Suspension Systems

1. MacPherson Strut (used in most cars in the front wheels)
2. Leaf Springs (used in heavy weight carrying vehicles like trucks - semitrucks)
3. Multi-link suspension (used in cars, usually at the rear. Gives a comfortable ride quality.)
4. Double Wishbone (used in most off road buggies. It gives the wheel a good freedom to stick to the ground even in the most difficult situations, if designed properly.)
5. Air suspension (bulky and space consuming; also expensive. Can be found in luxury cars and buses by Volvo, Scania, Mercedes Benz, etc. It is usually adjustable using an onboard air compressor to stiffen or soften the ride quality.)
6. Trailing arm suspension (used when the space above the wheel axle is required for some other utility. It is when the point of pivot is offset horizontally from the axle, and not vertically on top of it.)

These are the most commonly used suspension types in commercial vehicles. If the suspension arrangement is attached to an individual wheel rather than the whole axle, it is called independent suspension.

What to do to design a system without suspension system? (ChatGPT Says:)

1. Stiffen the structure: By increasing the stiffness of the body or the supporting structure, you can reduce unwanted movements. This can be achieved by increasing the thickness of the material, adding reinforcing elements, or changing the shape of the structure.
2. Damping: You can reduce vibrations by adding damping elements, such as shock absorbers or vibration dampers. These elements dissipate the energy of the movement, reducing the amplitude and frequency of the vibrations.
3. Control systems: Depending on the application, you can use control systems to actively stabilize the body. This can involve using sensors to measure the motion and adjust the forces applied to the body in real-time, or using feedback control to adjust the motion of the body in response to disturbances.
4. Balancing: If the body is imbalanced, this can lead to undesired movements. By balancing the body, you can reduce or eliminate these movements. This can be achieved by adding counterweights or adjusting the distribution of mass.
5. Rigidity control: In some cases, it may be desirable to allow some movement or flexibility in the body while still maintaining rigidity overall. In this case, you can design the body with flexible joints or elements that allow controlled motion in specific directions while still maintaining overall stiffness.

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1. Use a rigid frame: A rigid frame will provide a solid foundation for the car and can reduce unwanted movement. This can be achieved by using a frame made of strong and rigid materials such as steel, carbon fiber, or aluminum.
2. Use a low center of gravity: A lower center of gravity can help to reduce body roll and improve stability. This can be achieved by placing heavy components such as the engine and transmission low in the car, and by keeping the overall weight of the car as low as possible.
3. Use stiff suspension components: If you don't want a full suspension system, you can still use stiff suspension components such as sway bars, strut braces, and stiff springs to improve stability and reduce body roll.
4. Use wide tires: Wide tires can help to improve grip and stability, particularly in corners. Make sure to choose tires that are appropriate for the type of driving you'll be doing.
5. Consider aerodynamics: Improving the aerodynamics of the car can help to reduce lift and improve stability. This can be achieved by using a spoiler or diffuser, or by designing the body of the car to be more streamlined.

Examples of robots without traditional suspension systems:

1. Segway Robotics Loomo: Loomo is a two-wheeled robot that can be used both indoors and outdoors. It has a self-balancing system that provides stability without the need for a suspension system.
2. TurtleBot3: TurtleBot3 is a small, open-source robot with two wheels that can be used for research, education, and other applications. It does not have a suspension system, but the wheels are designed to provide stability on uneven terrain.
3. KUKA OmniMove: The OmniMove is a mobile platform that can be used for a variety of applications, including logistics and materials handling. It has four wheels that are designed to provide stability and maneuverability without the need for a suspension system.
4. Robomart: Robomart is a self-driving grocery store that uses a four-wheeled robot to deliver groceries to customers. It does not have a suspension system, but the wheels are designed to provide stability on uneven terrain.
5. Adept Lynx: The Lynx is a mobile robot with four wheels that can be used for a variety of applications, including materials handling and inspection. It does not have a suspension system, but the wheels are designed to provide stability and maneuverability on uneven surfaces.

Note that some of these robots may incorporate other technologies, such as active damping or dynamic stabilization, to improve stability and reduce vibrations.

Here are the general steps to obtain independent suspension:

1. Determine the type of independent suspension you want to use: There are several types of independent suspension, including double wishbone, MacPherson strut, and multi-link suspension. Each type has its own advantages and disadvantages, so it's important to choose the one that best suits your needs.
2. Choose the components: Independent suspension typically includes several components, including control arms, shock absorbers, and springs. Choose the components that are appropriate for the type of suspension you have chosen.
3. Design the suspension system: Once you have chosen the type of independent suspension and the components you will use, you need to design the suspension system. This will involve determining the placement of the components and ensuring that the suspension geometry is correct.
4. Fabricate or purchase the components: Once you have designed the suspension system, you will need to fabricate or purchase the components. This may involve welding, machining, or purchasing pre-made components.
5. Install the suspension system: Finally, you will need to install the suspension system on your vehicle. This may involve removing the existing suspension system and installing the new components.

Note that obtaining independent suspension can be a complex and time-consuming process, and may require significant expertise in suspension design and fabrication. It's important to ensure that the suspension system is properly installed and tuned to ensure optimal performance and safety.