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Commentary

Leaf Springs and its Advantages in Automobiles

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DESCRIPTION

A leaf spring is a basic type of spring that is widely used for suspension in wheeled vehicles. It is one of the oldest varieties of springing, first appearing on carriages in France in the mid-17th century in the form of the two-part elbow spring and then migrating to England and Germany. It is also known as a semi-elliptical spring, elliptical spring, or cart spring.

A leaf spring is a short arc-shaped length of spring steel with a rectangular cross-section. In the most popular layout, the axle is located in the centre of the arc, with loops generated at either end for attachment to the vehicle frame. A leaf spring can be built for very heavy vehicles by stacking multiple leaves on top of each other in several levels, sometimes with increasingly shorter leaves. Leaf springs can perform locating, dampening, and springing tasks to some extent. While interleaf friction dampens the motion of the suspension, it is not well managed and results in stiction. As a result, several manufacturers have adopted single-leaf springs.

A leaf spring can be joined to the frame directly at both ends or at one end, generally the front, with the other end attached *via* a shackle, a small swinging arm. The shackle mimics the leaf spring's inclination to stretch when compressed, resulting in softer springiness. The shackle gives the leaf spring some flexibility, preventing it from breaking under large loads.

Characteristics

A leaf spring's two ends are shaped as eyes or eyelets, through which a fastener joins each end to the vehicle's frame or body. One eye is normally fixed translationally but permitted to pivot with the movement of the spring, whereas the other eye is attached to a hinge mechanism that allows that end to pivot as well as move in a restricted translational range. U-bolts are typically used to secure the axle to the spring's centre. Because the leaf spring functions as a linkage to keep the axle in place, separate linkages are not required. As a result, the suspension is both simple and sturdy. Inter-leaf friction dampens the spring's motion and minimizes rebound, which was a substantial advantage over helical springs until shock absorbers became extensively used. Because the axle is held in place by the leaf springs, soft springs, or springs with a low spring constant, are not appropriate. The resulting rigidity, along with inter-leaf friction, renders this style of suspension uncomfortably stiff for the riders.

ADVANTAGES

Leaf springs provide a lot of support between the wheels, axles, and the car chassis because of the sheer volume of metal placed together. Because of their tight-knit construction, they can withstand massive vertical loads, which is why heavy-duty industries continue to utilize them. Vertical stress is also dispersed along the length of the leaf spring rather than abruptly through a small spring and damper, which could potentially create a concentrated force that the suspension cannot sustain.

Damping can be an incredibly essential feature of a car. If the suspension is not properly dampened, the automobile will wallow and bounce after hitting any bump or pothole in the road. This was a key feature in automobiles that employed helical springs prior to the advent of the shock absorber and was detrimental to cars when driven at any reasonable speed. Because of the friction between each plate of steel, leaf springs coped much better with vehicle dampening, making the response time following a vertical bend in the suspension significantly faster, providing for a far more controlled car.

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