

IAT 2 Automotive Engineering- Solution

1)

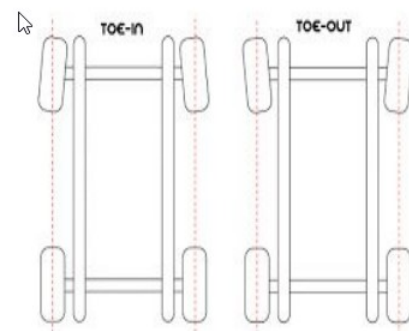
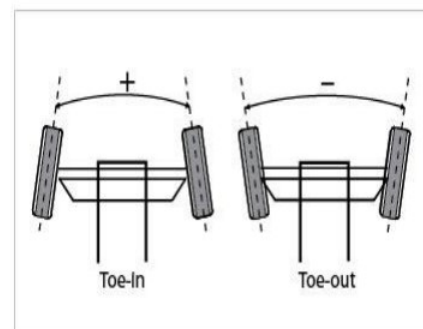
Caster



- Caster is the measure of how **far forward or behind** the **steering axis** is to the **vertical axis**, when **viewed** from the **side**.
- The **king pins** are **tilted slightly** from the **vertical**, the **angle obtained** in the plane **between kingpin centre line and vertical** is called **caster angle**.
- If the **kingpin centre line** contacts the ground at a point **in front** of the **wheel centre line** it is called **positive caster**.
- If the **kingpin centre line** contacts the ground at a point **behind** the **wheel centre line** it is called **negative caster**.
- The caster angle should not exceed **3 degrees**.
- It gives **directional stability** by making the wheels to lead or follow in the **same direction as the vehicle moves**.
- **In correct caster angle** results in **hard steering** when brakes are applied **vehicle pulls to one side** tendency to **wobble** due to lack of directional

Toe in and Toe out

- When the **vehicle is stationary** and **viewed from the top** the difference between the centre i.e., if the distance between the **front end** of the wheel is **smaller than rear end** of the wheel it is called as **toe in**
- If the distance between **front end** of the wheel is **bigger than the rear end** of the same wheel is called **toe out**.
- When the wheel is camber the tire engages the road at an angle. So toe in and out conditions are used.



3)

Coil spring

- The coil spring is held between spring seat in the car frame and lower control arm.
- The inner ends of control arms are pivoted on the car frame, the outer ends are connected to the steering knuckle.
- This in turn is attached to the control arms.
- The ball joint used to allow the steering knuckle to swing to the left or right for steering.
- Low cost and compact size

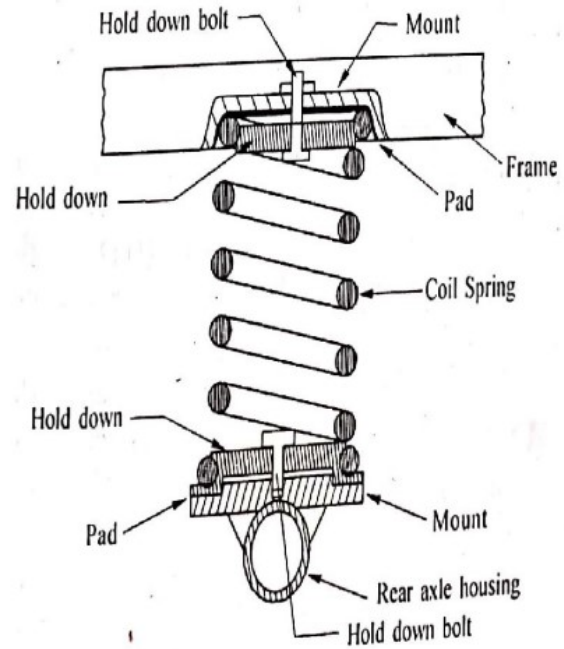


Fig. 7.7 : Coil Spring.

4)

Leaf Spring

- Leaf springs are made up of Steel plates of leaves.
- The leaves are held together at centre by a bolt which passes through holes in the leaves.
- Many leaf springs have special inserts between the leaves to permit the leaf to slip over one another when spring bends.
- The spring leaves are graduated length the front end of the largest leaf is bent into a circle to form a spring eye and is attached to the spring hanger by a Bolt.
- Rubber bushings are used to provide the insertion to the bolt from the spring hanger.
- Generally used in rear end of vehicles.

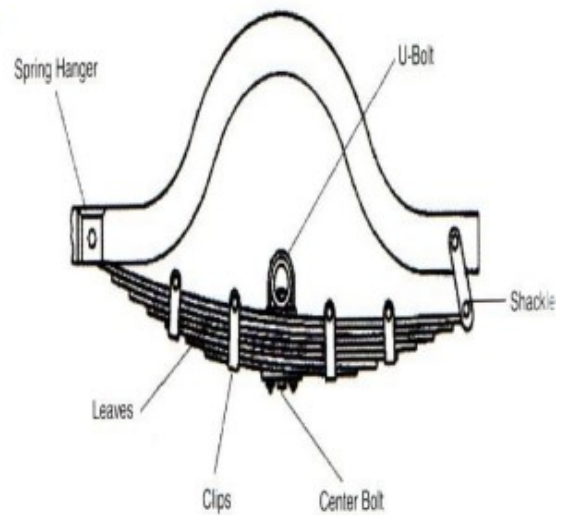
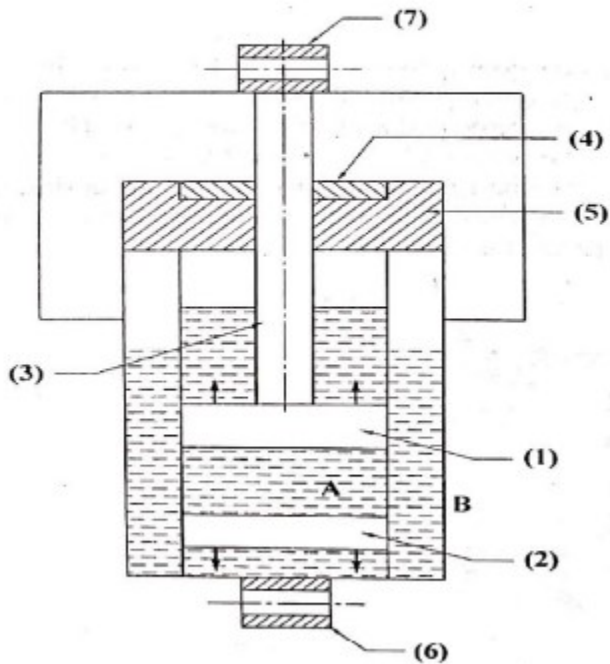


Figure 8.17. A multi-leaf spring. Adapted from TM 9-8000 (1985).

5)

Telescopic Shock absorber



- A - Inner cylinder
- B - Outer cylinder
- (1), (2) - Two way valve
- (3) - Piston rod
- (4) - Gland
- (5) - Head
- (6) - Eye connected to axle
- (7) - Eye connected to frame

Telescopic Shock absorber

- The telescopic shock absorber consists of an outer cylinder in a cylinder piston and piston rod.
- At the bottom of the inner cylinder and in the piston a series of valves controls the movements of the hydraulic fluid within the shock absorber.
- In this piston rod is attached to the two way valve 1 while valve 2 which is also a two way valve is attached between cylinder and tube.
- The inner and outer cylinders are filled with oil when the vehicle comes across a hump the eye connected to axle will move up, with this the oil below the valve 1 moves up.
- Due to the resistance to the flow of oil through valve 1 it exerts pressure on valve 2 this allows oil to flow through valve 2 also.
- The flow of oil through valve 1 and 2 will be slow because of damping effect.
- In the similar way for the downward movement of the eye connected to axle because off road irregularities, the oil will move from the upper side of valve 1 to the lower side and vice versa.