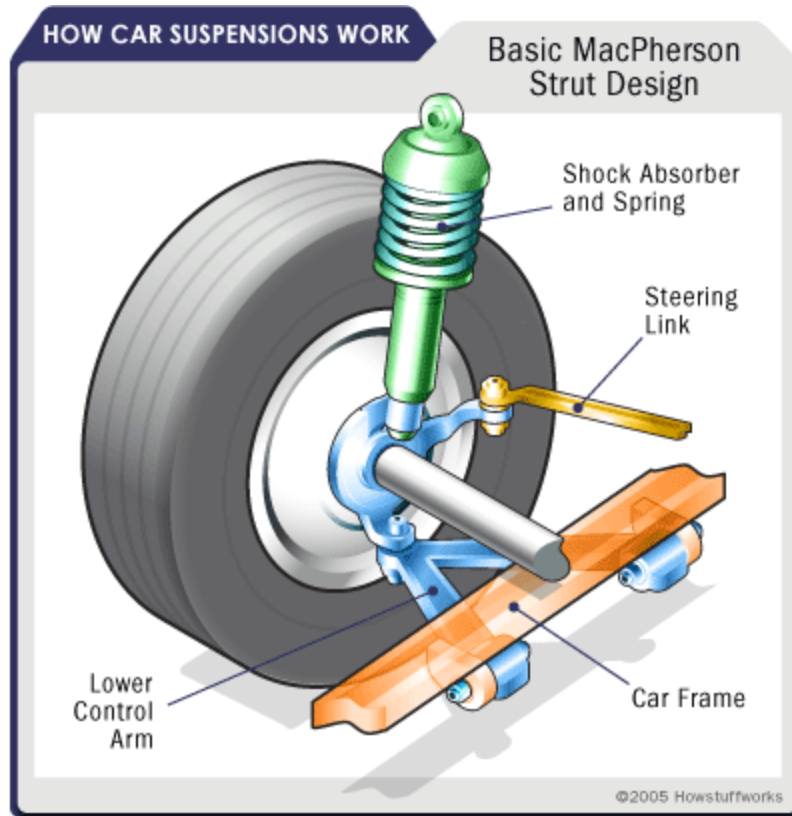
This is a very popular and efficient form of suspension. It has one control arm and a strut assembly. A coil spring and shock absorber will normally form parts of the strut assembly.

Coil springs may be mounted on the control arm instead of being around the strut. On this type, the shock absorber connects the knuckle to the frame.

This type of suspension strut is often also used on rear suspension systems.



Front Suspension (MacPherson Strut)



MacPherson Strut Suspension

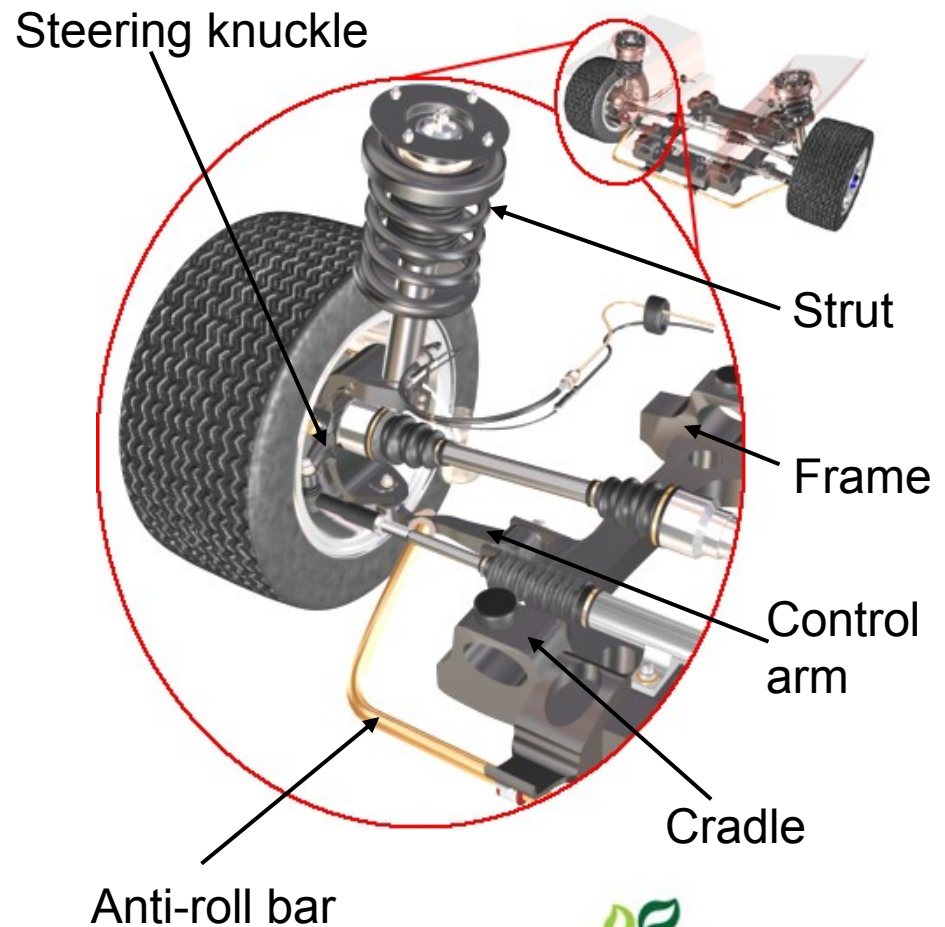
The top of the strut is bolted to a reinforced section of the frame structure.

The lower end of the strut is attached to a steering knuckle.

The control arm is also attached to the steering knuckle.

The control arms are mounted on a cradle section of the frame.

An anti-roll bar links the two control arms together to reduce sway (body roll).



Advantages & Disadvantages of Macpherson strut suspension

Advantages

- Light in weight.
- Camber does not change due to up & movement of wheels
- Maximum Engine compartment available.
- Maintenance cost is less.
- Initial cost is less.
- Ride comfort is more.
- Improve road safety.

Disadvantages

- Not suitable for Heavy motor vehicle.
- Load carrying capacity is less.

Applications:-CARS



Solid Rear Axle Suspension

This type of rear suspension is typical for a rear-wheel drive vehicle.

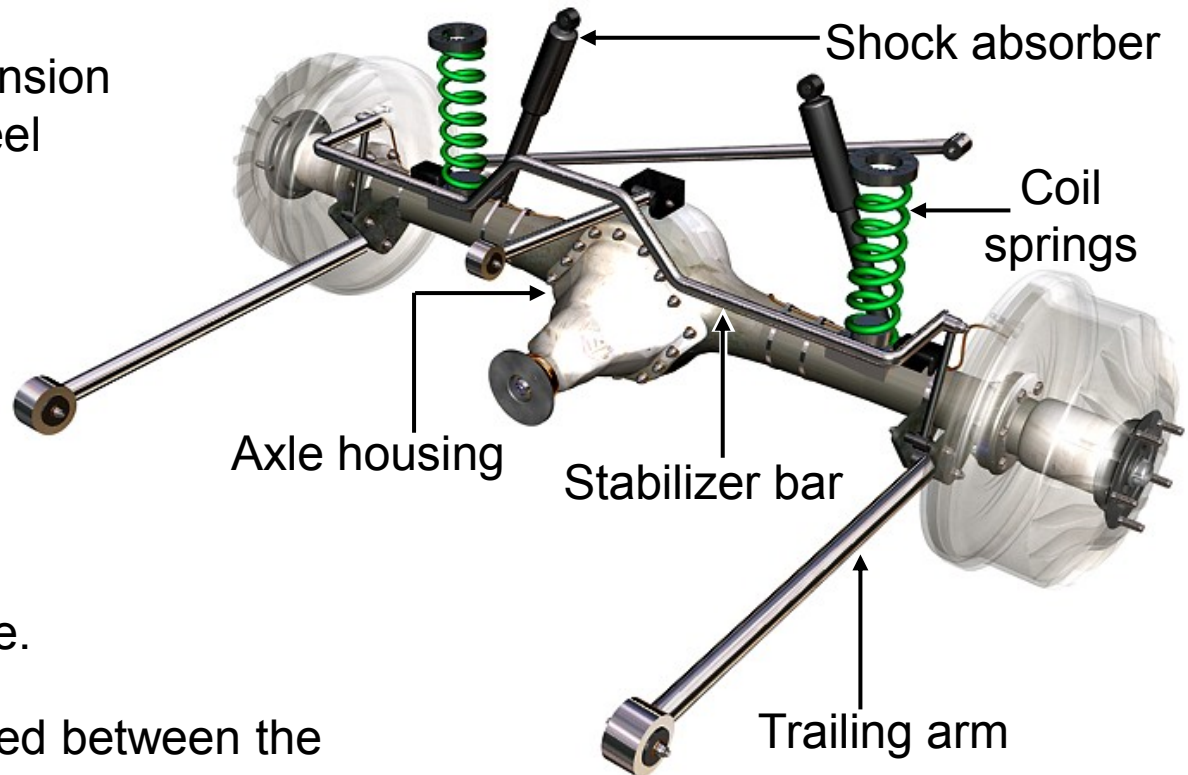
The axle is inside a solid housing.

The shock absorbers are mounted between the solid axle and the frame.

The springs are arranged between the axle housing and the frame of the vehicle.

Trailing arms, or links, hold the rear axle in position.

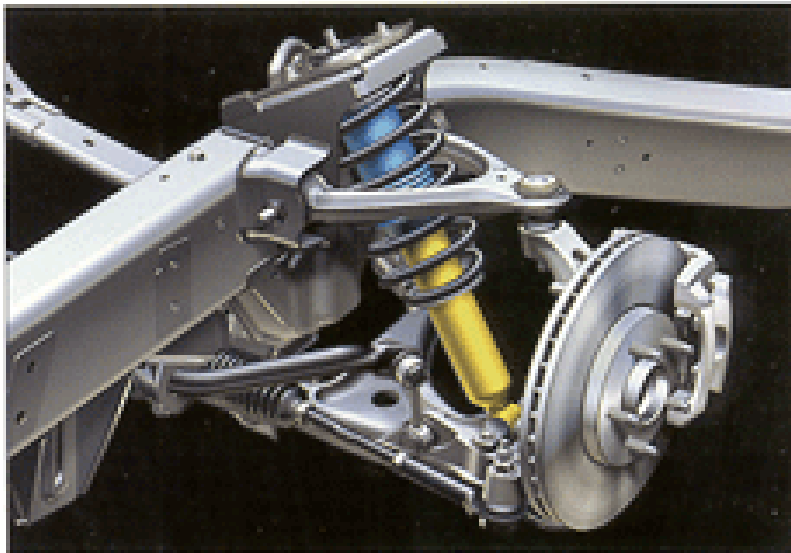
A stabilizer bar and track bar are included to add vehicle stability.



Independent Suspension System Parts

Basic Parts

Ball Joints – swivel joints that allow control arm and steering knuckle to move up and down and side to side.



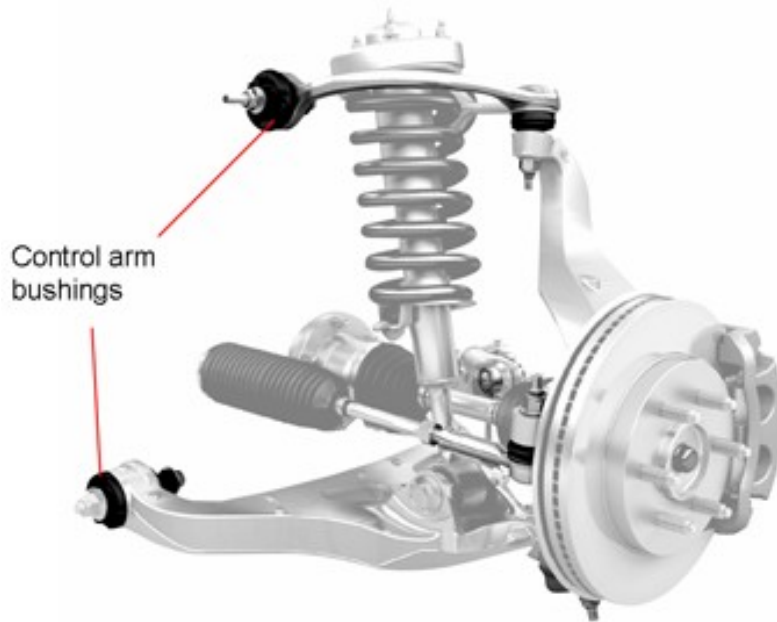
Today's complex import suspension systems aren't tolerant of excessive wear.

Springs – supports the weight of the vehicle; permits the control arm and Wheel to move up and down.



Independent Suspension System 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.



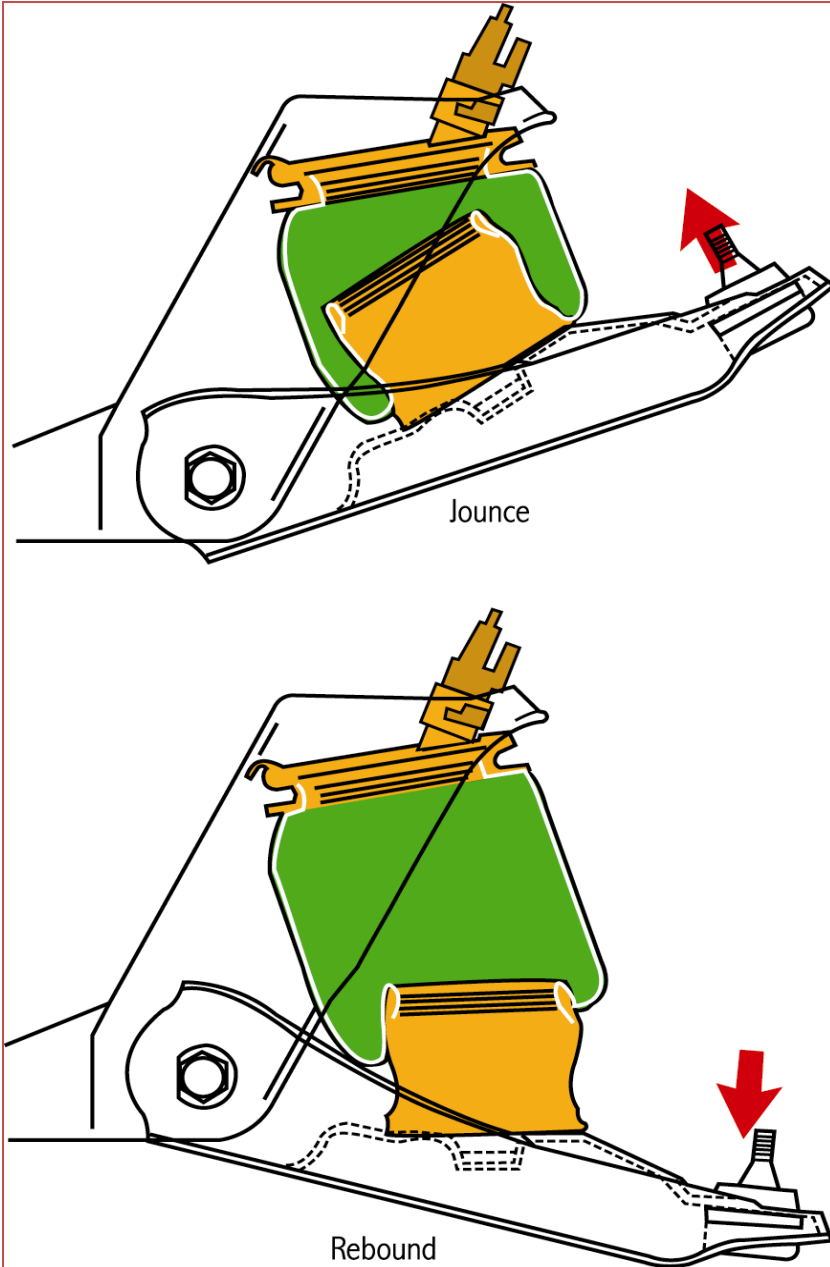
Coil Springs



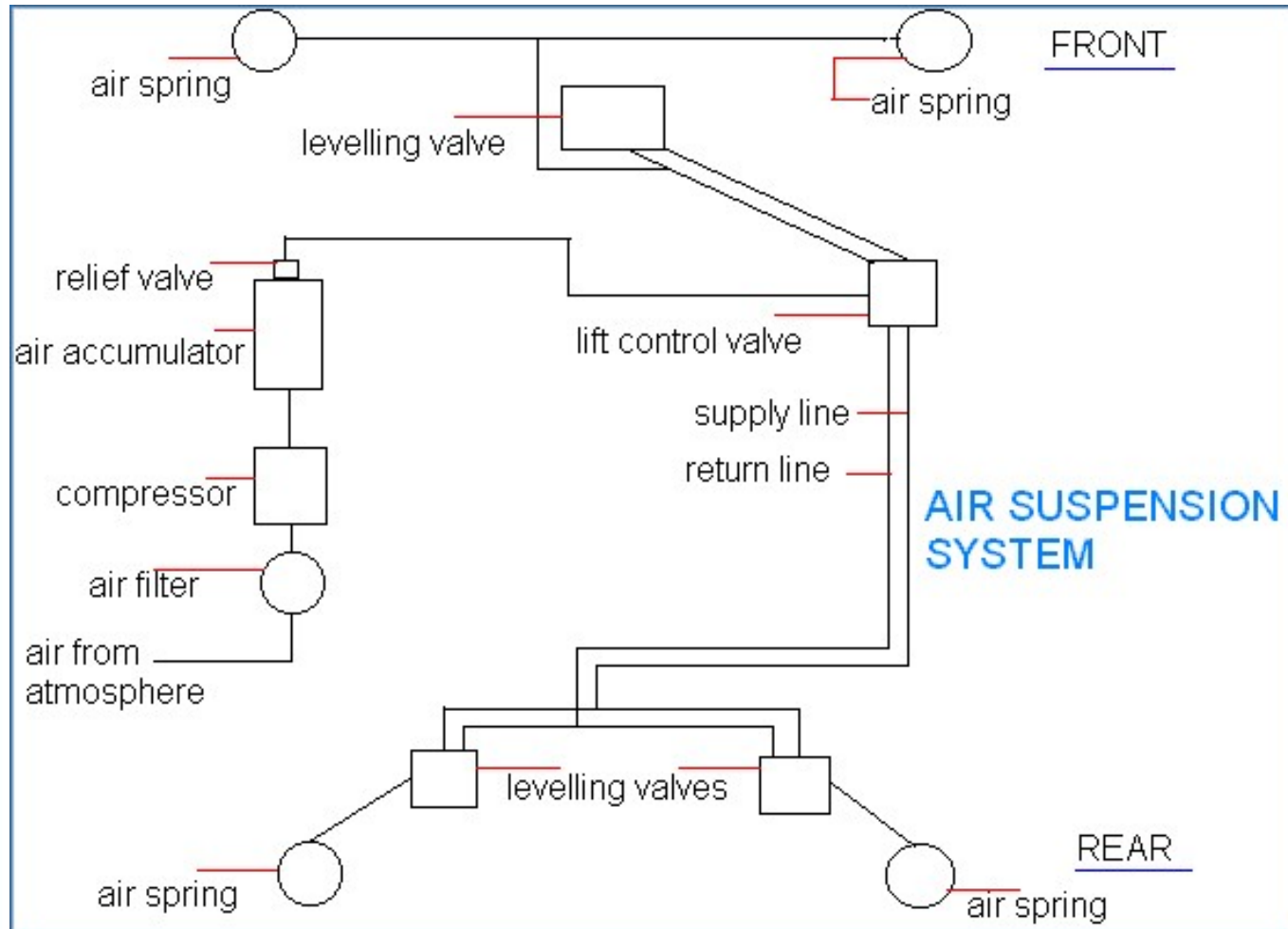
Leaf Spring Assembly



Air Springs

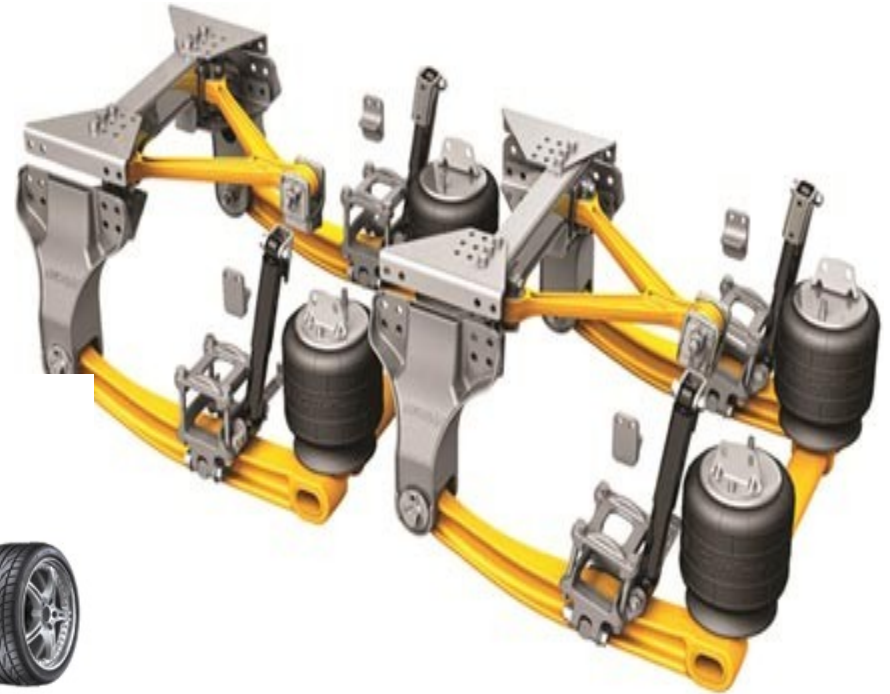


Layout of Air Suspension System



Schematic view of Air Suspension System

Location of Air bellows



Front Suspension System

Location of Air bellows in Heavy Motor Vehicles



Rear Suspension System

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Advantages & Disadvantages of Air suspension

Advantages

- Variable space for wheel deflection is put for optimum use for automatic height control
- Head light alignment does not vary due to different loading condition.
- It improve the ride comfort.
- Reduce noise in suspension system.

Disadvantages

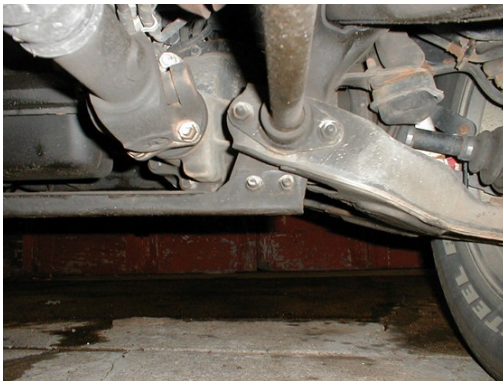
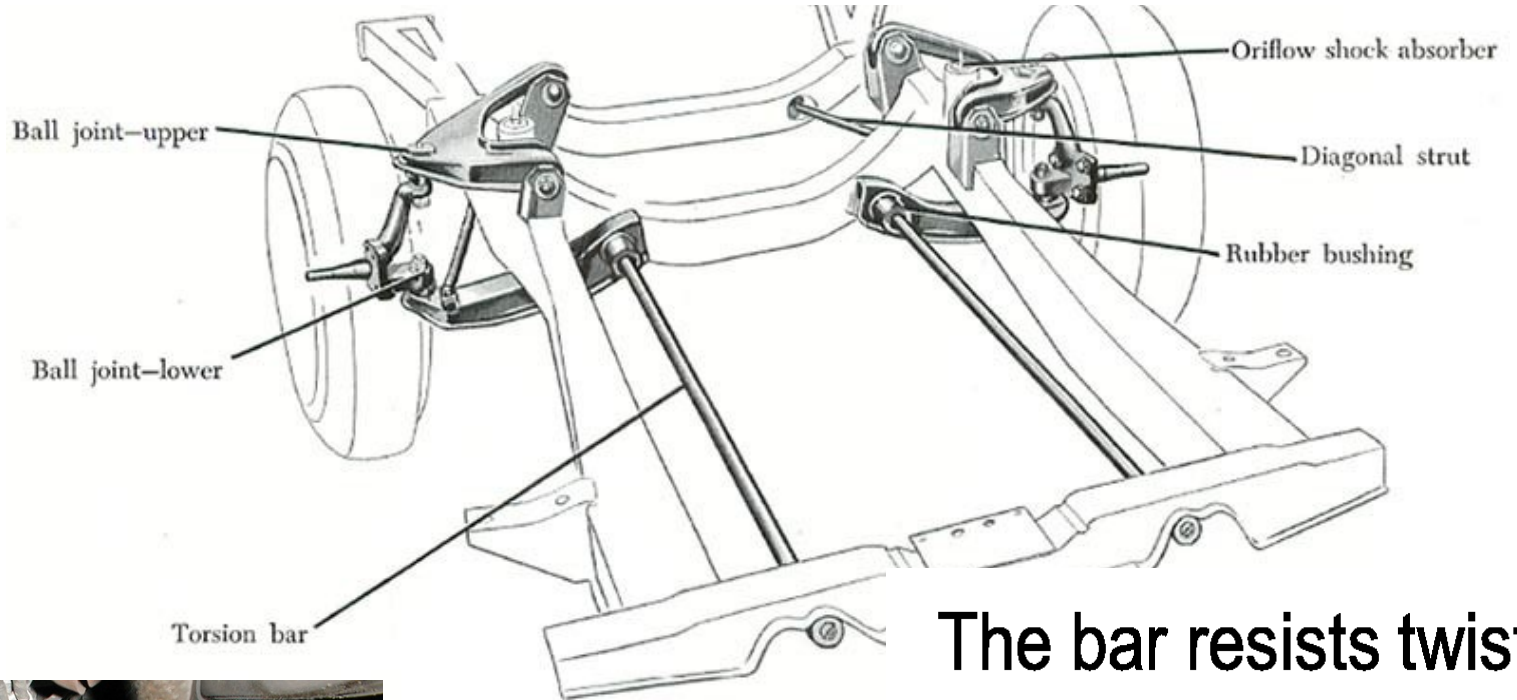
- Higher initial cost
- Occupies more space.
- Maintenance cost is more
- Due lack of friction damping is necessary due road shock



Applications:- Volvo Buses



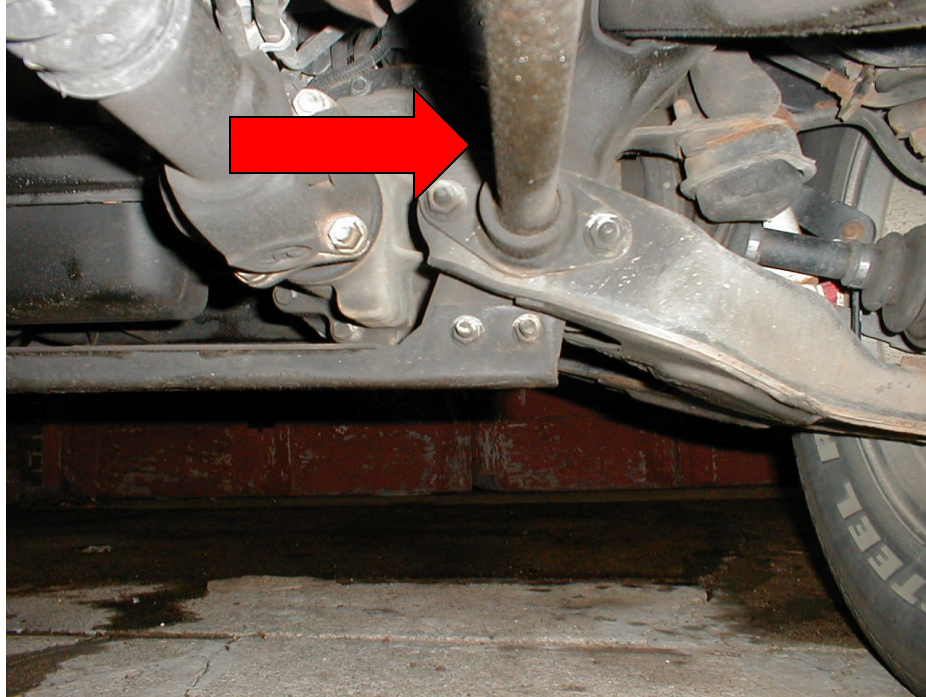
Torsion Bar



The bar resists twisting action and acts like a conventional spring



Torsion Bar



The bar resists twisting action and acts like a conventional spring



Torsion bar (*large spring rod*)

- One end is attached to the frame and the other to the lower control arm.
- Up and down of the suspension system twists the torsion bar.
- It will then try to return to its original shape, moving the control arm to its original place.



Advantages & Disadvantages of Torsion bar suspension

Advantages

- Light in weight.
- Less space occupies .
- Its maintenance cost is less.
- Initial cost is less.
- Ride comfort is more.



Disadvantages

- It does not take accelerate & Braking thrust so required additional linkages
- Due lack of friction damping is necessary due road shock

Applications:-SUV Tata Safari, Tempo Trax



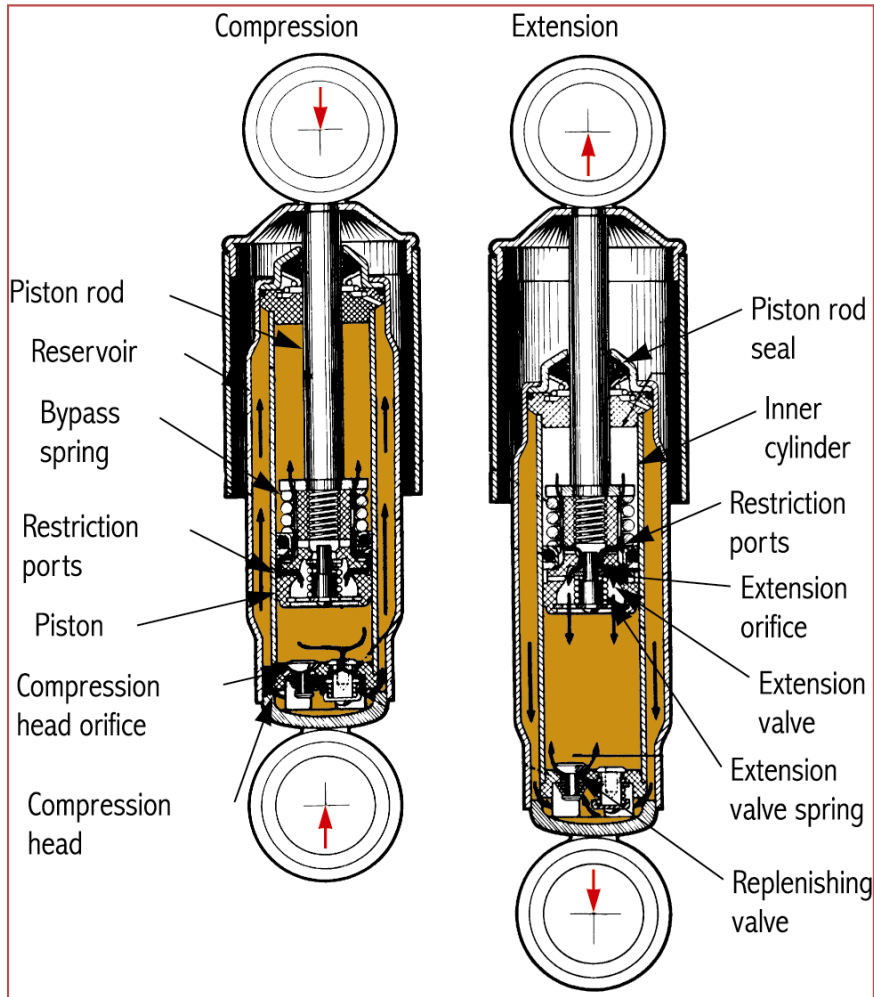
Suspension System

Shock absorbers

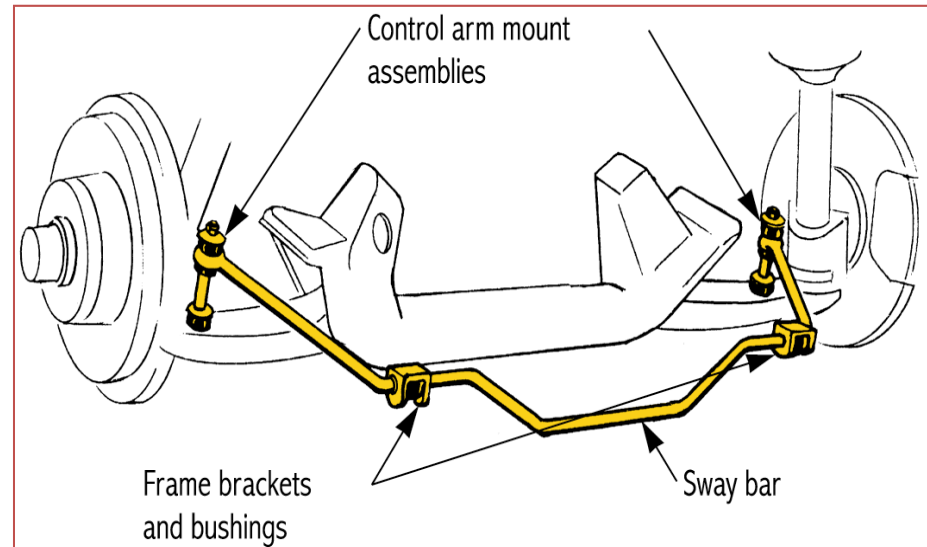
- Limits spring compression-extension movements to smooth the vehicle's ride.
- Without shock absorbers, the vehicle would continue to bounce up and down long after striking dip or hump in the road.



Shock Absorber Action



Sway Bar (Stabilizer Bar)



- Sway bar links connect the bar to the control arms
- The function of a sway bar is usually to prevent weight transfer from one side to the other in cornering situations. By preventing weight transfer, the inside wheel in a corner maintains more of its static weight.
- The sway bars main function is to equalize the suspension springs mainly when cornering.



Suspension System

Sway Bar (*Stabilizer Bar*)



- Used to keep the body from leaning excessively in sharp turns.
- Fastened to lower control arms. (*rubber bushings are used*)
- During cornering, centrifugal force makes the outside of body drop and inside raise.
- The bar's resistance to twisting motion limits body lean in corners.



Advantages of stabiliser bar

Advantages

- It prevent the road shocks
- To provide safe guard to occupied & passenger
- To provide stability to vehicle during rolling pitching bouncing yawing

