Wheelchair suspension/shock absorption

Suspension is a concept applied to devices in order to absorb a shock that the device might experience from being dropped or hitting a bump. The application of suspension is usually seen in transportation vehicles that involve wheels, such as cars, motorcycles, bicycles, and wheelchairs. Despite the benefits of installing a suspension system in wheelchairs, many mechanical wheelchairs do not employ any type of suspension. This most likely results from the fact that wheelchairs are typically not used to travel over rough terrain, and they rarely experience being dropped. Furthermore, it requires more force to move a manual wheelchair with a suspension/shock absorption system than it does to move a rigid manual wheelchair. This results from the fact that there is more inertia to overcome with the wheelchair that has the suspension system. However, certain mechanical wheelchairs, including those used for sports and for traveling over rough terrain, and most automatic wheelchairs make use of a suspension system of some type. When wheelchairs do not have a suspension/shock absorption system, the shock of a bump hitting the wheel is directly transferred to the rider, which can be uncomfortable. Listed and described below are the most prevalent types of wheelchair suspension.

Frog Legs

These are one of the several types of shock absorbers (suspension systems) for the manual wheelchair. These shock absorbers rely on altering the front castor forks, which are the metal upside-down U-shaped components of the wheelchair that cover the front wheels. Typically these forks are stiff and do not exhibit any kind of compliance when a load is placed on them or when the wheelchair hits a bump. The frog leg shock is composed of a polymer and hinge, which allow the wheelchair to roll over small obstacles without the rider experiencing a severe impact. Bullfrog power suspension is a type of suspension that is usually classified as a type of frog leg suspension. The most significant difference is that the bullfrog system has a higher weight capacity than the standard frog leg suspension system.

A-Arm

Currently, this is the most common suspension system for U.S. cars. However, its method for shock absorption can be transferred for use in manual wheelchairs, especially those used for intense physical activity. The a-arm suspension is also known as a double wishbone suspension, and this name provides a description for the appearance of the suspension. The arrangement of the a-arm suspension generally involves a wishbone-shaped arm attached at each front wheel. This arm is directly connected to a shock-absorber and a coil spring, which help to minimize the impact of rough terrain and bumps.

Rock Shox

Recently developed for use in Sunrise Medical's Quickie XTR, this suspension system/shock absorber is the first monoshock system to be used in a wheelchair. The Rock Shox's main innovative technology involves the use of "rebound dampening." Rebound dampening prevents the shock absorbers, or springs, from return the chair to its original position as quickly as they were compressed. This problem is one that often plagues other suspension or shock absorber systems such as frog legs and the a-arm. The Quickie XTR is a manual wheelchair, and, in conjunction, the Rock Shox monoshock system can only currently be used in manual wheelchairs.

Tweel

Although it is technically not a suspension system, the tweel, or tire and wheel, allows for wheelchairs to venture onto rougher or bumpier grounds. The tweel is essentially a wheel that has a system of interconnected rubber spokes that form the tire. As a result of the spokes, the "tire" requires no air, and the wheel and tire are essentially one in the same. This innovation prevents the tire from becoming flat and even results in the tire/wheel becoming a better source of absorption when it hits a bump, serving as an excellent substitute for or addition to shocks or a suspension system. Currently, the tweel is used in power wheelchairs, such as the iBOT.

Resources/External Links

Wikipedia: Suspension

Frog Legs Website

How Stuff Works: A-Arm Suspension

Wikipedia: A-Arm

Colours Wheelchairs

Rock Shox

Wikipedia: Tweel

Power Wheelchairs