Types of springs and their Classifications

What is a spring?

Springs are defined as an elastic body which stores mechanical energy and gets distorted when loaded and regains its original shape when the load is removed.

Types of springs

1. Helical Spring:

It is one of the most commonly used Mechanical springs. In this type of spring, a coil is wrapped in such a way that it resembles like a thread.

This type of springs is used for carrying Compression, Extension, and Torque forces.

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<th>Compression</th>
<th>Tension</th>
<th>Torsion</th>
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According to the loading condition helical springs are classified into following four types.

- Open coil springs (or) Compression helical springs
- Closed coil springs (or) Tension helical springs
- Torsion spring
- Spiral spring

Tension springs

A tension spring is also called as Extension Springs. They are opposite to compression spring. Pull force is applied, resulting in the extension of the spring. These type of springs have a hook or expanded eyes either one or both ends.
Applications of Tension Springs:

- Lever mechanisms
- Counterbalancing of garage doors
- Weighing machine,
- Vise-grip pliers
- Garage door assemblies

Compression springs:

These springs are open coil helical spring. A helical coil is pressed or squeezes by load. It resists compressive or push forces. It also shows resistance to linear compressive forces. Sometimes fluid behave as compression springs such as fluid pressure systems.

Application of Compression Springs:

- Motorcycle’s suspensions.
- Pen
- Lock
- Couches
- Lighter

Torsion spring

In this type of spring, the load applied to the coil is a torque or twisting force. In other words, Helical springs which can hold and release angular energy. Or these springs try to hold a system in place. After twisting, the helical coil applies proportional force to opposite direction. The torsion springs are used in the application which rotates Less than 360 degrees. These springs have either clockwise or antilock wise rotation.

Applications of Torsion Spring:

- Mousetrap
- Rocker switches
- Clothes pin
- Automobile starters
- Door hinges
Spiral Springs

Spiral spring is also known as clock spring or Constant force spring. A number of times band of steel wrapped around it to form this type of springs. Spiral springs releases a constant amount of force. This types of springs are used in machines that need to rotate a number of times and at the same time has to release the same amount of load constantly.

These types of springs are used when more power is required. Some of these springs are with thicker bond so that they can give fever rotations. These types of springs are used in heavy-duty applications

Applications of Spiral Springs

- Automotive seat recliners
- Alarm timepiece
- Watch
- Window Regulators
- DC Motors

2. Leaf springs
Leaf springs are also called as semi-elliptical spring or Cart spring. It is one of the oldest forms of springs. Leaf springs are long and flat slender arc-shaped. These types of springs are used in Vehicle suspensions. Location for axel is center of the arc. And either end of loop is attached to the vehicle. It spreads the load over vehicle chassis.

**Advantages of Leaf Springs:**

- Leaf springs are easy to construct.
- These springs are strong.
- No need for separate linkage to hold the axle in position, leaf springs work as a linkage.
- Rear axle location helps in reducing the extra weight.
- Axle damping is controlled by leaf springs.
- It reduces cost by eliminating the need for trailing arm and pan hard rod.

**Applications of Leaf Spring**

- Automobiles Suspension
- Used by blacksmiths (due to its relatively high quality steel.)

**Also read:** Other topics in *Strength of Materials*

### 3. Belleville spring

A Belleville springs also are known as a coned-disc spring, conical spring washer, disc spring, Belleville washer or cupped spring washer. These disc springs are dynamically or statically loaded to its axis. This spring required less space for installation but can bear a very large load. Also, Belleville springs have more advantages compare to other springs.

**Applications of Belleville Springs**

- Slip Clutch
- Overload Clutches
- High-Pressure Valve
- Drill Bit Shock Absorber
4. Volute and conical spring

These springs are conical shape compression springs. Conical Spring is also known as tapered spring. These springs used to provide stability and reduce solid height.

General applications of springs

Springs are a very useful machine element. There are various regions to use spring. Some of them are as follows:

Springs are mainly used for the following

- Absorb shocks
- Store energy
- Measure force
- Return motion
- Control vibrations

Also read: Other topics in Design of Machine Element

Spring materials

The materials used for spring steels are mostly low-alloy manganese, low carbon steel or high carbon steel with very high yield strength.

Materials used for spring making

- Oil Tempered Steel
- Stainless Steel
- Elgiloy
- Carbon Value
- Iconel
- Monel
- Titanium

Spring related online calculations can be done from this website