

Objective of Lecture: Suspension system:

Learning outcome: From this lecture the students are able to know about Suspension system & types of suspension system. They also come to know why the vehicle are running comfortably.

Tools use: → Chalk & Black Board
→ Books

Lecture: The suspension system is the system which provide comfort to the driver and passengers.
→ The suspension system isolate the vehicle from the road shock & vibration due to road uneven.
→ The suspension system is connect in between the road wheel and chassis of the vehicle.

Types of Suspension System:

- (I) Front Suspension
- (II) Rear Suspension
- (III) Leaf spring suspension
- (IV) Dampers
- (V) controlled suspension
- (VI) Air suspension system
- (VII) Suspension of six wheel vehicles

Front System Suspension System:

Front suspension provide the comfortable to driver and front side of the vehicle.

→ Front suspension is more complicated than the rear suspension system. This is because the front wheel must move up and down with respect to the vehicle.

-Frame for spring action and also they must be able to swing at various angle to the vehicle frame for steering.

Independent type front suspension.

Practically all passenger cars now use the independent type front suspension system.

In this system each front wheel can move up and down freely without affecting or altering the movement of the other front wheel.

→ The front wheel is independently supported by a coil, torsion bar or leaf spring.

Stabilizer or Anti-roll Bar

When one road wheel is deflected more than the other e.g. when it comes over a bump on the road or during hard cornering, there is a tendency for the vehicle to roll.

→ To avoid this tendency, a stabilizer is used in the form of torsion bar.

Rear suspension system:

The rear suspension system used is used to provide the comfortable to the rear side of the vehicle.

→ It connects between rear wheel and cross frame of the vehicle.

→ Rear suspension system generally uses coil spring, leaf spring.

* Rear Independent Suspension

Rear independent suspension provided in cars. Uses coil springs.

The coil spring are seated in the pan shaped brackets attached to the rear axle and are compressed against similar spring seat incorporated into the frame or body.

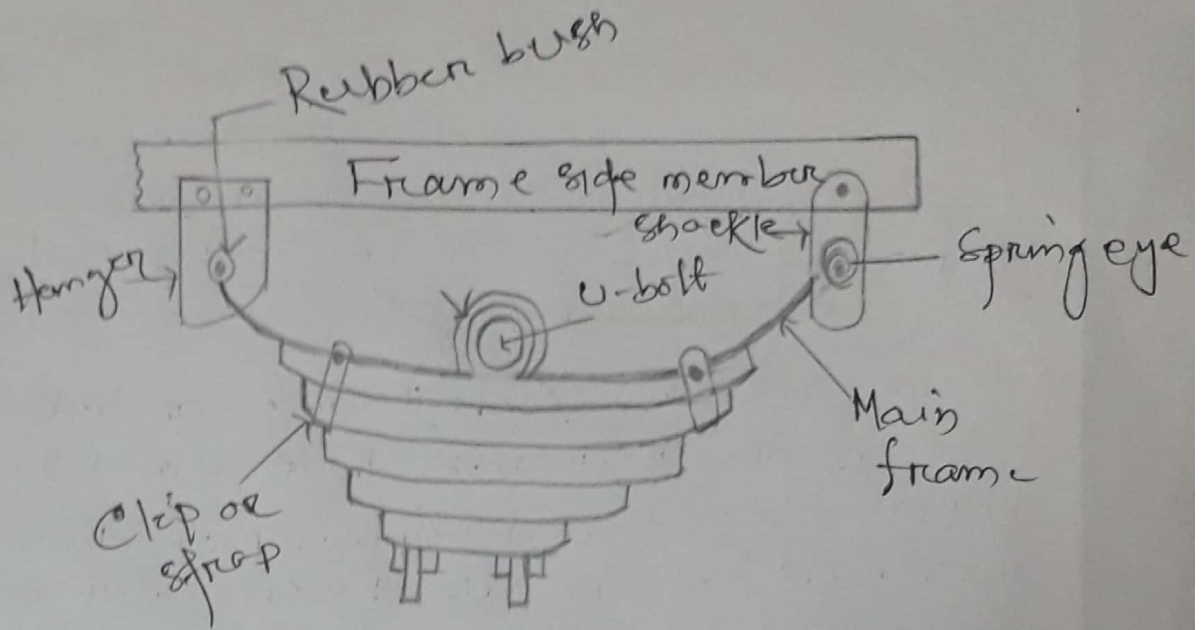
- There are two control arms or link attached between the rear axle housing and the car frame. They permit upward or downward movement of the axle-housing with respect to the car frame.
- They prevent side movement or forward and backward movement.
- ⇒ Some installation uses a track bar to prevent side movement.

Leaf Spring:

The Leaf Spring most commonly used in automobile vehicles is made of several long plates or leaves. Because the leaf spring consist of a series thin leaves, one on to another, it does not break when bent.

- The plates or leave are held together at the center by a center bolt which passes through holes in the leave leaves. Clips are there at interval along the spring. These clips keep the leaves in alignment and prevent excessive separation during rebound.
- Some light weight cars, (Maruti su) use single leaf spring. Single leaf springs are tapered from the centre to ends so that they work in the same way as multi-leaf springs →

Fig



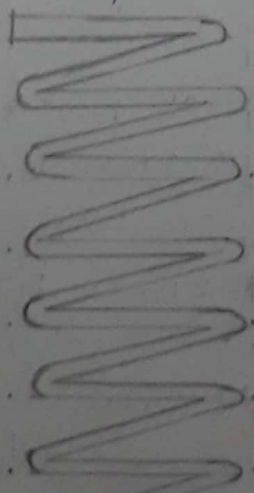
Leaf Spring

Coil Spring

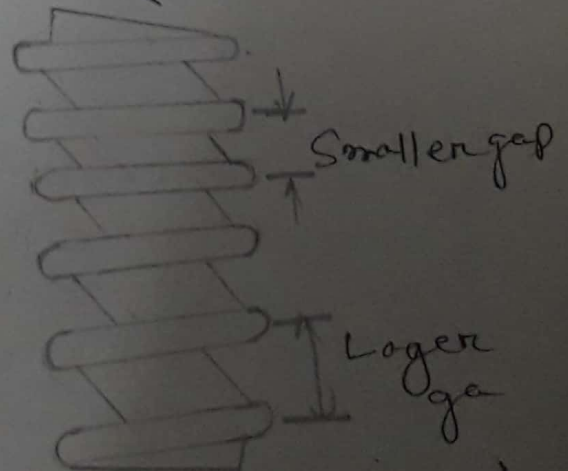
The coil springs are extensively used in suspension system of Automobiles. A standard coil spring is made from a length of spring steel usually round in section. It is wound in the shape of a coil. The ends of coil spring are kept flat so that they seat properly.

→ The coil spring is very elastic and compresses when a load is put on it. When vehicle goes over bump or a pot hole, the spring compresses or expands to absorb the shock.

Fig



Standard coil spring



progressive coil spring

Sometimes, instead of standard type of coil spring progressive type coil springs are used in Automobiles. In progressive type coil spring, the wire is wound into coil of progressively increased pitch.

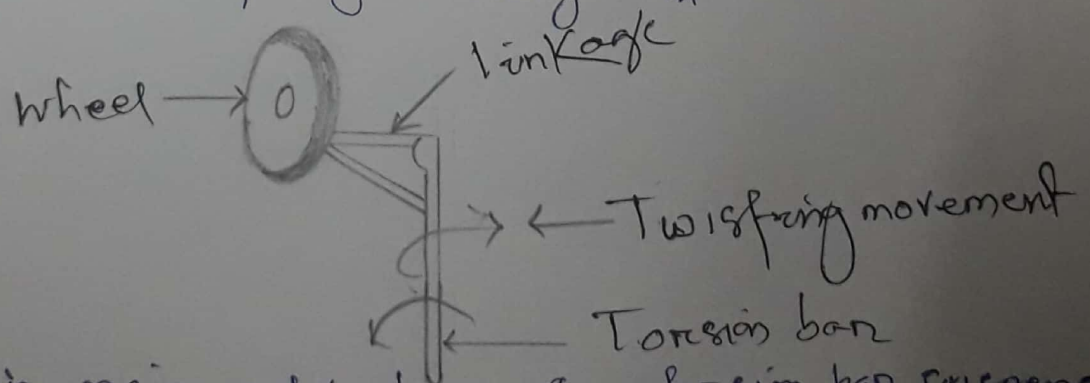
When the wheel hits a hole or bump, the large pitch section absorbs shock or impact with the smaller pitch section of spring completely compressed

→ The coil spring one mostly used is independent suspension systems. The advantages of this type of springs is that they can be assembled in compact space and are capable of storing twice the energy than that of a leaf spring

Torsion Bar: The torsion bar is made from spring steel, which function by twisting. One end of the torsion bar fixed to the frame. So, that it may not turn. The other end is attached to the lower or control arms.

→ when the vehicle goes over a bump or pot hole, the torsion bar rod gets twisting effect and elasticity of the rod is utilized to bring back the wheel to its normal position in the same manner as a spring arrangement.

Fig



The main advantages of torsion bar suspension are flexibility, easy adjustability of ride height and small profile along the width of the vehicle. It takes up less of the vehicle's interior volume as compared to coil spring. It is generally used front wheel of the vehicle for easy steering.

Model Questions

- (i) State the meaning of suspension system.
- (ii) State the types of suspension system.
- (iii) Compare between coil spring & leaf spring.
- (iv) Write ~~down~~ short notes of the following:
 - (a) Stabilizer
 - (b) Torsion bar.
 - (c) Progressive coil spring
 - (d) leaf spring

Reference

<u>Name of Author.</u>	<u>Title books</u>
R. B Gupta	Automobile Engg.
C. P. Nataraj	Automobile Engg.
Dr. Kripal Singh	Automobile Engg.
From Internet.	

Objective of Lecture: Telescopic shock absorber.

Learning Outcome: From this lecture the students should be able to about telescopic shock absorber. They also came to know about use of telescopic shock absorber.

Tools used: Chalk & Black Board
Books

Lecture: Telescopic shock absorber generally used in front ^{rear} suspension system in car.

→ This shock absorber is generally used in modern car and motor cycle.

→ This type shock absorber also called as hydraulic shock absorber. This type shock absorber is connected between the frame & the axle.

→ This type of shock absorber is called direct acting because of their direct contact between the car frame & the axle.

Main components

- (1) piston
- (2) Rod guide
- (3) cylinder
- (4) inner chamber
- (5) oil chamber.

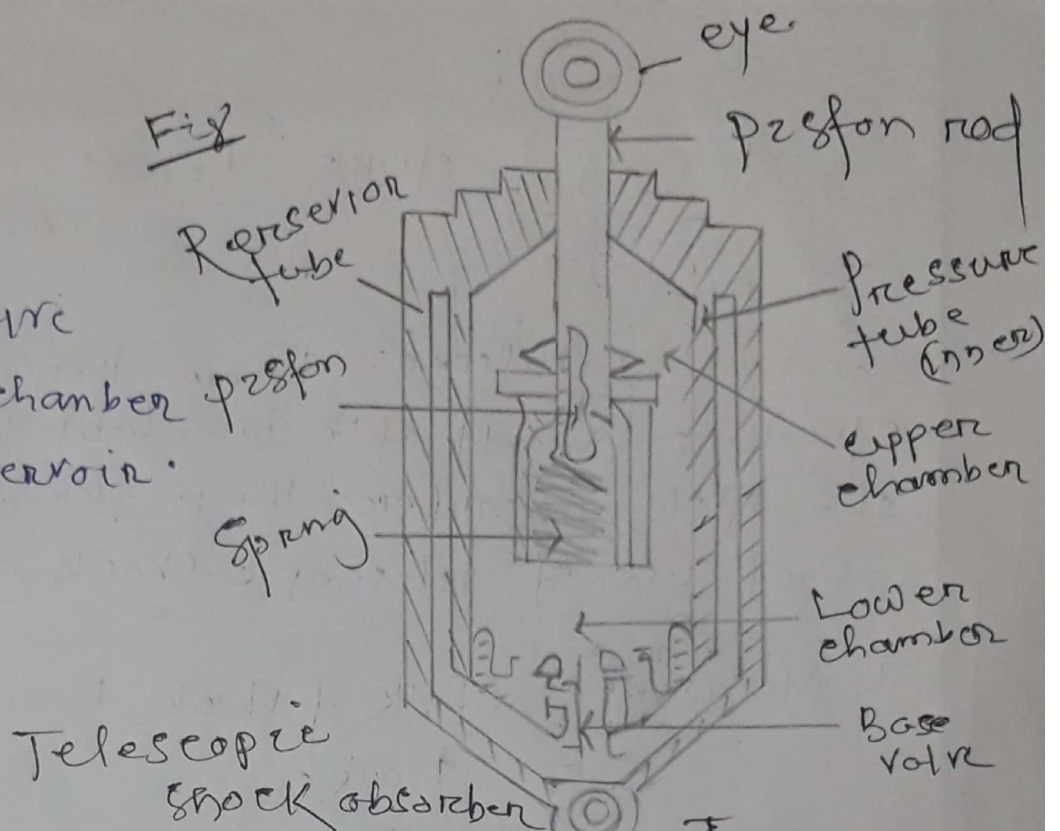
(6) Seal

(7) Base cup.

(8) Compressive

(9) Outer chamber piston
reservoir.

Fig



Construction of shock absorber.

The cylinder is simply is a drawn steel tube capable of with standing high pressure and provide a smooth surface for the piston to seal & move.

→ The cylinder & a well as reservoir is filled with a special damper oil. At the bottom of the cylinder a two way valve (also known as compressive valve) is fitted. The cylinder contain a combined piston and valve assembly further divides the cylinder into two chambers i.e. upper & lower chamber of the cylinder.

→ The upper chamber of the cylinder is called rebound chamber where as the lower one is called compression chamber.

Operation:

When the wheel goes over bump (i.e. compression stroke)

→ The piston and valve assembly is pushed into the Lower chamber of the cylinder, compressing the oil in this chamber. Since the oil is incompressible so it opens the valve connected with piston and enters into the upper chamber (ie rebound chamber) of the cylinder. Some of the oil runs into the reservoir by opening the compression valve.

→ When the wheel goes into a pot hole (ie rebound stroke) the piston and valve assembly is pulled up the valve opens in other direction, as this is a double type of check valve. A relatively small amount of oil also flows through the piston rod to guide clearance to lubricate the bearing area and seal. As the shock absorber is extended during this stroke, oil is drawn into the cylinder tube compression chamber to account for the rod volume being removed along with the amount of oil which flows through the rod guide clearance.

Model Question:

① Describe briefly about the Telescopic shock absorber with neat sketch.

Reference:

<u>Name of Author</u>	<u>Title book</u>
Dr. Kripal Singh	Automobile Engg.
R. B. Gupta	Automobile Engg.
C. P. Nalwa	Automobile Engg.
of Internet.	